International Committee on Global Geological and Environmental Change "GEOCHANGE" *(Munich, Germany)*
Ondokuz Mayıs University *(Samsun, Turkey)*
Halberg Chronobiological Center *(USA, Minneapolis)*
International Academy of Science H&E *(Innsbruck, Austria)*
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SETAC Chemistry and Industry *(Istanbul, Turkey)*
Global Network for the Forecasting of Earthquakes *(GNFE, UK, London)*

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CONTENTS

PLENARY SPEECH

Z.A. Samedzade, E.N. Khalilov
NATURAL CATACLYSMS AS A GLOBAL FACTOR OF INFLUENCE ON THE WORLD ECONOMY 19

E.N. Khalilov
GLOBAL GEOLOGICAL AND ENVIRONMENTAL CHANGE: THREATENING THE STABLE DEVELOPMENT OF CIVILIZATION 20

SPECIAL SECTION

O.V. Martynov, S.A. Shopin, S.P. Kurotchenko, R.V. Parshutin, V.A. Shopin, P.V. Anikeev, J.V. Chapkova
ULF VARIATIONS OF THE GRAVITATIONAL FIELD AND INSTRUMENTATION SYSTEM FOR THEIR REGISTRATION 23

Elchin Khalilov, Vitaly Starostenko, Ahsan Mubarak, Muhammad Qaisar, Rani Sjamsinarsi, Junun Sartohadi, Wahyudi, Cavit Yatman
GLOBAL GRAVITATIONAL EFFECTS BEFORE AND AFTER STRONG M8.9 EARTHQUAKE IN JAPAN ON 11 MARCH 2011 23

O.V. Martynov, S.A. Shopin, S.P. Kurotchenko, R.V. Parshutin, V.A. Shopin, P.V. Anikeev, J.V. Chapkova
EARTHQUAKE PREDICTION USING ULF VARIATIONS OF THE GRAVITATIONAL FIELD 24

Kuang-Jung Chen, Bonbbon Chiu, Cheng-Horng Lin, Jann-Yenq Liu, Kevin Chao
GEOMAGNETIC VARIATIONS BEFORE THE 1999 CHI-CHI EARTHQUAKE (M_W=7.6) 25

P. Kalenda, L. Neumann
EARTHQUAKE PREDICTION – WORLD-WIDE TASK 26

V. Saltykov
SEISMIC NOISE MONITORING: APPLICATION FOR LARGE EARTHQUAKE PREDICTION IN KAMCHATKA 26

V. Chebrov, V. Saltykov, Yu. Serafimova
KAMCHATKA EXPERT COUNCIL FOR EARTHQUAKE FORECASTING: EXPERIENCE AND RESULTS 27

A.A. Emanov, E.V. Leskova, A.F. Emanov, A.F. Fateyev, A.A. Demidova
AFTERSHOCK PROCESS OF CHU EARTHQUAKE 27

A.F. Emanov, A.A. Emanov, E.V. Leskova, A.F. Fateyev
TRIGGER EFFECTS IN DEVELOPMENTOF INDUCED SEISMICITY 28

Ladan Bazgir
WHAT IS AN EARTHQUAKE? 29

M.S. Boughacha, M. Ouyed, M. Idres, A. Bourmatte
STRESS TRANSFER IN NORTHERN ALGERIA AND ADJACENT REGIONS FOR EVENTS M≥6 THROUGH 1980-2004 30

Yu.I. Kolesnikov, E.A. Hogoev
SEISMIC EMISSION FROM ACTIVE ZONE UNDER SURFACE RUPTURE ARISING AFTER STRONG EARTHQUAKE 30

T. Tsvetkova, I. Bugaienko, A. Kendzera, V. Starostenko
MANTLE VELOCITY STRUCTURE UNDER EAST EUROPE AND VRANCEA EARTHQUAKES ... 31

B.B. Kapochkin, N.V. Kucherenko, A.B. Kapochkina, M.B. Kapochkina
SHORT-TERM PREDICTION OF MARINE EARTHQUAKES AND TSUNAMIS 32

I.L. Uchytel, V.N. Jaroshenko, B.B. Kapochkin
SEISMICITY, AS A PHENOMENON OF GLOBAL SCALE 33

N.V. Koronovsky, A.A. Naimark
THE FORECAST OF EARTHQUAKES TODAY: CHALLENGES AND SOLUTIONS 34

Nassir S.N. Al-Arifi
SPATIAL DISTRIBUTION OF MAXIMAL EARTHQUAKE EFFECTS IN THE RED SEA REGION 35

A. Bala, A. Aldea, S. Florin Balan, C. Arion
ASSESSMENT OF THE SEISMIC SITE EFFECTS BASED ON EARTHQUAKE RECORDINGS AND IN SITU BOREHOLE MEASUREMENTS IN BUCHAREST, ROMANIA 35

D. Gospodinov
APPLICABILITY OF THE RESTRICTED EPIDEMIC TYPE AFTERSHOCK SEQUENCE (RETAS) MODEL TO DESCRIBE GENERAL SEISMICITY IN THE AREA OF THE IZMIT M7.4 EARTHQUAKE OF AUGUST 1999 36

Boko Nurdiyanto, Hendri Subakti, I Putu Pudja
INTEGRATION OF GEOPHYSICAL PARAMETERS ANALYSIS IN THE EARTHQUAKE REDICTABILITY 37

Kariche Jugurtha, Boughacha Mohamed Salah
DISPLAYING OF THE FIELDS INDUCED BY A FAULT IN AN INTERACTIVE MODE: APPLICATION TO THE EL-ASNAM EARTHQUAKE (ALGERIA, 10/10/1980, M=7.2) 37

E. Boustan
APPLICATION OF PROBABILISTIC-FUZZY APPROACH IN SEISMIC HAZARD PREDICTION 38

Kubilay Kaptan
REALISTIC SCIENTIFIC GOAL FOR EARTHQUAKE FORECASTING 38

Boyko Iliev
A NEW PRECURSOR FOR PREDICTING EARTHQUAKES 39

I.A. Garagash, A.V. Dubovskaya
MODELING OF STRESS-STRAIN STATE OF THE EARTH'S CRUST OF THE CASPIAN REGION FOR PROGNOSIS OF SEISMIC PROCESS 40

V. Dedenok, A. Tkachenko
MONITORING OF IONOSPHERE PERTURBATIONS PRECEDING HIGH INTENSIVE EARTHQUAKES ON DATA FROM SATELLITE RADIO NAVIGATION SIGNAL RECEIVER NETWORK 40

Sinan Melih Nigdeli
ACTIVE BRACE CONTROL OF FRAME STRUCTURES UNDER EARTHQUAKE EXCITATION ... 41

Sinan Melih Nigdeli, Gebrail Bekdas
OPTIMIZATION OF TUNED MASS DAMPER PARAMETERS FOR STRUCTURES SUBJECTED TO EARTHQUAKES WITH FORWARD DIRECTIVITY 41

L.G. Moskovchenko
MONOFRACTAL ANALYSIS OF THE EARTH CRUST MICROSTRAIN DATA 42

Daya Shanker
EARTHQUAKE PREDICTABILITY? – PRESENT SCENARIO AND FUTURE PROSPECTS IN INDIA AND NEIGHBOURHOOD 43

Li Qinghe
THE POSSIBLE POSITION OF FUTURE LARGE EARTHQUAKE ON THE JIANGSU-SHANDONG SEGMENT OF TAN-LU FAULT ZONE, CHINA 43

A.K. Adamaki , E.E. Papadimitriou, G.M. Tsaklidis, V.G. Karakostas
STATISTICAL ANALYSIS BEFORE AND AFTER STRONG EARTHQUAKES 44

V. Seleznev, A. Bryksin
THE INFLUENCE OF TECHNOGENIC FACTORS ON SEISMICITY IN THE ALLOCATED AREAS OF ALTAY-SAYAN REGION AND NEAR LAKE BAIKA 45

A.S. Alekseev, G.M. Tsibulchik, B.M. Glinsky, V.V. Kovalevsky, M.S. Khairetdinov
VIBROSEISMIC TECHNOLOGY OF DETECTION AND MONITORING OF SEISMIC-VOLCANO-PRONE ZONES 45

Luciano Telesca, Vasile Alcaz, Rasid Burtiev, Ilie Sandu
TIME-CLUSTERING ANALYSIS OF THE 1978-2008 SUB-CRUSTAL SEISMICITY OF VRANCEA REGION 46

M.S. Khairetdinov, G.M. Voskoboinikova, G.F. Sedukhina
INFORMATIVE PARAMETERS OF VIBROSEISMIC WAVE FIELDS IN FRACTURED AND FLUID-SATURATED MEDIA 47

Maryam Safarshahi, Hossein Hamzehloo, Mehdi Rezapour
ESTIMATION OF Q_S AND SPECTRAL DECAY PARAMETER IN SOUTHEASTERN IRAN, USING STRONG MOTION DATA OF RIGAN EARTHQUAKES (2010 & 2011) 47

N.S. Buktukov, G.P. Metaksa
HYPOTHESIS OF ORIGIN OF EARTHQUAKES AS A RESULT OF ANTHROPOGENIC MASS TRANSFER 48

A.Ye. Vorobyev, G.P. Metaksa, G.Zh. Moldabaeva
FORECASTING OF ANTHROPOGENIC EARTHQUAKES AND LARGE-SCALE EVIATIONS OF THE ENVIRONMENT FROM THE BALANCE 50

R.A. Keramova, O.O. Osmanova, P.A. Abdulrazagova
DIFFERENTIATION OF LOCATION OF SEISMIC SOURCES IN GECHEMICAL FIELDS FLUIDS 51

R.A. Keramova
NEW TECHNOLOGY OF OPERATIVE EVALUATION OF SEISMIC SITUATION ON GEOCHEMICAL FIELDS OF FLUIDS OF AZERBAIJAN 52

S. Mukhamediev
ON THE PROBLEM OF STRONG EARTHQUAKES PREVENTION 53

Mostafa Allameh Zadeh
COMPLEX NETWORKS OF EARTHQUAKES AND AFTERSHOCKS IN TEHRAN REGION 54

M. Djeddi, Keteb Rachid
AVO ANALYSIS APPLICATION ON 3 D SEISMIC DATA 54

V. Starostenko, O. Kendzera, O. Legostaeva, L. Farfuliak
SEISMICITY AND SEISMIC PROTECTION IN UKRAINE 55

Rexhep Koci, Rrezart Bozo
THE STRONG EARTHQUAKES IN ALBANIA IN THE PERIOD 2004-2009 AND THE PROCEDURE FOR THEIR MACRO SEISMIC DATA COLLECTION 55

Rexhep Koci, Rrezart Bozo
GEODYNAMIC AND SEISMIC RISK IN ALBANIA TERRITORY 57

Wahyudi, Daryono
CORRELATION BETWEEN SEISMIC VULNERABILITY INDEX AND DAMAGE BELT IN BANTUL GRABEN, YOGYAKARTA SPECIAL PROVINCE, INDONESIA 58

S.I. Kabanikhin, I.V. Marinin, O.I. Krivorotko, V. Komarov, Karas Adel, Khidasheli David
NEW METHODS OF EARTHQUAKES AND TSUNAMI SOURCES DETERMINING, SIMULATION, MODELING AND VISUALIZATION 59

M. Awais, N. Ahmad, M. Shahid, M. Irfan, M. Qaisar
GRAVITY ANOMALIES AS EARTHQUAKE PRECURSORS RECORDED AT ATROPATENA NETWORK 60

N. Ahmad, Zeeshan Jilani, M. Awais, M. Qaisar
SATELLITE BASED STUDY OF THERMAL INFRARED (TIR) ANOMALY RECORDED BEFORE ASTOR VALLEY (PAKISTAN) EARTHQUAKES 61

S.I. Kabanikhin , B.G. Mikhailenko, A. Hasanov , A. Karas , D. Khidasheli , A.S. Belonosov , I.V. Marinin
NEW APPROACHES TO EARTHQUAKES PREDICTION, SIMULATION AND VISUALIZATION .. 62

SECTION 1. Earth Sciences
SUBSECTION - Geology and Geophysics

A. Mohsen, G. Asch, J. Mechie, R. Kind, R. Hofstetter, M. Weber, M. Stiller, K. Abu-Ayyash
CRUSTAL STRUCTURE OF THE DEAD SEA BASIN (DSB) FROM A RECEIVER FUNCTION ANALYSIS 63

M. Sadaoui, O. Naioua, R. Chaouchi
PETROPHYSICAL PROPERTIES AND COMPARTMENTALIZATION BY GEOCHEMICAL APPROACH OF TANK TAGI. BASIN OF BERKINE. SAHARIAN PLATFORM 64

A.G. Rodnikov
ELABORATION OF THE INTERDISCIPLINARY DATABASE FOR THE CONSTRUCTION OF THE GEODYNAMIC MODELS OF DEEP STRUCTURE OF THE NATURE DISASTER REGIONS (NEFTEGORSK EARTHQUAKE, SAKHALIN ISLAND) 64

T. Sh. Khalilova, E.N. Khalilov
TRACES OF THE ANCIENT CIVILIZATION AT THE BOTTOM OF CASPIAN SEA 65

T. Tsutsunava, I. Gamkrelidze, D. Shengelia
PRE-ALPINE GEODYNAMICS, MULTI-STAGE REGIONAL METAMORPHISM AND GRANITOID MAGMATISM OF THE CAUCASUS 66

T. Tsutsunava, F. Maisadze
GEOLOGICAL CATASTROPHICS AND EVENT DEPOSITS 67

R. Glavcheva, M. Matova
INCREASED SEISMIC RISK: DUE TO EARTHQUAKES OR THE HUMAN ACTIVITIES? 68

V.S. Seleznev, A.V. Liseikin, A.A. Bryksin
SEISMOLOGICAL MONITORING OF SAYANO-SHUSHENSKAYA HYDROELECTRIC POWER STATION 69

V.S. Seleznev, V.M. Soloviev, A.F. Emanov, A.S. Salnikov, V.N. Kashun, A.V. Liseikin, S.A. Elagin, I.E. Romanenko, A.E. Shenmayer
DEEP SEISMIC RESEARCHES WITH USING OF HIGH-POWER VIBRATION SOURCES AT THE PROFILES IN THE EAST OF RUSSIA 70

V.M. Soloviev, V.S. Seleznev, A.F. Emanov, V.N. Kashun, S.A. Elagin, I.E. Romanenko, A.E. Shenmayer, N.A. Serezhnikov
ACTIVE SEISMIC MONITORING USING HIGH-POWER MOVEABLE 40-TONS VIBRATION SOURCES – RESULTS, OUTLOOKS 71

V.M. Soloviev, A.S. Salnikov, V.Y. Timofeev, S.V. Shibaev, A.F. Petrov, A.V. Liseikin, A.E. Shenmayer, V.V. Chechelnickiy
MODERN DATA ON DEEP STRUCTURE AND SEISMICITY OF JOINT AREA OF EURASIAN, NORTH AMERICAN AND OKHOTOMORSK PLATES 72

A.S. Salnikov, A.S. Efimov, V.L. Kuznetsov
SEISMIC INVESTIGATION OF THE EARTH'S CRUST OF A UNIQUE PROVINCE OF CENTRAL ASIA (ALTAI) WITH DEEP SEISMIC SOUNDING 73

Dilshad Hussain, Abu Taleb
NATURAL DISASTERS IN THE INDIAN OCEAN REGION 74

Mohamed Said Guettouche
MODELING AND ASSESSMENT OF LANDSLIDES RISK. APPLICATION ON THE SLOPES OF THE ALGERIAN TELL (ALGERIA) 75

H.T. Hagverdiyev, R.A. Akhundov
CATACLYSMS: REASONS OF THE ORIGIN AND THE WAYS OF PROTECTION FROM THEM ... 75

H.T. Hagverdiyev
A NEW GEODYNAMIC MODEL FOR FORMATION AND EVOLUTION OF THE EARTH CRUST DEEP FAULTS 76

O.K. Mironov
PARETO OPTIMUM FOR COMPILING INTEGRAL HAZARD MAPS 77

A. Bala, A. Aldea, B. Grecu, D. Hannich
METHODS TO ASSESS THE SITE EFFECTS BASED ON GEOPHYSICAL MEASUREMENTS IN BUCHAREST CITY, ROMANIA 78

V.I. Popkov
COLLISION TECTONICS OF THE NORTH-WESTERN CAUCASUS 78

Y.F. Kopnichev, I.N. Sokolova
RING-SHAPED SEISMICITY WITHIN VARIOUS DEPTH RANGES IN THE REGION OF KURIL AND KAMCHATKA 79

Y F. Kopnichev, I.N. Sokolova
RING-SHAPED SEISMICITY STRUCTURES AND EARTHQUAKE OF 11/03/2011 (MW= 9.0) IN THE REGION OF THE NORTH-EASTERN JAPAN 79

K.M. Leptokaropoulos, E.E. Papadimitriou, B. Orlecka-Sikora, V.G. Karakostas
MODELING SEISMICITY RATE CHANGES IN THE AEGEAN AREA AFFECTED BY STRESS FIELD CHANGES 80

M. Alper Sengul, Selda Altuncu Poyraz
SEISMICITY AND RISK POTENTIAL OF THRACE REGION, NOW TURKEY 81

Jestin Nordin, Andrew Charleson
TSUNAMI RESPONSIVE ARCHITECTURE: THE USE OF MULTI-GRID COUPLED TSUNAMI MODEL PROGRAMME TO REDEFINE COASTAL ARCHITECTURAL DESIGN STRATEGIES AND DECISION MAKING 81

O. Nikonorova
SEISMIC ACTIVITY IN THE SOUTHERN PREURALS 82

V.B. Svalova
MECHANICAL-MATHEMATICAL MODELING AND MONITORING FOR LANDSLIDES 82

R.I. Krivonosov
RUSSIAN NATIONAL SYSTEM OF MONITORING GEOPHYSICAL PROCESSES AND REAL TIME VARIATIONS THEREOF 83

Ch. Gkarlaouni, V. Karakostas, E. Papadimitriou, A. Kilias
SEISM TECTONIC PROPERTIES WITH IMPLICATIONS ON FAULTING IDENTIFICATION REVEALED FROM RECENT SEISMICITY IN MYGDONIA BASIN (MACEDONIA, N. GREECE) 84

A.A. Kiratzi
THE 1912 GANOS EARTHQUAKE: SOURCE CONSTRAINTS USING GROUND MOTION SIMULATIONS 85

E. Archipova, O. Anisimova
OUTER INFLUENCES AFFECT TO ANATOLY SEISMICITY 86

M. Nesterenko, O. Nikonorova
TECHNIQUE OF GEODYNAMIC MONITORING FOR HYDROCARBON DEPOSITS 87

B. Theilen-Willige, I.D. Papadopoulou, P. Savvaidis, I.N. Tziavos
USE OF REMOTE SENSING AND GIS METHODS FOR MITIGATING THE IMPACT OF EARTHQUAKES IN CITIES 87

R. Motenko, E. Kuznetsova
THE CHANGING OF DEPOSIT PROPERTIES DURING VOLCANIC ASHES AGEING (KAMCHATKA) 88

K.S. Murty
NATURAL CATACLYSMS AND INDIA 89

T.O. Abdulmutalimova, B.A. Revich
THE GEOECOLOGICAL PROBLEMS OF NATURAL ARSENIC POISONING OF DRINKING WATER IN DAGHESTAN REPUBLIC 90

A. Marchuk
METHODS FOR COMPUTING DIRECT AND INVERSE PROBLEMS OF TSUNAMI KINEMATICS 91

M. Moharrampur, M. Jahangir Bakht, M. Sadeghi Moghaddam
PREPARATION OF SEISMIC HAZARD MAP IN QAZVIN PROVINCE 91

Nikos Efthimiu
AVERTING VOLCANIC WINTER AND OTHER PREPARATIONS 92

Esmaiel Darvishi
PETROLOGY OF VOLCANIC ROCKS IN SOUTH AZNA 92

I.P. Gamkrelidze, D.M. Shengelia, T.N. Tsutsunava
PRE-ALPINE GEODYNAMICS OF THE CAUCASUS, MULT-STAGE REGIONAL METAMORPHISM AND GRANITOID MAGMATISM 93

F. Maisadze, T. Tsutsunava
GEOLOGICAL CATASTROPHES AND EVENT DEPOSITS 93

Z.R. Gasimov
THE METHOD OF INTERPRETING THE SPECTRAL CHARACTERISTICS OF OBJECTS AT DIFFERENT TIME WITH HIGH RESOLUTION SATELLITE IMAGES 94

Karim Solaimani, Ali Goharnejad
INVESTIGATION OF OPTIMIZED WATER HARVESTING REGIONS BASED ON GIS (A CASE STUDY; NAZLOOCHAY BASIN, WESTERN AZERBAIJAN-IRAN) 94

Karim Solaimani, Fatemeh Shokrian
ECOTONENE DETECTION BASED ON LANDSAT ETM^{+} DATA (A CASE STUDY; NORTHERN IRAN) 95

Dehbandi, Reza, Aftabi, Alijan, Damangir, Abbasali, Gharibhosseini, Saeed
NATURAL AND ENVIRONMENTAL MINERALOGY OF EOLIAN SEDIMENTS, INDOOR DUSTS AND ROAD DUSTS IN KERMAN URBAN ENVIRONMENT 95

Paiboon Nuannin
A STUDY OF *b*-VALUE PRECURSORS APPLIED TO THE ANDAMAN-SUMATRA REGION 96

Ildus Nurgaliev
CATACLYSMS AS UNIVERSAL PHENOMENA *96*

SUBSECTION - Atmosphere and Climate Change

A.N. Gruzdev
WEEKLY CYCLE IN THE ATMOSPHERE: NATURAL VERSUS ANTHROPOGENIC ORIGIN 97

A.N. Gruzdev
QUASI-DECADAL OZONE AND NITROGEN DIOXIDE VARIATIONS AND SOLAR ACTIVITY ... 98

Christoph J. Blasi
THE HYDROLOGICAL CYCLE AND NATURAL CATACLYSMS IN THE MODERN CIVILIZATION 99

A.L. Vetrov
A NUMERICAL STUDY OF THE EXPLOSIVE CYCLONES: ROLE OF THE AVAILABLE POTENTIAL ENERGY 100

I.V. Kozlyakova, I.A. Kozhevnikova, O.N. Eremina, Yu.A. Azyukina
THE STUDY OF SINKHOLES IN THE MOSCOW TERRITORY 101

T. Kuderina, A. Voropaev
TIME AND SPATIAL ASPECTS OF NATURAL CATASTROPHES IN RUSSIAN ANDSCAPES AIR AEROSOL AS AN INDICATOR OF CATASTROPHIC PROCESSES IN RUSSIAN LANDSCAPES 102

R.N. Mahmudov
THE IMPACTS OF GLOBAL CLIMATE CHANGES ON THE HYDRO METEOROLOGICAL CONDITIONS OF AZERBAIJAN REPUBLIC 103

T. Basilashvili, M. Tatishvili, M. Elizbarashvili, S. Elizbarashvili, J. Tabatadze, M. Janelidze
CATASTROPHIC EVENTS ON THE BLACK SEA RIVERS AGAINST THE BACKGROUND OF GLOBAL CLIMATE CHANGE, THEIR DEVELOPMENT TENDENCIES AND ADAPTATION ACTIVITIES 104

SECTION 2. Economy, Finances, International Law

L.Yu. Novikova, V.N. Djubin, I.G. Loskutov, E.V. Zuev, I.V. Seferova
THE FORECAST OF DYNAMICS OF ECONOMIC VALUABLE CHARACTERS OF VARIETIES OF GRAIN CROPS IN THE CONDITIONS OF CLIMATE CHANGE 105

Ozden Timurlenk, Kubilay Kaptan
EFFECTS OF NATURAL DISASTERS ON ECONOMY, TURKEY CASE 106

Saied Jafarzadeh, Mohd Nizam Ab Rahman, Behzad Nadi, Elmira Shamshiry
OPTIMIZATION OF EXPENSES FOR MANUFACTURING COMPANY BY STATISTICAL MODEL 106

L. Petrashko
BUSINESS SCHOOLS' GLOBAL RESPONSIBLE LEADERSHIP 107

S.I. Adinyaev, E.A. Karslyanc
INTERNATIONAL HUMANITARIAN DISASTER AND THE INTERNATIONAL UMANITARIAN AID 107

T.V. Maslova, V.P. Maslov, A.B. Maslov
BOSE CONDENSATE AS A CATASTROPHE OF THE MEASURE OF KULLBACK-LEIBLER INFORMATION AND DEBT CRISIS 108

Seyed Reza Eftekhari
DEBATES ON LEGITIMACY AND COOPERATION: INTERNATIONAL LAW OF SOCIO-ECONOMIC INSTITUTIONS 109

F.G. Damirov
NEW CHALLENGES IN NATURAL HAZARD INSURANCE.
SOME THOUGHTS IN THE AFTERMATH OF THE 2010 ICELANDIC VOLCANO CRISIS 110

SECTION 3. Cosmic-terrestrial relations, chronobiology, BIOCOS program

F. Halberg, G. Cornelissen, G.S. Katinas, P. Grambsch, D. Hillman, O. Schwartzkopff
META-ANALYTIC HISTORY OF CONGRUENT CYCLES IN SPACE WEATHER, THE HUMAN MIND AND OTHER AFFAIRS 111

G.Cornelissen, H.Wendt, F. Halberg
CYCLES IN THE OCCURRENCE OF MAJOR EARTHQUAKES 112

Y. Watanabe, F. Halberg, K. Otsuka, G. Cornelissen
PHYSIOLOGICAL CHANGES IN RELATION TO THE 2011 EAST JAPAN EARTHQUAKE 113

E.V. Syutkina, G. Cornelissen, M. Mitish, M.V. Narogan, A.V. Surgyk, O.S. Krylova, A. Masalov, O. Schwartzkopff , F. Halberg
NEONATES AS PARTICULARLY SENSITIVE MAGNETORECEPTORS? 114

F. Halberg, D. Hillman, O. Schwartzkopff, T. Breus, E.V. Syutkina, A. Masalov, G.Cornelissen
PUTATIVE SOLAR SIGNATURES CAN DIFFER AMONG VARIABLES AND CIRCADIAN ENDPOINTS AND IN INDIVIDUALS VS. POPULATIONS 115

F. Halberg, S. Sello, G. Cornelissen
PARA-TRIDECADAL COMPONENT IN NEONATAL ANTHROPOMETRY IN MOSCOW BY THE LATE BORIS NIKITYUK 116

F. Halberg, R.B. Sothern, D. Hillman, G. Cornelissen
PARA-TRIDECADAL COMPONENTS CHARACTERIZE PSYCHOPHYSIOLOGICAL VARIABLES OF A CLINICALLY HEALTHY MAN 117

R.B. Sothern., F. Halberg, D. Hillman, G. Cornelissen
INFRADIAN COMPONENTS GAUGE AGING OF THE CIRCULATION AND RESPIRATION IN SELF-MEASUREMENTS BY A HEALTHY MAN FOR OVER FOUR DECADES 118

G. Cornelissen, F. DeMeester, A. Wilczynska-Kwiatek, F. Halberg
CHANGES WITH AGE IN THE RELATIVE PROMINENCE OF WEEKLY-TO-DAILY AMPLITUDE RATIO OF BLOOD PRESSURE 119

S. Chavan, G. Cornelissen, D. Hillman, F. Halberg
CROSS-SPECTRAL COHERENCES OF TERRORISM AND SUNSPOTS 120

Y. Watanabe, G. Cornelissen, D. Hillman, K. Otsuka, F. Halberg
LONG PERIODS IN 23 YEARS OF AROUND-THE-CLOCK AUTOMATIC MEASUREMENTS OF HUMAN BLOOD PRESSURE AND PULSE 121

Y. Watanabe, G. Cornelissen, D. Hillman, K. Otsuka, F. Halberg
TRANSITION FROM SUNDAY-ONLY-MESOR-NORMOTENSION TO SUNDAY-INCLUSIVE-MESOR-HYPERTENSION 122

G.S. Katinas, G. Cornelissen, S. Sanchez de la Peña, Y. Watanabe, J. Halberg, F. Halberg
CEREBRO-CARDIOVASCULAR RISK ASSESSMENT NEEDS CHRONOBIOLOGICAL ANALYSES 123

J. Costella, F. Halberg, D. Hillman, M. Mikulecky, G. Cornelissen
MULTIPLE CIRCADIAN PERIODS CHARACTERIZES SLEEP-WAKEFULNESS OF A CLINICALLY HEALTHY MAN ON A SELF-SELECTED LIVING ROUTINE 125

J. Czaplicki, G. Cornelissen, F. Halberg, D. Hillman, J. Finley, F. Thomas, T. Kino, G. Chrousos
DIFFERENT RESPONSES OF BLOOD PRESSURE AND HEART RATE TO LUNAR AND SOLAR DAYS DURING ADYNAMIC DEPRESSION 126

G. Cornelissen, F. Halberg, O. Schwartzkopff
COMPETING TIDAL CIRCADIAN LUNISOLAR RESONANCE IN AN ARCHAEON 127

K. Hecht, K. Otsuka, F. Halberg, G. Cornelissen
ASSESSMENT OF ANY EFFECT OF DEPRESSION ON BLOOD PRESSURE 128
F. Halberg, G. Cornelissen, V. Brandes, O. Schwartzkopff
INDISPENSABLE 24/7 CHRONOMICALLY-ASSESSED ABPM REPLACES CASUAL OFFICE BLOOD PRESSURE SNAPSHOTS 129

N. Cegielska, M. el-Khoury, G. Cornelissen, J. Czaplick, D. Hillman, J. Finley, F. Thomas, T. Kino, G. Chrousos, R. McCraty, E. Ilyia, F. Halberg
ADYNAMIC DEPRESSION ASSOCIATED WITH CIRCADIAN LENGTHENING (STRONG LUNAR PULL) OF ENDOCRINES, 24-SYNCHRONIZED IN WELLNESS 130

M. el-Khoury, N. Cegielska, G. Cornelissen, J. Czaplicki, D. Hillman, J. Finley, F. Thomas, T. Kino, G. Chrousos, R. McCraty, E. Ilyia, F. Halberg
SOLAR FLARES' CIS-HALF-YEAR (~5-MONTH-LONG) QUINMENSAL CYCLE, CIRCADIANS, AND PERHAPS THE SOLAR WIND'S FAR-TRANSYEAR ALL CHARACTERIZE SALIVARY CORTISOL 131

G. Cornelissen, V.Brandes, F. Halberg
SYSTOLIC BLOOD PRESSURE RESPONDS TO LISTENING TO MUSIC IN A CIRCADIAN STAGE-DEPENDENT FASHION 132

G. Cornelissen, K. Otsuka, F. Halberg
RELIABLE DIAGNOSIS OF VASCULAR VARIABILITY DISORDERS (VVDS) REQUIRES WEEK-LONG ABPM RECORDS 133

V. Brandes, G. Cornelissen, D. Hillman, E. Ilyia, N. Cegielska, M. el-Khoury, J. Strestik, J. Finley, F. Thomas, T. Kino, G.P. Chrousos, R.B. Singh, M. Mikulecky, F. Halberg
SANOSON MUSIC THERAPY OF UNWELLNESS IN A CASE OF RECURRENT ADYNAMIC DEPRESSION WITH CIRCADIAN DIFREQUENTIA 134

O. Schwartzkopff, G. Cornelissen, E. Nolley, L.A. Beaty, F. Halberg
AN AUTOMATIC INTERNATIONAL MULTILINGUAL CHRONOMIC WEBSITE FOR C-ABPM ... 135

Y. Watanabe, F. Halberg, K. Otsuka, G. Cornelissen
INDIVIDUALIZED CHRONOTHERAPY OF BLOOD PRESSURE 136

F. Watanabe, G. Cornelissen, Y. Watanabe, K. Otsuka, F. Halberg
SELF-MONITORING OF A BOY'S BLOOD PRESSURE DURING 10 YEARS REVEALS TRANSYEAR DOMINATING OVER CALENDAR YEAR 136

Vera Brandes, Germaine Cornélissen, Franz Halberg.
ACUTE AND CHRONIC DEPRESSION, ANXIETY, PANIC DISORDER, POST TRAUMATIC STRESS – MUSIC-BASED AUDITORY STIMULATION CAN HELP RESTORE MENTAL AND PHYSICAL HEALTH 137

Lucanne Magill
MUSIC THERAPY AND GLOBAL CRISES 138

Abdullah Alabdulgader, Franz Halberg
INNOVATIVE BLOOD PRESSURE MEASUREMENTS FOR PROPER RISK STRATIFICATION CONSIDERING SPACE WEATHER EFFECTS 139

Abdullah Alabdulgader, Rollin McCraty.
EFFECTS OF SOLAR ACTIVITY AND THE EARTH'S MAGNETIC FIELD ON SOCIAL UPRISINGS, TERRORISM, AND HUMAN HEALTH: AN EARLY 140

Stathis Ilonidis, Junwei Zhao, Alexander Kosovichev.
DETECTION OF EMERGING SUNSPOT REGIONS IN THE SOLAR INTERIOR 141

A.V. Karkov
THE TERM ASTROLOGY AS SYSTEM TO SAFETY 141

M.S. Gigolashvili
VARIATIONS OF THE TOTAL SOLAR AND SPECTRAL IRRADIANCE DURING UNUSUAL DECREASING PHASE OF THE SOLAR CYCLE 23 142

B.S. Aslanov
INFLUENCE OF LUNAR-SOLAR TIDES ON THE GEODYNAMIC PROCESSES AT THE MAXIMUM APPROACH OF THE MOON TO THE EARTH 142

N. Kapanadze, M. Gigolashvili
INVESTIGATION OF SELECTED NARROW BANDS INTENSITY VARIATIONS OF THE SOLAR SPECTRAL IRRADIANCE DURING YEARS 1981-2008 144

SECTION 4. Health care

Mona Khaleghy Rad, Alexander Brenning, Stephen G. Evans
SPATIAL ANALYSIS OF EARTHQUAKE FATALITIES IN THE MIDDLE EAST, 1970-2008 145

Bunthose Rungpesh, Bunthose Pyrush, *Areerat Phlitnontkiat*, *Buaklai Tankimhong*, *Piangdao Khamnuengsitthi*
FACTORS AFFECTING THE FIRST ATTEMPT STANDARD TEST ACHIEVEMENT FOR PUBLIC HEALTH STUDENTS IN THAILAND 146

N.K. Belisheva, R.G. Novoseltsev, L.V.Talykova, D.A. Petrashova, S.D. Cherney, R.E. Michaylov, A.N. Vinogradov, A.A. Martynova, T.S. Pecar
DETERMINATION OF THE INCIDENCE OF DEATH AND CONGENITAL MALFORMATIONS BY VARIATIONS OF GEOCOSMICAL AGENTS 146

Linda M. Whiteford, Graham A. Tobin, Eric C. Jones, Arthur Murphy
VOLCANIC ERUPTIONS AND URBAN LANDSLIDES: HEALTH FOLLOWING DISASTERS 147

N.T. Dzhaynakbaev, A.R. Ryskulova
MOBILE CELL MEDICAL COMPLEX, A NEW FORM OF IMPROVING PRIMARY HEALTH CARE TO PREVENT AND REDUCE THE RISK OF THE CONSEQUENCES OF EMERGENCIES AND NATURAL DISASTERS 148

E.G. Novoselova
ZEOLITE-CONTAINING PRODUCTS "LITOVIT" SERIES. SORPTION ACTIVITY STUDIES 149

T.I. Novoselova
USAGE OF THE PRODUCTS "LITOVIT" SERIES IN MULTIMODALUTY TREATMENT OF PATIENTS WITH BURNS 150

T.I. Novoselova
ZEOLITE-CONTAINING PRODUCTS "LITOVIT" SERIES ADAPTATION OF ORGANISMS IN HIGH LOAD CONDITIONS 151

E.G. Novoselova
ASSESSING MEDICAL AND BIOLOGICAL VALUE OF 'LITOVIT' SERIES PRODUCTS 152

N.V. Abdullayeva, M.S. Kasimov, F.E. Sadikhova, A.K. Agadzhanova
«VIRAL-BACTERIAL MIXED INFECTIONS AND THEIRS CLINICAL AND CYTOMORPHOLOGICAL APPEARANCE» 153

F.E. Sadikhova, G.A. Guliyeva
CONCERNING ISSUES, ASSOCIATED WITH SPREAD AND INDICATION OF VIRUS FLORA IN AQUEOUS MEDIUMS 153

S.A. Muradhanova, T.Sh. Khalilova
THE RELEVANCE OF AZEOMED IN MEDICINE 155

S.M. Ibragimova, T.Sh. Khalilova
ANTHRAX AND THE POSSIBILITY OF ADSORPTION OF NATURAL ZEOLITE 155

Sh.T. Shikhaliyeva, T.Sh. Khalilova
APPLICATION OF NATURAL ZEOLITE "AZEOMED" AS AN ADSORBENT OF CYTOMEGALOVIRUSES 155

M.A. Rajabov, F.E. Sadykhova, T.Sh. Khalilova
ABOUT THE PROBLEM Y.ENTEROCOLITICA 156

Yusuf Sait Turkan, Murat Anbarci
AN EXAMINATION OF WORK ACCIDENTS IN THE TURKISH CONSTRUCTION SECTOR USING FAILURE MODE AND EFFECT ANALYSIS AND THE DEVELOPMENT OF A SUSTAINABLE MODEL FOR MINIMIZING ACCIDENTS 157

N.T. Dzhaynakbaev, A.R. Ryskulova
MOBILE CELL MEDICAL COMPLEX, A NEW FORM OF IMPROVING PRIMARY HEALTH CARE TO PREVENT AND REDUCE THE RISK OF THE CONSEQUENCES OF EMERGENCIES AND NATURAL DISASTERS 157

Kh.I. Ibadova, T.Sh. Khalilova
TRACE ELEMENTS IN MEDICINE 158

A. Panichev, K. Golokhvast
LITHOPHAGIAL METHODS ADAPTATION TO ADVERS ENVIRONMENTAL FACTORS 160

L.F. Rzayeva, T.Sh. Khalilova, F.E. Sadikhova
CORRECTION OF DYSBACTERIOSIS IN APPLICATION OF AZEOMED NATURAL ZEOLITE 162

T.S. Bahareva
PROJECT "GLOBAL SAFETY SYSTEMS". LONG-TERM SURVIVAL DURING NATURAL CALAMITY AND ANTHROPOGENIC DISASTER..... 162

SECTION 5. Emergency management and communication systems

A.M. Abbasov, E.N. Khalilov
SPECIAL SYSTEM OF INFORMATION TRANSFER TO NATURAL DISASTER AREAS "SatPag" .. 164

J.N. Imamalieva, T.J. Hasanova
NATURAL DISASTERS AND ACTS OF THE POPULATION TO ELIMINATE THE CONSEQUENCES 165

Y. Smara
REMOTE SENSING TECHNOLOGIES APPLIED TO DISASTERS MANAGEMENT IN ALGERIA ... 165

V.A. Aliyev, R.N. Mahmudov, M.Yu. Yusifov, S.G. Nabiyeva, A.A. Ahmedov, E.K. Gafarov
MINGECHEVIR EMBANKMENT DAM COLLAPSE: CATASTROPHIC RISK ANALYSIS AND MANAGEMENT 166

Safar Ghaedrahmati, R. Ghaneie, A. Bagheri
AN ANALYSIS OF IRAN'S CITIES DISTRIBUTIONS IN RELATED TO EARTHQUAKE HAZARD 167

N.A. Babakhanov, M. Musayeva
FLOOD FIGHTING METHODS IN THE KURA AND ARAZ RIVERS 168

N.A. Babakhanov, I.G. Gasimov
EFFECTS OF NATURAL CALAMITIES ON THE AZERBAIJAN TRANSPORT SYSTEM 168

V.I. Osipov, N.A. Rumyantseva
NATURAL RISKS MANAGEMENT 169

V. Burova, V. Pyrchenko
THE MAP OF SOCIAL RISK OF RUSSIA FROM THE HAZARDOUS NATURAL PROCESSES AS THE TOOL OF CONSEQUENCES' REDUCTION FROM EMERGENCY SITUATIONS 170

G. Batrak, S. Semenov, S. Seleznev, I. Galitskaya
CONSIDERATION OF EXTREME HYDRO-GEOLOGICAL EVENTS IN NUMERICAL FORECASTS OF HYDRO-GEOLOGICAL CONDITIONS CHANGE IN THE TERRITORY OF IMPORTANT INFRASTRUCTURE OBJECTS 172

M. Alper Sengul
MAIN PROBLEMS ON COMMUNITY BASED DISASTER EDUCATION IN TURKEY 173

Graham A. Tobin, Linda M. Whiteford, Arthur Murphy, Eric C. Jones
A SOCIAL NETWORK ANALYSIS OF RESILIENCE IN CHRONIC HAZARD SETTINGS 173

El Sayed, El Gammal
IMPACT OF GEOENVIRONMENTAL HAZARDS IN EAST CAIRO, EGYPT 174

Sedigheh Lotfi
URBAN FLOOD HAZARD ZONATION IN THE CITY OF BABOLSAR, IRAN 175

M. Mitrovic, Z. Kovacevic, M. Bojovic, A. Ostojic
ASSESSMENT OF THE EXENT OF DANGER TO DAMS IN NORTHEAST ALGERIA FROM SEISMIC AND RELATED FLOOD HAZARD 176

I.V. Galitskaya, G.I. Batrak, I.A. Kostikova
ASSESSMENT OF HAZARD AND RISK, CAUSED BY GROUNDWATER CONTAMINATION IN THE URBAN TERRITORY IN THE EXTREME EMERGENCY 176

R.G. Ilyazov
FOOD SAFETY IN TERMS OF GLOBAL CLIMATE CHANGE AND TECHNOGENESIS: ACTUAL ISSUES AND WAYS OF THEIR SOLUTION 177

R.G. Ilyazov
MANMADE CATASTROPHE OF XX CENTURY (CHERNOBYL, 1986): PHILOSOPHIC MORAL AND COUNTERMEASURES 179

R. Aghazadeh
GLOBALIZATION AND MODERN URBAN-PLANNING POLICY 181

P. Thanapackiam, O.S. Khailrulmaini, A.G. Fauza
URBAN SLOPE FAILURE THREAT AND PEOPLE-FRIENDLY EARLY WARNING SYSTEM IN THE KLANG VALLEY REGION MALAYSIA 182

Rahman Tafahomi
APPLICATION OF URBAN DESIGN TO VITALIZE THE LOST WATERFRONTS IN DROUGHT SITUATION OF IRAN MEGACITIES 182

Mehmet Fatih Doker, Cem Kırlangıcoglu
DISASTER MANAGEMENT IN ISTANBUL RAILWAYS 183

V.A. Menshikov, S.V. Cherkas
IGMASS AS A TOOL FOR EVOLVING GLOBAL AND REGIONAL DISASTER SECURITY INFORMATION AREAS 183

V.A. Menshikov, S.V. Cherkas
INTERNATIONAL GLOBAL MONITORING AEROSPACE SYSTEM IGMASS – NEW APPROACH TO THE DISASTER MANAGEMENT ISSUE 185

E. Ahmadov, I. Valiyev, N.Talibov
INTERNET AS A TOOL FOR FORMING GLOBAL NETWORK FOR PREVENTION AND COMBATING THE EFFECTS OF GLOBAL NATURAL DISASTERS 186

Aigul Niyazgulova
ALMATY – SEISMIC AND MUDFLOW ZONE 186

SECTION 6. Construction

E.N. Khalilov, F.G. Damirov
NEW TECHNOLOGY OF SEISMIC STAIBLE CONSTRACTION "DANCING BUILDING TECHNOLOGY" 188

S. Mamedov, T. Hasanova, J. Imamaliyeva
EXPERIMENTAL RESEARCH OF THE DYNAMIC PARAMETERS OF HIGH-RISE SKELETON-TYPE BUILDINGS AT VIBRATING SEISMIC LOADINGS 189

Cevdet Emin Ekinci
THE ELEMENTS OF BIOHARMOLOGICAL BUILDING DESIGN 189

O.M. Salamov, A.M. Hashimov
UNDERGROUND METALLIC EQUIPMENT'S CATHODIC PROTECTION FROM ELECTROCHEMICAL CORROSION USING SOLAR ENERGY 190

T.A. Laniyan, A.F. Abimbola, M.K. C Sridhar
GEOCHEMICAL EVALUATION OF ARSENIC IN EFFLUENTS, SURFACE AND GROUNDWATER IN IBADAN METROPOLIS AND POSSIBLE REMEDIATION METHODS..... 191

I.V. Kozlyakova, I.P. Balobanov, N.G. Anisimova
ASSESSMENT OF RISK CAUSED BY THE NATURAL HAZARDS AT THE SANATORIUM CONSTRUCTION SITE IN THE COASTAL ZONE OF THE BLACK SEA, THE PITSUNDA PENINSULA 192

F. Aptikaev, O. Erteleva, Baruah Saurabh, Joshi Anand
ESTIMATION OF SEISMIC TREATMENTS IN HIMALAY REGIONS OF INDIA USING THE STATISTIC OF THE EMPIRICAL DATA 193

F. Aptikaev
CONSTRUCTION SAFETY AND BUILDING CODES 194

Nadia Tahernia, Noorbakhsh Mirzaei
PROBABILISTIC SEISMIC HAZARD ASSESSMENT OF METROPOLITAN TEHRAN 194

Nadia Tahernia, Morteza Khodabin
STATISTICAL FEATURES OF EARTHQUAKE WAITING TIMES 195

Sh.A. Mamedov, T.J. Hasanova
RESEARCH OF MOVEMENT CYLINDRICAL INCLUSIONS IN THE VISCOELASTIC MEDIUM DESCRIBED MODEL FOIGHT 195

T. Musabaev, T. Kayupov
THE NONLINEAR THEORY OF INTERACTION UNDERGROUND CONSTRUCTIONS WITH A SOIL ROCK UNDER VARIOUS EXTREME SITUATIONS 196

Barıs Sayın, Gebrail Bekdas, Barıs Yıldızlar
THE PARAMETERS THAT CAUSE TORSIONAL IRREGULARITY IN RC BUILDING UNDER EARTHQUAKE EFFECT 196

Gebrail Bekdas, Sinan Melih Nigdeli
INVESTIGASTION OF SDOF IDEALISATION FOR STRUCTURES WITH OPTIMUM TUNED MASS DAMPERS 197

A.A. Kasimzade, Soyhan Bal, Gencay Atmaca
NATURAL STRUCTURAL PROTECTION OF STRUCTURES IN NATURAL CATACLYSM: STRUCTURAL RESISTIVITY SECRET OF "WALLED OBELISK" MONUMENT AGAINST STRONG EARTHQUAKE ACTIONS FOR TEN CENTURIES AND ITS MATHEMATICAL MODEL FOR APPLICATION 197

Rosa Grazia De Paoli
INTEGRATED APPROACHES FOR THE EVALUATION OF THE DAMAGES AND ETRAINING OF HISTORICAL CENTRES: THE CASE OF PAGANICA (AQUILA) 198

T. Mussabayev, T. Kayupov
NONLINEAR THEORY OF THE INTERACTION BETWEEN UNDERGROUND CONSTRUCTIONS AND GROUND MASSIVE AT VARIOUS EMERGENCY SITUATIONS 199

SECTION 7. Ecology and Environment

Q.Sh. Mammadov
USE OF NEW TECHNOLOGIES IN SOLLUTION OF ENVIRONMENTAL PROBLEMS IN AZERBAIIJAN..... 200

Q.Sh. Mammadov
ECO ETHIC PROBLEMS IN AZERBAIJAN AGRICULTURE 201

Y. Smara, S. Bouchaib, S. Malki
OIL SPILL DETECTION AND IDENTIFICATION USING RADAR SAR IMAGES APPLIED TO THE ALGERIAN COASTS 202

A.N. Kuznetsov, Yu.A. Fedorov
DISTRIBUTION AND NATURAL TRANSFORMATION OF FUEL OIL SPILLED IN THE STRAIT OF KERCH IN NOVEMBER 2007 (THREE-YEAR OBSERVATIONAL RESULTS) 203

L. Sail, f. Ghomar, A. Bezzar, O. Benali
COMPARATIVE STUDY OF THE INFLUENCE OF THE IONS NA^+ AND K^+ IN THE INHIBITION PROCESS BY MASS LOSS 204

E.D. Vyazilov
CLASSIFICATION OF ENVIRONMENTAL IMPACTS ON VITAL ACTIVITY OBJECTS AND OF RECOMMENDATIONS FOR DECISION MAKING 204

Y.M. Eyvazova
THE INFLUENCE OF ANTHROPOGENIC FACTORS TO THE HYDROLOGICAL REGIME OF RIVERS AND THE ESTIMATION OF ECOLOGICAL FLOW 205

M.F. Mir-Babayev, A.A. Khalilova, H.G. Mamedova
OIL PRODUCTION AND ECOLOGY OF THE CASPIAN BASIN 206

G.G. Matishov, E.N. Ponomareva
BIOTECHNOLOGY OF AQUACULTURE FOR REHABILITATION OF STURGEON SPECIES' GENE POOL 207

Adrian Toader-Williams, Roberto F. Nespolo
THE INFLUENCE OF HORSERADISH (ARMORACIA RUSTICANA) AND COMMON COMFREY (SYMPHYTUM OFFICINALE) UPON THE EDIBLE TERRESTRIAL SNAILS HELIX ASPERSA MULLER (CORNU ASPERSUM) DURING HEAT WAVE AND DROUGHT AS MEANS TO IMPROVE SNAIL FARMING TECHNOLOGIES 209

Adrian Toader-Williams, Aurel Sara, Mihai Radu Pop, Maria Dana Bobit, Mihai Bentea, Matei Marcel Duda
THE INFLUENCE OF SOME PERENNIAL PLANTS AND SEL-PLEX UPON THE DEVELOPMENT, RESISTANCE TO EXTREME CLIMATE CONDITIONS AND MEAT QUALITY OF THE EDIBLE TERRESTRIAL SNAILS AS ONE OF THE MOST EFFICIENT AND ECOLOGICAL SOUND ANIMAL PROTEIN SOURCE FOR HUMAN CONSUMPTION 210

Ayeche Riad, Hamdaoui Oualid
TREATMENT OF URBAN WASTEWATER TREATMENT (CITY OF ANNABA IN ALGERIA) BY THE LIME WASTE FROM THE ENGI 211

P.M. Paradisopoulou, E.E. Papadimitriou, J. Mirek, V.G. Karakostas
PROBABILITY DISTRIBUTION ON FAULTS NEAR THE CITY OF THESSALONIKI (NORTHERN GREECE) 211

Vijayan Gurumurthy Iyer
ENVIRONMENTAL PROCESS BASED EDUCATION AND RESEARCH FOR BETTER LIFE AND ENACTMENT OF INTERNATIONAL POLICY ACT ON ENVIRONMENT 2011 212

B. Dimiskovska
MODELING OF CONSEQUENCES ON ENVIRONMENT THROUGH ANALYSIS OF INDUSTRIAL RISKS 214

Behzad Nadi, Ibrahim Komoo, Elmira Shamshiry, Saeid G. Jafarzadeh
RISK REDUCTION DUE TO INDUSTRIAL POLLUTION BY GEOSPATIAL MODELING 214

V.B. Boltyrov
THE ANTHROPOGENIC AND COSMOGENIC FACTORS OF NATURAL DISASTERS 215

N.V. Baranovskiy
NEW CONCEPT OF FOREST FIRE DANGER FORECAST IN RUSSIAN FEDERATION 215

N.V. Baranovskiy, G.V. Kuznetsov
MATHEMATICAL MODELING AS A TOOL TO PREDICTION OF FOREST FIRE DANGER 216

E.Q. Ismibeyli, S.R. Kasimova
ENVIRONMENTAL PROTECTION FROM EXPOSURE ELECTROMAGNETIC RADIATION 216

Mansour Yeganeh
HUMAN, NATURAL ENVIRONMENT AND ARCHITECTURE 217

Sh.Yu. Goychayly, I.M. Afandieva
ADDRESSING THE ENVIRONMENTAL SAFETY IN EMERGENCY SITUATIONS 217

K. Baddari, M. Djeddi, Gh. Brahmi
ANALYSIS AND INTERPRETATION OF HEAVY METALS ATMOSPHERE CONCENTRATION OBTAINED BY NUCLEAR TECHNIQUES IN ALGIERS URBAN SITE 218

Yusuf Sait Türkan, Osman Hürol Türkakın
FUZZY RULE BASED FIRE RISK ANALYSIS OF ISTANBUL'S STREETS AND AVENUES 219

G.I. Kurbatova, E.A. Popova
OFFSHORE PIPELINES PROJECTION AND ECOLOGY PROBLEMS 219

PLENARY SPEECH

NATURAL CATACLYSMS AS A GLOBAL FACTOR OF INFLUENCE ON THE WORLD ECONOMY

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Natural cataclysms have a devastating effect on the stable development of the world economy, causing enormous economic damage to countries in which they occur.

Disregarding the significant impact of natural factors on the global economy during the sharp increase in the number and energy of natural disasters can greatly exacerbate the negative developments in the global economic system.

Analysis of the growth dynamics of the economic damage caused by natural disasters leads to very disappointing conclusions. If the economic losses from natural disasters in 2009 totaled $ 63 billion, according to the largest Swiss insurance company Swiss Re, in 2010 they amounted to $ 222 billion, three times the economic loss for the year 2009. Meanwhile, economic losses from natural cataclysms in the first quarter of 2011 alone exceeded $ 320 billion, most of which related to the economic damage inflicted on Japan by the strong earthquake with M8.9 and devastating tsunami that occurred March 11, 2011. The direct economic damage alone caused to the Japanese economy is $ 280-309 billion.

By 15 September 2011, the global economy's losses from natural disasters according to the lowest estimates by the International Committee GEOCHANGE have exceeded $ 550 billion. This figure takes into account the economic damage inflicted on the Japanese and world economy as a consequence of the catastrophic earthquake and tsunami, from March to September 15, 2011. If the trend for the number and energy of natural cataclysms to grow continues, by early 2012 the world economy will suffer disaster losses exceeding $ 800 billion.

Conclusions and suggestions

- In the first place, the negative impact of natural disasters affects the insurance sector, involving the global banking system and destabilizing thus the entire global financial system.
- Taking into account the observed tendency of the significantly increased number and energy of natural disasters worldwide, appropriate preventive measures must be taken to stabilize the world economic system. For this purpose, it is suggested that UN-sanctioned international legal norms and laws be developed and adopted to effectively coordinate both the insurance sector and the entire global financial system in times of large-scale natural disasters. It is necessary to improve the international legal rules governing the provision of financial support and humanitarian aid to countries and regions affected by natural disasters.

GLOBAL GEOLOGICAL AND ENVIRONMENTAL CHANGE: THREATENING THE STABLE DEVELOPMENT OF CIVILIZATION

Prof. Dr. Elchin Khalilov
Chairman of World Forum – International Congress GEOCATACLYSM-2011,
Chairman of International Committee GEOCHANGE, Munich, Germany

The time has come when accumulated earth science data make it possible to take a deeper look into the nature's global changes, and reconsider their extent and their role in the sustainable development of civilization. Many world scientists realize that not only do these changes affect the climate, but they have an impact on virtually the entire volume of the Earth, from its core tothe atmosphere and magnetosphere.

Global Changes of the Environment, "GEOCHANGE", means natural, planet-wide changes in nature, influenced by endogenous, exogenous and cosmic factorsoccurring within the solar system and having negative implications for the sustainable development of humankind.

This summarizing scientific work by IC GGEC "GEOCHANGE" is our attempt to demonstrate the extent of these processes and how they influence the development of humankind. Those processes may destabilize the progress of civilization unless some preemptive and effective joint action is taken by the international community to ensure the maximum possible reduction in the number of casualties and economic damage caused by natural disasters.

The conclusions drawn on the basis of the research are as follows:

1. Magnetic poles' drift acceleration

The explosive, more than fivefold growth of the North Magnetic Pole's drift rate from 1990 to the present has been accompanied by a significant increase in Earth's endogenous activity. In 1998, the North Magnetic Pole's drift rate approached its maximum value. From roughly 1998 on, there has been observed a sharp increase in the number of large earthquakes and earthquake fatalities, of volcanic eruptions and tsunamis (catastrophic, medium-sized and weak).

2. Anomalous J_2 coefficient change

1998 saw the beginning of abnormal changes in some of Earth's geophysical parameters, a leap in J_2 coefficient values in particular. This coefficient is determined using measurements made by the laser ranging system from US satellites.

The J_2 coefficient demonstrates the dynamics of the ratio between Earth's equatorial and polar radii. According to NASA, the J_2 coefficient had been decreasing for many years supposedly due to the release of meltwater from the mantle since the ice age. This was indicative of an increase in Earth's radius at the poles and its reduction at the equator. Meanwhile, new data show that since 1998 the J_2 coefficient began to grow. This process reflects the global redistribution of Earth's masses, as well as Earth's expansion at the equator and its flattening at the poles. Thus, some global-scale event is thought to have occurred in 1998; this could mean both global redistribution of Earth' masses and minor changes of its shape.

3. Global sea level change

During the period between 1997 and 1999, sea level fluctuations of the Indian Ocean, Western and Central Pacific were in antiphase to fluctuations of the Eastern Pacific and Atlantic Ocean. While the level of the Eastern Pacific and Atlantic Ocean began to rise sharply from 1997 with a peak in 1998 (about 3 cm), the level of the Indian Ocean, Western and Central Pacific was falling with a 1998 minimum (about 3 cm). The timing of these processes coincided with the J_2 coefficient anomaly. Meanwhile, an article by B. F. Chao and others (B.F. Chao et al., 2003) indicates that even considering the model of possible impact of the redistribution of water masses in the world ocean, the actually observed effect of the J_2 coefficient is 3 times greater than those influences.

4. Global tropospheric temperature change

An anomalous, explosive growth of the global tropospheric temperature was observed in 1998.

5. Large earthquakes

A comparative analysis of anomalous J_2 variations and the dynamics of numbers of large M > 8 earthquakes between 1980 and May 2010 has revealed that starting from 1997-1999, there has been a surge in the number of large earthquakes and fatalities caused by them according to the exponential law.

6. Volcanic eruptions

A comparative analysis of volcanic eruptions and J_2 variations has also showed that 1997-1998 were years of deep minimum of volcanic activity, followed by a sharp increase in volcanic activity observed to date.

7. Tsunamis

Since 1998, there has been observed a dramatic change in the tendency for statistical distribution of the annual numbers of catastrophic, medium-sized and weak tsunamis. The "leap" in the annual tsunami number statistics, witnessed since 1998 is described by exponential trends.

8. Floods

Analysis of the evolution of numbers of severe U.S. floods over the past 100 years makes it possible to conclude that there has been a substantial increase in this indicator since 1998.

Studying the dynamics of the numbers of worldwide flood notifications from 2002 to late May, 2010 (according to the Global Flood Detection System, an experimental system aimed at providing flood disaster alerts) has shown a steady increase in the number of floods since 2005. Meanwhile, comparing the number of seasonal floods from 2005 to May 2010 (from February to late May) for the same period in previous years indicates some constant increase in the number of seasonal floods from year to year. In particular, the number of worldwide flood notifications received for the period between February 2010 and late May 2010 is more than 2,5 times higher than the figures for the same periods from 2002 to 2006 inclusive.

9. Tornadoes

Germany has been given as an example of a sharp increase in the number of tornadoes since 1998. There were 2,5 times more tornadoes in Germany for 5 years (between 2000 and 2005) than over the preceding ten years. A similar situation can be observed in the U.S.

10. Hurricanes and storms

A surge was observed between 1998 and 2007 in the number of North Atlantic tropical storms, and this tendency continues today. An increase in the total number of Atlantic Basin hurricanes from 1944 to the present is observed as well.

11. Forest fires

The dynamics of the annual numbers of U.S. forest fires from 1960 to 2007 reveals their tendency to grow, with the "surge" beginning in 1998 as well. A similar pattern in the dynamics of forest fire statistics is observed in other regions of Earth. For instance, Kazakhstan in 1997 witnessed a "surge" in the form of a sharp increase in the number of forest fires and fire-affected areas. As for the territory of Eastern and Western Europe and the CIS, there is a tendency for the annual numbers of forest fires to soar as well, with the general nature of their dynamics described by an exponential trend. Around 1998, there was observed a "surge" in the number of forest fires.

12. The role of natural factors in global climate change

– Increased degassing of the mantle during the periods of intensification of Earth's endogenous activity can be one of the main factors causing global temperature changes.

This process occurs as a result of the following: growing number of volcanic eruptions; increased seismic activity and higher rate of gases entering the atmosphere through deep faults in the crust; deep gases penetrating into the world ocean and subsequently the atmosphere as a result of intensification of the spreading processes. All this ought to result in higher amount of greenhouse gases released from the mantle into the atmosphere.

– An important role in climate change is attributed to global changes in the parameters of the geomagnetic field and magnetosphere; this refers in particular to the more than 500% increase in the North Magnetic Pole's drift rate and reduction of the geomagnetic field intensity. Today, the impact of magnetospheric processes on Earth's climate is considered a proven scientific fact.

– Global climate change is also affected by solar activity, solar constant variations (flux of solar radiation) in particular, which is also a proven scientific fact.

As a result of the studies conducted, a conclusion has been drawn about the beginning of the so-called global "energy spike" in our planet's energy manifesting itself across all its strata: the lithosphere, hydrosphere, atmosphere and magnetosphere. The starting point for the global "energy spike" is roughly 1998.

The global "energy spike" is explicitly reflected in the soaring statistical indicators for the vast majority of natural disasters most dangerous to humanity: earthquakes, volcanic eruptions, tsunamis, tornadoes, hurricanes, storms, floods and forest fires.

SPECIAL SECTION

ULF VARIATIONS OF THE GRAVITATIONAL FIELD AND INSTRUMENTATION SYSTEM FOR THEIR REGISTRATION

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Wideband gradiometer instrumentation system based on the usage of "Cavendish balance" type torsion system allowing real-time registration of ultra low frequency ($<10^{-2}$ Hz) disturbances of the terrestrial gravitational field has been considered. Torsion system of the instrument has asymmetrical construction with wieghts having special shape. Basic theory for torsion systems elements construction is presented. The principle of torsion system rotation angle measurement using position-sensitive detector has been described.

There are considered seasonal features of signals, approach to their interpretation, correllation with geodynamical processes. Examples of the detailed instrument readings before several strongest events of 1995-2011 years are presented. High-frequency variations before several events is the key to the estimation of time of future event. Spectral properties of mega-anomaly registered in December 2009 are presented. Interpretation of such signals is discussed.

GLOBAL GRAVITATIONAL EFFECTS BEFORE AND AFTER STRONG M8.9 EARTHQUAKE IN JAPAN ON 11 MARCH 2011

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Before and after the powerful Japanese magnitude 8.9 earthquake of 11 March 2011 some gravitational effects were registered in large areas across the Eastern Hemisphere as far as over 9,000 km away from the earthquake's epicenter. The gravitational anomalies were measured experimentally using ATROPATENA stations, new physical registering devices deployed in Indonesia (Yogyakarta), Pakistan (Islamabad), Azerbaijan (Baku) and Turkey (Istanbul). The stations continuously measure time-varying changes of the natural gravitational field in three mutually perpendicular directions. It has been established that indications of the Cavendish balance can be influenced by the dynamics of lithospheric stress fields altering the density and mass of

large rock strata under the measuring stations before strong earthquakes. The authors believe that those stresses can be carried by tectonic waves. The effects registered provide a theoretical and experimental basis for initiating creation of an international network for monitoring and early warning of seismic hazards.

Experimental results

– To monitor spatio-temporal variations of the gravitational field, special detectors named ATROPATENA stations have been developed and made. The detectors continuously measure the value of the gravitational constant G in mutually perpendicular directions and relative values of gravity **Δg.**

– Before and after the strong magnitude 8.9 earthquake which hit the Honshu island of Japan on March 11, 2011, variations of the Earth's gravitational field were registered at large distances from the epicenter (up to 9,000 km); they were measured with the ATROPATENA stations in the following locations: Yogyakarta (Indonesia), Islamabad (Pakistan), Baku (Azerbaijan), Istanbul (Turkey).

– Indications of the Cavendish balance when measuring the gravitational constant G are influenced by spatio-temporal changes in external gravitational fields of geological origin, which alter over time indications of the true values of G.

– For the first time, the true cause of variations of the recorded values of the gravitational constant G has been identified. These variations were the subject of scientific dispute throughout the last century.

Model

Propose a model of emission of slow tectonic waves (stress waves) in the focal region of an imminent earthquake as a result of plastic deformation of crustal layers immediately before the rupture (abrupt displacement).Tectonic waves are a kind of mechanical waves, altering the density of crust layers in the motion process. Alternating changes in the density of the crust layers lead to periodic changes of the mass and, as a consequence, of the gravitational field within the front of the tectonic wave. The monitoring of spatio-temporal changes in the gravitational field can be carried out using special devices consisting of the mutually perpendicular Cavendish balance and gravimeter.

EARTHQUAKE PREDICTION USING ULF VARIATIONS OF THE GRAVITATIONAL FIELD

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It is considered concept of the geodynamical processes mechanism, based on the interpretation of our planet as open nonlinear dynamical system, whose quasi-equilibrium state is periodically disturbed by the external influences associated with more global spaces (Sun, Solar System, Galaxy and etc). In consequence of disturbances of quasi-equilibrium state (which we call additional polarization) compensational processes take place acting according to the conservation laws and aiming to return the system state to the equilibrium.

Originally additional polarization emerge in the planet inner core which is its center of the mass and center of polarization (according to A. Vlasov). Correspondingly

compensational process, being the response to the additional polarization, also begins in the inner core and gradually moves along the direction from the core to the surface (and further) involving additional volumes of the planet structures into the process. On every structural level compensational process results in the additional polarization and, correspondigly, in the secondary compensational processes. Outcome of the process into the lithosphere resulting in the polarization of some of its volume is the reason of future earthquake. On the basis of considered approach processes in the atmosphere are interrelated with the processes in the lithosphere. And this correlaton is the most obvious illustration of the process.

Whole processes complex is reflected in the dynamics of the terrestrial gravitational field. Every planet structural level (inner core, outer core, mantle, lithosphere, atmosphere and etc) is associated with the definitive frequency band. During the event preparation ultra low frequency (ULF, $<10^{-2}$ Hz) processes are leading, high frequency processes appear during the final stage.

Performing the measurements of the gravity potential gradient in the definite frequency bands using the instrumentation system based on the principle of Cavendish balance (torsion system with asymmetrical weights having special form), geodynamical process development (and, in particular, earthquake preparation) can be traced and its parameters can be estimated, leading to the event prediction – long-term, middle-term and, finally, short-term. Torsion system elements construction is based on the monitored system substructures geometry and the associated Lobachevski's spaces parameters.

It is considered instrumentation system construction and its signals, registered before several strong events during 1995–2011 years. Several succesful predictions are presented.

GEOMAGNETIC VARIATIONS BEFORE THE 1999 CHI-CHI EARTHQUAKE (M_W=7.6)

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A strong earthquake of magnitude 7.6 (M_L=7.3) occurred on September 21, 1999, near the small town of Chi-Chi in Nantou County in central Taiwan. The Lunping geomagnetic observatory in Taiwan region is situated 100 km from the epicenter. In this study, the geomagnetic data of the Lunping observatory are utilized for computing the amplitude variation of short-period geomagnetic total intensity data, by using complex demodulation method (CD method). The modulus of 3 significant periods (24, 12, and 8 hr) was obtained. The results show that the ratios of modulus in period 12, and 8 hr relative to period 24 hr reveal a remarkable change, appear to 2 months prior to the main shock of this strong earthquake. The modulus for the period 24, 12, and 8 hr increased gradually from the beginning of 1999 to August 1999. After the strong earthquake occurrence the modulus decreased again to the normal level. We propose that this significant increasing might be related to the preparation process of strong earthquake.

EARTHQUAKE PREDICTION – WORLD-WIDE TASK

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Many methods are now used for earthquake prediction and many groups on the whole Earth try to predict the particular event. Some groups use local methods, some use the methods, based on the stress measurements, which have the global range.

To predict the particular earthquake correctly, it is necessary to make the global network of all of possible methods. The global methods are able to determine the time (window) and magnitude range of incoming strong event. Then it is necessary to use the local methods to localise the hypocentral area and to put more precisely the magnitude of the incoming earthquake.

The prediction network must be made hierarchically (according to the methods), geographically (according to responsibility) and scientifically (statistic tests of results and verification of the data quality).

SEISMIC NOISE MONITORING: APPLICATION FOR LARGE EARTHQUAKE PREDICTION IN KAMCHATKA

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Tidal modulation of seismic noise proves that it's structure includes the endogenous component (seismic emission). This fact allows us to consider it as the informational geophysical field. The high-frequency seismic noise (HFSN) is the seismic radiation in the range of the first tens of Hz with amplitude of 10^{-9}-10^{-12} m. The HFSN is a complicated superposition of endogenous and exogenous microseismic signals. The factors affecting the intensity of the HFSN are human activity, wind, warming of the earth's surface, earth tides, and tectonic processes. At present, the observation of the highly sensitive geophysical field is complicated by industrial noise of large territories, which made it impossible to separate the natural signals from the obtained records in many cases. In Kuril-Kamchatka-Japan region the investigation of the HFSN are carrying out more then 20 years. During this time, four points of long-term observation were established in the areas with low level of anthropogenic cativity: «Nachiki» (1987, Southern Kamchatka), «Karymshina» (1999, Southern Kamchatka), «Erimo» (1993, Hokkaido) and «Shikotan» (2003, Lesser Kuriles). A resonance narrow-band vertical seismometer with a sensitive piezoceramic element was used as a sensor of the HFSN signals. Similar detectors are used at all four points of HFSN recording (the sensitivity with consideration for the preliminary amplification is not worse than 5×10^9 V/m, the frequency of the characteristic oscillation is f = 30 Hz, Q-factor=100). The most interesting object for investigation is the response of the HFSN to long-period deformation processes, in particular, to the Earth tides. The recorded data were processed using different time-windows. High-resolution coherent signal stacking clearly singled out the noise intensity variations with periodicity of tidal waves: $O1$ (main lunar, period T=25.82 h), $K1$ (lunar-solar declination, T=23.93 h), $P1$ (main solar, T=24.07 h), $Q1$ (large lunar elliptical, T=26.87 h), $M2$ (main lunar, T =12.42 h), $S2$ (main solar, T=12.00 h), and $N2$ (larger lunar elliptical, T=12.66 h). Thus effects of

other eventual factors with nearly 24-hour and 12-hour periods were reliably excluded. The noise modulation depth typically ranged from 1 to 10 percents. This value is extremely big in comparison with tidal strains in the Earth crust (having typical magnitudes about 10^{-8}). The revealed effect is the example of non-linearity in active geophysical medium: (1) HFSN non-linear response upon weak deformation and (2) energy redistribution from low-frequency to high- frequency range.

By HFSN structure study it was found: (1) the response on tide impact is not stable in time; (2) the synchronization of the HFSN and tides is observed during some time (usually one-two months) before large (with magnitude $M \geq 6.0$) Kamchatkan earthquakes ($\Delta < 300$ km); it is manifested as stabilization of phase shift between tidal component of the HFSN envelope and tides on certain level. This specific feature of the HFSN response on tides is used for investigation of the HFSN connection with large earthquakes. During the HFSN observations period (1992-2011) 25 earthquakes with $M \geq 6.0$ occurred on Kamchatka. The obtained experimental data confirm the hypothesis about correlation between values of stabilization level of the HFSN tide parameter with source characteristics of preparing earthquake and its geographic position.

Study is supported by RFBR (grant 11-05-00303).

KAMCHATKA EXPERT COUNCIL FOR EARTHQUAKE FORECASTING: EXPERIENCE AND RESULTS

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Kamchatkan Expert Council was established in 1998 as subdivision of the Russian Expert Council for Earthquake Forecasting, Assessment of Seismic Hazards and Risk. Kamchatka is one of most seismoactive region of the world, so problem of earthquake and volcano eruption forecasting is important here. Analysis of large earthquake precursors is one of the main functions of the Council. Precursors of large Kamchatkan earthquakes with M>6.0 detected by various kinds of observations and by different methods are shown. Among them there are seismological, seismoacoustic, hydrodynamic, hydro- and geochemical, electromagnetic precursors. Total amount of used methods is more than twenty. Significance evaluations are given for some procedures of monitoring.

The presented data about precursors were received by Kamchatkan Branch of Geophysical Survey, Institute of Volcanology and Seismology, Institute of Cosmophysical Research and Radio Wave Propagation, Kamchatkan State University, Institute of Physics of the Earth (Moscow), and "Kamchatnedra".

AFTERSHOCK PROCESS OF CHU EARTHQUAKE

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Chu earthquake of 27. 09. 2003, Ms = 7.3 occurred in joint zone of Chagan-Uzun raised block with North-Chu ridge. Epicentral zone cover a series of contrast geological structures of Mountain Altai (two hollows: Chu and Kurai, devided by Chagan-Uzun

block, and mountain range, franking them: Nort-Chu, Kurai, South-Chu, Aigulak). The seismic process occurred in zone of expressive block structure, and this is embodied in its space-time structure.

The high accuracy of hypocental construction in epicenral zone of Chu earthquake is provided by local network of seismological stations (fifteen stations) and experiments with temporary station network in this zone (20-50 stations).

The first stage of aftershock process formation is connected with Chagan-Uzun block. The second large aftershock of 01.10.2003 changes cardinally spatial pattern of aftershock process. Instead of round area an elongate aftershock area is formed along boundary of Kurai hollow with North-Chu ridge. In the following process spread out in north-west angle of Chu hollow. Linear elongate aftershock area is subdivided into four elements. The north-west element has form of horse tail, starting as a line in area of outlet of Aktru River in Kurai hollow, and ramifies short of settlement Chibit. Slope of plane of aftershocks for this element is determined from hollow under North-Chu ridge. The seismic process is going not along boundary hollow-mountain ridge, but displaced in hollow side. The central part of element – this are mainly horizontal shift faults, and outlying districts have pronounced vertical components of displacements. The second element stretches from Aktru River to Chagan-Uzun block. Earthquake epicenters in plane make two curved parallel lines. In the angle of Chagan-Uzun block are ceiling amount of uplifts. The third element is the boundary of Chagan-Uzun block with North-Chu ridge. The forth element is formed by aftershocks, leaving in range of Chu hollow. Areal dispersal of earthquakes is characteristic for events. The south-east ending of aftershock process is marked by change of horizontal shift on vertical movements. From data of seismotomography Chagan-Uzun block and raised north-west block of Kurai hollow have raised velocities of seismic waves. Linear contrast changes of seismic wave velocities are fixed along the line of aftershock process.

TRIGGER EFFECTS IN DEVELOPMENTOF INDUCED SEISMICITY

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The results of the experiments with use of seismological station local network in Kuzbas have been considered. Between 2005 and 2010 years temporary networks for study of induced seismicity have been developed five times. Most striking events of induced seismicity were found out in area of Polysayevo town. From twenty to thirty six digital stations operated simultaneously during the performance of the experiments over a 10x14 km area. So dense network allowed with high accuracy to be determined position data of hypocenter of events, constructed mechanism of source. High-accuracy information about induced seismicity let us with high distinctness make experiments in man-caused influence on seismic process.

Existence of two type of induced seismicity was discovered by experiments in Kuzbas: seismic activations in mine working surroundings (induced seismicity in short-distance of man-caused action); seismic activations, not coordinated with mine workings (induced seismicity in long-distance of man-caused action). Induced seismicity in short-distance of functioning mine workings has following properties: seismic process develops mainly under mine working, extending to 1 km depth under the mine working; seismic activation is shifted with mine face of working; seismic events are mainly uplifts. Induced

seismicity in far zone is cluster seismicity on 1-5 km depth. It is time-to-time changeable, arises in local area, is shifted in time and disappears.

Trigger action of coal-plough machine functioning in lavas on seismic process was studied. It was found that about 90 % of events occur under the productive mine worlings. It was experimentally found that at completion of one mine working functioning induced seismicity near it practically disappears, but at the same time useful increase of induced seismicity in near-field zone, continued working, is observed.

It was found that at stopping of coal production in all mines of this region on three days the properties of induced seismicity were cardinally changed and renewed at once after beginning of coal production. Stay of working of vibrated equipment had an equally strong effect on both types of induced seismicity. Industrial explosions in open-cast mines do not have such influence on seismic process.

The induced seismicity occurs on condition of pumping-out of fluid from mountain range and simultaneous action of vibration from productive mine workings.

WHAT IS AN EARTHQUAKE?

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An ***earthquake*** is what happens when two blocks of the earth suddenly slip past one another. The surface where they slip is called the ***fault*** or ***fault plane***. The location below the earth's surface where the earthquake starts is called the ***hypocenter***, and the location directly above it on the surface of the earth is called the ***epicenter.*** Sometimes an earthquake has *foreshocks*. These are smaller earthquakes that happen in the same place as the larger earthquake that follows. Scientists can't tell that an earthquake is a foreshock until the larger earthquake happens. The largest, main earthquake is called the *mainshock*. Mainshocks always have *aftershocks* that follow. These are smaller earthquakes that occur afterwards in the same place as the mainshock. Depending on the size of the mainshock, aftershocks can continue for weeks, months, and even years after the mainshock!

While the edges of faults are stuck together, and the rest of the block is moving, the energy that would normally cause the blocks to slide past one another is being stored up! When the force of the moving blocks finally overcomes the *friction* of the jagged edges of the fault and it unsticks, all that stored up energy is released! The energy radiates (moves) outward from the fault in all directions in the form of *seismic waves* like ripples on a pond. The seismic waves shake the earth as they move through it, and when the waves reach the earth's surface, they shake the ground and anything on it, like our houses and us!

Earthquakes vary immensely in size, from tiny events that can be detected only with the most sensitive seismographs, to great earthquakes that can cause extensive damage over widespread areas. Although thousands of earthquakes occur every day, and have for billions of years, a truly great earthquake occurs somewhere in the world only once every year. When a great earthquake occurs near a highly populated region, tremendous destruction can occur within a few seconds.

STRESS TRANSFER IN NORTHERN ALGERIA AND ADJACENT REGIONS FOR EVENTS M≥6 THROUGH 1980-2004

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How an earthquake, occurred on a fault (source), could delay, advance, or even trigger another event on another fault (target)? Many authors tried to answer this issue by studying the ΔCFF variations of **C**oulomb **F**ailure **F**unction, induced by the causative earthquake. ΔCFF is a combination of the normal and shear stress on the target fault. The fault source must be known by its size and its mechanism; the target fault is required its mechanism. The stress redistribution shapes the space in regions with ΔCFF>0 and ΔCFF<0. The first ones would be the sites of future earthquakes, while the latter would be devoid.

We apply this formulation to the region extending from 5°W-7°E and 34°N-38°N where 5 earthquakes followed the major event of El-Asnam (10/10/1980, M = 7.2, Algeria), during the period 1980-2004. These events were located at Constantine (27/10/1985, Algeria, M = 6), Tipaza (29/10/1989, Algeria, M = 6), Al-Hoceima (26/5/1994, Morocco, M = 6), Zemmouri (21/5/2003, Algeria, M = 6.8), and Al-Hoceima (24/2/2004, Morocco, M = 6.3).

In order to investigate, in terms of stress transfer, a possible interaction of these events, we adopt the following approach: 5 ΔCFF maps are calculated step by step through the periods [1*980-year*], where [1*980-year*] refers to the earthquake sources produced in this period, taking into account the cumulative ΔCFF; the target corresponds to that occurred just before *year* (*year* = 1985, 1989, 1994, 2003, 2004). ΔCFF computations are the result of our own code: the starting point is Okada's subroutine and Hooke's law. The calculations are made on nodes of a horizontal grid, at the depth of the target event.

The resulting maps reveal that all the target events occurred in regions with ΔCFF>0, implying a possible faults interaction.

Key words: Algeria, ΔCFF, fault interaction, Morocco, stress transfer.

SEISMIC EMISSION FROM ACTIVE ZONE UNDER SURFACE RUPTURE ARISING AFTER STRONG EARTHQUAKE

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Largest in the Altai-Sayan mountain area over a period of instrumental seismology Chuya earthquake (27.09.2003, *Ms*=7.3) was accompanied by numerous surface ruptures in its epicentral area. In 2009 passive seismic observations on the geophone line crossing one of the large surface ruptures were carried out. Recorded microseismic data were processed using algorithm of seismic emission tomography which can locate noisy zones. Two noisy zones were shown up: sub-horizontal zone at the depth of 100-200 m with gap and shift approximately in the central part of the profile, and directed to this gap sub-vertical zone at depths below 400 m. Position of upper zone gap and orientation of lower

zone are in agreement with the place of profile and surface rupture intersection. This fact allows suggesting that sub-vertical noisy zone corresponds to the active fault position. It is clear that a profile observing system, in the strict sense, does not permit to determine a three-dimensional distribution of seismic sources. But taking into account that the observations were carried out using vertical geophones it is possible to suppose that observed anomalies are connected with seismic sources located under profile.

Key words: earthquake, surface rupture, seismic emission

MANTLE VELOCITY STRUCTURE UNDER EAST EUROPE AND VRANCEA EARTHQUAKES

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Vrancea is considered as an unstable zone with triple junction: the East European Platform (EEP), the Moesian Platform (MP) and the Intra-Carpathian subplate (IC). Using the data about the first time arrivals of P-waves from ballots ISC, the three-dimensional P-velocity model of a mantle of Vrancea and its surroundings is constructed by the method of Taylor's approximation for the solution of seismic tomography problem, proposed by V.S.Geyko. In this model the intermediate-depth earthquakes in Vrancea are confined to the contact of high-velocity area at depths ranging from 75 km to a maximum of 225 km with a low- velocity surrounding. The given area is formed by the high-velocity inclined layer of the border region of the mantle under the EEP, spreading in a south-westerly direction. The given area is located under northern part of the MP between faults of Peceneaga-Camena and Intra-Moesian.

The velocities mantle boundary are determine as a zero residual velocity isoline, according to departure from common average velocity model for the mantle beneath Eurasia and its surroundings. With the depth uppermantle high-velocity border between EEP and its southern surrounding is changing, but the subvertical high-velocity border is allocated in a mantle under Vrancea on depths of 75-300 km. In the nearest surrounding in Vrancea from depth of 100 km displacement of the given border is observed from the Pannonian block of the IC in a northeast direction under the EEP. From the same depth from the EEP the border is displaced in the western direction towards the Transylvanian block of the IC and in a southern direction under the MP.

Nowadays, more and more researchers have come to geoenvironment presentation as an open, dissipative, nonequilibrium, block-hierarchical self-organizing system. Such approaches point to the instability of processes in geomedium and allow to suggest that trigger of earthquakes can be shifts of environment which are not directly related to the subsequent earthquake fokus. Our task is to distinguish the possible sources of instability of given isolated mantle boundary region.

Investigating the velocity structure of the mantle over a vast area, if has been highlighted the possible interaction of mantle-velocity areas that may have some impact on the Vrancea as subvertical boundary region. There are high-velocity sloping layers that implement the mantle and the EEP conjugation of the Afro-Arabian Platform (AAP). The first layer represents an sloping layer in northern direction from the AAP under the Aegean micro-plate. The second one represents an sloping layer in a southern direction from the EEP and passes under Vrancea and to the east of it. Data from ballots EMSC confirm the influence of the Eastern Mediterranean on mantle processes in Vrancea.

Taking into consideration that the mantle under the Vrancea belongs to the mantle velocity boundary region bordering the EEP and to the system of high-velocity sloping layers, one more high-velocity sloping layer in the mantle is allocated, which may affect the seismic situation in the Vrancea. The moving of this layer can also the cause for earthquakes in Vrancea, that is also confirmed by the observation.

SHORT-TERM PREDICTION OF MARINE EARTHQUAKES AND TSUNAMIS

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Method of earthquake prediction based on observations of surface deformation of the Earth using satellite technology. Forecasting tsunami is carried out on the kinematic parameters of a strong sea earthquake. Tsunami occurs during the horizontal movements of the lithosphere by asthenosphere.

Tsunami waves are type of Relley waves excited by a hydraulic shock in the epicentral area of the seabed. This model provides answers to questions such as:

1) Why did the tsunami can propagate aimed at?

2) Why all the strong earthquake followed by minor vertical changes in bottom topography, and form only a small tsunami focus earthquakes?

3) Why do tsunamis most often occur in areas of deep-sea trenches and never - in areas Sox, who have strong earthquakes there have not been made?

4) Why did the tsunami did not apply as usual waves on the surface of the wave front - from surface to bottom?

5) Why did the arrival of a wave to shore on the phase of lowering, not increasing?

Will be promoted geochemical methods of short-term earthquake prediction.

Will be shows the information for discussion.

Facts allocation of oxygen from the Earth's crust are well known. Important generalization on this issue made in a book, Bgatova V.I. "History of the Earth's atmosphere oxygen." Great value have the results of fixing the oxygen in the water of bottom layer of the Black Sea basin, containing hydrogen sulfide during the 51 voyage of the research vessel "Mikhail Lomonosov" Academy of Sciences of Ukraine. Debating the question remains about the source of oxygen in the fluids of the lithosphere. Question of the relationship of the oxygen regime of the Earth and seismicity discussed the first time.

The report examines case studies of oxygen lithosphere. This measurement data in the Black Sea in 1982, 1986, 1990 and in the Pacific Ocean in 1993 In all cases, the oxygen evolution were recorded shortly before earthquakes. Component composition of the fluid from the lithosphere, which containing oxygen, radically different from conventional fluids. Typically, the fluid is warm, with high concentrations of silicates, chlorides, low pH. Fluid containing abnormally high concentrations of oxygen usually has a high pH, low concentrations of silicates. An example study of lithosphere oxygen in the Pacific ocean, 10-16 September 1993. Fluid that containing oxygen was recorded more than 2 days. Volumes of oxygen evolved from the lithosphere can be considered significant. It is assumed that the synchronization in time of positive anomalies of chloride and oxygen is associated with the processes of compression of the crust. Analyzed the spatial confinement of hydrocarbon deposits in seismically active zones of the earth.

Suggested that the earthquake may be the result of explosions of hydrocarbons on admission of oxygen. With the explosion of hydrocarbon gases, excessive amounts of hydrocarbons in the anomalous increase in temperature and pressure can be converted to a vapor and liquid hydrocarbons.

Similar explosions may occur in the reaction of hydrogen and oxygen with the formation of water. It is suggested the formation of tubes of the explosion (kimberlitic pipes) as a result of exothermic reactions fluids of the lithosphere with oxygen.

SEISMICITY, AS A PHENOMENON OF GLOBAL SCALE

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Geodeformations sensors with an area of several hundred square miles does not exist, and existing satellite interferometric systems are imperfect. One of the oldest methods of "measuring" of earthquakes is to study the damage occurred. We applied this method to study the aseismic geodeformations. Destructive geodeformations aseismic character fixed in time and place of destruction of gas pipelines in Odessa (Ukraine). Global processes of crustal extension forming aseismic geodeformations destroying the pipelines. It is shown that between the manifestation of the compression process in Odessa (Ukraine), and the earthquakes in Turkey in 1999 (approx. 600 km), Greece in 2003 (approx. 1400 km), Indonesia in 2004 (approx. 7800 km) is one and the same time - half geodeformations cycle (3.5 days). On this basis, we conclude that earthquakes are formed by the geodeformations of global scale.

This communication will be considered only fast geodeformations, since they possess destructive power. Trend movement, creep, plate motion and other geodeformation processes long time scales have remained outside the classification performed by us.

Well known cyclic geodeformations global scale with periods fold to 14 day using the GPS monitoring, with the daily running-averaging, we have identified geodeformations with the duration than a week, close to week and lasting a day or two. Vertical amplitude of geodeformations measured in centimeters. The horizontal displacement. Using data from seismic monitoring are fulfilled classification geodeformations duration of seconds, hours, although recorded geodeformations with periods of several minutes can last for months. Lists various types of geodeformations: with a period of 10 minutes and lasting 5 hours, aperiodic with a duration of more than 30 minutes, strain jumps lasting 5 minutes, the geodeformations with a period of 10-20 sec., Lasting about 30 minutes, non-wave 2 - 3 min, strain jumps with a duration of 10-30 sec. In January 2011, on a planet detected motion that not detected by seismic stations. This happened 12-13.01.2011, 01.21.2011 (RF), 22. 01.2011 (UK), 24-25.01.2011, 26. 01.2011, 27.01.2011 (RF). In addition, registered an unusual earthquake (small magnitude, but the abnormal destruction). It was 15.01.2011 (RF) 19.01.2011 (Georgia), 20.01.2011 (Turkey), 24.01.2011 (Kyrgyzstan).

In the subsequent geodynamic processes were revealed cracks in the Earth's surface. Cracks were formed in Peru, Indonesia, Bolivia, Pakistan.

Thus Japanese earthquakes 9 and 11 March 2011 should be attributed not to the regional geological events, and considered a consequence of global geodynamic processes. The report presented data synchronous lifting and then return to normal some stations of the European network of permanent geodetic 21.02.2011, with amplitudes of about 5 cm.

Tabled in question to reduce the length of day on 12.03.2011 and 14.03.2011 0.4 ms even at 0.7 ms.

Brought up for discussion the question of the surface oscillations of the Earth with a ten minute period 12-14.03.2011, and abnormal absence of such geodeformations in the Caribbean plate.

The report examines the devastating effects of surface deformations of the earth recorded in Japan in March and April 2011. Analyzed fracture geodeformations according to data of destruction of gas pipeline in Odessa.

THE FORECAST OF EARTHQUAKES TODAY: CHALLENGES AND SOLUTIONS

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The statement of the problem of the forecast of strong earthquakes which till now are unexpected or have been "predicted" a post factum is discussed. Existing strategy and tactics of the solution of this problem are critically considered; opportunities and restrictions in a view of understanding seismic process as reflection of action of the general laws of evolution nonlinear far-from-equilibrium geodynamic systems are analysed. It is shown that there are neither theoretical nor empirical bases to hope for an opportunity of the forecast of earthquakes with necessary accuracy and reliability.

Traditionally it is believe, that for the reliable and accurate forecast it is necessary and sufficient to improve methods of research and knowledge of the process mechanism of and a structure of geomedium. But already for a long time nonlinear systems, which in conditions far from equilibrium evolve essentially unpredictably, deterministically-chaotically, have been known. The seismogeodynamic systems are those. In a basis of failures of forecasts of earthquakes: seismicity is shown in fractal result rough-discrete medium; destruction evolves from a microlevel to a macrolevel; a fracture in any volume of any rank unpredictably reorganizes conditions of occurrence of the subsequent destructions; process is extremely dependent on the slightest changes of initial conditions.

Unstable relations of the centers of earthquakes with parameters of geomedium, bifurcations of seismic process, high-probable evolution of any micro- or mesofracture to a seismogenic macrofracture, unpredictability of transition of the seismoactive area to instability with "choice" any one of several, vaguely various on a degree of readiness of "candidates" for the centers are important. Character of process as a whole, its separate stages, the attractor, scenarios of transitions from a stage up to a stage can be expected. But reliability and accuracy of predictions of concrete events are far enough from requirements of practice. Even minimally necessary requirements to the forecast basically are inaccessible. There is a insuperable "horizon of predictability", achievable earlier, than necessary quality of the forecast.

Strategy of forecasting consists in revealing certain precursor-anomaly. But for the reliable forecast such anomaly should be single and be contrastly individual on an extensive surrounding background. However, as a rule, in real geomedium some anomalies slightly conceding to most reliable of them in sizes and intensity are found out. Detection of last one reduces probability of the miss of dangerous event, but other anomalies reduce definiteness of the forecast as the main anomaly now is not individual and low-contrast on a surrounding non-uniform background.

Steadily reliable predictions of a place, time and magnitude of concrete event with a required accuracy are impossible. The alternative is obvious: certain, but the inadequate forecast of concrete event on the basis an unrealistic model of geomedium or a realistic model of medium with inevitable uncertainty of the forecast.

Key words: earthquakes, geomedium, discreteness, fractals, nonlinearity, unpredictability

SPATIAL DISTRIBUTION OF MAXIMAL EARTHQUAKE EFFECTS IN THE RED SEA REGION

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Two maps of estimated maximum intensity distribution has been prepared for the Red Sea region by applying appropriate intensity attenuation and conversion equations, without considering the probability of exceedance. The maps are represented in two parametric elements, which are the maximal earthquake effects and period of observation. The significance of the maps is due to their contributory aspect of providing supplemental earthquake information pertaining to simple, but required and necessary seismic hazard representation in the Red Sea area. Basically, the maps are illustrative of the areas that are likely and susceptible to experience the possibility of hazardous earthquake effects as shown and indicated.

ASSESSMENT OF THE SEISMIC SITE EFFECTS BASED ON EARTHQUAKE RECORDINGS AND IN SITU BOREHOLE MEASUREMENTS IN BUCHAREST, ROMANIA

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Within the NATO Science for Peace Project 981882 *"Site-effect analyses for the earthquake-endangered metropolis Bucharest, Romania"* we obtain a unique, homogeneous dataset of seismic, soil-mechanic and elasto-dynamic parameters. Ten 50 m deep boreholes are drilled in the metropolitan area of Bucharest in order to obtain cores for dynamic tests and vertical seismic profiles for an updated microzonation map related to earthquake wave amplification. The boreholes are placed near former or existing seismic station sites to allow a direct comparison and calibration of the borehole data with actual seismological measurements. A database is assembled which contains P- and S-wave velocity, density, geotechnical parameters measured at rock samples and geological characteristics for each sedimentary layer.

All the V_{S-30} computed values belong to type C of soil after this classification (Romanian Code for the seismic design for buildings – P100-1/2006).

Approximately 250 samples were gathered from the 10 drill sites. These samples were mostly not disturbed (samples as they were recovered from the tube of the drilling rig) and partly disturbed (those which had no proper consistency). The geotechnical laboratory analysis consists in the following parts: geological identification of the sample, identification of the sample after the ternary diagram, percentage of clay – dust - fine sand

- medium sand - big sand - gravel, density mineral skeleton, particle percent with diameter $d<2\mu m$, plastic limit determination, tests of compression - settling, triaxial (dynamic) test and resonant column tests.

Results obtained by the down-hole method in the 10 boreholes drilled in Bucharest City as well as from laboratory measurements are used as input data in the program SHAKE2000.

The mean weighted seismic velocities for the first 6 (of 7 types) of Quaternary layers present in Bucharest underground are computed for all the sites, in order to be compared with seismic velocity values obtained from previous seismic measurements and to be used as input for modeling with program SHAKE2000.

Using SHAKE2000 we compute spectral acceleration response and transfer functions for every site in which in situ measurements were performed. The acceleration response spectra correspond to the shear-wave amplifications due to the models of sedimentary layers down to: a). 50 m depth; b). 70 m depth. A comparison with a real signal recorded at surface is made in order to calibrate the spectral acceleration response.

APPLICABILITY OF THE RESTRICTED EPIDEMIC TYPE AFTERSHOCK SEQUENCE (RETAS) MODEL TO DESCRIBE GENERAL SEISMICITY IN THE AREA OF THE IZMIT M7.4 EARTHQUAKE OF AUGUST 1999

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It is important to know whether stochastic modeling of aftershock activity in a zone can capture some features of general seismicity, too. In this study we analyzed seismicity temporal characteristics for the area, in which the *M7.4* earthquake of August 1999 occurred near the town of Izmit in Turkey. This event is the last one, which occurred on the North Anatolian Fault (NAF), following six more events with $M>=7.0$ for a period of sixty years. We first compiled an earthquake catalog using data of Kandilli Observatory and Earthquake Research Institute at Bogazici University, Turkey. We also obtained additional data for the aftershock activity by personal communication with Prof. Dogan Kalafat from Kandilli Observatory. In this way we compiled a catalog of more than 6000 events for the period 1902-2008 in the magnitude range $M_d=2.0$ to $M_d=7.4$. We unified the earthquake magnitude in the catalog as there were different types of magnitude for different events. All magnitudes (surface waves - M_s, body waves - M_b, moment magnitude - M_w, local magnitude - M_l) were transferred to *Md*. The examined area was identified following a version of the so called 'Knopoff's window' for the Balkan region and was delineated between the vertices 40.0N, 41.7N, 28.5E, 31.98E.

After that we applied the restricted epidemic type aftershock sequence (RETAS) model to examine aftershock decay in time after the main M7.4 event of August 17, 1999 for a period of 500 days. Then we utilized the model with the same parameter values for the description of general seismicity for nearly ten years subsequent to the strong earthquake. The model provided good fit to real data, the latter being in between the error bounds for the entire period. Finally we compared real cumulative numbers to forecasted ones, obtained by the model application. Real and model data reveal similar behavior but there is some discrepancy between them after the strong earthquake in 1967, probably due to data incompleteness for this period. On the whole the results reveal that the RETAS model can be

successfully used to depict general seismicity temporal behavior, but it is not suitable for simulation purposes as model intensity depend on future real events magnitudes.

INTEGRATION OF GEOPHYSICAL PARAMETERS ANALYSIS IN THE EARTHQUAKE PREDICTABILITY

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The purpose of this study is to analyze the predictability of earthquakes within a short-term and mid-term scale in the western part of Java using various parameters, i.e seismicity, magnetic, electromagnetic, surface temperature, and humidity. In this research we use the USGS and BMKG seismic data catalogue from 1973 to 2010, the earth's surface magnetic and electromagnetic field measurements data from magnetometer and magnetotelluric observation station of BMKG at Pelabuhan Ratu, and the surface temperature and humidity data obtained from the Sukabumi AWS station of BMKG is located in Pelabuhan Ratu. The case study used was large earthquake event with a radius of 300 km from Pelabuhan Ratu observation station that are on September 2nd, 2009 (M7.5), September 13th, 2009 (M6.6), October 16th, 2009 (M6.4), November 18th, 2009 (M5.3), January 10th, 2010 (M5.3), February 20th, 2010 (M5.0), May 18th, 2010 (M6.0) and June 26th, 2010 (M6.3). From the seismicity data, seismicity anomalies was found in 2.5 - 3.5 years before earthquakes occur that are classified as mid-term precursor. Anomalous magnetic field of the magnetometer was found 2-22 days before the earthquake occurs, magnetic fields from magnetotelluric anomalies was found 2-20 days before earthquakes occur, while the anomalous variation of surface temperature and average daily humidity was found 10 and 17 days before earthquakes occur. Anomalous magnetic field, electromagnetic, variations in surface temperature and average daily humidity is classified as a short-term precursor. And periodicity in the Java subduction zone with magnitude M6 based on the depth of the source showed a similar periodicity of dominant earthquake that is about four to five years.

Key words: Predictability, earthquake, precursor, seismicity, magnetic, temperature, humidity.

DISPLAYING OF THE FIELDS INDUCED BY A FAULT IN AN INTERACTIVE MODE: APPLICATION TO THE EL-ASNAM EARTHQUAKE (ALGERIA, 10/10/1980, M=7.2)

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We present a software in interactive mode, enabling to display the response of a fault (or a serial of faults) in terms of displacement, strain, and stress fields. The sources are embedded in an elastic half space, and are required their sizes (length, width, dislocation) and their focal mechanisms (strike, dip, rake). Using Okada's subroutine, computations are made at nodes of grids. Our code is validated using published cases.

Three models of the El-Asnam earthquake (Algeria, 10/10/1980, M=7.2) are studied in detail, taking into account the complexity of the deformation. Calculated

displacements are in good agreement with those observed. Angelier's parameter A_φ confirms the compressive state of the region.

The calculated fields are superimposed on *Google Earth* software by several KMZ files the software can be used for educational purposes.

Key words: displacement, fault, interactive mode, strain, stress.

APPLICATION OF PROBABILISTIC-FUZZY APPROACH IN SEISMIC HAZARD PREDICTION

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This paper presents a description for extending seismic hazard prediction concepts when vague and subjective judgments of a unique phenomenon enter probabilistic or mathematical models. In the literature of seismic hazard analysis, the uncertainties of the dominant factors affecting the overall hazard are usually treated using classical probabilistic methods. However, entering subjective judgments into the analysis as conditional probabilities maybe complicated or restrictive and a more heuristic approach, such as FST, then becomes attractive. The output is a fuzzy set describing the membership grading (or possibility distribution) of the estimated exceedance acceleration. A particular emphasis is placed upon the treatment of information within a probabilistic-fuzzy mathematical model using the α-cut approach.

As a case study, seismic hazard assessment of Iran is conducted using a combination of probabilistic approach and fuzzy sets theory. In order to calculate seismic hazard for different return periods in probabilistic procedure for this country, the area has been divided by 0.1° intervals. To carry out seismic hazard analysis in the framework of fuzzy sets theory, all of the variables converted into triangular fuzzy sets with α-cut method. Eventually, the fuzzy response is defuzzified using the surface center method. Two maps are developed to indicate the earthquake hazard of the region in the form of iso-acceleration contours. They display a fuzzy-probabilistic estimate of peak ground acceleration (PGA) over bedrock for the return periods of 475 and 50 years.

REALISTIC SCIENTIFIC GOAL FOR EARTHQUAKE FORECASTING

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According to the Seismological Society of America, for a statement to be accepted as a valid earthquake prediction, it has to contain the expected magnitude with error limits, the well defined area of the epicenter, the range of dates, and the probability of this to come true. The data from which the prediction was derived must be verifiable and the analysis of these data must be reproducible.

Long term predictions (years to decades) are more likely to be achieved than medium term predictions (months to years), and short term predictions (hours to days) are in general unlikely to be possible, at present. Though earthquake forecasting is a science that is still at a developing stage, scientists have mastered it enough to make official earthquake warnings. This will go a long way in enabling people to prepare for a

big earthquake and help the government and relevant organizations to conduct rescue and disaster recovery efforts.

Currently, earthquake forecasting is similar to weather forecasting. Scientists can predict that an earthquake has a certain probability of occurring within a given time frame, but not one that will definitely take place. Quakes usually occur in clusters that strike the same area within a specific period of time, and it is this characteristic that make scientists able to predict them. In a cluster, most quakes are aftershocks. There may be one or two powerful aftershocks that follow a mainshock which can be predicted. Knowledge of past earthquake patterns, the earthquake (foreshock or mainshock) magnitude and the seismic history of the fault on which it occurred are among the important factors that go into forecasting an earthquake. Equipped with this information, some large earthquakes can be predicted by foreshocks.

This paper reviews issues, models, and methodologies arising out of the problems of predicting earthquakes and forecasting earthquake risk. The emphasis is on statistical methods which attempt to quantify the probability of an earthquake occurring within specified time, space, and magnitude windows. One recurring theme is that such probabilities are best developed from models which specify a time-varying conditional intensity (conditional probability per unit time, area or volume, and magnitude interval) for every point in the region under study. The paper comprises three introductory sections, and three substantive sections.

The former outline the current state of earthquake prediction, earthquakes and their parameters, and the point process background. The latter cover the estimation of background risk, the estimation of time-varying risk, and some specific examples of models and prediction algorithms. The paper concludes with some brief comments on the links between forecasting earthquakes and other forecasting problems.

Key words: Earthquake Prediction, Predicting Disasters, Forecasting Earthquakes, Statistical Methods.

A NEW PRECURSOR FOR PREDICTING EARTHQUAKES

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Evidence for the existence of a new precursor for the prediction of earthquakes is presented an exhibition of predicted earthquakes in Bulgarian newspapers. This precursor is described in the scientific literature. It will be revealed during a lecture in Bulgaria. This precursor can be made primarily date of the forthcoming earthquake. Indication of the magnitude does not mean that it is predicted. Magnitude is interpreted primarily as the ike lihood of an earthquake. The method allows to forecast the time a case of earth quake and the location of the epicenter. The method is combined with other methods for predicting earthquakes, such as the increasing concentration of the radioactive gas radon and change the gravitational constant before the earthquake. Combining these three methods lead to a full forecast of the impending earthquake.

1. Indicate the location of the upcoming earthquake
2. Indicate the approximate magnitude
3. Indicate the most probable date and time of the quake
4. Indicate the probability of an earthquake
5. Indicate the normal error in kilometers and hours

Observations of the method for predicting earthquakes heralded new shows that error is normal within 24 hours and about 350 km radius.

MODELING OF STRESS-STRAIN STATE OF THE EARTH'S CRUST OF THE CASPIAN REGION FOR PROGNOSIS OF SEISMIC PROCESS

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The model of the earth's crust of the Caspian region is created for the area from 37.0°N – 47.5°N to 46.0°E – 56.0°E. The model include the existing faults and basic structural borders such as Moho surface and upper asthenosphere boundary, the surface of consolidated earth's crust and the upper surface including the mountain relief and bathymetry. The asthenosphere surface for the Caspian region has been received on the basis of the heat flux data in region, taking into account the internal structure of crust and thermal properties of rocks.

It is assumed that rocks behave as an elasto-plastic material with Drucker-Prager yield condition. Asthenosphere is modeled by the viscoelastic Maxwell material.

The calculation is done in two stages. First the initial stress state of the model under action of gravitational forces and temperature distribution is calculated. Then the loading by the tangential tectonic forces generated by the tectonic plate movements is applied. For the latter purpose we use the standard model of velocity distribution plate movements NNR-NUVEL. All calculations are executed taking into account creep in the asthenosphere.

Distributions of the stress and strain invariants are calculated and compared with the known data on seismic activity of the region and used for the seismic zoning of the region. Influence of Caspian sea level on stress-strain state is investigated.

MONITORING OF IONOSPHERE PERTURBATIONS PRECEDING HIGH INTENSIVE EARTHQUAKES ON DATA FROM SATELLITE RADIO NAVIGATION SIGNAL RECEIVER NETWORK

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High intensive earthquakes, which can cause large-scale destructions and carry away many human lives, are usually characterized by existence of ionosphere perturbations over the epicenter of earthquake. In most cases ionosphere precursors of earthquakes appear up to a few days before the main event therefore ionosphere state monitoring over seismically dangerous regions can be used as a part of an earthquake prediction system. Continuous monitoring of a wide region of the ionosphere can be arranged by using data from a network of satellite radionavigation signal receivers. A method of the ionosphere state assess in a local spatio-temporal region by using data from several satellite radio navigation signal receiving stations has been suggested. The method makes it possible to conduct nearly real-time wide-ranging ionosphere monitoring. The analysis of the ionosphere perturbations over the epicenter of a Greek earthquake (2006, magnitude=6.8) has been performed. It was revealed that the day before the earthquake there was an

abnormal increase of a vertical total electron content (TEC), that had reached two times more its average value. These results are absolutely consistent with those of known studies. The results of the analysis of the ionosphere variations over the epicenter of the Japan tsunamigenic earthquake in March 2011 have been presented. It was shown that within a week prior to the earthquake there was steady day-time increase of vertical TEC with the maximum of twice as much as its average value three days before the event.

Key words: ionosphere, total electron content, earthquake prediction.

ACTIVE BRACE CONTROL OF FRAME STRUCTURES UNDER EARTHQUAKE EXCITATION

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In this study, a single-span single storey frame structure was controlled with diagonal active brace. In this control concept, a diagonal brace equipped with actuator acts time varying force in order to control the vibration of structure during earthquakes. The frame structure was physically modeled with three degrees of freedom. These degrees are the lateral displacement at the story level and the rotations at the beam-column conjunction joints. Block diagrams of equations of motion were modeled with Matlab Simulink for both uncontrolled and controlled structures. The frame structure was analyzed with several earthquakes which caused several damages to civil structures. Control signal was obtained by proportional-integral-derivative (PID) type controller. Also, the time delay of the control system was considered in order to obtain realistic results. The parameters of the PID controller were obtained by using several trials. At the simulations, the structure characteristics such as displacements, velocities, accelerations, total shear forces at the story level and moments at the joints were obtained in time domain. These structural results were compared for the uncontrolled and controlled structure. Also, the frame structure was analyzes in the frequency domain in order to show the benefits of the control system. In frequency domain, the transfer function of the uncontrolled and controlled structure were obtained and compared. The control force was also investigated in order to show the feasibility of method. At the end of the analysis, all results show that active brace control is very effective on reducing structural vibrations.

Key words: Active brace, Structural Control, PID controller, Earthquake excitation

OPTIMIZATION OF TUNED MASS DAMPER PARAMETERS FOR STRUCTURES SUBJECTED TO EARTHQUAKES WITH FORWARD DIRECTIVITY

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Near fault ground motions contain long pulse-like motions such as directivity pulses at fault normal direction and flint step at fault parallel direction. These pulse-like motions with large amplitude and long period caused several damages to structures, especially when forward directivity is occurred. Forward directivity occurs because of

close velocities of fault rupture and shear wave velocity of the ground near the source. Also, the rupture propagation and the direction of slip are toward a site. Tuned mass dampers can play a great role on damping of the structural vibrations resulting from earthquakes with forward directivity effect. The tuned mass damper (TMD) is a passive vibration control device with mechanical components such as mass, springs and dampers. The properties of these mechanical components must be chosen optimally for the best reduction of structural responses. In this study, a metaheurestic optimization algorithm was used in order to find optimum TMD for structures with forward directivity effect risk. Harmony search (HS) algorithm was chosen for optimization method. A program was developed with Matlab for iterative optimization analysis. Several earthquake records that contain forward directivity effects were used in the optimization. As a result of the study, optimum tuned mass dampers are useful on damping structural vibrations resulting from forward directivity effects.

Key words: Tuned Mass Dampers, Harmony Search, Optimization, Passive Control, Forward Directivity Effect.

MONOFRACTAL ANALYSIS OF THE EARTH CRUST MICROSTRAIN DATA

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Data from a laser strainmeter (LS) are studied in terms of fractal dimension.

Laser strainmeter (LS) acts as an interferometer, so it is able to record Earth crust microdeformation with great precision. Variations in crust microstrain field, measured by the LS, have been found recently appearing before moderate and large earthquakes. However, only short-time precursory behavior was investigated.

Now LS data is studied in order to reveal any long-time effects, related to the alteration of the Earth crust in the process of earthquake preparation. It is taken into account that the Earth crust is near to the self-organized criticality (SOC) state. The main feature of the SOC state is that output parameters have scale-invariant or fractal structure both in space and in time. So fractal methods can be used to study evolution processes in crust before earthquakes.

Time series representing crust microstrain field, obtained with the LS located on Schults Cape in the south part of Primorsky region, have been investigated. The monofractal analysis method proposed by Higuchi, have been applied to 5 months long data period. Daily variations of fractal dimension have been calculated during seismically calm period and when some moderate earthquakes occurred in the 2000 km circle area around the LS. Peculiarities in the fractal dimension behavior are revealed during the seismically active period.

EARTHQUAKE PREDICTABILITY? – PRESENT SCENARIO AND FUTURE PROSPECTS IN INDIA AND NEIGHBOURHOOD

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Improved understanding of fault behavior, responsible urban planning, and advances in building construction have greatly reduced the threat to life from earthquakes, yet more could be done to reduce our exposure to their hazards. Generally, prediction can be completed by stochastic way (statistical) /and deterministic (subjective) way. Former includes the anomalies in seismic waves (abnormality in stress drop and shear stress,) while, latter includes anomalies in seismic images (increment and decrement of regional seismicity, appearance of seismic gaps, seismic belts, seismic swarms and anomalies in special value such as b-value). Earthquake Predictability can be defined as Brick by Brick seismic hazard assessment. In order to improve the accuracy of the earthquake prediction, the earthquake prediction mode should be transferred from the statistical mode to the physical mode. The seismic activity method analyses the time, space, and magnitude of the small to medium-size earthquakes that occurred before past strong earthquakes and can be use to predict the future medium-size or strong earthquakes. In this paper, results emphasize based on these methodologies and several predictions for Indian region including latest forecast in Central Himalaya have been made.

The Kashmir Earthquake of October 08, 2005 and many of them came true to some extent. But surprises and failure is difficult to address at this stage, which can't be ignored. However, the study highlight that space-time distribution of the earthquakes has enabled to locate potential area where future earthquake may be seated and recommend monitoring of multi-parameter short term precursory signals to make earthquake prediction programs more meaningful.

THE POSSIBLE POSITION OF FUTURE LARGE EARTHQUAKE ON THE JIANGSU-SHANDONG SEGMENT OF TAN-LU FAULT ZONE, CHINA

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Tan-Lu Fault Zone (simplified as T-L Fault) is biggest fault zone in the East China with 2400 km along NE direction. It can divided to three parts according to tectonic property and seismicity. In the middle part many large earthquakes occurred, i.e. Tanchang M8.5 at 1668, Bohai sea M7.4 at 1969, Haicheng M7.3 at 1975. The released seismic energies in middle part are 3200 times than sum of northern and southern parts. We are concerning where is the possible location of next large earthquake along this fault?

1. In the southern segment of middle part of T-L Fault Zone, i.e.Jiangsu-Shandong segment, the T-L fault are thrust fault, its active period is Holocene and later Pleistocene, the slip rate so lower like Longmenshan Thrust Fault(on this fault occurred Wenchuan M8.0 earthquake in 2008).

2. The T-L Fault Zone on .Jiangsu-Shandong segment represent intermittent activity, in Malingshan Mt, in Xinyi city, Chonggangshan Mt. Sihong city, Jiangsu

province, these strick slip activities on fault display possible occurrence of large earthquake.

3. A paleoearthquake with M8 in Suqian, Jiangsu province, along T-L Fault Zone, occurred at BC6280-BC70 from geological trench, according to recurrence theory, next large earthquake with M7-8 will be happen not so long time in the future..

4. The deep structure below 1668 M8.5 near Tancheng city has following features: shallow lithosphere, undulate Moho depths, lower velocity layer in middle crust, on the Jiangsu-Shandong segment of T-L Fault Zone reveals similar deep structure features. The seismic tomography, gravity , magnetic , geothermal and other geophysical anomaly reveals that the material of upper mantle upward to crust, the upward of mantle force may be the master source of stress concentration

5. Due to there were no any equipments records that time, so we can not get the accuracy epicenter of Tancheng M8.5 earthquake. Several macro-epicentres have been located by scientists by geological investigation or macro intensity. We have got 3-D velocity structure tomography by using travel time. The calculate network is 20*20*5km. Combining Deep Seismic Sounding and other geophysical investigation, the source of Tancheng M8.5 earthquake has following features: velocity variation stronger, undulate Moho depths, lower velocity layer in middle crust, source located in lower crust. We scan every blocks of different layer and comparing the velocity distribution to find source position satisfy above features, we got the position of Tancheng M8.5 earthquake, 1668, in scope of 35.42°-35.77°N, 118.3°-118.6°E, h=22-15km, the possible position is: 35.42°N, 118.6°E, h=23km.

6. In Anqiu city, northern 120 km far from the 1668 Tancheng M8.5 source region along T-L Fault Zone, a M7.0 earthquake occurred at BC70, there are no space to accumulate stronger energies for large earthquake between two source regions, but in the southern segment from 1668 Tancheng M8.5 source region, that is, Jiangsu-Shandong segment, it is a barrier body, blocking fault, like Wenchuan M8.0 2008, blocking source region along Longmenshan Fault, especially, in Xinyin-Sihong area, the future earthquake with M7-8 may occurred.

STATISTICAL ANALYSIS BEFORE AND AFTER STRONG EARTHQUAKES

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Seismicity irregularities both before and after the occurrence of a strong earthquake have attracted much attention as precursors to strong events, especially when the earthquake sequence occurs in a populated area. The temporal evolution of seismicity has to be studied, as the question arises: knowing the times of occurrences of the earthquakes between time 0 and T, where 0 is the occurrence time of the main event (i.e. in a specific period [0, T]), how can we assess the earthquake occurrence rate in a following time interval? In aftershock sequences, where the activity is high, the application of statistical models has prevailed, in order to point out such irregularities. Getting enough information from the past on each seismic sequence we try to estimate its future evolution by means of stochastic processes and the probabilistic theory. Interpreting the model application results in association with the

Coulomb stress changes, can provide a tool in assessing the imminent seismic hazard. The models used to estimate the seismicity rate changes are based on the Poisson point processes, where the rate parameter λ represents the seismicity rate for a particular period and therefore it can be either constant or time dependant. The homogeneous Poisson process is proposed for periods characterized by constant seismicity rates, whereas the non-homogeneous models are applied to the data of periods with strong rate changes. In the present work non-homogeneity is approached by different formulas that are adopted to describe the rate function λ(t). An exponential and a Weibull form are used to express the seismicity rate changes, with their parameters being estimated using the data provided by earthquake sequences that took place in the territory of Greece during the past decade. One additional statistical approach of the temporal distribution of the earthquake sequence is presented, based on the Epidemic Type Aftershock Sequence (ETAS) model as well as on the Restricted Epidemic Type Aftershock Sequence (RETAS), where it is assumed that the aftershocks with magnitudes larger than or equal to a threshold magnitude can induce secondary seismicity. The results of the application of the models are tested with statistical tests in order to assess the goodness of fit in each of the cases presented here.

THE INFLUENCE OF TECHNOGENIC FACTORS ON SEISMICITY IN THE ALLOCATED AREAS OF ALTAY-SAYAN REGION AND NEAR LAKE BAIKA

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The qualitative assessment, based on the data of seismic events catalogue of Altay-Sayan region, of the influence of human activity on natural seismicity in designated areas is constructed.

Local intervention in natural processes on examples of carrying out of industrial explosions at open-cast mining in Kuzbas and operation of a site of the railway along coast of lake Baikal is investigated.

Gutenberg-Richter plots (GR-plots) are built for various samples of seismic events on time for Kuzbas region and the difference of an inclination of a line of a trend for them is shown, which depends on time of observation.

Also GR-plots are constructed for various strips along the railway near Baikal lake and the difference of an inclination of a line of a trend for them is shown, which depends on offset from the railway.

Finally the experiment with powerful vibration exciter is considered and the hypothesis of discharging effect of powerful influences on short distances is setting up.

VIBROSEISMIC TECHNOLOGY OF DETECTION AND MONITORING OF SEISMIC- VOLCANO- PRONE ZONES

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The surface dilatancy zones comprise a phenomenon found in computational experiments, namely the loosening process of extensive zones within the upper Earth's crust under the action of tangential and tensile tectonic stresses near the surface. This

purely mechanical phenomenon is of special interest to earthquake prediction: in particular, it enables a quantitative approach to calculating fracturing characteristics (an "integral precursor" of seismic activity) using data from a variety of geophysical fields. Physical models of integral precursors are being developed. These models are space-time functions of the crack density within developing earthquake sources and anomalous geophysical fields on the Earth's surface. These models are obtained by solving the multidisciplinary (combined) inverse problems for corresponding geophysical fields (e.g., the field of displacements and deformations on the Earth's surface, the electric conductivity field, anomalies in the gravitational field, the groundwater level, etc.).

To localize zones of likely seismic activity in the Earth's crust, we propose a dynamic tomography method, developed within the framework of the scalar wave equation, and a numerical approach to optimizing the evaluation of dilatancy zones. A vibroseismic monitoring scheme for the "source" and dilatancy zones is discussed in detail.

Key words: dilatancy zones, multidisciplinary inverse problems, computational experiments, active vibroseismic monitoring.

TIME-CLUSTERING ANALYSIS OF THE 1978-2008 SUB-CRUSTAL SEISMICITY OF VRANCEA REGION

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The analysis of the time-clustering behaviour of the sub-crustal seismicity (depth larger than 60 Km) of Vrancea region is performed.

The time span of the analyzed catalogue is from 1978 to 2008, and only the events with magnitude $M_w \geq 3$ are considered. The analysis, carried out on the full and aftershock-depleted catalogues, is performed by using the Allan Factor (AF), that allows to identify and quantify correlated temporal structures in temporal point processes. Our results, whose significance was analysed by means of two methods of generation of surrogate series, reveal the presence of time-clustering behaviour in the temporal distribution of seismicity data of the full catalogue. The analysis performed on the aftershock-depleted catalogue indicates that the time-clustering is associated mainly to the aftershocks generated by the two largest events occurred on August 30, 1986 (M_w=7.1) and May, 30 1990 (M_w=6.9).

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INFORMATIVE PARAMETERS OF VIBROSEISMIC WAVE FIELDS IN FRACTURED AND FLUID-SATURATED MEDIA

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In this paper, to solve the problem of active vibroseismic monitoring of the processes of fracturing and dilatancy in seismically and volcano prone zones, we take into account dynamic characteristics of the wave field, in addition to following the change in the coefficients of medium's anisotropy and propagation velocities of P- and S-waves proposed earlier by A.S. Alekseev. Thereby, wave form variations and nonlinear transformation of wave fields associated with the geodynamic processes developing in destruction source zones will be taken into account. The efficiency of the approach proposed was confirmed by the results of experimental investigations with the method of vibrational sounding of mud volcanoes of the Taman mud volcano province and the tectonic fracture in Novosibirsk region. The problem of estimating the dynamics of development of geodynamic processes in the destruction source zone becomes a multiparametric problem, which can be solved by pattern recognition methods.

ESTIMATION OF Q_S AND SPECTRAL DECAY PARAMETER IN SOUTHEASTERN IRAN, USING STRONG MOTION DATA OF RIGAN EARTHQUAKES (2010 & 2011)

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The attenuation of seismic waves is closely related to the seismicity and regional tectonic activity of a particular area. December 20, 2010 earthquake with magnitude of M_w=6.5 and January 27, 2011 earthquake with magnitude of M_w=6.2 (National Earthquake Information Center; NEIC), occurred in Rigan region, Southeastern Iran.These earthquakes recorded on the 24 and 8 stations of the Iran Strong Motion Network (ISMN) installed by BHRC with maximum accelerations equal to 124 cm/s^2 for the Transverse component recorded at Rigan station and 195 cm/s^2 for the Longitudinal component recorded at Sarzeh station, respectively. In this research, the attenuation of Shear waves in Rigan region has been estimated using the strong motion data of Rigan earthquakes (2010 & 2011) with epicentral distance of less than 100 km and average focal depth of about 17 km. These events were relatively strong signal to noise ratio enabled a relatively accurate determination of the quality factor. The spectral decay method is employed to calculate frequency dependence relationship of the quality factor of shear waves (Q_S). The Q_S values have been computed at 6 central frequencies of 1.5, 3, 6, 9, 12 and 18 Hz. Time windows of shear waves are determined by Kinoshita algorithm. The average frequency relationship of Q_S for Longitudinal and Transverse components are $Q_S = (102) f^{(0.58)}$ and $Q_S = (96) f^{(0.60)}$, respectively. The spectral decay parameter, κ, has been estimated from the high frequency

of the spectra. The dependence of κ on the epicenteral distance for the Rigan region is also found.

Key words: Quality Factor, The Spectral Decay Parameter, Rigan Earthquakes, Iran.

HYPOTHESIS OF ORIGIN OF EARTHQUAKES AS A RESULT OF ANTHROPOGENIC MASS TRANSFER

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It is known that the shape of the earth and other planets is determined by gravity forces which change in time. Thus, under the impact of the Moon the shape of the Earth is distorted by the value $\delta R_з$ [1]:

$$\delta R_з \approx R_з M_л (R_з/ R_л)^3 / M_з \approx 0.36\ m, \quad (1)$$

where $R_з$, $M_з$ and $M_л$, $R_л$ are the radiuses and the masses of the Earth and the Moon.

Under the impact of the Sun the radius of the Earth is changed by the value:

$$\delta R_з \approx R_з M_c (R_з/R_c)^3 / M_з \approx 0.16\ m, \quad (2)$$

where R_c and M_c are the radius and mass of the Sun.

Relative impacts of Jupiter and Venus on the Earth have the order 10^{-5} m. These average statistical values of gravity impacts are subject to spasmodic changes at the moments of eclipses, passage of comets or large asteroids across the line of maximum impact. Then gravity impacts small in absolute value can cause significant shifts of conditions of mutual equilibrium, especially at resonant coincidences of space-time parameters of interacting objects. The basic law establishing the connection between the scale R and the period of interaction T in the Solar system is the third Kepler's law:

$$R^3/T^2 = const,$$

where R is a distance from the Sun to a Planet;
T is a period of planet revolution.

This law determines the equilibrium conditions of all planets in the Solar system.

Considering this correlation to be universal for macroscopic kinds of interactions, let us calculate the period of oscillations which restore the equilibrium. Expressions (1) and (2) provide us understanding of the value of the shift under the action of gravity forces. Thus, for the system Earth-Moon this parameter equals 0.36 m. The period of self-oscillation will amount to T = 3.73 years for $\delta R_з$ = 0.36 m. Such interval can be easily seen in the rhythms of geophysical and tide-generating origin.

In the system Sun-Earth the calculation using the correlation (3) gives for all $\delta R_з$ = 0.16 m the value of the period of revolution to the original state, equaled ≈ 1 year. This rhythm is typical not only for geophysical processes; it is in here to all elements of the Earth's biosphere.

This same law allows the evaluation of the response of the Earth to the gravity impact of Venus and Jupiter. Here, the calculation results for $\Delta R_з \approx 10^{-5}$ m in the value of the period $T \approx 17$ s. Such oscillations are seen in the spectrums of surface waves by records of long-period complexes of frequency-selective seismic stations .

According to the data of satellite geodesy (Gerasimenko, 1993) real increase of the Earth's radius is 4.15 ± 0.27 *mm*/*year*. According to the data of Kuznetsov (1984), who is following the hypothesis of expanding Earth, $\Delta R_з \approx 3$ *mm*/*year*. Frequency response to these shifts must contain the spectrums with the periods of 4.6 *s* and 2.8 *s*. These same oscillations are found in the summary of spectrums of maximum wave phases measured in the direction North-South in the course of earthquakes.

The whole set of obtained information testifies that, extending the limits of application of basic laws characterizing the intraplanetary equilibrium, we thus obtain a new method of decoding of spectrums of oscillation processes arising in the course of an earthquake. Thus, knowing the period, it is possible to identify the cause of dynamic process and vice versa, using the value of the shift it is possible to determine the period of restoration of original state.

The table below contains scale conformities for the major Earth's cycles calculated using the third Kepler's law, i.e. it shows the elements of the structure able to detect such processes. The data obtained prove that all elements of the geosphere, biosphere and technosphere are the part of one system which has an ability to conserve or restore the equilibrium state.

Let us consider cause-effect relations of the anthropogenic activity of the Republic of Kazakhstan where annual mass transfer as a result of mining of mineral resources is about $\geq 2 \cdot 10^{13}$ *kG*. Redistribution of such mass on the planet distorts the regime of its balancing (self-restoration of equilibrium state) by the value dependent on the change of speed of its revolution. For better apprehension it is possible to give an example of the wheel wobble of a vehicle in case of misbalance which is corrected by means of balancing.

Cycle	Period *T*, *s*	Radius *R*, *m*	Scaling conformities		
			Geosphere	Biosphere	Technosphere
Diurnal cycle	86400	$1.35 \cdot 10^{-4}$	Ashes, gels, colloids, clay sands, microcracks	Protista, protozoa and metazoa	Elements of information equipment, coatings
Moon (28 days)	2419200	$2.717 \cdot 10^{-2}$	Pebbles, macrodefects	Herbs, mosses, lichens, insects	Components of machines
Seasonal	$7776 \cdot 10^{6}$	$5.87 \cdot 10^{-2}$	Fragmental debris, macro-nonuniformities	Minor plants, minor animals	Components of building structures (angles, armature)
Earth's year	$31.536 \cdot 10^{6}$	0.145	Crushed stones, water course beds	-//-	-//-
Solar year	$3.78 \cdot 10^{8}$	0.79	Rocks, aeration zone	Annual plants, haematherms	Elements of large structures
Secular cycle	$3.1536 \cdot 10^{9}$	3.2	Chops, ravines	Large plants, animals, human	Domestic facilities, industrial zones

Kinetic energy of any body is the extent of its mechanical movement and is measured by the work which this body can perform at its braking. As it is known this energy $E\kappa$ equals half of the product of *M* mass by the squared speed of its movement *v*

$$E_\kappa = M v^2/2. \quad (4)$$

For instance, for seasonal variation of the Earth's speed revolution, Δv amount to 1000 *m/s* [3]. Then for the mass *M*, equaling the anthropogenic mass transfer of the RK we receive:

$$E\kappa = 2 \cdot 10^{13} kG \cdot (1000)^2/2 = 10^{19} \text{ kilogrammeter} = 10^{20} J.$$

Scaling conformities for basic cycles of the Earth (calculation is done using the third Kepler's law)

As we can see, this order of energy is the same as that of earthquakes, volcanic eruptions, strongest hurricanes [4]. Therefore, anthropogenic mass transfer on the Earth's scale and in particular at the coincidence of phases of lunar tides and syzygy will require significant energy to eliminate the imbalance (restoration of revolution balancing). Such self-restoration of equilibrium state initiates earthquakes since the internal structure of the Earth has a liquid phase which responses to the misbalance and there is no any other possibility of balancing.

From the physical point of view, in this case there arises a kind of non-harmonic oscillations determining the process of beating at the frequency equaling the difference of frequencies of processes of impacts and responses:

$$v_\delta = v_2 - v_1. \quad (5)$$

Thus, basing on the hypothesis of self-restoration of equilibrium state of the Earth, i.e. elimination of beating caused by significant volumes of anthropogenic mass transfer, it is possible to forecast natural earthquakes. In addition, the possibility of formation of new fields of useful resources is not excluded at the transfer of liquid phase.

FORECASTING OF ANTHROPOGENIC EARTHQUAKES AND LARGE-SCALE DEVIATIONS OF THE ENVIRONMENT FROM THE BALANCE

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In connection with sharp change of cosmophysical conditions of the earth such as shift of magnetic poles, changes of spectral characteristics of solar radiation there is a need in the analysis of response parameters of a substance to happening changes. Seismic responses of natural and anthropogenic nature are studied the most. Rhythmic components of seismic activity are identified; spectral composition of responses to external impacts is registered in the field of low frequency from fractions of hertz to megahertz range.

However reliability of developed methods of forecasting large events of planetary scale does not exceed 60% which is proven by the latest quakes in Japan.

In this work, it is proposed to carry out analysis and forecasting of large events by means of the measurement of high-frequency component of the changed conditions of Earth existence, i.e. monitoring of gamma radiation of original energy flow supplied within the earth and options of responses to it by atmosphere, radioactive and nonradioactive minerals and fluid-containing components of the environment. Preliminary studies of the change of substance conditions in various aggregative states revealed that amplitude distortions of the response to external impacts are different for each environment and to much extent depend on the earth position in the space as well as on the relief of certain locality. This is proven by the amplitude range of the fixed γ – with a dosimeter of response values to the changed external impacts. Some particularities of rhythmic pattern

of response have been identified that allows the determination of spectral composition of responses in other ranges, the frequencies of which depend on the speeds of propagation of progressive waves (electromagnetic and mechanical) in each environment.

Ability to self-focusing of waves of certain range is determined by the relief of certain locality which has its own oscillation frequency of electromechanical reactions and in case of resonance produces sharp splash of amplitude values of response.

Determination of scale conformities and rhythmic sequence of events is done according to the third Kepler's law with due account to diurnal, moon, annual and solar cycles of planetary balance. The method of processing of sequential line of measurements of gamma radiation has been developed with the purpose of determination of critical condition of the comprehensive system of response or its parts having the set relief and orientation of its scale components relative to sub-latitudinal and sub-meridional directions.

Comparative analysis of the past events revealed the success of the chosen direction of studies for the forecasting of bounces, anthropogenic earthquakes and other large-scale deviations from the balance of all environmental components.

DIFFERENTIATION OF LOCATION OF SEISMIC SOURCES IN GECHEMICAL FIELDS FLUIDS

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It is known that within one seismogenic zone can be allocated several different types of seismic sources. Therefore with the assessment of seismic hazard in a particular region, it is very important to develop methods that will allow quickly differentiate and predict "dangerous" seismogenic source, ready for the implementation of the earthquake in a short period of time. One of them is seismic geochemical method. For a long period of time (1979-2011) in seismically active zones of Azerbaijan Seismogeochemical Branch of Republican Center of Seismic Survey of Azerbaijan National Academy of Science (RCSS ANAS) conducts a year-round seismic geochemical monitoring of fluids. Based on the obtained data of the analysis, the following important facts were established: a) short-period (1-16 days) abnormal perturbation of the geochemical field of fluids at the sites of observation occurs only at the final stage of the earthquake preparation, i.e. the period of time, which was left before the realization of the predicted seismic event corresponds to (1-16 days); b) informative seismogeochemical parameters are individual for each seismic source. Proceeding form this fact, all combinations of indicator elements were arranged on the identification charts, which we conventionally called geochemical "portraits" of earthquakes, preparing for implementation. On the basis of a comprehensive systematic, generalized and analyzed seismic and geochemical materials, has been created "Atlas of the identification of seismic sources on geochemical fields of fluids of Azerbaijan". On the basis of certification of implemented hypocenters listed in seismological "Catalogue of earthquakes in Azerbaijan" (RCSS ANAS), have been created – geochemical "portraits" of the earthquakes. On this basis also have been established important facts: a) on seismogeochemical abnormalities by mechanism can be detected different types of seismic sources; b) the period of time in which abnormalities reflect the strength (magnitude) and location of the seismic source in space. The longer an anomaly in the fields of geochemistry of fluids endures, the further is the location hypocenter and the higher is the

value of the magnitude of the forthcoming seismic event. Empirically was established the "range-bound" of the distances for the predicted earthquakes in the Caspian Sea and within the Anatolian-Iran-Caucasus tectonic blocks: a) local ($\Delta \leq 50$ km), weak ($Mpv \geq 4.0$), which occurred in the Caspian Sea and in Azerbaijan; b) distant ($\Delta \geq 500$ km), but strong $MLH \geq 6.0$, sources which are in neighboring countries (Russia, Dagestan, Georgia, Armenia, Turkey, Iran). Moreover, within one seismogenic zone on geochemical fields of different types of fluids can be localized different types of earthquake sources and identify their association with different tectonic structures.

NEW TECHNOLOGY OF OPERATIVE EVALUATION OF SEISMIC SITUATION ON GEOCHEMICAL FIELDS OF FLUIDS OF AZERBAIJAN

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This work is devoted to the new technology for the rapid assessment of seismic conditions (calculation of time ranges, earthquake magnitude and location of the hearth) in real time on geochemical fields of fluids. Its code name is "SEISMOGEOCHEMICAL-on-line". These are – first developed rapid methods for identifying "dangerous" earthquake source zones with seismic geochemical methods. They were tested for the strong and devastating earthquakes on the basis of the factual materials of seismic geochemical monitoring in Azerbaijan during 1979-2011. The objects of monitoring are the fluids of seismic zones of Azerbaijan and the sea water of the shore of the Caspian Sea.

It is known that for the correct prognosis of strong earthquake it is necessary to indicate 3 main parameters: the strength (magnitude) of a future seismic event, location of the source and time of its implementation. With these requirements, proposed technology for the rapid assessment of seismic conditions on geochemical fields of fluids of Azerbaijan reflects the results of creating mathematical and software security. They consist of the developed and implemented rapid methods:

1. Express-method of revealing the anomalies (formulae) at daily processing of data (153 parameters) of seismic geochemical monitoring for operative evaluation of seismic situation in the region.
2. Express-method of calculation of diapason of the magnitude (formulae) of the forecasted earthquake.
3. Express-method of identification of seismic center on anomalies in geochemical fields of fluids. It allows determining 2 parameters: a) "diapason" of location of center zone which is going to be realized; b) diapason of time which is left for realization of the forecasted earthquake in the interval of 1-16 days.
4. Empirically was determined the "diapason, i.e. horizon of time of forecast" of seismic event on anomalies in geochemical fields of fluids. It equals 1-16 days.

As a result of experimental works there were determined the following important regularities:

- at preparation of earthquakes of different magnitude the anomalous disturbance of geochemical field on the time of appearance and in combinations of elements – indicators for different seismic centers has individual geochemical "portrait".
- at repetitive realization of earthquake in the same center with analogous seismic parameters (magnitude, depth), its geochemical "portrait" is stable, i.e. it is the etalon for this earthquake source.

- within the concrete tectonic fault, in different years, in the same center zone, in the final stage of preparation of the earthquake of the equal diapason, the anomalies of identical parameters are formed. Their combinations are the "etalons" for concrete center zones within the concrete tectonic faults.

On basis of the determined regularities have been created:

a) "Atlas of etalons for identification of seismic centers on geochemical fields of fluids of Azerbaijan";

b) "Atlas of geochemical "portraits" of seismic centers of Anatolian-Iranian-Caucasian tectonic block" for all realized strong and catastrophic earthquakes for the period of 1997-2011.

Results of operative evaluation of seismic situation reflect the main parameters of the forecasted earthquakes (location of center zone, diapason of magnitudes for the period of 1-16 days). And there is indicated the possibility of preparation for realizing of not only strong- but also medium-tangible and weakly-tangible seismic events. Region of evaluation of seismic situation on geochemical fields of fluids of Azerbaijan is the basin of the Caspian Sea, Azerbaijan and frontier territories of adjoining countries (Russia-Dagestan, Georgia, Armenia, Turkey, Iran). Accuracy of the forecast is 70-80%. All process of daily data processing (153 parameters) of seismic geochemical monitoring is automated. But the researches in this direction haven't been finished yet. Seismic forecasting researches by geochemical method in Azerbaijan continue.

ON THE PROBLEM OF STRONG EARTHQUAKES PREVENTION

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Changes in the seismic regime that occur during explosions of different intensities, the filling up of reservoirs, the injection of liquid into boreholes, and during the application of vibro, pulsed, and electromagnetic actions were observed in all regions for a relatively long time. To a certain degree, these observations led to the idea of considering the prevention of a forthcoming strong earthquake (FSE) as a method of active protection of the population, dwellings, and large-scale engineering structures from this natural disaster. It was proposed to use the abovementioned factors influencing the seismic regime (or their combination) as the industrial impact on the hypothetical portion of the Earth's crust that is in the pre-failure state in order to "exchange" the FSE for a number of smaller earthquakes or aseismic slips. There were a lot of ideas suggesting various solutions of the aforementioned problem. Among the published proposals on the prevention of a FSE, methods based on water injection and vibro influence merit greater attention as they are based on field observations and the results of laboratory tests. In spite of this, the cited proofs are, for various reasons, insufficient to acknowledge the proposed techniques as highly substantiated; in addition, the physical essence of these methods has still not been fully understood. First, the key concept of the methods, namely, the release of the accumulated stresses (or excessive elastic energy) in the source region of a forthcoming strong earthquake, is open to objection. If we treat an earthquake as a phenomenon of a loss in stability, then, the heterogeneities of the physical properties and stresses along the existing fault or its future trajectory, rather than the absolute values of stresses, play the most important role. This statement is illustrated by the classical examples of stable and unstable fractures and by the examples of the calculated stress fields, which were realized

in the source regions of the tsunamigenic earthquakes of December 26, 2004 near the Sumatra Island, of September 29, 2009 near the Samoa Island, and of January 03, 2010 near the Solomon Islands. Here, just before the earthquakes, there were no excessive stresses in the source regions. Quite the opposite, the maximum shear stresses Tmax were close to their minimum value, compared to Tmax in the adjacent territory. We provide quantitative examples that falsify the theory of the prevention of FSE in its current form. It is shown that the measures for the prevention of FSE, even when successful for an already existing fault, can trigger or accelerate a catastrophic earthquake because of dynamic fault propagation in the intact region. Some additional aspects of prevention of FSE are discussed. We conclude that in the near future, it is too early to consider the problem of prevention of a FSE as a practical task; otherwise, the results can prove to be very different from the desired ones. Nevertheless, it makes sense to continue studying this problem. The theoretical research and experimental investigation of the structure and properties of the regions where the prevention of a forthcoming strong earthquake is planned in the future are of primary importance.

COMPLEX NETWORKS OF EARTHQUAKES AND AFTERSHOCKS IN TEHRAN REGION

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We propose a method for analyzing precursory seismic catalog data by using artificial neural networks to recognize places where strong earthquakes may occur in Tehran region in central Alborz. The Self-Organizing algorithm was applied to obtain the clusters of Doughnut patterns before large earthquake. In this paper, We present pattern recognition of clustered earthquakes by using Self-organizing feature maps (SOFM), which can be successfully used to build a statistical model for generating earthquake catalogs to make good short-term prediction of large earthquakes by shape of their clusters. The approach is based on statistical patterns of seismicity by using artificial neural net models is to provide good generalization to exhibit several intriguing precursory phenomena with fast computational tools. SOFM neural networks can visualize a clear seismic patterns anomaly that is observed preceding the large event such as doughnut patterns, precursory swarms, and seismic quiescence before large earthquakes. The results have been confirmed of 90% strong events took place at some nodes recognized by these clusters prior to their occurrence.

AVO ANALYSIS APPLICATION ON 3 D SEISMIC DATA

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Various researches were conducted on seismic signal behaviour on rocks with gas presence along with its influence on trace attributes.

In the 1980 ies, geophysicists have developed many techniques to explain the trace attributes to physical and petro physical parameters dependency. Among these techniques

we name the amplitude versus Offset technique abbreviated as AVO which has proved itself as an effective tool.

In the beginning, this technique was applied on a 2 dimensional seismic data and has shown encouraging results.

Acquisition simplicity (the source and receiver are on the same plane) has simplified the AVO application. However, in 3D seismic, other parameters are involved in the acquisition process whereas some of them are included in the AVO analysis, particularly, taking into account the effect of the seismic trace azimuth.

Throughout this paper, we will apply the AVO analysis on 3D seismic data used in the south of Algeria and study the azimuth's influence on the AVO response.

Key words: AVO/AVA – AVO Azimutale – Azimuth – Bright Spot – Amplitude abnormalities – Intercept – Gradient – fluid factor – Cross plot – Product – Interface – Reflection – Wave – Offset.

SEISMICITY AND SEISMIC PROTECTION IN UKRAINE

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Earthquake-resistant design and development of anti-seismic measures require knowledge of the quantitative parameters of the real seismic hazard and seismic data on the vulnerability of structures. The main link supplying objective data for activities to protect against earthquakes are seismological observation.

To obtain reliable baseline data is necessary to ensure the further expansion (increase in the number and uniformity of the distribution) network of seismic stations and its re-equipment by modern equipment and software.

At the state level is necessary to provide a centralized ordering and funding for the regular (once per 10 years) updating maps of general seismic zoning of the territory of Ukraine and for the improvement of regulations on earthquake-resistant design and construction, taking into account new data on the geodynamic situation in the country's territory and using new improved methods of quantification of real seismic hazard on the construction and maintenance sites.

THE STRONG EARTHQUAKES IN ALBANIA IN THE PERIOD 2004-2009 AND THE PROCEDURE FOR THEIR MACRO SEISMIC DATA COLLECTION

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The earthquakes are geological phenomena that demonstrate clearly the dynamics of the planet we are living on. They express most directly the enormous energy that the Earth hides inside as a new planet. These phenomena are the causes of sharp changes of the surface of our planet accompanied with its continuous evolution.

As disastrous phenomena the earthquakes have brought great damages to humanity during the centuries. Only during last 500 years more than 7 million people are killed from earthquakes worldwide and many other millions have lost their living resources.

Nevertheless, these phenomena have been not only a source of disasters but even a valuable source of geological information. The analysis of seismic waves has given detailed and unique information on the internal composition of the Earth.

The earthquakes are unavoidable phenomena and the people are trying to co-exist with them seeking most appropriate forms for making them as less dangerous as could during their time-to-time appearance. The best way for realizing it is the deep acquaintance of these phenomena.

The earthquakes occured in Albania during the past century and in the beggining of the XXI century, with the highest magnitude and in the same time causing demages and lose of lives.

After 1960-s, the first seismological station started operation, recording earthquakes with magnitude less than 4.0. Prior to this time, the instrumental records for albanian earthquakes results from near by seismological stations, setteled in Balkan area. Studing the instrumental seismicity of the country, for 1900-1995 time period, results 1037 recorded earthquakes with $M>4.1$. Up to now, the seismic aktivity in Albania is characterized by an intense microactivity ($1.0<M\leq3.0$), by many small earthquakes ($3.0<M\leq5.0$), by medium size earthquakes ($5.0< M\leq 7$) and very seldom by strong ones ($M>7.0$) (Muço, 1992, 1995). Comparing, instrumental and macroseismic data, several empirical relation has been derived. This relations are used getting very accurate results in observatory every day work.

The macroseismic data, for these events, has been collected using two main sources:

a) ***Questionnaire survey***

b) ***Fields investigations***.

During interval 2004-2009, the seismic activity is characterized mainly by small earthquakes with magnitudes in the interval $2.5 \leq M_L \leq 5.0$ and rarely by earthquakes with moderate size, with their magnitudes in the interval $5.0 \leq M_L \leq 5.5$. Some of these events have caused damages in the epicenter area.

The main events with evidenced damages, recorded from Albanian Seismological Netwrok during this time interval are as follow:

1) **Leskoviku earthquake of 23 November 2004**, **M=5,2**, in the sowth-eastern part of Albania.

2) **Tropoja earthquake of 10 July 2005**, **M=5,2,** in the northern part of the country.

3) **Tepelena earthquake *of* 13 June 2006, M=4,8,** (determined epicenter in the Luzati village), occured in the central part of Albania.

4) **Gjorica earthquake of 06 September 2009, M=5,4,** in the northrn-east part of Albania.

GEODYNAMIC AND SEISMIC RISK IN ALBANIA TERRITORY

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On the worldwide seismic zonation, Albania takes place on Alpin-Mediterranean seismic belt. This belt comprises the wide zone of contact between lithospheric plates of Africa and Eurasia, from Azore Islands up to the eastern border of Mediterranean basin (Fig.1). In this zone, the concept of plate tectonics is especially complicated from the presence of numerous blocks and the release of stress through plastic deformation on a large part of the zone. The region surrounded Albania comprises a wide tectonic belt with relatively rigid blocks as Adriatic, some sectors of Alpine belt, Alps, Carpathes, Balkan Mountains, Dinarides, Helenides, the Helenic Arc and Anatolian belts as well as internal basins as Tirren, Egean, Panonia and Black Sea.

In the above-mentioned belt, the most active part seismically is Egean and surrounding zone, where take place Greece, Albania, Montenegro, Macedonia, South Bulgaria and Western Turkey. Almost every year in this part (34-43^{o}N; 18-30^{o}E), occurs at least one earthquake with M_S>6.5 (Papazachos, 1988). Leaving apart the Helenic Arc where African plate sinks under the Eurasian plate in the subduction form, the other contact between these two plates and especially that part starting where the western wing of Helenic Arc already ends and continuing with western coasts of Balkan peninsula, is realized through Adria microplate. This unit acts as a wedge between Apenines, Alps and mountain range Dinarides-Albanides-Helenides.

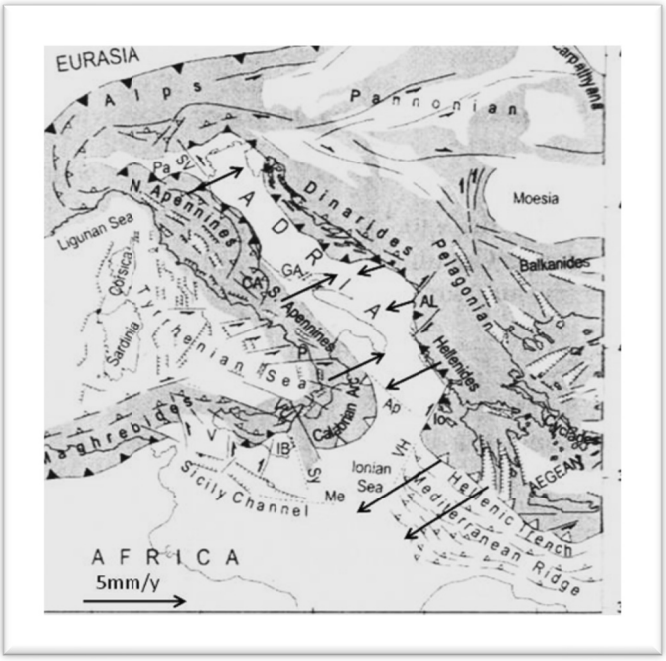

Fig.1 General sketch of the geodynamics of the zone surrounding Albania.

The origin of orogenic systems of western Balkan as well as those systems surrounding on the north and west the Adriatic Sea, is strongly connected with the convergence between Eurasian and African plates. This process that has began on Upper

Jurassic-Lower Cretaceous, influenced the disappearance of the old ocean Tethys, situated between two continental margins and whose reminants are today the ophiolites and abyssal sediments taking place on the nappes of above mentioned orogenic systems.

It is still a matter of dispute whether Adria is today a part of African plate or should be considered as an independent unit. From the focal mechanism and paleaomagnetism studies, it is revealed that the Adria microplate participates on an anticlock rotation with pole in the northern Italy. The conclusions of many studies on the geodynamics and seismicity of Egean and generally of eastern Mediterranean, zones where Albania takes place are converged on the point that mostly the seismicity of Albania is strongly connected with the contact between Adria and Albanides orogen which is part of a wider collision between Eurasian and African plates. This contact which possibly takes effect through a continental type of collision unceasingly accumulates deformations and propels the longitudinal tectonic faults bordering it as well as transversal tectonic faults cutting it and penetrating to the interior of the peninsula. Are precisely these continuous accumulations of tectonic deformations that through active faults as the earthquake cradles give way to seismic energy release shaping so the seismicity of the country.

Seismicity of Albania. The seismicity of a certain region is determined as a function of earthquake size (magnitude, intensity, seismic moment etc.) as well as the frequency of their occurrence. On this basis, keeping in mind the well known classification of earthquakes according their magnitudes.

(Hagiwara 1964, Lee *et.al*., 1981), the seismicity of Albania is characterized from an intensive seismic microactivity (1.0<M≤3.0), from many small earthquakes (3.0<M≤5.0) from rare medium-sized earthquakes (5.0<M≤ 7) and very seldom from strong earthquakes (M>7.0).

Usually the seismicity of a country is separated in two periods: the historical seismicity and instrumental seismicity. Historical seismicity is based on the information collected from different sources and has to do with that period of history when the earthquakes were not yet recorded with special instruments. Instrumental seismicity is identified with the 20th century because from this time in Europe and worldwide started the implementation of seismological stations and the earthquake records began to be collected and analyzed systematically.

CORRELATION BETWEEN SEISMIC VULNERABILITY INDEX AND DAMAGE BELT IN BANTUL GRABEN, YOGYAKARTA SPECIAL PROVINCE, INDONESIA

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Bantul Graben tectonically is one of very active seismic region in Indonesia. The May 27, 2006 Bantul Earthquake (M_W=6.3) caused severe damage to building structures and lifelines in the Bantul Graben and its surroundings. The earthquake caused extensive damages that shaped 'damage belt' which is parallel with Opak Fault. The 'damage belt' phenomenon is a question that it must be explained clearly, because the epicenter is not located within the serve damage area.

This research aimed to analyze spatial distribution of seismic vulnerability index in Bantul Graben and its surroundings, and to analyze the relationship among seismic vulnerability index, shear strain, and building damage ratio in the research area. To explain

the relationship between the distribution of damage caused by earthquakes with local site effects, then three years later was carried out 117 observation points of microtremor measurements to determine the seismic vulnerability index in the Bantul Graben.

The results showed that the values of seismic vulnerability index in Bantul Graben between 0.04 and 23.21. There is a similarity between the distribution pattern of seismic vulnerability index based on microtremor measurements with the distribution of damage caused by earthquakes. There was good correlation between seismic vulnerability index with the ratio of damage, the greater the value of seismic vulnerability index the greater the damage ratio. The seismic vulnerability index of 21.2 associated with the damage ratio of 77%, while the value of 8.3 associated with 56% ratio of damage.

Thus, it can be concluded that the distribution of damage caused by the May 27, 2006 Bantul earthquake that formed the 'damage belt' is a phenomenon of local site effects caused by the high seismic vulnerability index value at the volcanic fluvio plains of Young Merapi with rocky sand and gravel which are distributed along the Opak Fault.

Key words: *Seismic Vulnerability Index, Bantul Graben, Earthquake Damage Belt.*

NEW METHODS OF EARTHQUAKES AND TSUNAMI SOURCES DETERMINING, SIMULATION, MODELING AND VISUALIZATION

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We consider new techniques and methods for earthquake and tsunami related problems, particularly – inverse problems of determination of tsunami source parameters, numerical simulation of long wave propagation in soil and water, hazards and risks estimation. Besides that we will touch upon the issue of database management and the whole destruction scenario visualization. New approaches and strategies as well as mathematical tools and software are to be shown.

The long joint investigations by researches of Institute of Mathematical Geophysics and Computational Mathematics SB RAS and specialists from WAPMERR and Informap allow produce a special theoretical approaches, numerical methods and software tsunami and earthquake modeling, visualization, risk estimation. The system TSS numerically simulates the source of tsunami and/or earthquake and includes a possibility to solve the direct and the inverse problem. It becomes possible to involve advanced mathematical results to improve models and to increase the resolution of inverse problems. Via TSS one can construct maps of risks, the online scenario of disasters, estimation of potential damage of buildings and roads.

One of the main tools for the numerical modeling is the finite volume method (FVM). Advantages of FVM over finite difference method in application to tsunami modeling are follows:

1) Stability. FVM by default satisfies the property of mass conservation. This is a very important feature for tsunami related problems. Besides that, it is very simple to incorporate any kind of TVD (Total Variation Diminishing) technique into a finite volume

code for tsunami propagation. When the waves enter shallow water regions, numerical oscillations may occur and affect modeling results, making them less reliable.

2) Calculation speed. In FVM the cells of calculation domain are usually numbered with one-dimensional indexes, this fact makes the process of parallelization clear and obvious. If the calculations are performed using the multiprocessor system with shared memory there is almost no need for special adaptations. Time, required for calculations, linearly depends on the processor count.

3) Triangular meshes. One of the main weaknesses of the finite difference method is a restriction on mesh topology. Only rectangular meshes can be used for finite difference method calculations, while FVM has no such drawbacks. Even if the bathymetry data is rough, triangular meshes are much more efficient from the point of accurate topology mapping. When the problem size is relatively big (tsunami movement across the ocean for example), there is no noticeable differences between the usage of rectangular and triangular meshes, but when the run up heights near the city are calculated, this property of FVM comes to play. Our approach to inverse problem of tsunami and earthquake determination is based on the recent theoretical results concerning the Dirichlet problem for the wave equation. This problem is intrinsically ill-posed. We use the optimization approach to solve this problem and SVD-analysis to estimate the degree of ill-posedness and to find the quasi-solution.

GRAVITY ANOMALIES AS EARTHQUAKE PRECURSORS RECORDED AT ATROPATENA NETWORK

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The gravity anomalies, prior to major earthquakes, is a very well established fact and have been noticed in case of many major earthquakes. The ATROPATENA system which is based on principle of Cavendish balance is developed by scientists, working at Scientific-Research Institute on prognosis, International Academy of Sciences, Baku, Azerbaijan to measure such anomalous signals. The anomalous data from ATROPATENA system network was analyzed to forecast major earthquakes during the period Jan 2010 – June 2011. The forecast of earthquakes were made on the basis of arrival time of anomalies at ATROPATENA stations. The overall success ratio regarding recorded anomalies was about 77% which is a good achievement for successful forecasting earthquakes.

Summary of 18 months (Jan 2010-June 2011) Earthquake Forecasts

Table

Duration					Recorded Anomalies	Forecasted Anomalies	Successful Forecasts	False Alarms	Weak Anomalies	Percentage of Success
Jan 2010 - June 2011	224	145	111	34	78	77%				

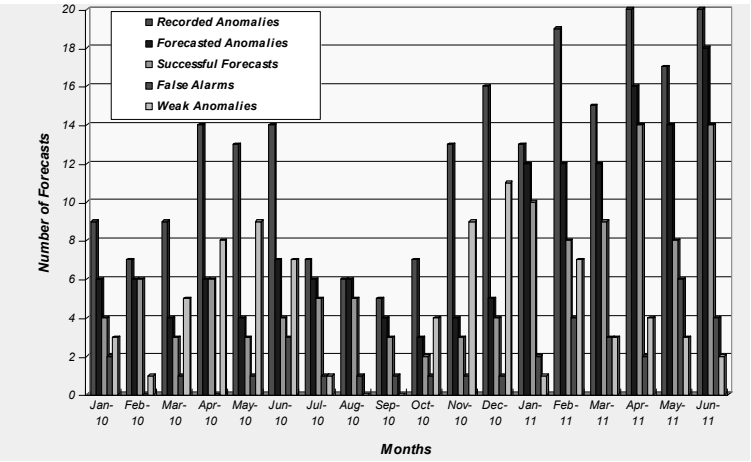

Fig.1. Graph showing summary of Jan 2010 – June 2011 Earthquake F.

SATELLITE BASED STUDY OF THERMAL INFRARED (TIR) ANOMALY RECORDED BEFORE ASTOR VALLEY (PAKISTAN) EARTHQUAKES

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Using Moderate Resolution Imaging Spectro-radiometer (MODIS) onboard Aqua and TERRA satellites pre and post earthquake cloud free data, pertaining to thermal infrared region, the study was carried out for Astor valley, Pakistan earthquakes of November 02, 2002 M 5.4, (34.493^{o}N, 73.629^{o}E), and November 20, 2002 M 6.3 (34.51^{o}N, 75.41^{o}E). The image processing software ENVI (Environment for Visualizing Images) was used to obtain the maximum, minimum and average radiance and corresponding temperature values were computed to see any change in surface temperature. Anomalies start to appear about a month to several days before the occurrence of strong earthquake with covering area of thousands km^2. From the analysis it was observed that the variation of surface temperature value was 4-11ºC for Astor valley events. The average temperature also manifest decreased trend just 1-7 days before the earthquake and attains its normal behavior after the occurrence of earthquake. The maximum energy was shifted towards the epicenters during that period. The locations of epicenters were found within the anomalous area.

NEW APPROACHES TO EARTHQUAKES PREDICTION, SIMULATION AND VISUALIZATION

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We consider new techniques and methods for the earthquakes prediction, simulation and visualization. Our approach is based on inverse problems theory, and involves the determination of the earthquakes source parameters, numerical simulation of long wave propagation in soil, hazards and risks estimation.

We discuss the theory of dilatancy as a premonitory phenomena for the earthquakes using the property of many solids to exhibit dilatancy during deformation. We also propose a new model for earthquakes parameters estimation that leads to the problem of determination inter-laminar stresses in the multilayered isotropic medium subjected to in-plane loads. These layers represent continental blocks in a simplified model of earth structure. Based on finite element discretization, by taking into account transmission conditions between the layers, an analysis of inter-laminar normal and tangential stresses is described. We also discuss the issue of database management and the entire destruction scenario visualization. New approaches and strategies as well as mathematical tools and software are to be shown.

SECTION 1
Earth Sciences

SUBSECTION - Geology and Geophysics

CRUSTAL STRUCTURE OF THE DEAD SEA BASIN (DSB) FROM A RECEIVER FUNCTION ANALYSIS

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The Dead Sea Transform (DST) is a major left-lateral strike-slip fault that accommodates the relative motion between the African and Arabian plates, connecting a region of extension in the Red Sea to the Taurus collision zone in Turkey over a length of about 1100 km. The Dead Sea Basin (DSB) is one of the largest basins along the DST. The DSB is a morphotectonic depression along the DST, divided into a northern and a southern sub-basin, separated by the Lisan salt diapir. We report on a receiver function study of the crust within the multidisciplinary geophysical project, DEad Sea Integrated REsearch (DESIRE), to study the crustal structure of the DSB. A temporary seismic network was operated on both sides of the DSB between October 2006 and April 2008. The aperture of the network is approximately 60 km in the E-W direction crossing the DSB on the Lisan peninsula and about 100 km in the N-S direction. Analysis of receiver functions from the DESIRE temporary network indicates that Moho depths vary between 30-38 km beneath the area. These Moho depth estimates are consistent with results of near-vertical incidence and wide-angle controlled-source techniques. Receiver functions reveal an additional discontinuity in the lower crust, but only in the DSB and west of it. This leads to the conclusion that the internal crustal structure east and west of the DSB is different at the present-day. However, if the 107 km left-lateral movement along the DST is taken into account, then the region beneath the DESIRE array where no lower crustal discontinuity is observed would have lain about 18 Ma ago immediately adjacent to the region under the previous DESERT array west of the DST where no lower crustal discontinuity is recognized.

Key words: crustal structure, Dead Sea Basin, receiver function

PETROPHYSICAL PROPERTIES AND COMPARTMENTALIZATION BY GEOCHEMICAL APPROACH OF TANK TAGI. BASIN OF BERKINE. SAHARIAN PLATFORM

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After the discovery of tank TAGI of the layer of Ourhoud in 1994 in the basin of Berkine, the Ourhoud organization envisages an initial plan of development having for the objective the maintenance of the pressure of the layer at the same time an increase in the production.

Principal geological uncertainties being able to affect the effectiveness of the maintenance of pressure by water injection in periphery were the possible compartimentalisation of the tank and bad the connectivity of the peripheral zone to the remainder of the tank (parallel faults).

In this context, the objective of this study consists in studying and analyzing the distribution of the parameters petrophysic who control the quality of the tank, the extension of tank TAGI and the description of compartimentalisation of the Ourhoud tank by using the results of geochemical analysis, who are based on a detailed examination of the fractions of crude oil.

The results of this study show that tank TAGI has better petrophysic characteristics in general, their increase by zone and between each unit, influences negatively connectivity between the blocks of the tank.

From geochemical point of view one can compartimentaliser our tank in 6 principal blocks: Compartment 1 (Well Qb-3, QB-11et Qb-31). Compartment 2 (Well Qb-26, QB-1et Qb-17 and Qb-20). Compartment 3 (Qb-24). Compartment 4 (Qb-25, Qb-15). Compartment 5 (Qb-30, Qb-19 and Qb-16) and Compartment 6 (Qb-22).

Key words: Berkine. Tank TAGI. Petrophysic properties. Geochemistry.

ELABORATION OF THE INTERDISCIPLINARY DATABASE FOR THE CONSTRUCTION OF THE GEODYNAMIC MODELS OF DEEP STRUCTURE OF THE NATURE DISASTER REGIONS (NEFTEGORSK EARTHQUAKE, SAKHALIN ISLAND)

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The Information interdisciplinary database was used for construction of the deep structure model in the region of the Neftegorsk Earthquake which has occurred on May 28, 1995 in the North Sakhalin. The location of the earthquake epicentre was 52.6° N, 142.8° E with magnitude Ms=7.2. The hypocentre of Neftegorsk earthquake was found on a depth of 18 km. As a result of this disastrous earthquake a seismic rupture of north-northeast strike of an overall length of 35 km appeared which caused right-lateral strike-slip fault displacement with amplitude of the horizontal shift component up to 8 m and vertical upthrust component up to 2 m. The constructed model shows that North Sakhalin consists

of the North Sakhalin sedimentary basin, the Deryugin basin and the ophiolite complex located between them. The Deryugin basin was formed on site of an ancient deep trench after subducting the Okhotsk sea plate under the volcanic arc along Sakhalin in the Late Cretaceous-Paleogene. The North Sakhalin sedimentary basin was formed on a place of back-arc basin at that time. The ophiolite complex combined by the ultrabasic rocks, fixes position of ancient subduction zone acting about 100-60 million years ago. On a surface the subduction zone manifests itself as deep faults running along Sakhalin. The center of the Neftegorsk earthquake was directly formed by burst of activity of this ancient subduction zone. From a position of the ancient subduction zone under Sakhalin, which is a cause of strong earthquakes here, it follows that the region is one of seismic dangerous in Russia.

Proposition

We propose to create the International Information Interdisciplinary Database including geology-geophysical parameters of lithosphere under the nature disaster regions of the Earth which characterized by tectonic, seismic and volcanic activity and other natural hazards. It will give the chance to construct geodynamic models of a deep structure of the regions dangerous to people living here. This database will provide a basis for the further possibilities of a prediction and prevention of grave consequences of disastrous events. Constructed on the basis of complex interpretation of the geologic-geophysical data the geodynamic models of active continental margins give the chance: to study a deep structure of the Earth under seismic dangerous zones, volcanic areas, mineralization regions and sedimentary basins; to investigate a role of the deep processes in mantle which have an influence on formation of crust structuress; to relate the geological features, tectonomagmatic, hydrothermal activity with the processes in the upper mantle; to plot maps in detail with zones of increasing risks to prevent active building or other economic activities in such dangerous regions.

TRACES OF THE ANCIENT CIVILIZATION AT THE BOTTOM OF CASPIAN SEA

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Development of human society in the course of the whole history of mankind significantly depended on a lot of natural factors such as climatic conditions, soil fertility, and availability of water sources, the vegetable world and the animal world. However perhaps only natural calamities distinguished by its unpredictability and scope exerted fatal impact on development of civilizations. There are many examples in the history of humanity that evidence destruction and dark oblivion for many centuries and sometimes millennia of the whole civilizations as a result of natural calamities.

Investigations show that the level of water in the Caspian Sea was exposed to periodical fluctuations and resulted in significant change of coastline of the Caspian Sea and area of water surface of the sea.

Investigation of shelf of Absheron peninsula using space photographs allowed scientists to find an extraordinary structure on the bottom of the sea, near the eastern

boundaries of Absheron peninsula i.e. Shikhov bay-bar and the shape of this structure reminded of the ruins of an ancient fortress. Authors temporarily titled this structure as "Zyrinskaya fortress".

Closer viewing of the picture allows us to see clearly the perimeter and the interior design of the structure. Special filters providing for viewing of the space photograph in various spectral ranges have been used in order to improve visual capacity of the obtained picture. The structure has oblong shape and stretches in the North-eastern direction. Ruins of several walls that have lateral and cross cut orientation in regard to exterior walls are clearly distinguished inside the structure. There is a semicircular structure near the southern wall, in the central part of the conditional fortress. However it can have square shape but looks circular as a result of silt or sand drift.

Detailed investigations and direct archeological digs will allow for more accurate description of the shape of interior structures of the fortress. Authors managed to some extent to get common understanding of possible spatial design of a number of components of the ancient fortress using methods of three-dimensional graphics. Implementation of special software allowed for identification of precise parameters of Zyrinskaya fortress. The length of the fortress equals to 316 meters, and the width of the fortress equals to 140 meters. Perimeter of the exterior walls of the fortress amounts to 823 meters.

The area of interior part of the fortress equals to 38,960 square meters. Diameter of semicircular interior structures equals to 21-25 meters. Thickness of the external walls is equal to 2-2,5 meters. It is clear that the eastern wall of the fortress is not even, and it represents an uneven oval that is slightly inclined in the eastern direction. The northern wall of the fortress has also an oval shape, and the southern wall is even. The oval shape of the walls could be imposed by local relief.

Indeed the geological data confirm presence in the historical past of the Caspian Sea of both global transgressions and regressions in terms of scale of geological time and space, and relatively small cycles of rising and consequent lowering of level of the Caspian Sea in terms of scale. Meanwhile we haven't found any notes in historical sources that would confirm presence of an ancient fortress in the area of the detected underwater ruins.

PRE-ALPINE GEODYNAMICS, MULTI-STAGE REGIONAL METAMORPHISM AND GRANITOID MAGMATISM OF THE CAUCASUS

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Granitoid magmatism and regional metamorphism of different type, being a reflection of thermobaric field variation in external shells of the Earth, represent a direct consequence of geodynamic settings in various structural units of the Earth's crust and lithosphere of the Caucasus. Geodynamic constructions are based on the conceptions of plate tectonics and horizontal tectonic layering of the lithosphere, which according to geological and geophysical data are established all over the Caucasian region.

Paleomagnetic and paleokinematic, as well as traditional geological data indicate that within the oceanic area of Tethys in geological past relatively small continental or subcontinental plates (terranes) were situated, having various geodynamic natures and characterized by specific lithologic-stratigraphic section and magmatic, metamorphic and structural features.

During the Late Precambrian, Paleozoic and Early Mesozoic these terranes underwent horizontal displacement in different directions within the oceanic area of Proto- Paleo- and Mesotethys (Neotethys) and ultimately joined the Eurasian continent.

The Greater Caucasian, Black Sea-Central Transcaucasian, Baiburt-Sevanian and Iran-Afghanian terranes are identified in the Caucasian segment of the Mediterranean mobile belt, which in geological past represented island arcs or microcontinents.

At the same time geological (structural) and geophysical data indicate that the Earth's crust of the Caucasus is tectonically layered. This layering, side by side with other sources of heat (subduction, stream of fluids, radiogenic heat), owing to dissipative warming up of rocks, creates "thermal screen" and stipulates the generation of supplementary deep energy for metamorphism and granite formation processes.

In Neoproterozoic and Paleozoic on the peripheries of the oceanic basins regional metamorphism and granite formation took place, which were conditioned by the functioning of subduction zones by both sides of Paleotethys and along the northern peripheries of comparatively small oceanic basins of the Arkhiz and Southern slope of the Greater Caucasus.

Processes of multi-stage regional metamorphism, granite formation and tectonic deformations were timed to Grenville, Baikalian (Panafrican), Late Baikalian (Salairian), Caledonian, Variscan and Early Cimmerian (Indosinian) orogenies that is recently corroborated by U-Pb zircon dating.

At the very end of the Variscan orogeny, extraordinary fast (instantaneous in a geological sense) exhumation of deeply subsided parts of the Earth's crust took place. Such instant raising of the crust and exposure of abyssal rocks can be attributed to the summary manifestation of isostasy processes, conditioned by high buoyancy of the consolidated crust lightened by that time, its shortening and intensive erosion.

Key words: geodynamic settings, regional metamorphism, granitoid magmatism.

GEOLOGICAL CATASTROPHICS AND EVENT DEPOSITS

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Event deposits are one of the indicators of catastrophic event manifestation in the geological past. With their help is produced reconstruction of catastrophic events occurring in the geological past and in general, of the paleogeographic conditions and tectonic processes.

One of the vivid examples of chaotically built event deposits are the Upper Eocene olistostromes and wild flysch of the Alpine folded area (the Swiss and French Alps, the Dinarides, Greater Caucasus, etc.), being mainly of tectonic-gravitational origin. Their formation in time coincides with the peaks of orogeny and is connected with consedimentary tectonic movements. They are somewhat marker formations allowing correlating the tectonic and catastrophic processes within the Alpine fold area as well as outside it.

In the Caucasus, the main part of Upper Eocene olistostromes is developed in the eastern segment of the Southern slope of the Greater Caucasus. Here, from the river Rioni they stretch as a narrow strip to the east, along the frontal line of the thrust of allochthonous flysch deposits. Due to this thrust, the deposits under consideration partially, and at places, probably entirely, are tectonically overlapped by the Cretaceous-Paleogene

flysch deposits. In their turn, from the north, the olistostomes thrust over the autochthonous normally-sedimentary rocks, including the Upper Eocene.

The olistostromes under consideration, despite their strong tectonic processing and displacement over great distances (20-50 km), give valuable information about the paleoeography and tectonic events, including catastrophic ones, going on in the second half of Late Eocene.

In olistostromes the presence of exotic inclusions of the Upper Jurassic limestones and crystalline rocks of the basement gave rise to the question of the location and structure of the land that supplied the Late Eocene basin with clastic material. Such a hypothetical land was most likely the Racha-Vandam land; it was a chain of separate cordilleras, located in the northern peripheral part of the Gagra-Java zone. The cordillera zone – at present completely overlapped with flysch trust.

For olistostromess formation along with catastrophic events is required the presence of a dissected relief in the form of cliffs and cordilleras – the basic suppliers of clastic material. Movements of disintegrated material to the areas of sedimentation mostly occurred due to the tectonic movements and the attendant downfall-landslide processes, being indicative of their tectonic-gravitational origin. These geological events occurred especially frequently in the zones of development of deep faults and in the process of nappe-formation as well.

Upper Eocene event deposits of the Alpine fold system, being synchronous formations, are clearly pointing to their timing to the same geological event. In particular, such could have been a collision leading to the formation of the fold-nappe structure of the Greater Caucasus. It began at the end of the Late Eocene, reaching its maximum in Late Miocene, when the Arabian plate became detached from the African plate and began movement to the north.

Key words: event deposits, olistostromes, catastrophic events

INCREASED SEISMIC RISK: DUE TO EARTHQUAKES OR THE HUMAN ACTIVITIES?

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Is there any change of the present-day tectonic activity? The earthquake origination, as well as volcanic eruptions, is a distinct indicator of the Earth's tectonic activity. The seismicity and its time changes are the subject of this presentation. Also the role of human development on the seismic risk has attracted our attention.

By the use of USGS NEIC earthquake database we searched for changes of seismic activity. This earthquake database might be considered one of the most homogeneous along with the ISC and EMSC databases.

We compiled several excerpts of damaging earthquakes proceeding from the USGS NEIC catalogues and USGS searching software. In order to get away from external periodical influences, the extract had to be made for a time period as long as possible. That is why we formed a database consisting of 2387 seismic events of a magnitude 6.5 or more starting from the year 1600 onwards. An analysis of this database shows different completeness of data in the course of time. And what more can be emphasized, is availability of a crucial point in the time behaviour of seismic events around 1970.

In result, our working database corresponds to the latest 40 years. It is brought under time analysis. The time pattern of the earthquake annual amount of events of a magnitude 6.5 or more has shown a barely visible trend of increasing in time (correlation coefficient about 0.2). The stronger earthquakes, those ones with a magnitude 7 or bigger, have not shown any trend in linear approximation; they have oscillating time behaviour. On the background of lack of clear tendencies concerning the earthquake origination, we have to be resistant against the challenges of the big modern city. An earthquake may affect the normal activities of people, hence the living style. This happens due to many factors including the ground shaking itself.

In order to investigate how people and buildings have perceived ground shaking in different periods of time, we searched for intensity maps. We planned to analyze a set of maps from the early XX century compared with another set of maps corresponding to the modern time of high storey buildings and reinforced constructions. Because in our interest are results from field survey after earthquake attacks spread all over the Earth, we have not succeeded in accomplishing an adequate set of maps.

In this situation another approach has a preference - to compare intensity values located close to each other. This means that the corresponding settlements should have been built in a similar manner, i.e. they have analogous types of constructions. Therefore, any variety of intensity ranging from one to three intensity degrees, which was not caused by the physical nature of soil conditions, should have been due to the buildings height mainly. Taller the buildings, bigger the inhabitants amount is; sometimes (during the day-time) the human population's density is greater. We started from the reasonable presumption for unfavourable influence of the big city's height on the seismic consequence. Based on the field survey pattern in cases of severe earthquakes, we may and have supported the assumption made.

Concerning the degree of seismic threat to the modern cities, the classical reasons like buildings solidity, symmetry and elaboration quality are not to be ignored.

SEISMOLOGICAL MONITORING OF SAYANO-SHUSHENSKAYA HYDROELECTRIC POWER STATION

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The authors took part in the State Committee on investigation of the accident cause at Sayano-Shushenskaya hydroelectric power station. Studding records, which were got at seismic station "Cheremushki" (it is situated at a distance of 4 km from the platinum), the authors could determine events happened during the accident.

It was determined that oscillations from a distance earthquake had run to the station in several seconds prior the accident. As these oscillations are low-frequency, it was possible to filter them and determine a record which shows that the accident began at 8 h.13 min.25 sec. of local time. Second hydroelectric generator changed operating mode before the accident, it resulted to increase of oscillations amplitude at frequency of 64 Hz. Frequency of hydroelectric generator cover is also about 64 Hz, and resonant excitation

appeared, it resulted to breaking of several stud-bolts. After 2.7 sec. the cover was tore, water flew into the generator hall.

According to records got by seismic stations situated in the generator hall during start and testing of the 6th hydroelectric generator, it is possible to determine connection between different operating modes of the hydroelectric generator and vibrational amplitudes behavior at different frequencies. It is determined that oscillations with frequency connected with number of turbine blades (38.095 Hz) are good observed at a great distances. It is possible to control operating modes of the hydroelectric generator and it`s good condition by changes of these oscillations amplitudes. On the base of carried out researches there is offered the method of seismic diagnostic of working hydroelectric power stations.

DEEP SEISMIC RESEARCHES WITH USING OF HIGH-POWER VIBRATION SOURCES AT THE PROFILES IN THE EAST OF RUSSIA

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Success of active seismology and deep seismic researches of seismically-active zones depends on technology and first of all on excitation sources. It is unacceptable to use strong explosions or powerful stationary vibration sources for this purpose because of ecologic reasons as well as poor spatial coverage. Low-power vibration sources (which are commonly used for seismic prospecting purposes) are also ineffective, because of low translucence aperture and small penetration depths.

Field investigations using powerful (40-60 tons) transportable and high-power stationary (100-tons) vibrators have been carried out by Siberian Branch of the Russian Academy of Science since for 30 years. For the long period of researches in various regions of Siberia, technique of work with moveable unbalanced vibration sources was proved; a considerable experimental data volume was accumulated.

Use of powerful transportable vibro-sources was developed into effective working technology. Optimal transportation unit was developed for work in hard-to-reach areas on the base of high performance cross-country vehicles. There were recorded wave fields for both longitudinal and transverse waves reflected from a reference boundary in the Erath crust and Moho which were recorded for 0 – 300-400 km. Data show high stability and repeatability of vibration effects. There were carried out many experiments on comparison of explosive and vibration records n various distances. A database of records registered in near-field zone was accumulated for various geology (from low-velocity sediments to crystal rocks). Effectiveness of explosive and vibration effects for various geology and records at various tectonic zones was researched. We started to research grouping of high-power 40-60-tons moveable vibration sources at DSS work on the profiles in Siberia. There are achieved much success in using of combined system of observations with using vibration sources, explosions and pneumosources in transit (land – sea) zones.

We present some examples of using high-power transportable and stationary vibrators, recording equipment, observation systems, data of deep vibroseismic researches

with high-power moveable vibrators at thousand-kilometer 2-DV geotransects (Magadan - Vrangel Island), 2DV-A (Pevek – Valunistoe village – Anadyr – Khatyrka village) and 3-DV (Dzhalinda village – Tynda – Yakutsk - Khatyrka village) at the East of Russia.

ACTIVE SEISMIC MONITORING USING HIGH-POWER MOVEABLE 40-TONS VIBRATION SOURCES – RESULTS, OUTLOOKS

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The paper presents data of operating vibroseismic observations using high-power stationary 100-tons and moveable 40-tons vibration sources, which have been carried out in Russia for 30 years. For this period the technique of active vibroseismic monitoring in seismic active regions was developed and long experimental lines of vibroseismic translucences were accumulated in the region of a big artificial storage close to Novosibirsk. It is shown that investigations using high-power vibration sources open new possibilities for study stressedly-deformed condition of the Earth`s crust and the upper mantle and tectonic process in them. There are given some examples of current and future systems of operating vibroseismic observations in seismic active zones of Siberia.

Special attention is given to developing operating seismic translucences of the Earth`s crust and the upper mantle using high-power 40-tons vibration sources. As a result of experimental researches there was proved high stability and repeatability of vibration effects, proved correspondence of wave fields from 40-tons vibration sources and explosions by reference waves from boundaries in he Earth`s crust and the upper mantle at distance of record to 400 km, there was researched effectiveness of vibration effects at excitations for various geology, there was carried out the technique of high-power vibration sources grouping for increase of effectiveness of emanation and increase of record distance, we started to accumulate lines of operating observations along the traces of vibration translucences in the region of Novosibirsk reservoir.

All these results prove possibility of using moveable collapsible 40-tons vibration sources for active monitoring of seismic dangerous zones, big special dangerous engineering objects like as nuclear power plants, nuclear waste storage etc.

MODERN DATA ON DEEP STRUCTURE AND SEISMICITY OF JOINT AREA OF EURASIAN, NORTH AMERICAN AND OKHOTOMORSK PLATES

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Modern geodynamics and seismicity of Far-Eastern region is mostly determined by interaction of Eurasian, Pacific, North American and Amur and Okhotomorsk plates. High activity of the regional structure at the latest stage and it`s modern geodynamics character are determined by development of two moveable belts of global level: Central Asian and Pacific. Seismic centers are concentrated in these belts, forming seismic belts of the same names.

The paper presents materials on seismicity, deep structure and space geodesy. These materials are used as a base for research the joint region of the plates. According to the data of seismic investigations, the width of seismic active zone along northern coast of the Okhotsk Sea is about 600 km, it could depend on triple joint of Eurasian, North American and Okhotomorsk plates here. All earthquakes of this zone are aroused in the middle and in the bottom parts of the Earth`s crust at the depth of 7-30 km.

Seismic investigation and DSS observation materials show that seismic process is proceeding at pressure conditions. Complex analysis of deep seismic investigations and seismology materials shows that there is significant appearance of the joint zone both in deep structures of the Earth`s crust and in the Moho. According to the DSS materials at the regional geotransect 2-DV (Magadan – Vrangle island) there is significant decrease of boundary velocity values (to 7.5-7.7 km/sec) along the Moho in the joint zone and local raise of the Moho. At the deep seismographic section in this zone we can see extremely heterogeneous middle crust, reduction of reflection contrast in the bottom of the crust and in the Moho section. In this zone we can also see reduction of average (effective) velocity in all stratum of the Earth`s crust, it can be an evidence of high fragmentation of the Earth`s crust structures. These materials, along with high seismicity at great depths up to 30 km, show appearance of the joint region of Okhotomorsk and North American plates not only in the upper part of the Earth`s crust, but also in the middle and in the bottom parts of the crust and in the Moho section.

There are also presented the data on analysis of dedicated seismic energy along the Eurasian plate boundary for long period of observation, which evidence united global seismic process within long-distance (more then ten thousands km) seismogenic zone.

SEISMIC INVESTIGATION OF THE EARTH'S CRUST OF A UNIQUE PROVINCE OF CENTRAL ASIA (ALTAI) WITH DEEP SEISMIC SOUNDING

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The Altai-Sayany region in Russia belongs to the most seismically active regions along with the Baikal rift zone, Kamchatka and the Caucasus. In recent years within the Altai-Sayany folded region different institutions have made studies into geodynamic situation and forecast of seismic danger using innovative technologies in the context of federal and international programs.

As of now, more than 5 000 km regional seismic profiles have been measured on the territory of the Altai-Sayany region. In terms of technique all the organizations conducted observations using similar systems: spread offset to a maximum of 300 km, receiver-to-receiver distance from 5-10 to 20 km at a shotpoint interval of 20 to 40 km.

Data of conventional and seismic-tomographic interpretations were used in combination with the resulting construction of geologic-geophysical sections. In doing so the deep consolidated crust was analyzed from views of its three-layer model. The upper layer, i.e. a granite-gneissic complex, is characterized by seismic wave velocities of 6.0-6.4 km/sec. Seismic wave velocities of 6.4-6.8 km/sec are inherent in the middle granulitic layer. The lower layer of the consolidated crust is represented by basic rocks with seismic wave velocities of 6.6 to 7.4-7.6 km/sec.

Geologic-geophysical sections were used to draw up schemes showing surface reliefs of crystalline formations, granulitic and basic layers, and Moho.

Against the background of average depths of the consolidated crust of 1 to 3 km one observes deep basins of submeridional trend with maximum values of depth contours from 5 to 10 km (Kuznetsk, Barnaul and Abakan ones). As a rule, the basins are broken apart by sizable uplifts of 0 to 2 km in depth and limited by deep faults. A dense network of deep faults as a whole is a peculiar feature of the structural surface of the territory under consideration.

In the regional pattern the M-discontinuity subsides from north to south between 36 and 54 km. On the background of the regional subsidence three large submeridional uplifts of the M-discontinuity are apparent. In plan they coincide with the Barnaul, Kuznetsk and Abakan basins revealed over the consolidated crust surface.

The Earth's crust of the Altai-Sayany Region is intensively broken by deep faults into blocks.

It is shown that earthquake focuses are confined to deep faults and areas of their crossing, which gives grounds to expect that in deep layers of the Earth's crust there are zones of high energy stress tending to reduction.

In the center of the territory under consideration there is a vast raised zone of the granulitic layer within which depths vary from 3 to 5 km. The whole surface is broken with numerous faults.

The relief of basites is rather generalized. In the center of the area under investigation there is a large subsided zone with 30-35 km depths to its surface. The basite surface is broken with deep faults, which more often than not, delineate rather wide linear uplifted zones of mainly submeridional trend.

NATURAL DISASTERS IN THE INDIAN OCEAN REGION

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The Countries and Regions in and around the Indian Ocean constitute around 50 states with a total land-area of 33 million sq. km. These states and regions accommodate about 2.6 billion or 39% of the global population (Braun.D.1983). The Indian Ocean occupies about 20% of the total ocean area of the world which covers a total of 73,427,000 sq .km of the globe stretching from East-Africa to west-Australia- a distance of about 6,400 km or 4000 miles from west to east and from south Asia to Antarctica in North-South Orientation (Ischoegle.L.2006). The Oceanic islands and littoral countries are thickly populated and at the same time these maritime regions are greatly vulnerable to different types of natural disasters with varied nature and differentiated effects. The states located along rim land areas of the countries in Eastern Africa, Southern Asia and South Asia. Asia is mostly poor and developing nations. Natural disaster under the group of climatologically (Cyclones, droughts), geological and tectonically (Earth Quakes and Tsunami's) Hydrological (Floods, tidal Surges, etc) origins are very common and recovering phenomena in the region. Although geographically the Indian Ocean region does not exhibit a coherent homogenous regional characteristics yet most of these littoral or oceanic areas experience a general tropical warm humid and semi-arid climatic condition and essentially due to these differentiated geographical peculiarities the whole of the Indian Ocean Region (IOR) can be divided into several sub-regions with their diversified and complex regional geographical ,climatologically, geological, hydrological and the resultant vivid biological or ecological sub-systems. Geologically and tectonically this region is one of the most unstable regions of the earth. Different tectonically plates have been actively moving beneath the sub-surface sports of different areas of this region. As a result these areas very frequently experience great earth quakes of huge magnitudes and very often these trigger great tsunamis or marine surges. Among the climatic catastrophic – tropical cyclones very often ravage the coastal parts of India, Bangladesh, Myanmar, Thailand, Sumatra, Eastern Africa, Arabian peninsula or Sri Lanka and Pakistan Recurring floods and cyclonic coastal surges are very common phenomena along the coastal states of the Indian Ocean Region. From The historical parts up to the very recent period's great earth quakes, huge floods, devastating, Tsunamis and prolonged draughts, famines, stormed, river-bank erosion etc numerous natural disasters wave enormously been causing tremendous loss to the life, property and environmental settings of the I O R. As a chain reaction of these disasters poverty, political unrest famine, diseases and epidemics and many other socio-economic vices have seriously been decaying and degrading the inhabitants of the most of the states of the region. From the foregoing studies and discussions it is evident that the IOR-countries are seriously vulnerable to different types of natural disasters. The coastal or the rim-countries of the Indian Ocean like India, Bangladesh, Indonesia, Sri Lanka, Myanmar, Thailand, Malaysia, Malagasy Rep. Kenya, Mozambique, S. Africa, Maldives, Pakistan, Oman, etc have been seriously experiencing one or another kind of natural disasters.

Key words: Natural Disaster, Indian Ocean, Indian Ocean Region, Climate Change

MODELING AND ASSESSMENT OF LANDSLIDES RISK. APPLICATION ON THE SLOPES OF THE ALGERIAN TELL (ALGERIA)

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The natural risk regains the notion of exposure to a natural disaster or dangers of any natural hazard. His management consists in the assessment and the anticipation of risks, as well as to the setting up of an alert system. From the natural risk, we mentions the one bound to landslides in the natural slopes, that are difficult to surround and to approach.

Nevertheless, the assessment of the landslides risk made the object of several works of research and many models, based on the multi-criteria analysis, have been established.

This work examines the contribution of multi-criteria analysis and fuzzy logic approaches to modeling and assessment a landslides Risk in the natural slopes. This one has been finished in two practicums:

- Assessment of the risk by multi-criteria approach, while basing themselves on the weighted sum model (WSM). The Results discover that, the use of qualitative parameters influence the classification of slop;
- It brought to use the fuzzy logic approach that permits the survey of these imprecision's, in adopting **Mamdani** model.

The method has been applied on slopes, situated in five zones of the Algerian Tell, where each is characterized by the different natural conditions. The result, put in evidence, summarizes himself in an optimal classification of slopes according to the degree of instability risk. He allows decision-makers to put in strategies for a possible work of these slopes.

Key words: landslide, slope, hazard, Vulnerability, Risk, Modeling, assessment, WSM, fuzzy sets, Algeria.

CATACLYSMS: REASONS OF THE ORIGIN AND THE WAYS OF PROTECTION FROM THEM

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The influence of the cataclysms on the ecological environment change is very high. Their origin is close connected with the geotectonic processes. Therefore volcanic activity, earthquakes, tsunamis, landslides and collapses, mud streams and other anomalies arise and develop directly under influence of the geotectonic processes. These geotectonic processes have a global character and occur under influence of the geodynamic forces arising from rotation of the Earth. The determined geodynamic forces take part in dislocation and movements of the lithosphere masses due to forces subordinated to well-known physical and mechanical laws moving these masses within the Earth crust from the west to the east and from the Poles in the direction to the Equator. As a result of interference of the indicated geodynamic forces the other geodynamic forces of the tangential character arise in the south-east direction in the northern hemisphere and in the

north-east direction in the southern hemisphere. Origin of natural catastrophes is connected with the geotectonic processes including activity of volcanoes, earthquakes, volcanic-plutonic processes, global deep-seated faults, dislocation and movement of the lithosphere masses; in its turn all these tectonic processes arise under influence of the global geodynamic events. Therefore study of the indicated geotectonic processes is very important in regular distribution and detection of the cataclysms in the Earth crust.

From the point of view of above-mentioned the regularities of origin and develop of the main geotectonic processes and their connection with the geodynamic processes resulted from rotation of the Earth are investigated in the paper and there is also explained the regularities of cataclysms origin and natural catastrophes.

As a result of theses investigations it will be possible to determine the way of protection from these cataclysms.

These investigations show that the ways of protection from these cataclysms are in detection of the nature of the geotectonic processes, the regularities of their origin in the Earth Crust.

In this paper all attention will be focused on this.

A NEW GEODYNAMIC MODEL FOR FORMATION AND EVOLUTION OF THE EARTH CRUST DEEP FAULTS

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A new geodynamic model of the Earth Crust evolution is suggested considering Earth rotation around its axis. Here on the base of scientific and factual materials dealing with Earth sciences and on the base of reliable obtained data the nature of some global geotectonic processes has been defined including the formation of the Earth Crust global deep faults and their further evolution.

It has been established while the Earth rotates around its axis the lithospheric masses are subjected to dislocation everywhere. Dislocation of mass occurs under influence of global geodynamic forces caused by the Earth rotation. Geodynamic forces have directions from west to east and from the Earth Poles towards its Equator. As a results of relationship between the main directions of geodynamic forces other direction forces appear, they are of tangential nature and have southeast direction in the north hemisphere and north-east direction in the south.

Under influence of these geodynamic forces a complex cascade of tensions appears in the Earth Crust represented by deep faults of various nature. A number of genetic types and also deep faults of different types (global, regional and local) can be defined here. On genesis submeridional faults of convergent (subduction) and divergent (spreading and riftogenic) nature are distinguished including perpendicularly located transformed faults. It is known the more active volcano-plutonic processes occur near equator latitudes of the Earth caused by increase of Earth radius.

According to suggested model each period of geological time has its appropriate geotectonic process and typical process development including global nets of deep faults. On the base of developed model the forces source of the main kinds of geological processes are connected with Earth rotation dynamics. So, the development of geological

processes occurs under influence of these forces and by change of the Earth Poles location all geological processes development changes including the development nature of global nets of deep faults, transmantle nature. Under influence of these faults the upper mantle matter decomposes and intensive physical-chemical phase transformations occur. They are the supply source for basic endogenic ore-formations.

PARETO OPTIMUM FOR COMPILING INTEGRAL HAZARD MAPS

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Synthetic maps of integral natural and technogenic-natural hazard are used in various management procedures. The main possible goals are strategy planning for the territory development, decision-making for a placement or protection of infrastructure objects, and risk management.

A traditional approach provides maps compiling as follows. At first, experts in every type of hazard compile maps for each hazard. As a rule, these maps show zones of various hazard intensity. When the total number of considered hazards is small then it is possible to demonstrate all the hazards in one map. In other cases, some algorithm is applied to compute the integral index. The final map shows the space distribution of this index. A popular method of numerical scores calculates the integral index as a sum of scores that are attached to each intensity level of each hazard. The main defect of this method is an arbitrariness of attached scores. Another problem is the necessity to compare intensities of various hazardous processes. If source hazards have the negative correlation, the final maps will demonstrate the voluntary preferences of experts, but not the results of analysis. If a group of source hazards has a similar genesis and, consequently, the positive correlation, the calculation will give a preference to this group.

IEG RAS uses the method of Pareto optimum for maps with concordant legends to compile integral hazards maps. The concordance of legends means that the same intensity level at various maps is characterized approximately by the same economical damage or human losses. The economic criteria are used instead of inner properties of the process. The unified approach to the source maps provides the possibility of comparison of different hazard processes from the one point of view.

The compiling of the integral map is considered as a multicriterion optimization problem. The task is to find the best or the worst areas according to the criteria of source maps. The Pareto optimum for multicriterion maximization is defined as follows. A set M of arguments is Pareto optimum, if for any x in M and y not in M there exists a criterion F_i such that: $F_i(x) > F_i(y)$.

The Pareto optimum zoning proceeds as follows. Let the 1st range zone be the set of points where the intensity level is equal to the total maximum at least at one of maps, i.e. the Pareto optimum. Let the 2nd range zone be the Pareto optimum at the territory with eliminated 1st range zone. By continuing this process we get the optimal zoning. It is possible to define subzones according to the number of criteria that are equal to the maximum at a point of map.

The Pareto optimum maps are good explainable for the officials and can be easy compiled in the GIS technique. The described approach was applied in various programs on safety of Russia, its regions and Moscow megacity. The algorithm does not depend on the map's scale.

METHODS TO ASSESS THE SITE EFFECTS BASED ON GEOPHYSICAL MEASUREMENTS IN BUCHAREST CITY, ROMANIA

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Bucharest is one of the most affected cities by earthquakes in Europe. Situated at 140-170 km distance from Vrancea epicentral zone, Bucharest had suffered many damages due to high energy Vrancea intermediate-depth earthquakes. For example, the 4 March 1977 event produced the collapse of 32 buildings with 8-12 levels, while more than 150 old buildings with 6-9 levels were seriously damaged. Since then the occurrence of 3 other earthquakes (1986 /M=7.1; 1990 /M=6.9; 2004 /M= 6.0) demonstrated that the Vrancea seismic activity is continuing, permanently threatening the Bucharest City area.

He studies done after 1977 earthquake had shown the importance of the surface geological structure upon ground motion parameters and emphasized the need for new methods of quantifying the site effects.

The earthquake from 27.10.2004 was one of the most studied as there were many good recordings in the Bucharest City area. The accelerometer network of National Institute for Earth Physics have recorded this earthquake and the PGA map for Bucharest was computed for the 3 components.

Considering only the EW horizontal component, they show variation in the PGA with amplitudes with ratio from 1 to 4 (16 to 65 cm/s^2) in the city area.

In seismic microzonation we want to display the variation in seismic response of the subsurface and subsequently determine where the soil is being amplified to a level that may damage existing buildings or other structures.

Frequently *peak ground acceleration (PGA)* is used to determine the maximum horizontal forces that can be expected. The method is not always adequate, because PGA often correspond to high frequencies, which are out of range of the natural frequencies of most structures. The largest amplification of the soil will occur at the lowest natural frequency or its *fundamental frequency*, which corresponds to the *characteristic site period.* In situ measurements of shear wave velocity in the soil and the soil thickness, provide a direct measure of the characteristic site period.

Extensively seismic noise measurements is a much accessible method and computed H/V spectral ratio can also provide a good indication on the fundamental frequency of the site. Average shear wave velocity in the first 30 m depth (Vs_30) as defined in EUROCODE 8 and Romanian Code P100-1 is a useful indicator in seismic microzonation, showing zones with low values of average seismic velocities in Bucharest.

COLLISION TECTONICS OF THE NORTH-WESTERN CAUCASUS

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There's given a proof of divergent flake-thrusted construction of North-western Caucasus, which was formed in conditions of submeridional lateral compression.

Many geologists suggest a determinative role of folding in the formation of the Northwestern Caucasus structure. Mapped or drilled thrusts are considered minor structures complicating steep fold limbs. More-over, they are often described as reverse or even normal faults. In accordance with the generally accepted concept of overthrusts as subordinate structures relative to faulting, they are shown as short unlinked segments, which do not extend beyond anticlinal folds. However, as will be shown below, this concept is erroneous and inconsistent with factual data. Actually, the genesis, morphology, and position of folds in plan view are completely controlled by overthrusts, which define the general tectonic style of the North-western Caucasus.

Key words: folds, thrusts, stress, tectonics, geodynamics.

RING-SHAPED SEISMICITY WITHIN VARIOUS DEPTH RANGES IN THE REGION OF KURIL AND KAMCHATKA

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We have analyzed characteristics of the seismicity in the region of the central and northern Kuril Islands and Kamchatka within depth ranges of 0-33 and 34-70 km prior to large and great earthquakes that have occurred in 1993-2007 and within seismic gaps. We have identified ring-shaped distributions of seismicity in both depth ranges. It was shown, that epicenters of the major earthquakes were located near areas of intersection or the closest proximity of the ring structures. By analogy with the Sumatra region, and using data on the sizes of such rings, we have obtained prognostic estimates of magnitudes of large earthquakes, which can occur in seismic gap zones. We have identified seismic gaps, where large earthquakes are most probable in the near future. We also compare these data with long-term forecasts of other authors.

RING-SHAPED SEISMICITY STRUCTURES AND EARTHQUAKE OF 11/03/2011 (MW= 9.0) IN THE REGION OF THE NORTH-EASTERN JAPAN

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We have been studying seismicity characteristics prior to 8 large and great earthquakes (Mw 7.0-9.0) in the region of the north-eastern Japan. Ring-shaped seismicity structures in two depth ranges (0-33 and 34-70 km) were picked out prior to all these events. Epicenters of the major earthquakes were located near areas of intersection or contact of the 'shallow" and "deep" seismicity rings. Sizes of the shallow rings and threshold magnitude values, corresponding to the seismicity rings increase with magnitudes of the major events. Earlier we have done a forecast of a place and magnitude of the future great earthquake using seismicity data, obtained before 01/07/2009. Using new data, obtained prior to 10/03/2011 allowed us to make more accurate such the forecast. The epicenter of the giant earthquake of 11/03/2011 (Mw 9.0) was located near the area of intersection of shallow and deep seismicity rings with high threshold

magnitudes (5.8 and 5.3 correspondingly). Dependencies of the threshold magnitudes on the energy of major events were obtained (with high correlation factors). Interestingly, duration of seismicity rings formation practically does not depend on the magnitude of the major events in this region. A nature of the ring-shaped seismicity structures and possibilities of using their parameters for the earthquake forecast are discussed.

MODELING SEISMICITY RATE CHANGES IN THE AEGEAN AREA AFFECTED BY STRESS FIELD CHANGES

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Changes in the rate of earthquake production in specific areas of the Aegean region are studied by the application of a combined deterministic–stochastic approach of Rate/State stress transfer concept. The spatial and temporal evolution of seismicity is investigated in sub-regions defined on the basis of seismotectonic features (regional stressing regime, geometric and kinematic fault properties, seismicity, and historical and instrumental strong earthquake occurrence). The studied time increments correspond to the learning period, from which the reference seismicity rates are derived, and the study periods i.e. the interseismic periods between two successive main shocks. After explicit determination of fault properties and seismological parameters associated with the stronger (M>=6.0) earthquakes occurrence, the evolution of the stress field is calculated according to representative faulting type of each subregion.

The influence of static Coulomb stress changes (ΔCFF) is then examined in association with the occurrence rates of the smaller magnitude earthquakes. A detailed data analysis is first accomplished to ensure that the sample used in the calculations is homogenous and sufficient. Statistical tests are then performed in order to filter the database, such that only events with magnitude greater or equal to the completeness magnitude, M_c, are taken into consideration. The Rate/State model incorporates the physical properties of the study fault zones (characteristic relaxation time, fault constitutive parameters, effective friction coefficient) with a probabilistic estimation of the spatial distribution of seismicity rates, derived from the application of a Probability Density Function (PDF). For this purpose a normal grid was superimposed onto the study areas of rectangular cells and the PDF determines seismicity rate values at the center of each cell. This probabilistic approach is necessary in order to take into account uncertainties resulted from epicentral locations errors. Different assumptions and combinations of the physical and statistical parameters are tested for the model performance and robustness to be evaluated. The simulated seismicity rates are then qualitatively compared with the real seismicity rates derived for the respective periods. Quantitative correlation between observed and expected seismicity rates is accomplished by the evaluation of Pearson linear correlation coefficient (parametric) and Spearman rank correlation coefficient (non–parametric). This comparison is applied for all the data pairs of observed – synthetic seismicity rates as well as for only specific areas of major interest i.e. for cells that experience positive ΔCFF, which are recognized as candidates to accommodate an anticipated strong earthquake.

SEISMICITY AND RISK POTENTIAL OF THRACE REGION, NOW TURKEY

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The north of the Thrace region has crystalline rocks belonging to the Strandza massif. Other parts of the region are covered by mostly clastics and carbonates with a peneplain morphology. In center of the region, there is a sedimentary sequence with up to thickness of 8000 m which overlies the regional structural features. Deep seismic investigations carried out in the region for oil explorations show NW-SE trending fault systems.

The distribution of the earthquakes for the last 100 years considered, seismicity is localized in some areas, and it is mostly linked to the North Anatolian Fault Zone (NAFZ) lying to the south. The NAFZ is a fracture zone that has affected southern coast of the region. Historical earthquakes have a range of magnitudes and the large ones appear to be linked to NAFZ, producing intensity V-VIII in the Mercalli scale. The dimensions of the impact are present in the Ottoman archives; however, destruction provides limited data on the locations of the activated faults. The settlement site for Edirne has been threatened by earthquakes extending to the Balkans; Tekirdag, Şarkoy, Silivri, Kesan, Corlu and Cerkezkoy settlement sites appear under seismic risk. The 1912 earthquake (M=7.3) produced significant impact on the region. In this presentation, the distributions of historical and instrumental earthquakes, their relations to the faults, the proximity of these faults to the settlement areas and their potential impact area is evaluated; fault plane solutions of some earthquakes with magnitude 4.0 determined and their relations to the potential faults are discussed.

Key words: Thrace region, seismicity, intensity, historical earthquakes.

TSUNAMI RESPONSIVE ARCHITECTURE: THE USE OF MULTI-GRID COUPLED TSUNAMI MODEL PROGRAMME TO REDEFINE COASTAL ARCHITECTURAL DESIGN STRATEGIES AND DECISION MAKING

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The ability to recreate the historical 2004 Sumatran Tsunami waves' characteristics and its impacts on the coastal structures are the pulling factor to use a computer simulation as the main tools of this research project. This paper discusses the reasons and needs of using the multi-grid coupled tsunami model programme in this experiment - to refine the strategies to be used in coastal architectural design works.

Cornell Multi-Grid Coupled Tsunami Model (COMCOT) (Wang, 2006) programme had been chosen to generate a series of tsunami events onto a one-kilometre-square of Kuala Muda (north-west of Peninsular Malaysia) coastal area. Therefore, it is expectantly COMCOT to helping the researchers to make firmer decision in choosing the best design possible for this tsunami-threatened near beach area. Two possible/predictable future tsunami sources are generated; Andaman Sea and Myanmar submarine earthquake; and tested against the proposed layouts and buildings designs two-dimensionally. Besides,

the proposed designs too are tested against the previous 2004 Sumatran Tsunami wave's characteristic – as the worst case scenario can this area ever experiences (Ismail, Wahab, & Ibrahim, 2009). Outputs generated by COMCOT are then to be used to propose carefully coastal architectural design strategies for the present and future near-beach area development, especially in the north-western coast of Malaysia. The design proposed optimistically to be culturally and locally accepted, and having a good future to be extended with or without modification; to suit any individual needs.

Key words: *Tsunami response, COMCOT, coastal design, coastal architecture, coastal design strategies.*

SEISMIC ACTIVITY IN THE SOUTHERN PREURALS

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According to the map of general seismic zoning of the territory of the Russian Federation, northern, northwestern and central parts of the Southern Preural region (including Buzuluksky basin, northern slope of the Solt-Ilets arch) and folded Urals are located in the 7-point area, and southern - in 6-point area of seismic activity by MSK-64 scale. We perform monitoring of seismic activity Southern Preural region by our network. Results of monitoring showed that the epicenters of seismic events tend to stressedly-deformed centers block-fault system of Southern Preural region, with impact of prolonged natural and anthropogenic factors. The current structure of the crust and the distribution of epicenters of seismic events for the period 2007-2010 allow to pre-zoning of natural and man-made seismic activity. The distanted from the zone of disturbances (central and eastern parts of the Ural foredeep, south-east Caspian syneclise, etc.) events is probably caused by natural tectonic processes, occur much less frequently in comparison with industrially disturbed areas. Events occur more frequently in the areas of disturbances of the geological environment (oil and gas, etc.) and have a more complex nature, can be man-made or natural and man-made.

In the developed fields the stress and deformation mode of geological environment is defined by natural and anthropogenic influences. Southern Preurals has a dense network of tectonic fractures. Seismic events caused by natural geodynamic processes occur throughout the Southern Preural region, the Urals and Trans-Urals. Network of seismic stations "Gas-seismic" register an annual average of 1-2 the natural background seismic events per 1000 km2 with an average energy of about $2*10^7$ J.

MECHANICAL-MATHEMATICAL MODELING AND MONITORING FOR LANDSLIDES

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Landslides process is one of the most widespread and dangerous processes in the urbanized territories. In Moscow the landslips occupy about 3 % of the most valuable territory of city. There are near 15 places of deep landslides and some hundreds of shallow landslides in Moscow. In Russia many towns are located near rivers on high coastal sides.

There are many churches and historical buildings on high costs of Volga River and Moscow River. The organization of monitoring is necessary for maintenance of normal functioning of city infrastructure in a coastal zone and duly realization of effective protective actions. Last years the landslide process activization took place in Moscow.

Mechanical-mathematical model of high viscous fluid was used for modeling of matter behavior on landslide slopes. The model of high viscous incompressible fluid can be applied to describe slow downslope soil movement. Such model allows estimating velocities of movement in a layer and comparison with monitoring data. Boundary conditions of a problem depend on an exact situation. Equation of continuity and an approximated Navier-Stockes equation for slow motions in a thin layer were used. The results of modelling give possibility to define the landslide section with upmost velocity that should be monitored in the first place. Some important parameters used for numerical modelling can be defined from monitoring data. Model can be used for calibration of monitoring equipment and gives possibility to investigate some fundamental aspects of matter movement on landslide slopes.

RUSSIAN NATIONAL SYSTEM OF MONITORING GEOPHYSICAL PROCESSES AND REAL TIME VARIATIONS THEREOF

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NPP GT «Geofizika» LLC (Pyatigorsk) has designed high-output geophone-hydrophone sensors GH-3 protected by patents [1, 2] able to determine parameters of gravity and wave fields in boreholes, underground openings, seas, on surface, flying or moving objects. The sensors may be used for hydrodynamic testing of wells, gravity and seismic survey, in meteorology, seismology, navigation, medicine, for earth-quake prediction. They are capable of sensing slightest variations of hydrodynamic pressure field in wide range of frequencies from 0 to 4500 Hz with sensitivity higher than that of modern gravimeters, seismic detectors, seismographs.

Substantial Earth deformation resulting from gravity waves acting upon earth surface and water medium, appearance of low-frequency noise (less than 0.001 Hz) in rocks are signs of forthcoming earthquake. There are correlations between variations of gravity, geohydrodynamic pressure and Earth magnetic fields which are to be used for prediction of oncoming earthquakes and location thereof. At the Russian National Exhibition in Azerbaijan (2006) NPP GT «Geofizika» LLC reported on the expediency of creating "Russian National System of advance warning people about oncoming earth-quake" (RNS AWP) based on the Geophone-hydrophone sensor GH-3 and Real Time Space-Time System (RT STS). The whole system was called "Russian National System of Monitoring Geophysical Processes and Real Time Variations thereof" (RNS MGP).

During the Exhibition joint operation agreements were concluded with International Seismic Risk and Earthquake Resistant Construction Commission of International Academy of Sciences, the International EUTRASIA PACIFIC UNINET Organization (Austria) and Research Institute for Earthquake Prediction and Study of the International Academy of Sciences (Azerbaijan). For financing the problem it was proposed to involve not only state but also international funds.

Based on the Geophone-Hydrophone GH-3 sensor".

Federal State Unitary Enterprise Moscow Energetic Institute Special Design Office (FGUP OKB MEI) of Roscosmos and NPP GT "Geofizika" LLC (Pyatigorsk) have

developed the RNS MGP pilot project including RNS OWP and RT STS as addition to the GLONASS system. RT STS pilot project is to be carried out by FGUP OKB MEI of Roscosmos (Moscow). Later on scientists and specialized organizations from foreign countries (Azerbaijan, Ukraine, Austria, Turkey, etc.) located in the zone of Alpic-Himalayan seismic belt will be involved into the work. To this end, "Geofizika" Research Centre ("Geofizika" RC) shall be established on the territory of Caucasian Mineral Waters (CMW). "Geofizika" RC tasks are: formation of RNS MGP regional sub-system, carrying out international researches and experimental development to supply the above countries with high-accuracy space-time measurements, development of the newest technologies for oil-and-gas industry, geophysics, seismology, earthquake prediction, navigation and medicine. Special attention is paid to realization of the RNS AWP project – the most actual problem for Nothern Caucasus and adjoining countries, especially for Turkey, Iran, Azerbaijan, Armenia, Georgia.

SEISM TECTONIC PROPERTIES WITH IMPLICATIONS ON FAULTING IDENTIFICATION REVEALED FROM RECENT SEISMICITY IN MYGDONIA BASIN (MACEDONIA, N. GREECE)

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Mygdonia basin is located at the northern part of the Greek mainland and is considered to define a rather high seismicity rate area. This neotectonic basin corresponds to a complicated extensional setting bounded mainly from normal faults that reveal a characteristic "S" shape development. Strong earthquakes have occasionally affected the metropolitan city of Thessaloniki since the historical times, whereas in modern times, there is an also high microseismicity rate. The operation of a dense seismological network inside and well surrounding the region contributes to the detailed analysis of seismicity and the identification of the seismogenic properties of the associated active structures. All earthquakes with magnitude greater than 2.0 which were recorded during the time period 2007 to 2010 after the national seismological network started its integrated operation in Greece and occurred in the Mygdonia basin, were analyzed for the purpose of the present study. For that reason, arrival times of well recorded events that occurred in the basin were taken into account. The Wadati method was applied, in order to constrain a crustal model that seismically describes best the study area. A velocity model that approximates best the seismic structure of the area was constructed. According to the results, all earthquakes that occurred in the area were relocated and their focal properties were re-estimated. Earthquake activity is characterised by spatial properties defining clusters. In addition, the spatial distribution of the earthquake epicentres is associated with the presence of the active seismogenic zones. Cross sections normal to the long axis of each cluster show the structural and, to some extent, kinematic properties of the faults.The results from such an investigation, provide important contributes to fault interaction, seismotectonic zoning and seismic hazard assessment.

Key words: Mygdonia basin, seismicity, clustering

THE 1912 GANOS EARTHQUAKE: SOURCE CONSTRAINTS USING GROUND MOTION SIMULATIONS

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We study the source characteristics of the 9 August 1912, Mw 7.4, Mürefte (Ganos) earthquake that ruptured the Ganos Fault in the westernmost segment of the North Anatolian Fault. We apply the stochastic method for finite-faults in order to simulate strong ground motion acceleration using different fault geometries in terms of the rupture initiation and the length of the fault. A first-order approximation of the site effect variation is achieved following an empirical approach based on the topography gradient as a proxy for site-effect. The simulated ground motions, which are calculated at phantom stations, over a grid covering the area of study (Fig. 1), satisfactorily produce the regions which were more severely shaken during the 1912 event. We simulate ground motions using a conservative fault length (one land segment) which is able to explain the location of the surface ruptures but is not able to reproduce the surface extent of strong shaking. We then use a longer fault of approximately 120 km, extending to Saros Bay in the west and to Marmara Sea in the east. The synthetic peak ground acceleration values were converted to macroseismic intensities through an empirical relation and discussed in comparison with available reports on the macroseismic effects of the 1912 earthquake. Further constrain in our modelling is posed by surface ruptures, with small releasing and restraining structures and 1.5–5.5 m right-lateral offsets, that have been previously measured by others, at 45 sites of the on-land ~45-km-long fault section.

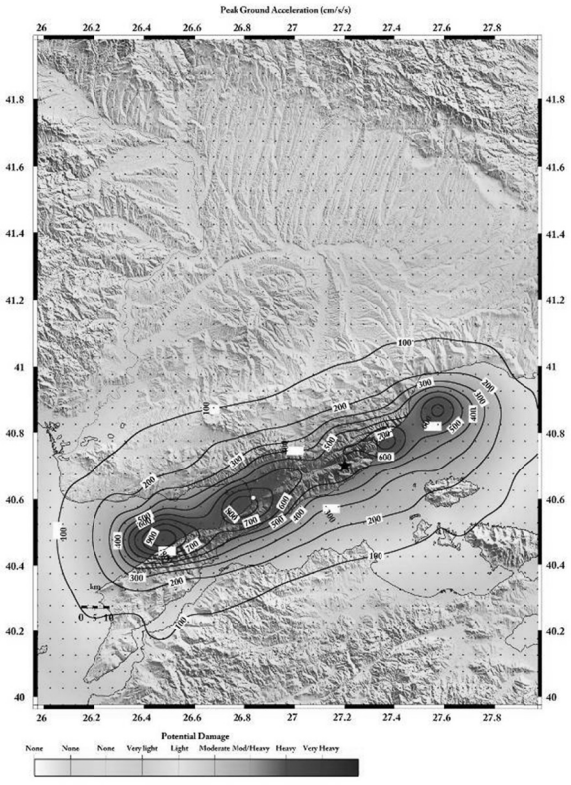

Fig. 1. The distribution of peak ground acceleration (in cm/s/s) due to the rupture of the 1912 Ganos Fault using a stochastic approach.

OUTER INFLUENCES AFFECT TO ANATOLY SEISMICITY

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Slow Anatolian rock mass drift appears as the result of creep and seismic rockslides along East-Anatolian and North-Anatolian zones of active faults towards West and Southwest. Beginning from the 30-th of the past century two distinctly expressed periods of seismic activity were traced. One of them happened in the 40-th – 50-th of the century and the other has been registered since 1990 until now. Comparison of active periods with the dates of military events has shown that the first activation occurred in the time of the Second World War and the second activation took place after the military operation 'Storm in the desert' in 1991 in Iraq.

Extremely high sensitivity of this region to bombing of the nearest territories was noticed through the comparison of the number of earthquakes with the magnitudes not less then 4,4 in the period from 1973 through 2008 to the periods of the military events in the neighboring regions, Serbia and Iraq in particular. In 1992, a year after, the military operation 'Storm in the Desert' cased three earthquakes with M=6.6, M=6.1 and M=6.3.Two seismic events with magnitudes 7.6 and 7.2 were a powerful response to bombing Yugoslavia which took place in August, 17 and November, 12. In 2003, the year of the last attack of American-British coalition of Iraq, two more powerful events with M=6.4, M=6.1. took place.

There are at least three reasons to the explanation of anomalous seismic sensitivity. The first one is that Anatolia originally is the energy discharging region in which the throw off constrains, accumulated in geological medium capacity surpasses the size of the region itself. The main point is that Anatoly is a part of a large-scale geodynamic system in the region of convergence of Arabia and Eurasia which is famous for tectonic strains discharging. Just because of this the influence on any part of the system is a trigger for Anatoly lithosphere and cases its seismic response.

The second possible reason is in grouping of seismic focuses to upper horizons of the crust. According to data of the UGSC catalog, from 1973 to 2008 more then 75% of Anatoly earthquake hypocenters have depth not more than 20 km, in comparison with the Eastern Caucasus where in such depth not more then 25% of the total number of seismic focuses are localized. High tension of closed-to-surface horizons explains there high vulnerability to air attacks of the surface and causes there quick seismic response to outer influence.

The third reason of seismic sensitivity is changing of gradual creep regime of the impulse seismic rockslides in the process of tension discharging strains accumulated as a result of Eurasia and Arabia collision. It's highly possible that destabilization of accumulation and discharging tension in the system of collision region occurs in the case of even insignificant inflow of the unplanned energy of outer influences and responses to it by catastrophic seismic events incomparable to outer influence.

As the result the energy discharging role of Anatoly in the geodynamic large-scale system, near surface position of discharging strains horizons and also abrupt change from creep regime to the impulse one under the outer influences evidently explain sensitive seismic reaction of Anatoly to percussive influences in the neighboring regions.

TECHNIQUE OF GEODYNAMIC MONITORING FOR HYDROCARBON DEPOSITS

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Pressure in the reservoir and surrounding aquifers is gradually decreasing during oil and gas production. Changes in hydro-and gas dynamics affect changes in the geodynamics of the solid crust. The consequences anthropogenic changes in Earth's crust can lead to the largest man-made disasters and emergencies: earthquakes, the surface collapses, changes in the balance and quality of ground water zone of active water exchange, which are the main source of water for stream flow and water supply.

Geodynamic polygons based on geometric leveling are very expensive and ineffective in large areas and interior volumes covered by technogenesis. Direct leveling can not predict dangerous geodynamic processes in the interior, but only captures the changes on the surface. In this regard, the Department of Geoecology Orenburg Scientific Center, Ural Branch of the RAS offers to establish the geodynamic polygons based on seismic monitoring in the oil and gas fields. The approach is based on identified changes in gidrogeodinamics, stress-deformation state and seismic activity in areas of mineral resources of oil and gas fields. The technique of geodynamic zoning areas based on cluster analysis of morphologic units and sites identified by group characteristics is offered.

Key words: geodynamic zoning, seismic activity, oil and gas fields

USE OF REMOTE SENSING AND GIS METHODS FOR MITIGATING THE IMPACT OF EARTHQUAKES IN CITIES

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Society, infrastructure and economy may periodically and extensively suffer from the impact of natural disasters. Especially, in the case of an earthquake catastrophe that happens and affects cities and settlements, immediate and efficient actions are required, which ensure the minimization of damage and loss of human lives. Nowadays, the use of Remote Sensing (RS) and web-based Geographic Information System (wGIS) methods along with the related geo-databases may assist local and national authorities to take action in order to meet the above objective. In fact, these tools may efficiently support the organization of public protection activities.

The evaluation of satellite imageries, digital topographic data and open source geodata can contribute to the acquisition of the specific tectonic, geomorphologic and topographic settings influencing local site conditions in a region under investigation. In this way, RS methods can facilitate the identification of areas that are more susceptible to earthquake ground motions and present high damage expectancy due to local site conditions in case of a severe earthquake. Furthermore, RS data and results can be combined with updateable and dynamic scenarios for earthquakes and more categories of

data in the geo-databases of a wGIS system assisting the procedure of preparedness and increasing the good organization and effectiveness of response activities. Finally, wGIS components can be used for the collection and analysis of real damage to the built environment thus providing valuable information on the behavior of buildings and the severity of people's distress. This paper, based on the results of already implemented and related EU projects, describes the contribution of RS and wGIS methods for mitigating the impact of earthquakes mainly in cities, describing also the application of the above mentioned procedures in the city of Grevena, in Northern Greece.

THE CHANGING OF DEPOSIT PROPERTIES DURING VOLCANIC ASHES AGEING (KAMCHATKA)

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The ash piroclastic is the least stable sediments solid phase that is predisposed to different mineral transformation in all lithogenetic stages. Among the alteration products resulted by weathering and diagenesis there are determined smectites, halloysite, kaolinite, allophane, palagonite and others. The alteration volcanic glass processes are complicated and phasic. The features their appearance depend on time, landscape conditions, thermo dynamical parameters of diagensis – metagenesis and composition of initial materials. Let us have a look on changing of some properties during volcanic ashes ageing.

There were obtained 21 samples of volcanic ash collected from different attitudes in Kamchatka Peninsula, located on the far east of Russia. Their age is ranging from 35 to 9000 years (Table 1). According to silicon dioxide the volcanic glass of our samples are referred to three types: andesite (SiO_2 53-65%), basaltic ($SiO_2 \leq 53\%$) and rhyolite ($SiO_2 \geq 65\%$). IR-spectrums of the first groups let us make a diagnosis of samples with andesite and basaltic glass as amorphous allophane and samples with rhyolite glass - as opal. Volcanic ashes are referred to the fine sands by their granulometric composition.

There were obtained thermal properties and phase composition of water (the content of unfrozen water, ice and steam) of frozen volcanic ashes. The values of thermal conductivities for volcanic deposits are lower than for sedimentary rock the same granulometric composition in the wide range of density and humidity. On condition that the density (ρ_d) and humidity (W) are changing from 0.7 to 1.65 g/sm^3 and from 10 to 80 % respectively the thermal conductivity (λ) increases from 0.37 to 1.0 W/(m·K) in a thawed state and from 0.41 to 1.27 W/(m·K) in a frozen state for all investigated ashes.

In the frozen state thermal conductivity is effected by unfrozen water content. In the investigated ashes unfrozen water content ranges from 0 % to 11 %. The content is connected with the transformation of volcanic glass and the appearance of clay minerals that is presumably controlled by the duration of alteration. The unfrozen water content is growing during increasing of sample age and in the ashes contained allophane the content of unfrozen water is higher that in the ashes contained opal.

All properties of frozen grounds are formed by unfrozen water (W_w) and ice content ($W–W_w$) because the thermal conductivity (λ) of ice (2.2 W/(m·K)) is greater than λ of water (0.56 W/(m·K)). There was found the influence of allophane appearance on $W_w/(W–W_w)$ ratio and therefore on the thermal conductivity in frozen volcanic ashes.

In the ashes containing opal, there not much unfrozen water (0-3%), the unfrozen water and ice content ratio varies from 0 to 0.08.

In the ashes containing allophane, there unfrozen water content ranges from 2 to 11%, the ratio $W_w/(W-W_w)$ varies from 0.08 to 0.58. Even a little change of water and ice ratio (for example, from 0.02 to 0.04) in the ashes of opal composition induces the decrease of thermal conductivity by a factor of 2. As for ashes containing allophane this change happens by a greater variation of this ratio (from 0.19 to 0.58).

NATURAL CATACLYSMS AND INDIA

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By virtue of its geographical position on the globe, India is prone to natural cataclysms like floods, cyclones, earthquakes and landslides and droughts. The National Commission on floods estimated that nearly 40 million hectares of land is prone to flooding. The cropped area affected annually is about 3.5 million hectares and was as high as 10 million hectares in 1988. On an average as many as 1500 lives are lost during floods every year. The total loss on account of flood damage to crops is estimated at about Rs. 53,000 crores during the period 1953-88. After 1988, the Assam floods of 1998 and 2002 were the worst in recent history, damage due to the latter event estimated at Rs. 2,000 crores. The flood-prone area rose from 19 m.ha in 1953 to 41 m.ha and is likely to go up to 60 rn.ha. Droughts is a perennial problem in some of the States and one-third of the area is prone to this phenomenon. The rehabilitation programme and measures cost the Government about Rs. 2,000 crores every year. Between 1891 and 1979 there were droughts with an interval ranging from 1 to 20 years while there floods at intervals of 0 ro 21 years! The 26 th January 2001 earthquake that hit Gujarat and the 2004 December tsunami are the most recent natural cataclysms that hit India. National and International Agencies provided aid on a large li scale. The tsunami caused human loss as also of forest lands. A consequence of this tsunami was the estabkishment of a Tsunami Earthquake Warning System in Hyderabad in 2007 which works in cordination with the Pacific System. There are 157 flood forecasting stations in the various River Systems, 109 in the Ganga-Brahmaputra System, 15 in the west-flowing reiver systems, 8 in the Krishna basin, 3 in the Mahanadi, 9 for eastern rivers and 13 for the Godavari basin. Data from the INSAT-2B is analysed directly by Indian Meteorology Department. Computerised Mathematical Models have been introduced with the help of the national Informatics Centre. Flood Zoning Maps, Drought Zone Maps and seimic zoning Maps have been prepared and updated. A National Disaster Management Division operates from the Ministry of Home Affairs, with an Advisory Council. IUGS and UNESCO have endorsed programmes to study Geohazards through Geohazards Theme of the Integrated Global Observing Strategy (IGOS) which is expected to reduce the data gaps between what is known and what needs to be known, by aiming to improve hazard inventories, maps and monitoring tools available to monitoring and acvisory agencies. India a too can benefit from these steps.

THE GEOECOLOGICAL PROBLEMS OF NATURAL ARSENIC POISONING OF DRINKING WATER IN DAGHESTAN REPUBLIC

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Background: We studied arsenic spreading on the Daghestan territory and containing in drinking water.

Methods: We used hydride generation-atomic absorption spectrometry to determine total As.

Results: All water samples that we have analyzed contain high level of arsenic. The level of arsenic increased from 0.011 to 0.229 mg/L.

Conclusions: The population of the studying territory use poisoning groundwater as drinking water for years that may lead to different kinds of diseases.

Key words: arsenic, groundwater, drinking water.

Worldwide chronic arsenic toxity has become a human health threat. Evidence for elevated arsenic concentrations in groundwater of geologic origin in aquifers of fluvial and deltaic river delta formations has been increasing over the past 20-30 years in different parts of the world (1). Although the calamity of arsenic exposure in Bangladesh may have been the most well-known endemic because of the magnitude of the exposure (2, 3), many other regions in the world have well-documented high level arsenic concentration in drinking water. This documentation has been possible thanks to geological and geochemical researches that had been made in these countries.

The problem of arsenic poisoning of drinking water is also actual in Daghestan republic. The Daghestan Republic is one of the water resources rich regions of the Russian Federation. The water resources are presented by surface water and groundwater. The ground hydrosphere consists of hidrogeological basins and massives: aqueous massives of Shale Daghestan, karsted fracturing massives of Limestone Daghestan, basins of thermomineral waters of Foreland Daghestan, the North Daghestan Artesian Basin (NDAB). In several regions of Daghestan republic, there is high arsenic contamination in groundwater. In north districts drinking water contain arsenic as a result of geochemical characteristics of the land, as well as in south districts causing a non-occupational exposure. The populations in this region use groundwater as drinking water and obtain it from the naturally contaminated sources. This region is known as having elevated arsenic levels of water dating back from the 1970's. And as a result, more than 300 thousands of people are exposed to arsenic via drinking water. These poisoning districts are within NDAB, which is the part of huge East-Ciscaucasian synclinal depression. It consists of Pliocene-Pleitocene sediments and with magnitude 300-1200 meters. The climate of this territory is arid, the lowland soils are normal light chestnut. In hydromorphic landscapes there are meadow and meadow-chestnut soils. In the sea sediments (in the east part of the lowland) there are saline soils. As we know, arsenic occurs as a constituent in more than 200 minerals, although it primarily exists as arsenopyrite and as a constituent in several other sulfide minerals. The introduction of arsenic into drinking water can occur as a result of its natural geological presence in local bedrock. Significant natural contamination of surface waters and soil can arise when arsenic – rich geothermal fluids come into contact with surface waters. Arsenic minerals exist in the environment principally as sulfides, oxides, and phosphates. Mechanisms by which arsenic is released from minerals are varied and accounted for by many (bio) geochemical processes: oxidation of arsenic-bearing sulfides, desorption from oxides and hydroxides, reductive dissolution, evaporative

concentration, leaching from sulfides by carbonate, and microbial mobilization. Arsenic enrichment also takes place in geothermally active areas; surface waters are more susceptible than groundwater. The scientists have different opinions about arsenic genesis in groundwater. But there is the most evident hypothesis about possible regional arsenic coming with infiltration water after its contact with arseniccontained rocks.
So, poisoning groundwater is an important and often the only source of drinking water in northern Daghestan.

METHODS FOR COMPUTING DIRECT AND INVERSE PROBLEMS OF TSUNAMI KINEMATICS

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Numerical modeling of tsunami wave propagation can provide better understanding of the phenomenon. There are many methods for computing tsunami kinematics directly and inversely. Tsunami wave propagation and travel times can be calculated for different time intervals (isochrones) and various numerical methods have been developed. For areas with complicated geomorphology and bathymetry (islands and narrow straits), travel-time computations based on methods that use Huygens principle are more effective than others. Convergence and divergence of tsunami wave rays can easily show us the wave energy radiation directivity. In a non-homogeneous medium where tsunami wave propagation velocity varies, it is not very easy to determine a wave-ray that connects two given points along a path. An approximate ray trace path can be developed from a source origin point to any other point on a computational grid by solving directly the problem - and thus obtain the tsunami travel times. The direct detection of waves in the deep ocean by few deep ocean tsunami detectors makes it possible to establish tsunami source characteristics and origin. Effective methods and algorithms for computing direct and inverse tsunami kinematics problems were developed, tested and presented.

PREPARATION OF SEISMIC HAZARD MAP IN QAZVIN PROVINCE

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Qazvin province is one of the most important, economic and politic city in Iran because of it's population centralization, industrial spaces and it's Tehran neighborhood, so making it to a safe city is so important then, in this study, geology maps with reports about 8 parts of this region were prepared and active and semi active faults in this region were acquainted then, historical earthquake maps and Seismotectonic map in this region and around were studied and prepared in scale of 1:500000 by calculating the seismic parameters and using the SeisRiskIII software, the same haste map and earthquake dividing map were drawn. The results show that the earthquake with 7.4 Richter may happen in future. At last, the prepared earthquake hazard map were compared with

earthquake engineering and seismology international institute's hazard map, the results show they were so similar to each other. Some advantages of hazard map are high accuracy, precision and clarity.

Key words: *seismic hazard map, Seismotectonic map, earthquake, Qazvin.*

AVERTING VOLCANIC WINTER AND OTHER PREPARATIONS

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Several studies since the '90ies show a correlation between weak solar cycles and raised magma and volcanic activity. Present data show not only a weak solar cycle and a rise in earthquakes and volcanic erruptions, but that most probably next decades will be worse.

First we propose a test with a cap hold by zeppelins, some hundred meters above active volcanoes, in order to prevent volcanic ash to reach troposphere, and thus spread all over Earth with predictable catastrophic consequences, similar to those that provoke the collapse of Minoans, Mayans, Aztecs and Incas, sometimes with cannibalism.

Secondly we propose an extented spread of soot over icecaps and other glaciers, in order to decrease albedo, as already, at least the 90% of Earth's ice in Antarctica raises. Last series of actions needed is decentralization of all present Babylons to autarky villages and afforestation of ALL open places, even plains, to have food and wood in case of the worst scenarios.

PETROLOGY OF VOLCANIC ROCKS IN SOUTH AZNA

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In the south Azna (Daretakht-Kamandan) and sanandaj-sirjan zone have outcrop land surface volcanic andesite rock that possible age volcanic units estimated to be upper Triassic-Jurassic.The microscop study indicated main minerals include plagioclase (andesine-labradorite), pyroxene (clinopyroxen) & amphibole (hornblende) and mainly texture include porphyric, Glomeroporphyric, Microlite, Kataclastic, Vesicular and Poiklitic. Lithology composition contain Andesite, andesitebasalt, Pyroxene andesite, Hornblende andesite to Basalt with Andesitic tuffs & limit Agglomerate and Breccia volcanic. In the base of geochemical data South azna volcanic rocks have Tholeiity & calcalkaline trend and investigation of spider diagram indicated enrichment of Th, Pb, Sr, Ba & deplation of Ta, Nb, Ti element that these are characteristics of source magma in over subduction zone. Petrologice evidence and tectonic environment diagram were confirmed the volcanic erupted at a convergent plate margin of Volcanic Island Arc, that subduction oceanic crust (Neo-Tethys) under medium crust on paraller trend Zagros fault in mid cimmerian orogenic.

Key words: Andesite Volcanic, Petrology, South Azna

PRE-ALPINE GEODYNAMICS OF THE CAUCASUS, MULT-STAGE REGIONAL METAMORPHISM AND GRANITOID MAGMATISM

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Granitoid magmatism and regional metamorphism of different type, being a reflection of thermobaric field variation in external shells of the Earth, represent a direct consequence of geodynamic settings in various structural units of the Earth's crust and lithosphere of the Caucasus. Geodynamic constructions are based on the conceptions of plate tectonics and horizontal tectonic layering of the lithosphere, which according to geological and geophysical data are established all over the Caucasian region. Processes of multi-stage regional metamorphism, granite formation and tectonic deformations were bound up with Grenville, Baikalian (Panafrican), Late Baikalian (Salairian), Variscan and Early Cimmerian (Indosinian) orogenies.

Key words: the Caucasus, geodynamic settings, regional metamorphism, granitoid magmatism.

GEOLOGICAL CATASTROPHES AND EVENT DEPOSITS

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Event deposits are one of the indicators of catastrophic event manifestation in the geological past. With their help is produced reconstruction of catastrophic events occurring in the geological past and in general, of the paleogeographic conditions and tectonic processes. One of the vivid examples of chaotically built event deposits are the Upper Eocene olistostromes and wild flysch of the Alpine fold area (the Swiss and French Alps, the Dinarides, Greater Caucasus, etc.).

For olistostromes formation along with catastrophic events the presence of a dissected relief in the form of cliffs and cordilleras (the basic suppliers of clastic material) is required. Movement of disintegrated material to the areas of sedimentation mostly occurred due to the tectonic movements and to the attendant downfall-landslide processes indicative of their tectonic-gravitational origin. These geological events occurred especially frequently in the zones of deep faults and in the process of nappe-formation as well.

Upper Eocene event deposits of the Alpine fold system, being synchronous formations, are clearly pointing to their timing to the same geological event. In particular, such could have been a collision leading to the formation of the fold-nappe structure of the Greater Caucasus. It began at the end of the Late Eocene, reaching its maximum in Late Miocene, when the Arabian plate separated from the African plate and began movement to the north.

Key words: event deposits, olistostromes, catastrophic events

THE METHOD OF INTERPRETING THE SPECTRAL CHARACTERISTICS OF OBJECTS AT DIFFERENT TIME WITH HIGH RESOLUTION SATELLITE IMAGES

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In this article the question of interpretation of objects from their spectral characteristics and the identification of changes resulting from Nonequal shooting. Danae technique demonstrated for the detection of forest fires on the territory of the Republic of Azerbaijan in 2006. With remote sensing studies can obtain information about the object of study in different spectral bands: X-ray, ultraviolet, visible, infrared. The smaller the wavelength, the higher the accuracy of the element.

Therefore, optical observations are more informative and accurate. Different reflective properties of the object and the environment affect the characteristics of the radiation and remote sensing instruments are recorded - so gather and collect data. A further problem lies in the interpretation of theatment data available to obtain information about the properties of the objects.

INVESTIGATION OF OPTIMIZED WATER HARVESTING REGIONS BASED ON GIS (A CASE STUDY; NAZLOOCHAY BASIN, WESTERN AZERBAIJAN-IRAN)

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In this study three water harvesting systems were evaluated which are including semi circular bunds, contour furrow and bench terrace. As the significant and effectiveness factors on watershed behaviors such as climate, physiography and hydrological factors for the Nazlou basin six important layers were produced as precipitation, slope, land use, hydrologic soil groups, drainage and soil depth. Since some of the factors are qualitative and the others are quantitative variables therefore there would be an expectation to have different classification, weighting and significance of them. Therefore, fuzzy logic with trapezoidal membership function and fuzzy logic with analytical hierarchical process (AHP) were used for the quantitative and qualitative variables respectively. This study evaluates to determine suitable area of water harvesting using GIS extensions, combining concepts of layers using fuzzy logic methods, Boolean logic and overlay index. To determine and prioritization areas the used operators was Boolean AND, Boolean OR, Fuzzy algebraic Product, Fuzzy algebraic sum, Fuzzy gamma of 0.1 to 0.9 and multi-criteria evaluation. Finally, comparison of the gained results with the observed data is showing that the multi-criteria evaluation and gamma 0.9 fuzzy are most close together than the other used methods. The results extracted from decision support system which was purposed to compare the used systems is determined that the semi circular bund contains the largest areas with 30 percent and the bench terrace was included the lowest percentage in the both multi-criteria evaluation and gamma 0.9 fuzzy methods. Also, the most

extended area is belonged to the bench terrace which is located in the mountains units. This rate for the contour furrow system related to the hills and for the semi circular bund system to the piedmont plains units.

Key words: Water harvesting, GIS, Boolean logic, fuzzy logic, Nazlouchay basin.

ECOTONENE DETECTION BASED ON LANDSAT ETM$^+$ DATA (A CASE STUDY; NORTHERN IRAN)

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Environmental change and socio-economic pressure are expected to have significant impacts on northern Alborz vegetation, particularly along ecotone such as the treeline. Remote sensing may be well suited to monitoring recent changes across the treeline because it captures integrated changes of all vegetation life forms over large spatial extents. This research examines treeline vegetation composition and change along the Nojmeh treeline using a high resolution, ETM$^+$ 2000. In this paper we investigate the use of satellite data to produce a classification of a treeline ecotone in Northern Alborz Mountains which has supported with the field investigation as ground truth data collected in the summers from 2008 to 2010. The maximum correlation is related to the bands 3 and 4 of Landsat ETM$^+$ with shrubs canopy cover that indicated in r of 0.34 and 0.37 respectively. The maximum rate of correlation respect to the indices were recognized for the vegetation cover of Moisture Stress Index (MSI) for forbs cover (r=0.62). The Ratio Vegetation Index (RVI) for grasses cover was indicated (r=0.53). In conclusion, the results are specified that the ETM$^+$ sensor is the significant data with the elevated competence to discrimination of ecotone using vegetation indices.

Key words: Electromagnetics, Satellite, classification, ecotone, Alborz, Iran

NATURAL AND ENVIRONMENTAL MINERALOGY OF EOLIAN SEDIMENTS, INDOOR DUSTS AND ROAD DUSTS IN KERMAN URBAN ENVIRONMENT

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The purpose of this paper is to study the mineralogical characteristics of eolian sediments, indoor dusts and road- deposited dusts in Kerman urban environment. On the basis of mineralogical observation, calcite, quartz, magnetite, pyroxene, amphibole, olivine and epidote are the most common minerals in the samples, respectively. According to the mineralogical similarity between eolian sediments and dust samples, it is likely that eolian sediments are main source for the dusts. The existence of some anthropogenic particles in road dust samples indicates their input from vehicles and construction materials in the Kerman urban environment.

A STUDY OF *b*-VALUE PRECURSORS APPLIED TO THE ANDAMAN-SUMATRA REGION

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The temporal and spatial frequency-magnitude distribution (FMD) of earthquakes in the Andaman-Sumatra region is analyzed. Four earthquake catalogs have been used namely the ISC, NEIC, IDC and HRVD catalogs comprising between 1,107 and 13,672 events. Reported earthquake data during period 1/1/1995 to 26/12/2004 are divided into two consecutive five-year periods, 1995-1999 and 2000-2004 for the analysis. Results of the investigation from each catalog are comparable. Temporal variations of *b*-values, *b(t)*, are investigated using sliding time windows containing 50 events with 5 event shifts at a time. The results reveal that large earthquakes occur when *b* decreases by more than ~0.3-1.0, suggesting that variation of *b* can be used as a medium-term (months-years) earthquake precursor. Spatial variations of *b*-values in the region are mapped by estimating the *b*-value at every 0.5°x0.5° grid node using the nearest 50 events. Mapping of *b* provides information about the state of stress of the region, i.e. major *b*-value anomalies (low *b)* indicate epicentral areas of large earthquakes. During the studied period, large earthquakes occurred in areas of low value of *b* (*b*~0.5-1.1). On the other hand, no large earthquakes were observed in high *b*-value (*b*~1.2-2.2) areas. Areas of major *b* anomalies are found at latitude 0°-15°N, i.e. north of the two giants shocks M_w 9 and M_w 8.7, at 4°S-2°S and at 5°S-7°S or around and southeast of the M_w 8.7 epicenter areas. Aftershocks of the M_w 9, December 26, 2004 and the M_w 8.7, March 28, 2005 events are also studied. Overall *b*-values of the aftershock series follow the G-R relation and are higher than overall *b*-values before the first mainshock by 0.12 for IDC and NEIC and by 0.14 for HRVD data. *b*-values in the epicentral areas increase after the two mainshocks, suggesting that changes of *b(t)* can also be used as a short-term (days-months) earthquake precursor for aftershock sequences.

Key words: Andaman-Sumatra; *b*-value; earthquake precursor; aftershock sequences

CATACLYSMS AS UNIVERSAL PHENOMENA

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Typical and universal character of the cataclysms, as bifurcations in the complex systems such as geosystems, is discussed. Mathematical classes of models and their interpretations are include re-arranging of the structure of the geosystems as one of the crucial importance to predict. Studying cosmological perturbations in the Universe occurs useful and instrumental experience to analyze cataclysms of the smaller space size. It is shown that taking into consideration vorticity-related component of motion averts singularity type cataclysms and explains acceleration of the expansion in the space of the motion parameters. As an example, no mystic dark energy is needed to explain accelerated expansion in the Universe, so there is no need the declare that we do not see three quarters

of the matter in the Universe (Nurgaliev I.S. "Singularities Are Averted by Vortexes. "***Gravitation and Cosmology***, 2010, Vol. 16, No. 4, pp. 313,315). That energy belongs to the local rotational motion (vorticity). Einstein's idea on static universe occurs to be encompassing conception for the standard cosmology as well as for the emerging new (oscillating) one. Effectiveness of advances mathematics helps in understanding dynamics and cataclysms of the other systems on the Earth, some of which are even more complex than cosmological dynamics of the Universe. Other published results of the author in analizing triggers and prevention mechanizms (energetics, demography) are presented in the report.

Atmosphere and Climate Change

WEEKLY CYCLE IN THE ATMOSPHERE: NATURAL VERSUS ANTHROPOGENIC ORIGIN

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Major anthropogenic burden of the climate and ecological systems is related to injection of radiatively and chemically active species to the atmosphere. Anthropogenic fluxes of heat and species undergo various changes including long-term changes and cyclic variations. Among the latter are the variations of a weekly scale related to the weekly working rhythm that affects in particular the traffic intensity and results in the weekly cycle of gaseous and aerosol species dependent on fuel combustion. An important question is whether the weekly rhythm has an essential effect on the climate system on the regional scale, which could manifest itself in weekly variations in the thermodynamic and dynamical parameters of the atmosphere near megapolises and in densely populated areas. There is an increasing number of papers drawing a conclusion about existence of anthoropogenically-related weekly cycles in the atmosphere including the cycles in temperature, wind, precipitation, cloudiness and thunderstorms.

However we show that the typical methods of analysis used in the bulk of papers can lead to a fictitious conclusion about existence of a weekly cycle even if there is no this cycle in observational data. Using a combination of the typical analysis and the high-resolution spectral analysis, we further analyze the data of routine radiosonde sounding at station of Dolgoprudny (north suburb of Moscow) and the data of measurements of the nitrogen dioxide (NO_2) contents in the stratospheric column and in the atmospheric boundary layer at the Zvenigorod Research Station (40 km west to Moscow) for the past two decades. We have found the statistically significant weekly cycles in the NO_2 content, temperature and wind velocity in the stratosphere with amplitudes of 0.5 K, 2% and 0.6 m/s, respectively. The NO_2 and temperature cycles correlate to each other and are characterized by reduced values in the beginning of the working week and by enhanced values before the weekend. The two cycles are opposite in phase to the weekly cycle in the wind velocity. However, the weekly cycle does not actually manifest itself at a statistically significant level both in meteorological parameters and the NO_2 content in the atmospheric boundary layer that is most exposed to anthropogenic pollution. Moreover, the weekly oscillations have not been found anywhere in the troposphere except in temperature in the neighborhood of the 500 hPa level during the warm period of year. This tropospheric

temperature cycle is opposite in phase to the stratospheric temperature cycle. The weekly oscillations in the stratosphere are unlikely be a direct result of the man weekly rhythm in the Moscow megalopolis.

More likely explanation for it could be associated with the natural variability of the atmosphere which does include quasi-regular fluctuations of the weekly scale. But then, quasi-weekly variations should be on the whole synchronous in phase for a long time so that they manifest themselves as a statistically significant weekly cycle. This can be hardly expected for natural processes. However this can be a case if one supposes a synchronization of natural oscillations of the weekly scale with the calendar weekly cycle through a mechanism that is sensitive to anthropogenic influence.

QUASI-DECADAL OZONE AND NITROGEN DIOXIDE VARIATIONS AND SOLAR ACTIVITY

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Quasi-decadal oscillations were detected in different terrestrial parameters and phenomena: in the atmospheric circulation, climate, volcanic eruptions, and other. Is these oscillations an inherent property of the Earth system, or are they forced by the Sun, or are they a result of an interaction of the internal variability and the solar forcing? Solar activity variations cause variations in the flux of short wave radiation, solar wind, and geomagnetic field modulating, in addition, the flux of solar and cosmic rays entering the Earth's atmosphere. One direct way the solar activity affects the Earth's atmosphere is its influence on radiatively and photochemically active species, primarily on atmospheric ozone that is one of the main absorbers of short wave solar radiation and a heating agent in the middle atmosphere. However nonlinear feedbacks between radiative, chemical and dynamical processes make studying the solar-terrestrial relations difficult. Using the interactive chemical dynamical radiative model SOCRATES we showed that the dynamical contribution to the ozone response to the 11-year solar cycle can be significant in the extratropical stratosphere in winter. In the present work, we implement an analysis of the quasi-decadal variations in atmospheric circulation indices, ozone and nitrogen dioxide (NO_2) contents from the point of view of their relation to the 11-year solar cycle. The data are long-term North Atlantic, Antarctic, and El Nino-Southern Oscillation indices, ozone concentration in the stratosphere and lower mesosphere measured by the SBUV and SBUV-2 instruments aboard Nimbus 7 and NOAA 9, 11 and 16 satellites for 1979-2003, and total column NO_2 contents measured within the Network for the Detection of Atmospheric Composition Change for approximately the two last decades. To characterize solar activity, various solar indices are used, such that the solar spot numbers, the radio flux $F_{10.7}$, the spectral solar radiation fluxes, and the total solar irradiance, but all are qualitatively similar regarding the 11-year cycle. Power spectra of all the circulation indices have spectral maxima at quasi-decadal periods, and the cross-spectral analysis exhibits high spectral coherence of the indices with solar activity at the 11-year cycle scale, with the phase lags being different from the in-phase or anti-phase values. Using a multiple linear regression method, we further analyze the quasi-decadal variations in ozone and NO_2 that are in phase with or opposite by phase to the solar cycle. The quasi-decadal

variations in total NO_2 anticorrelate with the solar cycle, and they are observed in regions where significant positive effects are observed in total ozone. The ozone concentration correlates with the solar cycle in the most part of the stratosphere and lower mesosphere. The solar effect in ozone in low latitudes is maximum in the neighborhood of the stratopause and varies within 4-8% depending on season. However in the upper stratosphere and lower mesosphere of high and polar latitudes the effect in ozone can be much stronger during the cold period of year. In the Antarctic lower stratosphere, the ozone effect approaches 20% in November, the month when the breaking of the circumpolar vortex occurs.

THE HYDROLOGICAL CYCLE AND NATURAL CATACLYSMS IN THE MODERN CIVILIZATION

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Water, the most important natural resource in the world, plays a major role in the development of communities. Without water life cannot exist and industry cannot operate. Unlike many other raw materials water cannot be substituted by any other resource. Therefore it can be stated that water is an essential prerequisite for the establishment of human communities.

However, water as a natural resource for human wellbeing is only one aspect. Water in its different physical phases, like liquid, solid and gaseous, may pose risks to life, residences, and industrial plants. Heavy precipitation, floods, storm surges, and ice are only some examples for the occurrence of risks and the related problems. Therefore the knowledge about the movement of water on the land surface and the interactions with oceans and the atmosphere is a key issue. This movement is known as the 'Hydrological Cycle'. The hydrological cycle is a closed system in the sense that water circulating in the system always remains within the system. The whole cycle is driven by the excess of incoming solar radiation over outgoing radiation. The cycle consists of several subsystems, namely: the atmosphere, surface runoff, subsurface water (or unsaturated zone), groundwater (or saturated zone), river networks, and the oceanic subsystem. It is obvious that the occurrence of water on the land plays a major role within this cycle, because it is mainly there where man and the hydrological cycle interact. This part is called surface hydrology and it follows the atmospheric hydrology, which deals with the atmospheric motion of water usually in the form of vapour and water fluxes, and finally subsurface hydrology, which deals with the water in porous underground. The subdivision of the hydrological cycle into subsystems above and below the land surface is somewhat arbitrary, because continuous, but spatially and temporally varying, interchanges between them take place in the dynamic processes of the water movement. Within these highly dynamic processes of the water movement, the main activities of the mankind take place with all the cities, industrial plants and harbours on lakes, rivers, estuaries, or coastal waters. Even if all these facilities did not release any kind of substance which is not harmful, they would have influence on the dynamic water motion. Change in vegetation, e.g. from forest to arable land, has influence on the movement of water and its variation in time. There will be changes in water storage, precipitation, and even loss of soil into the rivers. The soil in the river can also cause reactions like erosion and sedimentation in other

parts of the river system. Urbanization and the creation of impervious areas affect both the hydrology and hydraulics of drainage systems. They change the runoff characteristics and have adverse effects on the designed drainage structures, such as bridges, culverts, and sewers. These are only a few examples of anthropogenic impacts on the hydrological cycle. There are many other processes, which take place on local, regional, and global scales. When evaluating the influence of man's activity, the natural variation of the system has always to be taken into account. This variation can be tremendous. Nowadays, nearly all large rivers are trained for navigation. The natural behaviour of a river is not static, it is dynamic, e.g. meandering. Storms that hit unprotected coastlines can carry off large amounts of valuable land. Nowadays many coastlines are improved by shore protection structure and dikes. Therefore the risk of land loss by storm surge will be small, but there is always a remaining risk. However, tidal rivers, which were deepened for navigation, will have a much bigger tidal range than before. Deeper water serves the incoming ships by providing a fairway and improves the transport by large ships. The reverse effect is the change of the incoming tide, which introduces more energy and carries more sediment into the tidal river. As a consequence, more dredging is needed in the fairway. Unfortunately, the liquid and solid wastes from communities have a considerable potential for environmental pollution. This pollution also affects the hydrological cycle. Therefore it is necessary to address this problem in more detail. The various interconnected subsystems and parts of the Earth, like atmosphere, water, soil sediments, and biota, contain material that is characterized by high area-to-volume ratios. Adsorption influences the distribution of pollutants between the aqueous phase and particulate matter and, in turn, affects their transport through the various parts of the hydrological cycle. The geochemical fate, the residence times, and the residual concentrations of reactive elements such as heavy metals and organic pollutants are to a large extent controlled by their affinity to solid surfaces. Colloids are ubiquitous in sea water, in freshwater, in soil, and in groundwater. The chemical, physical, and biological processes that occur in the different subsystems and at the interfaces between them influence the major geochemical cycles. Hydrological knowledge is also needed in the assessment of the interaction of the hydrological cycle with the biochemical cycles. Understanding how chemical cycles inter-depend and are coupled with particles and organisms may aid our understanding of global ecosystems and teach as how interacting systems may become disturbed by human activity. Water, a natural resource for a growing population and industrial development, has to be managed very carefully.

A NUMERICAL STUDY OF THE EXPLOSIVE CYCLONES: ROLE OF THE AVAILABLE POTENTIAL ENERGY

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Tor Bergeron is reputed to have characterized a rapidly deepening extratropical low as one in which the central pressure at sea level falls at the rate of at least 1 hPa/h for 24 h. Explosive cyclones storms can generate hurricane-force winds and convective precipitation. When track across land, the results can be devastating. Usually strong extratropical cyclone tracks over the north part of Europe. In this work we focus on those cases in which the European Russia are is affected by extreme wind and precipitation episodes during past years. Convection is an important contributor to the total precipitation and wind involved in a midlatitude cyclone. In an occluded front, part of the precipitation

is caused by convective instability, while the post-frontal precipitation is exclusively triggered by this mechanism. In this study, heavy precipitation in an intense mid-latitude cyclone is analysed by generation APE (Available Potential Energy) due latent heat. In general, latent heat release that is due to condensation may have a strong impact on the evolution of cyclones as shown by observational and modelling studies (Davis and Emanuel 1991, Fantini 1991). In meteorological bombs the latent heat release seems to be crucial to promote low-level vorticity (Kuo and Low Nam, 1990). We are used a numerical WRF model (Weather Research and Forecast) for simulations.The data set used is given by the Global Forecast System (GFS) is a global numerical weather prediction computer model of the National Oceanic and Atmospheric Administration (NOAA) with 6-hour resolution. The model was run with a horizontal grid spacing of 10 km and 37 vertical levels. The model top is at 25 hPa. Split explicit time differencing is used with a time step of 120 s. Wind, temperature, relative humidity and geopotential height interpolated to 17 pressure levels are used for calculations APE and generation of APE due latent heat release. Parameterization scheme are used to estimate diabatic heating due latent heat release. Diagnostic calculations reveal that generation available potential energy due to sensible heating influence on development heavy precipitation. High speed and large deepening of the low is related with liberation of latent heat in lower levels. The study was supported by the grant of President of Russia for state supporting young Russian scientist MK-3730.2010.5.

THE STUDY OF SINKHOLES IN THE MOSCOW TERRITORY

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About ten new sinkholes are registered every year in Moscow during the last 10 years. The lateral dimensions of sinkholes formed at the surface reach 10--15 m. These sinkholes cause noticeable damage to the urban economy and may threaten human lives and health. They may occur on roadways, under which the subsurface pipelines are laid, near construction pits and sewage wells. However, most of sinkholes are not evidently confined to any underground structures. To forecast possible collapses, it is necessary to be aware of their formation mechanism and to identify geological criteria for subdividing urban territory in areas of different stability. In Moscow, sinkholes and surface subsidence have been investigated by many researchers; most of them treat these phenomena as karst and suffusion manifestation. Karst-suffusion development is favored by specific geological structure: easily soluble calcareous deposits are overlain by sand and clay of varying thickness. Suffosion processes are induced by the presence of water-saturated sandy deposits of different age and heterogenous composition in the upper part of geological massif. Proceeding from annual information reports published during 1935-1995, mass media data, and our own observations, 183 sinkholes and subsidence cases were registered on the Moscow territory since 1930 till 2010. The MS Excel database was compiled, which included information about time, place, and the data source on each case; sinkholes and subsidence cases were classified depending on the data availability on the possible technogenic reasons of an incident (water pipelines break, new construction, etc.) The obtained data on sinkholes were represented in the form of point objects in a computer map of Moscow using MapInfo Professional GIS. Next, for each case of collapse or subsidence,

the neighbor boreholes records were analyzed and the geological structure information was added to the database (surface elevation a.s.l., technogenic layer thickness, thickness of moraine deposits, depth of karstified limestone occurrence, the total thickness of overlaying clay, etc.) The statistical processing of the data obtained permitted us to classify sinkhole cases by seasons, allocation at different geomorphological areas, and types of geological structure.

TIME AND SPATIAL ASPECTS OF NATURAL CATASTROPHES IN RUSSIAN LANDSCAPES AIR AEROSOL AS AN INDICATOR OF CATASTROPHIC PROCESSES IN RUSSIAN LANDSCAPES

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Desertification processes intensifies in Central Eurasia in the late 20th – early 21st centuries causing local and regional natural and human-induced catastrophes. *Desertification means land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities* (UN Convention to Combat Desertification, Article 1, 1994). The desert area becomes greater in the arid zone. The frequency and duration of droughts increases in semi-arid and sub-humid areas that causes the degradation of natural landscapes.

The frequency of droughts in Russia increases. Droughts are accompanied by fires in the forest and steppe zones. The official statistics says about 2 million ha of forests burned down a year, while unofficial figures are about 14 million ha. Landscape fires do damage to natural ecosystems and contribute to air pollution.

Ploughing up and overgrazing in southern arid and semiarid areas of Russia caused land degradation. Higher air temperatures under the lack of precipitation intensify deflation of light soils, which are typical of the area. The most dynamic indicator of intensifying desertification processes and related catastrophic effects is the content of fine-dispersed aerosol in the near-ground air layer. During fires of the dry summer of 2010, the content of sulphur, manganese, and heavy metals (cadmium, lead, antimony) increased in fine-dispersed aerosol in the Moscow region compared with the background concentrations of European Russia. In Kalmykia, which is located in the arid zone of Russia, spatial land degradation results in the formation of newest sand deserts. They content 6 to 8% of silty fraction. The main desertification processes in the region are deflation and soil salinisation, exhaustion of water sources, biocycle change, human-induced pollution of the environment. While intensifying deflation, fine-dispersed aerosol is carried out from the surface of dried up landscapes to the atmosphere. Sampling shows that the content of chlorides and sulphides accompanied with copper and lead becomes higher in the near-ground air level. The regional and long-distance transfer of fine-dispersed matter in southern European Russia occurs in the mountain–plain paragenetic system and the silty fraction reaches high altitudes. The chemical composition of fine-dispersed aerosols was determined for the Shatzhatmaz Station (2100 m high). Under westerly winds, an air mass has higher content of heavy metals, while being transferred from the arid zone it has higher content of readily soluble salts and specific rare elements. When transferring from the sea, it has higher contents of sea salts. Fine-dispersed aerosols are also condensation nuclei that cause higher precipitation in foothills and dusting high mountains. The dust trace has been found even in Elbrus – highest peak in Europe.

THE IMPACTS OF GLOBAL CLIMATE CHANGES ON THE HYDRO METEOROLOGICAL CONDITIONS OF AZERBAIJAN REPUBLIC

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As the result of global climate changes the number of natural disasters related to dangerous hydro meteorological processes, such as mudflows, floods, forest fires, droughts and etc. has been increased recently. According to the information provided by World Meteorological Organization (WMO) 80-85% of natural disasters all over the world were caused by dangerous hydro meteorological processes. It's clear that such increase in the dynamics of natural disasters of different origins is the result of global warming impacts on atmosphere connected to the global climate changes.

In general, during whole observation period, XX century was declared as the most warm century, the last 10 years of the XX century were declared as the most warm decade, 1995, 1998, 2000, 2003, 2006 years – the most warm years in history. As the result, humanity has been faced with climate changes and dangerous natural disasters created by certain geophysical processes. One of the key challenges for scientists worldwide is the increasing of World Ocean's level, decreasing of ice cover on the Arctic Ocean, Antarctica and in Greenland follows from global temperature increasing.

Distribution of the middle-term annual and long-term annual (1961-1990) temperature on different altitudes of the Azerbaijan Republic territory in 2007, 2008 and 2009

Table 1.

Heights м	≤ 0	0 - 200	201-500	501-1000	>1000	According to the Republic territory
Norm 1961- 1990	14.6	14.3	13.3	11.9	7.8	12.3
Middle annual 2007	15.3	14.9	13.7	12.4	8.5	12.9
Difference, °C	*+0.7*	*+0.6*	*+0.4*	*+0.5*	*+.0.7*	*+0.6*
Middle annual 2008	*15.4*	*15.1*	*14.2*	*12.5*	*8.9*	*13.0*
Difference, °C	*0.8*	*+0.8*	*+0.9*	*+0.6*	*+1.1*	*+0.7*
Middle annual 2009	*15.2*	*14.9*	*14.1*	*12.3*	*8.8*	*12.9*
Difference, °C	*+0.6*	*+0.6*	*+0.8*	*+0.4*	*+1.0*	*+0.7*

In comparison with the basis period 1961-1990, established by WMO, at the territory of Azerbaijan Republic increasing of long-term annual (perennial) temperature up on 0.7^0C and little increasing in precipitations were observed. It's particularly interesting that, if we will make confrontation between basis period and last 15 years period the increasing in winter seasonal temperature and decreasing in spring seasonal temperature could be observed. For other seasons, such as summer and autumn, seasonal temperature increasing could be observed. In 2006, 2007, 2008 and 2009 years at the altitudes of the territory of Azerbaijan Republic significant changes in dynamics of precipitation and temperature in comparison with the norm were observed.

The table shows that at the territory of republic the maximum increase of temperature was observed at the altitude more than 1000 m. As the result of disasters, about 20000 houses were flooded, more than 300 were destroyed, 2000 were in emergency condition, about 50 hectare of cropped land were flooded.

The total amount of material looses were estimated at 500 million AZM.

CATASTROPHIC EVENTS ON THE BLACK SEA RIVERS AGAINST THE BACKGROUND OF GLOBAL CLIMATE CHANGE, THEIR DEVELOPMENT TENDENCIES AND ADAPTATION ACTIVITIES

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The mountain rivers and dry ravine in the western Georgia during spring flooding transform in powerful streams flow towards lowland and inflow into the Black Sea. During whole year period the flooding caused by showers has catastrophic character. Especially in past years when the intensity of sea wet air masses condensation has been increased, also the melting intensity of snow and glaciers has been increased. During last two decades it resulted in large-scale catastrophic flooding that damaged state economy and environment. To elaborate relevant recommendations for safety and damage elimination the historic archive, also the statistical observation data for several decades have been studied. For the research precipitation and temperature database have been used. The database has been passed quality control and for missing data approved climatologic methods were used to refill them. According passed year data flooding have been strengthen, that is connected with global climate change. The multiyear dynamic of river maximal discharges their growth tendency is sharply expressed by their trends. Based on the conducted research including forecasting models the adaptation activities have been proposed for mitigation negative impact of hydrological catastrophic events.

SECTION 2
Economy, Finances, International Law

THE FORECAST OF DYNAMICS OF ECONOMIC VALUABLE CHARACTERS OF VARIETIES OF GRAIN CROPS IN THE CONDITIONS OF CLIMATE CHANGE

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Optimization of structure of areas under crops is the major problem of adaptation of agriculture to changing climate conditions. N.I.Vavilov Research Institute of Plant Industry (VIR) has one of the world's largest collections of cultivated plants and a network of experimental stations, where cultivated varieties evaluated for many years in a wide range of environmental conditions. The purpose of this work is creation of methodology of use of this data for an agroclimatic estimation of varieties.

The time series of observations 1970-2000 years over varieties of spring wheat, oats, a soya bean at four stations of VIR with contrast climatic conditions (Northwest, Central, Central Black Earth and North Caucasian regions of the European part of the Russian Federation) are investigated. At these stations is observed growth of the sums of active temperatures, falling of summer precipitation; an exception is the station of Central Black Earth region – weak growth of precipitation there was observed.

For some varieties the tendency to earlier dates of phenological stages, to reduction of duration of the vegetative period, heights of plants, weights of 1000 grains and productivity was revealed. In station of Central Black Earth region there were a tendency to increasing this characters. But characteristics of varieties for so long periods are subject to economic and agrotechnical trends. For revealing the climatic factors for economic valuable characters has been used regression analysis in the consecutive differences, used in econometrics for the pure analysis of relationships of time series. In Northwest and Central regions growth of temperatures has appeared a determinative, i.e. despite reduction of the sums of temperatures, level of moisture remains sufficient. Limiting factors for plants of Central Black Earth and North Caucasian regions had appeared both growth of temperatures, and change of the precipitation. It appears that the vegetation period is determined by environmental conditions namely the sums of temperatures and precipitation during steady transition of temperatures through 15°C in the greatest degree. Height of a plant and weight of 1000 grains are sensitive to not climatic influences. The weight of 1000 grains has proved to be the most conservative sign, is weak and indirectly depending on climatic conditions. With growth of temperatures and reduction of precipitation it is possible to predict reduction of duration of the vegetative period, heights of a plant, productivity. On the basis of the analysis of dependence of the sum of temperatures for the interphase period from duration of this period for a number of years it is possible to calculate the sums of effective temperatures and the minimum temperature,

necessary for each interphase period of each variety. This calculation gives the chance a choice of varieties from collection for new climatic conditions.

EFFECTS OF NATURAL DISASTERS ON ECONOMY, TURKEY CASE

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World disaster situation shows that disasters are increasing each year. Countries which are mostly affacted, have to set out their own disaster model which should cover mainly two phases which are; post-disaster recovery phase and pre-disaster reduction phase. Post-disaster recovery phase covers; response, recovery, development topics and pre-disaster covers; prevention, mitigation and preparedness, risk mitigation, risk management, hazard assesment phases. This disaster Management system should be based on a strong technical, legal, organizational aspects and financial aspects.

In general terms, the economic activity is sensitive to many influences, including other sources of shock, so in practice it is relatively difficult to isolate the impact of economic losses caused by natural hazards-related disasters from other internal and external factors. This limitation poses considerable methodological difficulties when trying to quantify the real magnitude and consequences of these phenomena over national economies. Moreover, available data on economic consequences caused by disasters is usually restricted to direct physical impacts or losses of fixed capital and inventory, while the indirect and secondary effects on the economic activity (such as changes in fiscal policies, the long-term consequences of the reallocation of investment resources, or the losses in human capital) as well as other long-term consequences remain unrecorded or underestimated. Available data just can offer a picture of the consequences in terms of direct damages caused mainly on properties, infrastructure, equipments, inventories, etc. Within the article, hazards situation of Turkey is shown and the impact of natural disasters on economy with the view of direct and indirect costs is described.

Key Words: Earthquake, Disasters, Economic Impacts of Disasters, Disasters in Turkey.

OPTIMIZATION OF EXPENSES FOR MANUFACTURING COMPANY BY STATISTICAL MODEL

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This research is investigating effective factors to reduce expenses of car manufacturing industry supply chain. The mentioned effective factors under analysis considers to assembly parts of manufacturing company up to the target market. Utilizing

mathematical and statistical models, also the research undertakes to use the best selection of vehicles and the number of human resource for reducing expenses in industry. For reach to this aim, first of all; the limitations are classifying, then in the next step the variables of mathematical modeling are optimization.

In this paper a response surface model (RSM) was established and numerical simulations were performed to study the impact factor. The effects of three parameters such as fuel consumption, total workforce, and volume of transport were investigated.

Key words: optimasation, RSM, manufacturing industry

BUSINESS SCHOOLS' GLOBAL RESPONSIBLE LEADERSHIP

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The main purpose of this academic work is activization and formation of the development vector of the business schools' global responsibility as well as of the methodological approaches to the development of the educational programs devoted to responsible management. The results of the critical analysis consist of a substantial investigation of the international and Ukrainian teaching practice of corporate social responsibility (CSR) and a conclusion of a strong need for "CSR" course integration into business schools' masters programs. Since it is considered to be a highly efficient step on the way of education of the new generation of managers, able to identify vital global problems, related to the prevention, prediction and dealing with consequences contemporary ecological, natural and economical crisises on our planet and moreover to produce knowledge, skills and mentality of the global business environment. Basic behavioral forms of business schools' global responsibility are developed in this paper. Furthermore an author's project of the MBA program "Global responsible leadership" is tailored. It is devoted to the preparation of leader-integrators, who will provide the process of reorientation of the company towards stable development and responsible business activities.

Key words: responsibility management, global responsible leadership, corporate social responsibility

INTERNATIONAL HUMANITARIAN DISASTER AND THE INTERNATIONAL HUMANITARIAN AID

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The modern world is so volatile and unpredictable that virtually every day in some corner of our planet emergencies. Regional authorities are always trying to solve the problems encountered, but often these situations go beyond the individual country and global in nature, when the state can not do without the support of the international

community. Under the humanitarian catastrophe is meant a state of society, which are endangered as a result of migrations, famine, epidemics and violence against civilians, etc. To prevent a humanitarian disaster in the disaster area send humanitarian aid.

In international law, humanitarian assistance is defined as "a form of grant aid (assistance) means for life, distributed free to residents of areas affected by a humanitarian catastrophe, or standing on its edge." Emergency international assistance in disasters is to provide the affected country or region of basic need (food, medicines, water), shelter, property, personnel for assistance and services (transport of medical, rescue utilities, information, etc.). In international practice in the conduct of humanitarian operations, the following main areas of action:

– Search and rescue;
– The granting of asylum;
– Provision of food;
– Drinking water;
– Health and Welfare;
– Protecting the population from violence and intimidation.

These courses of action to determine the real needs of people affected by emergencies. In the case of a complex situation and the extent of the inconsistency of available funding affected the state Department of Humanitarian Affairs, the UN has provided financial assistance to the Government of that country. The humanitarian catastrophe could erupt in the area, is the scene of the fighting - in this case, civilians wishing to leave the area, provided a "humanitarian corridor".

BOSE CONDENSATE AS A CATASTROPHE OF THE MEASURE OF KULLBACK-LEIBLER INFORMATION AND DEBT CRISIS

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A special case of amount of Kullback-Leibler (K-L) information corresponds to the entropy of the modern thermodynamics. One can see the analog of the so-called Bose condensate in the Bose-Einstein distribution generalized by one of co-authors who discovered the relation between the critical compressibility factor $Z_{cr} = (P_{cr}V_{cr})/(T_{cr}R)$, where R is the gas constant, P_{cr} is the critical pressure, T_{cr} is the critical temperature, and V_{cr} is the critical volume, and the number $Z_{cr} = \zeta(\gamma+2)/\zeta(\gamma+1)$, where γ corresponds to Hausdorff dimension and ζ is the Riemann zeta function.

The gases were classified beginning with He3 as the gas with the least value of $T_{cr}=3.34$ *K*, and covering all gases with smaller values of Z_{cr} and hence with smaller values of γ. This classification enables one to determine the points of the beginning of the metastable state of a liquid (the points of a liquid spinodal).

By the Irving Fischer correspondence principle, the temperature T corresponds in economics to the rate of turnover v. Therefore, for the starting point in the classification by the dimension γ we can take a country having its own currency and a small rate of turnover of money. It is convenient to consider a country with a sufficiently open financial history.

Fischer's relation $PQ=Mv$,

or $v=(PQ)/M$,

where the symbol P corresponds to the pressure P, the symbol Q corresponds to the volume V, the symbol M corresponds to the number of particles N, and the symbol v corresponds to the temperature T, more or less precisely reflects the economic case. Thus, Fischer's relation

$$PQ=Mv$$

corresponds to the thermodynamic law

$$PV=RT.$$

The more exact definition of P and Q is the following: P is the price index indicating the mean growth of the prices with respect to the basic ones, Q is the production rate of new goods per unit time measured in constant (basic) prices, M is the amount of money (cash and other forms), and v is the rate of turnover of money.

In the conventional calculation of the gross domestic product (GDP), its value is obtained by summing the gross added costs during a given time interval over all manufacturing units grouped by the branch of production. The gross added cost is the difference between the cost of manufactured goods and services (the output) and the cost of the goods and the services fully used in the process of production (the intermediate consumption):

$$GDP = \sum_i (PQ)_i = \sum_i M_i v_i .$$

The amount of money (cash and other forms) is taken for the whole time interval t. Let us present this correspondence principle and the calculation method.

We have

$$GDP = \sum_i (PQ)_{ti} = \sum_{I,j} (PQ)_i (t_i) = \sum_{I,j} M_i (t_i) v_i (t_i), \text{ where } = \sum_{I,j} M_i (t_i) = M.$$

Calculating the Hausdorff--Besicovich dimension for the collection

$$v_{ij}=v_i (t_j)$$

we find the required dimension.

As was shown the monetary units are indistinguishable (Bose particles). This allows us to find the liquid spinodal and its values under negative pressures. By extending the Fischer correspondence principle, it is natural to associate negative pressures with debts and a minimal pressure with a debt crisis.

DEBATES ON LEGITIMACY AND COOPERATION: INTERNATIONAL LAW OF SOCIO-ECONOMIC INSTITUTIONS

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International institutions ranging from NGOs to non-profit and charitable foundations and serving a wide range of purposes like humanitarian aids, scientific researches, donations, education, and social works, can play an important role in directing huge financial and human resources that are organized in special ways, toward constructive and productive aims of development.

The new patterns of development and economic reconstruction mostly advised by international financial institutions like IMF and World Bank for developing countries, apparently sacrifice economic justice and public interests for privatization and free market and decentralization of economic regulations. In this regard, the enforcements of

international law indicating regulations of these institutions and facilitating their interaction and cooperation in a global level are needed. International law can provide a constitutional framework for legal publicity of all different activities of these institutions.

This goal may be achieved by enacting regulations enforcing the governments and global community to consider them as a part of the development programs devoted to human prosperity in all aspects. In this way, that is by both local and international legislation, and free from administrative power and official policies of the governments, global community must make of the socio-economic structures a new program that serves human development and establishes global approaches toward justice in welfare, education, participation and life.

Key words: NGOs, International Law, Economics, Socio-economic Institutions.

NEW CHALLENGES IN NATURAL HAZARD INSURANCE. SOME THOUGHTS IN THE AFTERMATH OF THE 2010 ICELANDIC VOLCANO CRISIS

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The eruption of the Icelandic volcano Eyjafjallajökull in March-April 2010 was an unprecedented event in the history of air communications in terms of its impact and consequences when emissions of volcanic ash literally paralyzed the air traffic throughout Europe.

The eruption and the subsequent flight cancellations caused huge losses to airlines, insurance companies, tourist agencies and especially passengers whose policies did not cover natural disaster risks and who had to find shelter in hotels and airports at their own expense without being reimbursed.

The Icelandic volcano eruption demonstrated that the international community is not prepared for large-scale natural cataclysms which can lead to serious financial problems all across the world unless there is a proper planning and regulation with due regard to current trends in natural disaster dynamics and their prediction for the future.

The paper analyzes the state of international laws in the field of air communications and suggests how to improve them to avoid future losses and protect the insured against force-majeure risks.

SECTION 3
Cosmic-Terrestrial Relations, Chronobiology, BIOCOS Program

META-ANALYTIC HISTORY OF CONGRUENT CYCLES IN SPACE WEATHER, THE HUMAN MIND AND OTHER AFFAIRS

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We need tools for understanding, predictions, alerts and the rational design of countermeasures of societal cataclysms, such as terrorism and war, and of natural disasters such as earthquakes, and may find these tools in data collected to avoid personal cataclysms such as massive strokes; in the same data, antecedents of the cataclysms, in the form of time structure alterations not found in various controls, may be sought. Concurrent controls can be complemented, when possible, e.g., by prior data without an event, in similar cycle stages. Such investigations, superposed epochs from many earthquakes, and Monte Carlo methods could identify harbingers that, in their turn, could prompt the evasion of natural disasters and perhaps the avoidance of other man-made cataclysms. With historical data meta-analyzed herein, mapping the time structures of terrorist acts and of a host of environmental variables leads to putative triggers affecting the mind of populations, analyzable as cycles in individuals. Cycles in aggression and their periodic counterparts in our environment, far as well as near, currently (with notable exceptions) ignored in the West, have long been recognized in importance in Russia and its associated states. Yet in England, already in 1801, Sir William Herschel had raised concerns about the consequences in human and other earthly affairs, including crops, of an "ill-disposed" sun. Apart from the foregoing reasons, basic science needs to monitor not only the weather on earth and in extraterrestrial space, but also the consequences of space weather in populations and individuals. The mechanism involved can be studied at the cost of computer-aided self-surveillance for avoiding a stroke.

CYCLES IN THE OCCURRENCE OF MAJOR EARTHQUAKES

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Major earthquakes may not occur randomly, being characterized by cycles along different time scales that may help understand underlying mechanisms and allow the development of precautionary measures to minimize their impact on populations and their infrastructures, whether or not the cycles also serve the prediction and thus the evasion of cataclysms. The case often made against the predictability of earthquakes (Edgescience 2011; 7: 12-14) is built upon the fact that fractures and failure in bedrock deep beneath the Earth are notoriously intractable. Any cycles found to characterize the occurrence of earthquakes are, of course, only statistical by nature and may not be accurate enough for actual prediction. Between January 1900 and June 2010, the dates of 331 earthquakes (primary magnitude $\geq$ 1.0; MMI $\geq$ 1.0; deaths $\geq$ 10) were listed in the NOAA (NESDIS/NGDC) website for Natural Hazards (accessed on 26 July, 2011). A tsunami followed in 102 cases. The monthly incidence of earthquakes and tsunamis was determined and analyzed by the extended cosinor (Acta med rom 1980; 18: 399-440).

Least squares spectra in the range of one cycle per 100 years and 5 cycles per year identified components with periods of about 50, 11.5, 1.44, and 0.41 year(s), all validated by nonlinear least squares when considered separately. Whereas the about 50-year component is less prominent in tsunamis, it is also detected with statistical significance, along with an about 12-year cycle. An about 2-year component characterizes tsunamis more prominently, along with a large-amplitude about 0.38-year cycle that has a period somewhat shorter than that characterizing all earthquakes. Fitted separately, it is validated nonlinearly, as is an about 2-year component, not present in the spectrum of earthquakes. Fitted concomitantly by nonlinear least squares, all four components have 1-parameter limits for the amplitude non-overlapping zero.

A possible connection between sunspots and earthquakes was postulated in 1920 by Alter (Science 1920; 51: 486-487). A short period of about 14.8 months is also reported, corresponding to a transyear, along with a longer period of about 78 years. Zhang (Acta Seismologica Sinica 1998; 11: 495-500) also reports that earthquakes occur frequently around minima of solar activity. Variations in electric tension underground have been postulated to underlie the triggering of earthquakes (Nat Hazards Earth Syst Sci 2007; 7: 1-6). It should be noted, however, that results herein point to a period of about 12.2 years, with a 95% confidence interval for the period ranging from 11.1 to 13.3 years, corresponding to a cycle length somewhat longer than that characterizing sunspots during the same 110-year span, estimated at 10.52 [95% CI: 10.48, 10.56] years. The largest earthquakes may not be evenly distributed throughout the 110-year-long seismic record. A big-quake cluster was identified that ran from 1950 to 1965, including 7 of the 9 greatest quakes of the 20th century. It was followed by a 36-year span without a quake of magnitude 8.4 or greater (Science 2011; 332: 411), preceding a second cluster that may have started with the magnitude-8.4 quake off Peru in 2001. These observations are well in keeping with the about 50-year cycle detected in the data analyzed herein and found also in physiology, pathology and societal upheavals. The influence of solar activity on seismic and volcanic activity has also been extensively studied by Elchin Khalilov and his school (Trans Int Acad Sci H & E 2008; 3: 217-240). Khalilov deserves much credit for his endeavors aimed at forecasting strong earthquakes by means of a specially-designed detector of super-long gravitational waves. According to his estimation, gravitational

signals can precede strong earthquakes by 5 to 15 days, and can be detected in about 90% of occurrences, even when epicenters are as far away as 1,000 km from the monitoring station (Natural Cataclysms and Global Problems of the Modern Civilization. Baku-Innsbruck, ICSD/IAS 2007, pp. 51-69).

PHYSIOLOGICAL CHANGES IN RELATION TO THE 2011 EAST JAPAN EARTHQUAKE

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This study aims at determining whether systolic (S) and/or diastolic (D) blood pressure (BP) and/or heart rate (HR) changed in relation to the magnitude 9.0 Tohoku earthquake and tsunami of 2011. Bracketing the 12 May 2008 Wenchuan magnitude 8.0 earthquake in China, locomotor activity of mice monitored automatically around-the-clock was found to be dramatically decreased in 6 of the 8 animals on day 3 before the earthquake, the behavioral change lasting 6 days (Bioelectromagnetics 2009; 30: 613-620). Abnormal behavior in fish, snakes, dogs, frogs and mice before an earthquake has been primarily anecdotal, however. In humans, the literature has focused on consequences from cataclysms rather than on any precursors (J Am Coll cardiol 1997; 29: 926-933). This investigation draws on the ongoing self-surveillance of BP and HR for health monitoring by several individuals to seek any changes that may have either followed or perhaps preceded the onset of an earthquake. Weeklong around-the-clock profiles of SBP, DBP and HR from 13 Japanese in Tokyo at the time of the earthquake, from one of them during 11 prior years, and from 11 similar individuals monitored during prior years in March were analyzed by the fit of a two-component model consisting of cosine curves with periods of 24 and 12 hours, separately for each calendar day and also for each day relative to the time of occurrence of the earthquake. The circadian parameters were normalized for each profile and the relative values analyzed by one-way analysis of variance (ANOVA) across all subjects in each of the 3 groups, testing for any day-to-day differences. As the 2011 earthquake occurred on a Friday, Friday was chosen as the reference "event" day to account for any weekly pattern known to characterize BP and HR as well as the incidence patterns of adverse cardiovascular events. Controlling for the entire pertinent spectrum of rhythms would have required additional decade-long records from subjects who happened to be exposed to an earthquake. Based on analyses of 7 calendar days, day 4 being the day when the earthquake occurred, the 12-hour amplitude of SBP was decreased 2 days prior to EQ ($F=3.903$, $P=0.002$), a feature not observed in the controls. The standard deviation of HR was larger before the earthquake and started decreasing on day 2 after the earthquake ($F=2.486$, $P=0.040$). Particularly noteworthy is the steady increase in the MESOR of SBP, reaching a peak on the first day after the earthquake ($F=3.157$, $P=0.013$). Patterns in the controls were not statistically significant and showed primarily no noticeable change. Comparing patterns of the different endpoints among the three datasets, characteristic features associated with the 2011 earthquake, not seen in the controls, include a steady increase in the MESOR of both SBP and HR preceding the earthquake and peaking one day after the disaster and a drop in the SD of HR starting on the second day after the earthquake. Whereas the latter effect may be a response to the disaster and may contribute to an increase in cardiovascular disease risk, in keeping with earlier reports, the increase in

both SBP and HR preceding the earthquake is a novel finding in humans, akin to earlier observations of precursor signs made in animals. Continuous physiological surveillance could serve not only for primary prevention in healthcare but also as a way to monitor the antecedents of cataclysms in the environment. Monitoring on a broader scale in different geographic locations can yield signals that may eventually serve as a warning. If found to be amenable to generalization in different populations at different times, the data may be particularly welcome to those seismologists who hold the view that earthquakes are unpredictable. The biosphere needs to be tested for use as a very sensitive frequency-dependent magnetometer.

NEONATES AS PARTICULARLY SENSITIVE MAGNETORECEPTORS?

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To determine the risk of developing cardiovascular disease (CVD) later in life, we monitored the systolic (S) and diastolic (D) blood pressure (BP) and heart rate (HR) of babies around the clock in Minneapolis, Moscow, Brno, Milan and Yamanashi (Neuroendocrinol Lett 2003; 24, Suppl 1). During 1985-1986, on 161 babies, the circadian amplitude (A) of BP, albeit small, was larger in babies with a positive than in those with a negative family history of high BP and/or other CVD, in keeping with a similar finding in children. In 1987-89 we found no such difference (Progr Clin Biol Res 1990; 341B: 491-549).

We assumed that the newborn's circadian BP rhythm may be modulated by one or several infradian cycles with long period(s) and that this modulation affected newborns' CVD risk differently as a function of family CVD-history. In the following years (1988-1995), we found an about 10-year cycle in the MESOR of systolic (S) and diastolic (D) BP of 527 babies studied over 8 years ($P<0.001$).

Follow-up studies on 154 newborns from 1995 to 2005 revealed a circadecadal cycle in the 24-hour amplitude, as well as in the MESOR of BP and HR. Overall, SBP-M are DBP-M are modulated by a cycle with a period of 8.29 [95%CI: 6.49, 10.09] or 8.67 [6.48, 10.86] years, respectively, with corresponding amplitudes of 13.4 [8.2, 18.6] and 9.7 [2.7, 16.7] % ($P<0.001$ at a trial period of 10.5 years). The modulating periods for SBP-A and DBP-A are 10.76 [3.52, 18.00] and 10.56 [6.33, 14.79] years, respectively, with corresponding amplitudes of 20.9 and 31.1% (SBP: $P=0.090$; DBP: $P=0.003$ at a trial period of 10.5 years). In the case of HR-M and HR-A, the modulating periods are 9.80 [5.51, 14.10] and 9.96 [6.10, 13.82] years, respectively, with corresponding amplitudes of 5.5 and 35.0% (HR-M: $P<0.001$; HR-A: $P=0.004$ at a trial period of 10.5 years). Differences in decadal characteristics between babies with a negative or positive family history of high BP are observed for the MESOR of SBP and DBP, illustrating how interactions among rhythms of several frequencies (e.g., one cycle per day and one cycle per decade) may lead to differences in opposite directions at different stages of the lower-frequency component.

These findings also led to a vast new spectrum of complementary neonatal population rhythms, found further in longitudinal monitoring of adults (Biomed &

Pharmacother 2003; 57 (Suppl 1): 55s-57s). These aeolian non-stationary non-photic components include circaseptans (Biomed & Pharmacother 2001; 55 (Suppl 1): 32s-50s), quinmensals (Scripta med 2010; 83: 16-32; Sun and Geosphere 2009; 4: 55-59), semiannuals (Biomed & Pharmacoth 2003; 57 (Suppl 1): 45s-54s), transyears (Biomed & Pharmacother 2003; 57 (Suppl 1): 58s-76s; Human Physiology 2004; 30: 86-92), decadals (J Atmos Solar-Terr Phys 2002; 64: 707-720), didecadals (Biomed & Pharmacother 2002; 56 (Suppl. 2): 266s-272s), para-tridecadals (Istoria Nauk o Zemle 2009; 2: 59-71) and multi-decadals (Neuroendocrinol Lett 2001; 22: 359-384), probably related to magnetism, complementing the body's counterparts of the photic day and year. Infradians (as well as circadians), including a decadal range of periods are essential controls for avoiding blunders and constitute novel features of aging, of interest in their own right, whether newborns are studied with serially-independent sampling for spans exceeding individual lifetimes or whether individuals are investigated longitudinally, preferably from womb to tomb.

PUTATIVE SOLAR SIGNATURES CAN DIFFER AMONG VARIABLES AND CIRCADIAN ENDPOINTS AND IN INDIVIDUALS VS. POPULATIONS

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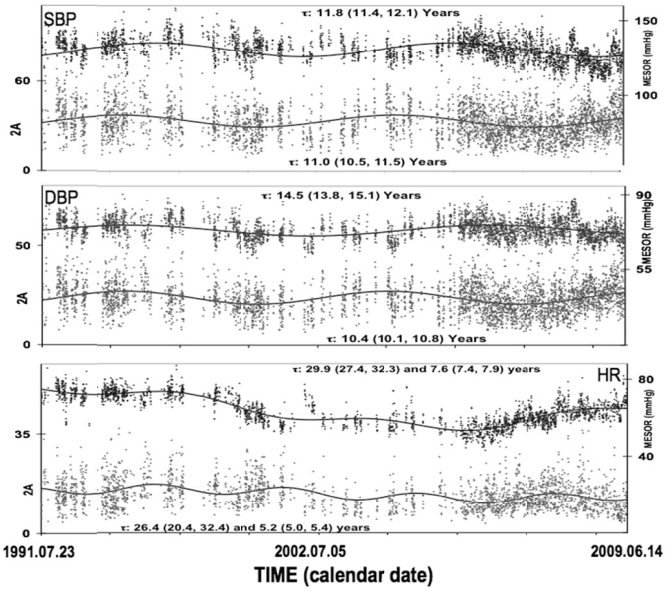
Environmental cycles can be mimicked in different circadian rhythm characteristics, such as the Midline-Estimating Statistic Of Rhythm (MESOR, M) and the double circadian amplitude (2A) of the same variable of the same individual. Moreover, this physiological-environmental pairing can be concordant or differ from the M vs. the 2A, as seen in Figure 1.

A man (FH) was 68 years (y) of age when he started a new series of automatic, including ambulatory blood pressure (BP) and heart rate (HR) monitoring with interruptions (1). The original data's spectrum was aligned with that of the solar wind's speed. The systolic (S) BP 1.3-y transyear's amplitude was dampened but persisted when the solar wind lost a 1.3-y component (1). Furthermore, the BP and HR data were also first analyzed in 24-hour (h) or longer sections by the fit of a 24-h cosine curve. The results of these fits were used as intermediate results (imputations). Thus the Ms, and separately the 2As obtained for consecutive intervals of the original data (by serial sections) were constituted into 3 separate sets of SBP, diastolic (D) BP or HR and were further analyzed by the nonlinear extended cosinor, to estimate, among others, decadal or multidecadal periods (τs). For SBP, Figure 1 (top), the M had a best-fitting τ of 11.8 y, the CI (95% confidence interval) extending from 11.4 to 12.1 y. FH's SBP-2A series yielded a τ of 11.0 (10.5, 11.5) y that overlapped the CI of the τ of the SBP-M series: both series qualify as having a circaundecennian or in a broader perspective as a circadecadal τ. Periods of 14.5 (13.8, 15.0) y characterized the DBP-M series. The CIs are ordering and close to each other for the case of SBP and the DBP-2A. But the CI of the τ of DBP-M is certainly different. Moreover, the CIs of HR differ even more, overlapping with their CIs a 30-y τ. Both the M and 2A series of FH's HR, Figure 1 (bottom), have τs that overlap none of the CIs of τs of SBP and DBP. The τs best-fitting the HR-M and 2A were either longer or shorter than those fitting the characteristics of SBP or DBP. The longer τs of HR are in

keeping with a paratridecadal τ, except for the qualification that the data series, covering only 22 y, are shorter than the period found. The validation of a paratridecadal τ for FH's HR depends on his motivation to continue monitoring and on his lifespan.

Periods*, τ, characterizing average (MESOR; dots) and circadian double amplitude (2A; triangles) of systolic (S; top) and diastolic (D; middle) blood pressure (BP) and heart rate (HR; bottom) of FH**



*Period, τ, with 95% confidence interval from nonlinear cosinor determined in intervals of 48 hours displaced in increments of 24 hours.
**FH, man 68 years of age at start of ~half-hourly automatic measurements with gaps.

PARA-TRIDECADAL COMPONENT IN NEONATAL ANTHROPOMETRY IN MOSCOW BY THE LATE BORIS NIKITYUK

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Body weight and length and head circumference at birth covering 112 years are revisited by a glocal analysis, involving both global analyses of time series as a whole, and local analyses of sections of the data. A para-tridecadal Brückner-Egeson-Lockyer (BEL) cycle in body length of newborn boys and girls is detected and its time course documented by chronomic serial sections. Data were recorded from random samples of 25-150 babies in Moscow, Russia. Body weight of boys and girls had major components with periods of 63.02-year (95%CI: 50.33 - 75.71) and 64.35-year (CI: 40.91-87.67), respectively. Boys and girls showed an added circadecadal (Horrebow-Schwabe) component of smaller amplitude, significant for girls (10.29 years; CI: 9.70-11.01). An about 60-year component was dominant for head circumference in boys, a longer cycle dominating in girls. Other components found in the least squares spectra were circadidecadal signatures of the Hale cycle of sunspot bipolarity (of about 20 years), present in body length and head circumference at birth. The major component in body length was of about 50 years for both genders. The extended linear-nonlinear cosinor was applied for global examination complemented by chronobiologic serial sections. Table 1 summarizes the periods found in

a more recent nonlinearly extended cosinor analysis, prompted by results from wavelets on body length by one of us (SS). The table includes a BEL, with a period of 32.4 and 33.5 years in boys and girls, respectively, 95%CIs listed in.

Table 1

Period(s) (τ) in body length (cm) at birth in Russia (1874-1985): data of Boris Nikityuk*

	Boys (overall standard error: 0.44)	Girls (overall standard error: 0.47)
MESOR	52.224 (51.962, 52.687)	51.564 (51.288, 51.840)
Slope	-0.017 (-0.027, -0.008)	-0.015 (-0.025, -0.005)
τ 1 (years)	53.671 (46.12, 61.23)	53.666 (42.00, 65.33)
Double amplitude	1.52 (0.74, 2.28)	1.32 (0.42, 2.22)
Acrophase	-276˚ (-247, -305)	-274˚ (-237, -311)
τ 2 (years)	32.404 (29.35, 35.13)	33.487 (25.88, 41.09)
Double amplitude	0.76 (-0.00, 1.50) [0.42, 1.08]	0.86 (0.00, 1.74) [0.48, 1.24]
Acrophase	-243˚ (-187, -300)	-207 (-151, -263)
τ 3 (years)	20.441 (18.31, 22.57)	21.217 (19.18, 23.25)
Double amplitude	0.84 (0.56, 1.10)	0.94 (0.62, 1.24)
Acrophase	-184˚ (-129, -240)	-158˚ (-109, -208)

The time course of the characteristics of three components characterizing body length at birth shows greatest stability of the acrophase for the about 50-year period. Acrophase drifts may reflect drifts in periods. A BEL cycle is also detected for body length at birth, as it also characterizes environmental temperature, human affairs and global warming. Meta-analyses by the nonlinearly extended cosinor, complemented by a chronomic serial section, revealed a para-tridecadal component, statistically significant before 1930 with one interruption, in keeping with its intermittent nonstationary aeolian behavior. The serial section complements the wavelet by focus upon a specific frequency.

PARA-TRIDECADAL COMPONENTS CHARACTERIZE PSYCHOPHYSIOLOGICAL VARIABLES OF A CLINICALLY HEALTHY MAN

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Multiple psychophysiological variables – oral temperature (Temp), vigor (VIGr), mood (Mood), 1-minute time estimation (TE1m) and eye-hand coordination (EyeH) – were self-assessed about (~) 5-6 times/day for ~43.5 years by a man, RBS. Cosinors of consecutive 48-hour spans yield a time series for each variable of the MESORs (M, a better average than the arithmetic mean) and of the 24-hour amplitudes (A, a measure of predictable within-day change). Linear-nonlinear analysis of the circadian Ms and As reveal separate sets of periods (τ) during aging from ~20.5 to over 60 years of age, Table 1. Accordingly, para-tridecadal τs have been redefined, in the light of analyses here tabulated, as having a CI (95% confidence interval) of τ reaching into the range of τs from 28-42 years. Some other τs may be evolutionary built-in signatures of the ~22-year Hale sunspot

bipolarity and the ~11-year Schwabe cycle or of its harmonics. A selective assortment of the organism's and the environment's congruent τs has changed somewhat with the lengthening of the time series and/or as a function of age.

Table 1: Statistically significant periods (τ) from nonlinearly extended cosinor in 5 variables of RBS, a clinically healthy man self-measuring and self-rating ~5-6 times a day for ~43.5 years*

		MESOR	Period (95% CI) (years)			Trend	Overall SE
Temp	P	21.9 (20.7, 23.2)	10.6 (10.2, 11.0)	5.16 (5.00, 5.31)		-	0.2
	2A	0.14 (0.11, 0.17)	0.12 (0.09, 0.15)	0.06 (0.03, 0.09)			
VIGr	P	25.4 (22.3, 28.5)	9.38 (9.06, 9.70)	5.74 (5.61, 5.87)		t^2	0.29
	2A	0.17 (0.12, 0.22)	0.16 (0.11, 0.21)	0.15 (0.10, 0.19)			
Mood	P	26.5 (22.3, 30.7)	11.6 (11.1, 12.1)	3.87 (3.78, 3.96)		-	0.65
	2A	0.20 (0.10, 0.30)	0.35 (0.25, 0.44)	0.19 (0.10, 0.29)			
TE1m	P	21.9 (20.5, 23.4)	6.59 (6.36, 6.82)	3.69 (3.61, 3.77)		-	3.38
	2A	2.27 (1.74, 2.80)	1.32 (0.80, 1.83)	1.10 (0.58, 1.61)			
EyeH	P	9.80 (8.98, 10.6)	8.05 (7.66, 8.44)	5.76 (5.49, 6.04)	3.45 (3.39, 3.50)	t^2	0.91
	2A	0.63 (0.36, 0.90)	0.90 (0.62, 1.18)	0.39 (0.18, 0.61)	0.59 (0.40, 0.78)		
		Double amplitude					
			Period (95% CI) (years)			**Trend**	**Overall SE**
Temp	P	15.7 (14.2, 17.3)	10.2 (9.81, 10.5)	5.17 (5.00, 5.35)		-	0.4
	2A	0.13 (0.07, 0.19)	0.21 (0.15, 0.27)	0.11 (0.05, 0.16)			
VIGr	P	40.1 (35.3, 44.9)	[h] 20.0 (17.6, 22.4)	5.74 (5.59, 5.89)		t	0.78
	2A	1.08 (0.82, 1.34)	[h] 0.26 (0.13, 0.39)	0.33 (0.21, 0.44)			
Mood	P	46.0 (41.2, 50.8)	12.4 (11.3, 13.6)			-	0.6
	2A	0.48 (0.41, 0.56)	0.14 (0.06, 0.22)				
TE1m	P	43.3 (30.6, 55.9)	16.6 (15.0, 18.2)	9.71 (8.83, 10.6)		-	6.68
	2A	3.10 (2.07, 4.13)	2.93 (1.83, 4.03)	1.70 (0.63, 2.78)			
EyeH	P	42.5 (27.2, 57.8)	10.2 (9.40, 11.0)	1.01 (1.00, 1.02)		-	1.88
	2A	1.00 (0.69, 1.31)	0.80 (0.48, 1.13)	0.70 (0.38, 1.02)			

Temp: core temperature; VIGr: vigor; TE1m: time estimation, 1 minute; EyeH: eye-hand coordination; SE: standard error. 95% CI: 95% confidence intervals. SE: overall standard error. [h]: fixed harmonic; t: linear trend; t^2: quadratic linear trend.

INFRADIAN COMPONENTS GAUGE AGING OF THE CIRCULATION AND RESPIRATION IN SELF-MEASUREMENTS BY A HEALTHY MAN FOR OVER FOUR DECADES

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Cosinor analyses of 48-hour spans of self-measuring or self-rating multiple physiological variables -- systolic (S) and diastolic (D) blood pressure (BP), heart rate (HR), pulse pressure (PP), respiratory rate (BR2m) and peak expiratory flow (PF) about 5-6 times a day for about (~) 43 years yields time series for the characteristics M and A. The 24-h MESORs, M (**m**idline-**e**stimating **s**tatistics **o**f **r**hythm, a better average than the arithmetic mean), and 24-h amplitudes (A, a measure of within-day change) reveal separate sets of periods during the span examined accumulated during aging from ~20.5 to over 60 years of age. Some of the periods found correspond roughly in length to components of solar variability or to harmonics and may or may not differ for Ms vs. As. Table 1 illustrates part of the results.

Table 1: Statistically significant periods (τ) from nonlinearly extended cosinor in 11 variables of RBS, a clinically healthy man self-measuring and self-rating ~5-6 times a day for ~43.5 years*

		MESOR						
		Period (95% CI) (years)					Trend	Overall SE
SBP	P	27.6 (26.3, 29.0)	13.8 (13.4, 14.3)	6.48 (6.40, 6.57)	1.00 (0.997, 1.01)		t	3.08
	2A	4.06 (3.51, 4.61)	3.35 (2.82, 3.88)	3.32 (2.81, 3.82)	1.61 (1.11, 2.12)			
DBP	P	24.5 (23.3, 25.7)	12.8 (12.6, 13.0)	[h] 6.40 (6.31, 6.50)	10.2 (9.76, 10.7)		t	2.65
	2A	2.61 (2.13, 3.08)	1.70 (1.20, 2.21)	[h] 2.14 (1.71, 2.56)	1.83 (1.36, 2.31)			
HR	P	32.9 (31.4, 34.4)	14.0 (13.7, 14.2)	8.49 (8.19, 8.79)	5.52 (5.46, 5.59)	4.18 (4.12, 4.24)		5.27
	P	48.8 (38.7, 58.9)	13.5 (13.1, 13.9)	8.03 (7.68, 8.38)	5.46 (5.39, 5.53)	4.21 (4.16, 4.26)	t	4.85
	2A	9.75 (8.82, 10.68)	9.32 (8.35, 10.29)	2.84 (1.85, 3.82)	5.62 (4.68, 6.56)	3.38 (2.46, 4.30)		
	2A	6.52 (10.34, 22.71)	[h] 6.85 (5.87, 7.83)	2.48 (1.58, 3.58)	4.95 (4.06, 5.83)	3.68 (2.81, 4.55)		
PP	P	15.2 (14.5, 15.8)	6.72 (6.48, 6.96)	4.74 (4.60, 4.89)	0.996 (0.987, 1.00)		t	2.82
	2A	2.24 (1.76, 2.71)	1.15 (0.68, 1.62)	0.93 (0.46, 1.40)	0.62 (0.16, 1.08)			
BR2m	P	29.1 (24.7, 33.5)	14.1 (13.7, 14.4)	6.84 (6.63, 7.05)			t^2	0.68
	2A	0.76 (0.57, 0.94)	1.14 (1.03, 1.26)	0.31 (0.19, 0.42)				
PF	P	11.0 (10.6, 11.4)	5.30 (5.10, 5.51)				t^3	11.03
	2A	6.09 (4.45, 7.73)	2.80 (1.16, 4.44)					
		Double amplitude						
		Period (95% CI) (years)					**Trend**	**Overall SE**
SBP	P	20.3 (17.2, 23.4)	8.88 (8.15, 9.60)	5.67 (5.35, 5.99)	1.00 (.999, 1.00)		t^3	8.16
	2A	5.05 (3.46, 6.65)	2.25 (0.74, 3.76)	1.86 (0.41, 3.31)	6.48 (5.07, 7.90)			
DBP	P	15.2 (12.7, 17.8)	12.8 (12.2, 13.3)	[h] 6.39 (6.11, 6.66)			t^2	3.94
	2A	1.90 (0.58, 3.22)	0.98 (0.01, 1.94)	[h] 1.16 (0.56, 1.76)				
HR	P	17.7 (16.8, 18.7)	14.4 (12.7, 16.2)	[h] 8.86 (8.38, 9.33)	5.64 (5.50, 5.79)		t^2	7.01
	2A	3.53 (0, 7.08)	4.38 (1.83, 7.93)	[h] 2.62 (1.39, 3.85)	3.31 (2.13, 4.49)			
PP	P	38.4 (26.4, 50.4)	14.9 (12.7, 17.0)	6.65 (6.25, 7.06)	1.00 (0.996, 1.00)		t	4.42
	2A	2.50 (1.75, 3.26)	1.21 (0.43, 1.99)	1.03 (0.29, 1.78)	2.02 (1.29, 2.75)			
BR2m	P	31.3 (24.4, 38.1)	9.58 (9.01, 10.1)	5.05 (4.94, 5.17)			t	1.29
	2A	0.52 (0.32, 0.71)	0.41 (0.22, 0.61)	0.53 (0.33, 0.72)				
PF	P	25.2 (20.0, 30.5)	12.5 (11.3, 13.7)	5.17 (4.91, 5.42)	3.06 (2.99, 3.13)		t^2	8.57
	2A	9.36 (6.51, 12.21)	4.17 (2.50, 5.85)	2.02 (0.51, 3.53)	3.33 (0.85, 3.81)			

SBP: systolic blood pressure; DBP: diastolic blood pressure; HR: heart rate; PP: pulse pressure; BR2m: breathing rate, 2 minutes; PF: peak flow; SE: standard error; 95% CI: 95% confidence intervals; SE: overall standard error; [h]: fixed harmonic; t: linear trend; t^2: quadratic trend; t^3: cubic trend.

A selective assortment of the organism's and the environment's periods has changed somewhat with the lengthening of the time series and/or as a function of age.

CHANGES WITH AGE IN THE RELATIVE PROMINENCE OF WEEKLY-TO-DAILY AMPLITUDE RATIO OF BLOOD PRESSURE

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The biologic week is prominently expressed in early extra-uterine life. A trough in mid-adulthood in amplitude (A) ratios of the week and half-week versus day has been documented longitudinally in self-measurements of blood pressure (BP) taken about 5-6 times a day for over 4 decades similar to changes with age observed transversely. We here check whether the increased prominence with age of the circaseptan-to-circadian and/or circasemiseptan-to-circadian BP-A ratio could be detected in a pilot study on 9 subjects in 3 age groups. Subjects measured their systolic (S) and diastolic (D) BP around the clock at

30-minute intervals for one week or longer with an ambulatory monitor (TM-2430) from the A&D Company (Tokyo, Japan). The 3 groups consisted of 3 teenagers (2F/1M), 3 adults (1F/2M), and 3 elderly people (2F/1M). Participants were monitored once a month during 3 consecutive months in the fall of 2010, two adults monitoring continuously during the entire 3-month span. Each record was analyzed by the extended cosinor. Individual least squares spectra, computed in the frequency range of 1 cycle per week to 1 cycle in 2 hours, were averaged across all 36 profiles by population-mean cosinor. The 7-day and 3.5-day As were expressed as a percentage of the 24-hour A and the ratios were linearly regressed with age. A circaseptan component was detected ($P<0.05$) in 20 of the 36 profiles for SBP and in 14 cases for DBP. A circasemiseptan component was detected in 15 and 17 of the SBP and DBP profiles, respectively. Overall, the circadian component was the most prominent in the spectrum ($P<0.001$), accounting for 26% (SBP) and 20% (DBP) of the variance. Several harmonic terms contributed significantly to the circadian waveform. The 12-hour component accounts for 5% (SBP) and 4% (DBP) of the overall variance ($P<0.001$) and the 6-hour component accounts for 1.5% of the variance ($P<0.001$). An about 3.4-hour component that may be related to the REM cycle is also detected for DBP ($P=0.049$). As expected, circaseptan-to-circadian and circasemiseptan-to-circadian A ratios showed a concave relation with age, with a trough in mid-adulthood. The fit of a second-order polynomial of the circasemiseptan-to-circadian A ratio versus age reached borderline statistical significance in the case of SBP ($R^2=0.141$, $P=0.081$; on $\log_{10}$ amplitude ratios: $R^2=0.159$, $P=0.058$). The larger prominence of the week and half-week versus the day early and late in life is corroborated in this rather small population involving subjects in an age range (17 to 71 years) narrower than that in earlier studies. Ultradian endpoints of interest in their own right and as a gauge of a non-sinusoidal circadian waveform deserve mapping on a population basis, as do infradians, for alignment with environmental cycles in longer and larger follow-up studies.

CROSS-SPECTRAL COHERENCES OF TERRORISM AND SUNSPOTS

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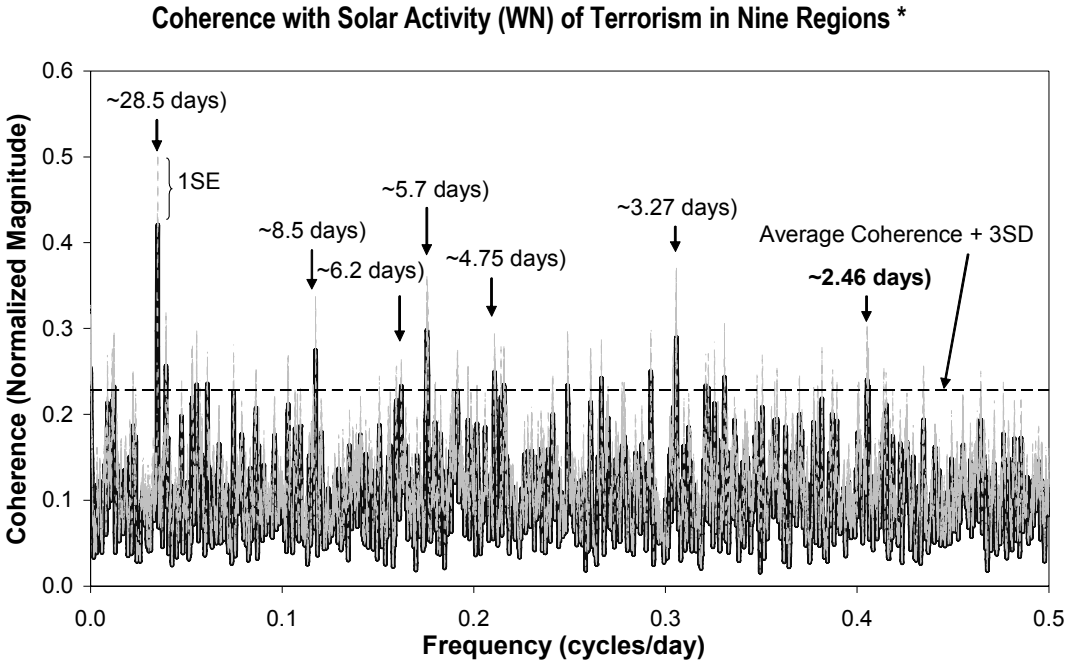
We here report cross-spectral coherence of the incidence pattern of terrorism during 1968-2010, with Wolf's relative sunspot numbers, among others, at frequencies of one cycle in 28.5, 5.7, 3.27 and 2.46 days, Figure 1. Coherence was also found in similar spectral regions between myocardial infarctions (MI) in Moscow and the local geomagnetic index K near Moscow, and between MI and the Bz-GSE component of the interplanetary magnetic field. These results are in keeping further with coherence found between heart rate and blood pressure on the one hand and Wolf numbers and the planetary index Kp on the other hand, in data monitored at half-hour intervals over several years by a clinically healthy subject. Coherence as such is no proof of causal relations. Evidence supporting a non-spurious association is available from shared transyears (components with a period of about 1.3 years) found in the incidence of international terrorist acts during 39 years as well as in solar wind speed (SWS) and the antipodal index of geomagnetic disturbance (aa) that were particularly prominent in all three variables during solar activity cycle 22. The emergence of an about 1.3-year cycle in terrorism slightly lagged behind that in SWS or aa and persisted in terrorism after it damped in SWS and aa.



* WN: Wolf Numbers; Regions: Africa (1499), East & Central Asia (259), Eastern Europe (1652), Latin America (3816), Middle East & Persian Golf (16977), North America (604), South Asia (6464), Southeast Asia &Oceania (3051), and Western Europe (5801), where number of terrorist acts during 1969-2010 are given in ().

Figure 1. *© Halberg.*

LONG PERIODS IN 23 YEARS OF AROUND-THE-CLOCK AUTOMATIC MEASUREMENTS OF HUMAN BLOOD PRESSURE AND PULSE

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Blood pressure (BP) and heart rate (HR) are greatly variable in health or disease, changing from moment to moment with an about 24-hour rhythm, from day to day, week to week and even along scales of decades. A 24-hour profile is hence best replaced by a 7-day record or preferably by continuous lifetime monitoring. As yet tentative reference values for the circadian rhythm in BP and HR allow the screening for circadian Vascular Variability Anomalies (VVAs), checking on whether circadian parameters (MESOR, circadian amplitude and acrophase) lie within acceptable (90% prediction) limits in healthy peers matched by gender and age. (MESOR-)Hypertension is a VVA, defined as an elevation of the BP-MESOR (usually more accurate and more precise than the arithmetic mean), derived from fitting a model consisting e.g., of cosine curves with periods (τs) of 24 and 12 hours to data collected around the clock for 7 days at half-hourly or shorter intervals. Ecfrequentia, another VVA, is a condition when τ deviates from 24 hours. Infradian variations likely contribute to all rhythm characteristics, exhibiting a selective assortment with physical environmental cycles. Analyses by the extended cosinor were carried out on original unedited systolic (S) and diastolic (D) BP and HR data (OrD), and on the MESOR (M) and double 24-hour amplitude (2A) computed from consecutive 21-day intervals of an about 23-year ABPM record from YW, about 34 years of age at start of monitoring. Analyses of OrD and M are checks of the analytic method used. Their results

are in agreement insofar as the τs have overlapping CIs (95% confidence intervals). Namely, SBP τs (and CIs) of OrD, and M are (in years) 9.98 [9.82, 10.14], and 9.85 [8.89, 10.80]. SBP-2A τs are 19.4 [14.0, 24.8] and 7.61 [7.14, 8.08] years. DBP τs (and CIs) of OrD, and M are (in years) 33.1 [31.5, 34.6] and 10.5 [10.0, 11.0], and 34.8 [25.1, 44.5] and 10.6 [8.2, 13.0]. DBP-2A τ is 21.3 [15.1, 27.4] years. HR τs (and CIs) of OrD, and M are (in years) 32.7 [27.1, 38.2] and 11.3 [10.6, 12.0], and 29.4 [26.2, 49.1] and 11.8 [7.3, 16.4]. HR-2A τs are 27.0 [20.8, 33.0] and 7.04 [6.22, 7.86] years. Selective assortment is found for SBP, τ of OrD and M being decadal (corresponding to a Horrebow-Schwabe cycle in sunspots) but didecadal (mimicking the Hale's sunspot bipolarity cycle) for 2A. Results for DBP and HR are qualified by the fact that the estimated anticipated para-tridecadal τs are longer than the time series analyzed.

TRANSITION FROM SUNDAY-ONLY-MESOR-NORMOTENSION TO SUNDAY-INCLUSIVE-MESOR-HYPERTENSION

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YW, a clinically active physician, has monitored his blood pressure for the past 23 years. In updating data, a change from workday MESOR-hypertension and Sunday MESOR-normotension occurred to Sunday-inclusive MESOR-hypertension. This transition could be a characteristic in the development of MESOR-hypertension more generally or may occur distinctly only in special cases. If this intermediate stage is found generally, it could clarify the role of work-imposed loads and recognition of the kinds of loads inducing vascular variability anomalies (VVAs) may lead to preventive measures.

In January 2009, YW had systolic MESOR-hypertension during weekdays but was MESOR-normotensive during a vacation. His blood pressure was lower on Sundays than on weekdays, as seen in the top half of Table 1 which summarizes analyses completed in 2010 on the data of the preceding months. Those in the bottom half of Table 1 summarize half-hourly data from August 2010 to January 2011. In January 2011, by comparison with January 2009, there is a statistically significant change by sign test: 7 out of 7 systolic BP MESORs have increased ($P<0.05$), perhaps as a result also of severe lumbago-associated pain. A time-dependent weekday-only MESOR-hypertension is a true white-coat hypertension when it concerns a physician donning a white coat at work only from Monday to Saturday. It remains to be seen whether Sunday-inclusive MESOR-hypertension on all days of the week is reversible, e.g., may fade in YW. One should study whether these transitions recur in both directions, and whether they might constitute an index of strain, the recognition of which in the stage of reversibility, if any, might be desirable to prevent the onset of true systolic Sunday-inclusive MESOR-hypertension.

Table 1

Transition from "true white-coat hypertension" in YW to systolic MESOR-hypertension

In YW, a physician-scientist, a comparison of vascular endpoints on Sundays with weekdays reveals acceptability of blood pressure (BP) on Sundays by contrast to weekdays in 2009 but not in 2011

	SBP-M	DBP-M	PP	HR-M	SBP-2A	DBP-2A	HR-2A	HR-SD	S-HBI	D-HBI	TCI
Jan 2009											
1. Sun	132.9	83.0	49.9	72.2	20.03	9.10	10.30	11.24	5	1	0
2. Mon	**138.8**	86.9	51.9	74.2	28.15	19.86	11.25	12.27	**53**	11	0
3. Tue	**140.9**	**88.2**	52.7	76.2	29.58	18.05	14.23	12.95	**70**	12	0
4. Wed	**138.6**	86.2	52.4	75.0	28.33	18.33	10.46	12.20	**51**	9	0
5. Thu	**141.4**	**88.3**	53.1	75.2	22.85	10.78	8.07	12.34	**80**	6	0
6. Fri	**143.0**	**88.4**	54.6	77.0	27.52	17.70	8.84	12.99	**80**	5	0
7. Sat	**141.0**	85.6	55.4	78.5	30.86	19.30	16.17	14.30	**57**	5	0
Jan 2011											
1. Sun	**143.2**	**87.5**	55.8	72.6	17.35	9.67	10.06	11.99	**109**	9	0
2. Mon	**143.4**	**89.7**	53.7	73.0	22.22	17.90	7.33	12.39	**104**	22	0
3. Tue	**143.6**	**90.6**	53.0	77.0	18.17	12.59	9.63	15.00	**129**	31	1
4. Wed	**142.4**	**87.3**	55.1	75.4	17.78	12.28	6.78	13.10	**98**	8	0
5. Thu	**146.0**	**88.8**	57.2	75.7	32.01	19.54	**3.80**	13.49	**174**	31	1
6. Fri	**144.4**	**88.0**	56.4	76.5	18.81	9.46	6.11	13.31	**119**	7	0
7. Sat	**147.1**	**87.3**	59.8	75.8	24.67	11.11	9.97	14.67	**195**	12	2

*S: systolic; D: diastolic; M: MESOR, a **m**idline-**e**stimating **s**tatistic **o**f **r**hythm; 2A: double circadian amplitude; HR: heart rate; HBI: hyperbaric index; TCI: tachycardic index. In 2010, a lower value on Sundays for BP was also found for 30 series from 25 individuals, when the data of each subject were expressed as a percentage of their mean values, examined as a group by a one-way analysis of variance. The degree of generality of the transition from weekday- to all week-MH will have to be checked on others.

CEREBRO-CARDIOVASCULAR RISK ASSESSMENT NEEDS CHRONOBIOLOGICAL ANALYSES

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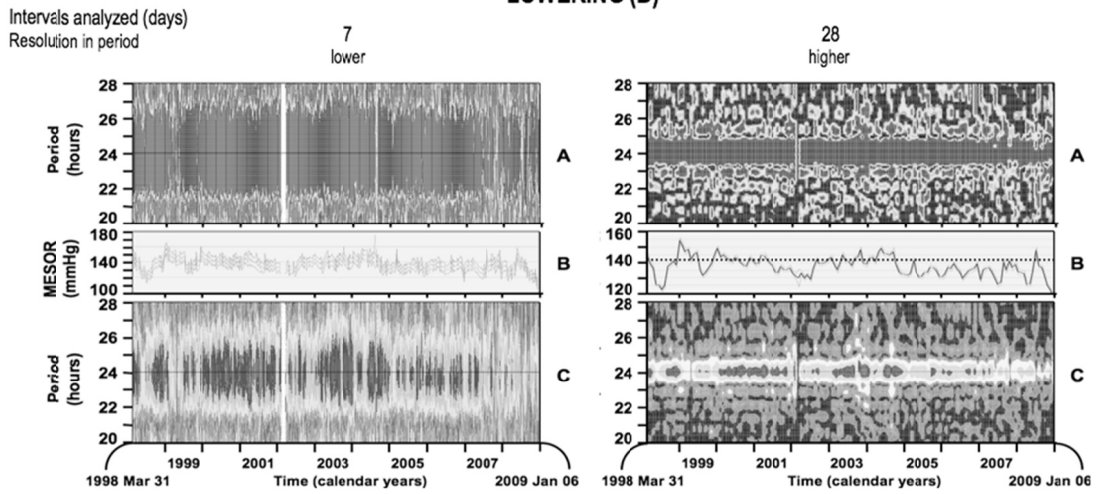
Aim. To replace reliance on office measurements of blood pressure (BP) and heart rate (HR) by continuous, as-one-goes, easily computer-analyzed self-surveillance. For this task, automatic analyses from BIOCOS (corne001@umn.edu) and eventually from a website (http://www.sphygmochron.org/) are available. We recommend at least 7d/24h **c**hronobiologically-**i**nterpreted (C) **a**mbulatory **BP** and HR **m**onitoring (C-ABPM). Otherwise, systematic chronobiologically-interpretable schedules of **m**anual

measurements, C-MBPM, are less reliable. In either case, a BP and HR summary can be aligned with a space weather report. An intermittent circadian overswing will be demonstrated by surveillance for over 10 years with weekly analyses and in their light with changes in medication. The point made is that GSK, the physician-scientist who monitored himself, needed the continued surveillance to avoid repeatedly recurring CHAT, shown in red to be gradually reduced if not eliminated in Figure 1. Almost certainly the same need concerns the millions of hypertensives who, like GSK, may well have undiagnosed complicating **v**ascular **v**ariability **d**isorders, VVDs that can be eliminated, sometimes by a change in timing of medication.

Background. Taking a BP measurement in the office and treating for a lifetime misses a circadian overswing now documented worldwide that can constitute a greater risk of ischemic stroke and kidney disease than a high BP. That treatment timing can make the difference between harm or benefit has also been rigorously demonstrated for other individuals by timing (by FH with 240 mg Diltiazem HCl and by YW with Hyzaar, a combination of 50 mg Losartan and 12.5 mg hydrochlorothiazide). These findings reveal in common practice what may be lost in clinical trials that provide lessons which are no substitute for individualized supervision.

Conclusion. The chronobiologic approach is cost-effective, providing much more (this must be emphasized) for less, namely by self-help implemented by automatic, now-available analyses of data preferably from C-ABPM or from self-measurement. As the editor of a journal in which some of us published our results put it, the opportunity of "not flying blind" is within the scope of a chronobiologic automatic analysis of 7d/24h data.

A DIFFICULT-TO-ELIMINATE CIRCADIAN OVERSWING (CHAT) (C) OF A 24-HOUR SYNCHRONIZED RHYTHM (A) OF SYSTOLIC (S) BLOOD PRESSURE (BP)* CAN BE THE UNWELCOME TRADE-OFF FOR A SUCCESSFUL BP MESOR-LOWERING (B)



*In GSK, treated MESOR-hypertensive man 72 years of age at start of automatic measurements; original data analyzed, N=175,171.
Gliding interval and increment = 7 (left) or 28 (right) days, longest trial period (τ) = 28 hours (h), shortest τ = 20.
A: Probability of rhythm, without account for any pink spectrum; shading density corresponds to: >0.05 (dots), 0.05-0.01 (light), 0.01-0.001 (middle), <0.001 (dark). B: MESOR: thin sidelines: 99.9% confidence corridor; dotted line: upper 95% prediction limit from gender- and age-matched peers. C: amplitudes: darker shading corresponds to larger amplitude. Strongest spectral components have double amplitudes: in SBP ~60 (7 days) or ~58 (28 days) mm Hg, in DBP (not shown) ~19.2 (7 days) or ~17 (28 days) mm Hg. Red = CHAT; note with advancing time a lower occurrence of 7-day and disappearance of 28-day CHAT.

CHAT = **c**ircadian **h**yper-**a**mplitude-**t**ension. © Halberg.

Figure 1

MULTIPLE CIRCADIAN PERIODS CHARACTERIZES SLEEP-WAKEFULNESS OF A CLINICALLY HEALTHY MAN ON A SELF-SELECTED LIVING ROUTINE

John Costella[1], Franz Halberg[2], Dewayne Hillman[2], Miroslav Mikulecky[3], Germaine Cornelissen[2]

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A double tidal 24.8-hour (lunar) period, τ, and another 24-hour synchronized τ, were both present and alternated in prominence in a 61-year-old woman, JF, with a 20-year history of twice-yearly, 2-3 months, of adynamic depression, during which the 24.8-hour τ predominated while the 24-hour synchronized τ had the larger amplitude, A, during relative well-being. As Table 1 shows, multiple τs also characterize a clinically healthy man, JC, 23 years of age. Coexisting with a 24-hour synchronized and a 24.8-hour lunar τ are the presence of a 24.26-hour τ that may correspond to a free-running τ (1, 2), and a 24.4-hour τ corresponding to perhaps a nearly equal pull by society and by the moon. Chronobiologic serial sections with the fit of 24.0-hour and 24.8-hour τs to intervals covering 7 cycles (of the τ fitted) document the relative contributions and changing prominence of societal (socidian), lunidian and other τs. Table 1 also shows that the As of 24.00 and 24.84-h τs by far exceed the amplitudes of a possibly free-running τ or of an intermediate (compromise?) component resulting from similar pulls by society and the moon. Multiple circadian periods, as such, in sleep-wakefulness on a self-selected routine need not be pathogenetic, at least not in a single well-documented case.

Periods, amplitudes and acrophases* found in sleep-wakefulness on a largely self-selected schedule by JC**

	Period (CI*)	Amplitude (CI)	Acrophase (CI)
Name	Length (h)		
Solar day	24.001 (24.000, 24.001)	0.25443 (0.2337, 0.2751)	-293˚ (-288, -287)
Lunar day	24.836 (24.833, 24.838)	0.10606 (0.0854, 0.1268)	-233˚ (-222, -244)
Compromise ?	24.432 (24.427, 24.436)	0.05643 (0.0357, 0.0772)	-250˚ (-229, -271)
Free-running ?	24.260 (24.252, 24.268)	0.03253 (0.0118, 0.0533)	-10˚ (-334, -47)
Half-day	11.999 (11.997, 12.001)	0.03204 (0.0113, 0.0527)	-356˚ (-319, -33)
Tide	12.414 (12.410, 12.418)	0.01728 (0.0034, 0.0380)	-199˚ (-131, -268)

*With uncertainties (CI, 95% confidence interval)

**A healthy man, 23 years of age at start of recording from February 19, 1990, to March 11, 1993 with linear-nonlinear rhythmometry by the extended cosinor (3, 4). Local analyses by separate serial sections with 24.0- and 24.8-hour periods (in 1-week intervals) reveal the dominance, in alternation, of these 2 periods in the data.

DIFFERENT RESPONSES OF BLOOD PRESSURE AND HEART RATE TO LUNAR AND SOLAR DAYS DURING ADYNAMIC DEPRESSION

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JF, a 62-year-old woman at start of study, monitored her blood pressure (BP) and heart rate (HR) hourly during about (~) 10 months, including downtimes of adynamia and depression lasting ~2 months, with desynchronization from the societal 24-hour routine of her sleeping and waking and, i.a., of her partly monitored wrist activity and vigor self-rating. Vigor/wellness showed the double tidal period of 24.8 hours in the first months of 2 out of 3 self-rated episodes of unwellness and loss of vigor. In Figure 1, data from Dec 2009 to Sep 2010 are shown as spectrograms obtained in Matlab by moving windows of 1 (top), 2 (middle) and 10 (bottom) months. Dark bands denote high amplitude peaks, seen in the circadian range with 1- and 2-month windows, notably during the depressive (adynamia) episodes (2 Jan-28 Feb and 7 Jul-16 Sep 2010, associated with prolongation of circadian period beyond 24.8 hours). Note in Figure 1 on the average greater pull toward 24.8 hours of BP than of HR. Also note the demonstration of multiple coexisting peaks in the circadian range between 24.0 and 24.8 hours. The two peaks at and near 24 hours with the 10-month windows (bottom) are in keeping with the coexistence of a precise 24.0-hour period and of one only slightly longer than 24.0 hours, in keeping with a free-running period reported on living routines outside the range of synchronizability of the circadian rhythm.

Differential Circulatory Responses to Lunar and Solar Days: A Glocal * Analysis of Systolic (left) and Diastolic (middle) Blood Pressure (BP) and Heart Rate (HR, right) of JF (F, 62y)

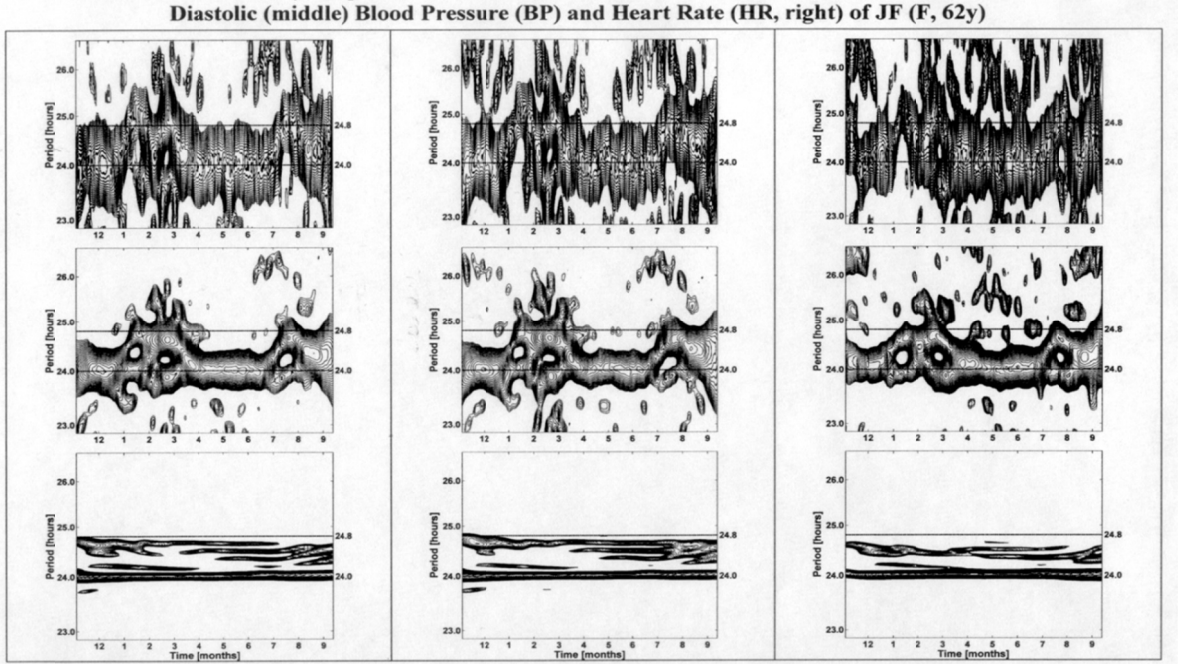

Figure 1

COMPETING TIDAL AND CIRCADIAN LUNISOLAR RESONANCE IN AN ARCHAEON

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This presentation is dedicated to the memory of Hans Kaiser and complements our discussions with him in 1990 (Kaiser H, Cornelissen G, Halberg F. Paleochronobiology: circadian rhythms, gauges of adaptive Darwinian evolution; about 7-day (circaseptan) rhythms, gauges of integrative internal evolution. Progress in Clinical and Biological Research 1990; 341B: 755-762).

The dogma and battle about circadians restricted to eukaryotes is history, and the declaration (decree) of a committee rejecting bacterial circadian periodicity on the basis of "too much mathematics" and failure to see bacterial periodicity macroscopically by the unaided eye by some short-sighted investigators is recorded. Earliest life may well be characterized not only by a circadian but also by a lunar (tidal) average period (τ) of 12.4 hours, which may have originally dominated in amplitude over any 24-hour or, more broadly, circadian component in any universal ancestor or ancestors if life originated repeatedly. This hypothesis is in keeping with the assumption that life originated at the bottom of the sea and with results of our analysis of data by Whitehead K. et al., in which periodicity persisted for at least 72 hours in continuous darkness in three classes of mRNA profiles for 180 of the 290 genes detected as cyclers, with modes in the published Figure 1b histogram corresponding to periods of 21 and 12.5 hours. Our chronometaanalysis of data off Whitehead et al.'s Figure 3A replaces point estimates of the period (originally assessed by Lomb-Scargle periodogram) by periods with their CI (95% confidence interval) in of 12.38 [11.40, 13.37], 18.91 [16.66, 21.17] and 21.14 [18.55, 23.72] hours. Note that the first estimate covers the tidal period and the other two cover with their CIs a circadian period (of 20 to 28 hours) shorter than 24 hours, not covered by the CI.

Since results were expressed as normalized log-ratios, amplitudes of major components could not readily be expressed as a percentage of the MESOR. In order to compare relative amplitudes among three curves, the MESOR was first back-transformed as $bt\text{-}M=10^{M}$, where bt-M is the back-transformed MESOR and M is the MESOR of the normalized log-ratios. Because amplitudes (As) cannot be back-transformed in a similar way since the back-transformation depends also on the MESOR, the range of predictable values was estimated instead. This was done by first computing the values at the nadir and peak of each curve as M-A and M+A, respectively, and then back-transforming these as $10^{(M-A)}$ and $10^{(M+A)}$. The range of predictable variation is thus estimated as $R=10^{(M+A)}-10^{(M-A)}$, and the relative range of predictable variation as $rR=100*R/bt\text{-}M$.

Results for rR of the three curves of Whitehead et al. are 38.93%, 37.52%, and 33.31% (70-gene, 45-gene and 65-gene mRNAs). Comparing 70-gene/45-gene mRNAs yields a ratio of 1.037, 70-gene/65-gene mRNAs one of 1.169 (and 45-gene/65-gene mRNAs one of 1.126). Inverse ratios are 0.964, 0.856 and 0.888, respectively. In other words, the relative tidal amplitude was numerically the largest, slightly larger than those of the two circadian components, which were in the range we had reported for a meta-analysis in 1961 of original data by Rogers and Greenbank, published in 1930. The extracircadian vs. circadian ratio later in phylogeny and in post-Lucy human ontogeny is greater than unity not only in human babies, pigs and crayfish, but also in an archaeon where the tidal component has the largest amplitude. Prokaryotic chemosignalling occurred in cycles that were a condition for the origin of life as well as for its evolution.

ASSESSMENT OF ANY EFFECT OF DEPRESSION ON BLOOD PRESSURE

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Aim. To determine whether changes in blood pressure (BP) are observed in association with depression.

Background. Hecht et al. recently reported that in 425 patients with a resting systolic BP of <110 mmHg and not treated for high BP, they verified the triad of low BP, cervical spine syndrome, and depressive disorders. BP was measured in a state of relaxation for 10 minutes at 1-minute intervals, using the lowest value among the last 5. No circadian stage of measurement was indicated. Fixing the time of day is not necessarily a sufficient precaution since opposite results such as changes with age over 4 decades have been observed with measurements taken at different circadian stages by the same subject.

Subjects and Methods. As part of the project on the BIOsphere and the COSmos (BIOCOS), 182 week-long profiles of around-the-clock measurements at 30-minute intervals by day and 60-minute intervals by night have been obtained from residents of Uruasu, Japan. Depression scores were obtained according to the GDS scale from 170 subjects once (GDS1), 141 of them also providing a second score (GDS2) about a year later. Each BP record was analyzed by the extended cosinor. A two-component model consisting of cosine curves with periods of 24 and 12 hours was fitted by least squares, yielding estimates of the MESOR (M, Midline Estimating Statistic Of Rhythm, a rhythm-adjusted mean), as well as double amplitudes (2A, a measure of the predictable extent of change within a cycle) and acrophases (τ, a measure of the timing of overall high values recurring in each cycle) of each component. The M and 24h-A of systolic (S) and diastolic (D) BP and heart rate (HR) were compared by Student t test between subjects with a GDS score ≥5 (depressed) or a GDS score <5. These parameters were also linearly regressed with respect to the GDS score. Student t tests were also applied to the predicted low and high daily values computed as M-A and M+A, respectively, for the pool of all subjects and separately for men and women.

Results. Depressed subjects had a higher SBP-M (132.1 vs. 125.2 mmHg; P=0.002) and tended to have a higher DBP-M (79.8 vs. 77.4 mmHg, P=0.054). The increase in SBP-M with GDS1 is confirmed (r=0.171, P=0.025). SBP-M is also positively correlated with the $GDS1^2$ (r=0.176, P=0.022). The higher SBP-M in depressed subjects is observed numerically in both genders but only reaches borderline statistical significance in women. Numerically, both the nadir and the peak BP values are invariably higher in depressed subjects, but the differences are not statistically significant.

Discussion and Conclusion. Depressed subjects were also found to have a smaller 24-hour HR-A (6.9 vs. 7.7 beats/min, P=0.084). The HR-A was negatively correlated with GDS1 (r=-0.215, P=0.005). HR-A is also negatively correlated with GDS2 (r=-0.179, P=0.034). The smaller HR-A is found only in men but not in women. Whether ethnic differences, the fact that the Urausu database includes many elderly people, and/or the fact that 7-day ABPM instead of a few resting measurements were used in Urausu account for the discrepancy between the two studies remains to be investigated. Reasons underlying a higher depression score may also play a role and may differ in the elderly versus younger people. In the case of a 41-year old woman diagnosed with bipolar II disorder who monitored her BP longitudinally around-the-clock for several months, the BP-M tended to be lower when mood ratings were lower (SBP: r=0.563, P=0.053; DBP: r=0.233,

P=0.089), in keeping with findings by Hecht et al. Also worth of further investigation is the finding both in this case and in the Urausu database of an amplified about 7-day component associated with a higher depression score.

INDISPENSABLE 24/7 CHRONOMICALLY-ASSESSED ABPM REPLACES CASUAL OFFICE BLOOD PRESSURE SNAPSHOTS

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Taking THE (single) blood pressure is a current sine qua non before any physical examination. But if the risk of a hard event like an ischemic stroke within 6 years increases with the diagnosis of multiple vascular variability disorders (VVDs) from well below 10% to near 100%, reliance on a single or average of many home blood pressure (BP) measurements at the start of an examination can be misleading: the single acceptable BP can neither diagnose nor rule out VVDs. Hence, they are necessarily a hindrance, as already recognized in 1904 by Janeway, who did not wish to examine a patient before seeing a record of measurements revealing the periodicities (note plural) involved. In 2011, many periodicities have been mapped by chronomically interpreted decades-long ABPM and the consequences of alterations in variability are defined in outcome studies. Hence, eventually as the evidence is disseminated, the measurement in the caregiver's office, now acceptable in view of the care providers' and recipients' ignorance of VVD, can be replaced by a C (chronobiologic/chronomic 24h/7d)-ABPM which detects risks much greater than hypertension that are otherwise undiagnosed. BP data can be collected in a way that can be analyzed by methods available on the BIOCOS website.

An elevation of the MESOR, MH or MESOR-Hypertension and Mh or MESOR-hypotension are VVDs when M is above or below the upper 95% or lower 5% limit of gender- and age-matched clinically healthy peers. An elevation of the circadian amplitude above the upper 95% prediction limit of peers has been associated with an increase in cardiovascular disease (CVD) risk larger than MH, even among certain MESOR-normotensive subjects. This condition, called CHAT (Circadian Hyper-Amplitude-Tension), can be iatrogenic in origin but, whatever its origin, is amenable to treatment.

An odd timing of the circadian rhythm of BP but not of HR (BP ecphasia) is also associated with a large increase in CVD risk, notably when related to the presence of autonomic system dysfunction in patients with non-insulin-dependent diabetes mellitus. VVDs include an excessive pulse pressure (above 60 mmHg) and a deficient HR variability (HR-SD < 7.5 beats/min). These VVDs have been shown to be largely independent and additive. Assessment of VVDs has been shown, i.a., to work when "dipping" failed or even misled: the dipping was abnormal in healthy controls while patients with hypertensive retinopathy dipped acceptably. C-ABPM is continued for weeks or much longer, if an abnormality is detected and replicated rather than transient, while therapy is indicated. Therapy of VVDs with drugs can reduce the risk of hard events (or enhance it if given blindly); music (composed for the treatment of specific conditions, such as depression) can relieve symptoms of a novel VVD, consisting of two circadian components in each systolic and diastolic blood pressure and heart rate, associated with about half-yearly recurring, about 2 months lasting adynamic depression, i.e., vascular circadian difrequentia, documented to be an endocrine difrequentia as well.

ADYNAMIC DEPRESSION ASSOCIATED WITH CIRCADIAN LENGTHENING (STRONG LUNAR PULL) OF ENDOCRINES, 24-SYNCHRONIZED IN WELLNESS

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A 62-year-old woman (JF) at start of study collected saliva every 4 hours during parts of 2 winter and 1 summer downtimes of adynamia and depression lasting about (~) 2 months and recurring half-yearly for 20 years, with desynchronization from the societal 24-hour routine of her sleeping and waking and, i.a., of her partly monitored wrist activity and vigor self-rating. Vigor/wellness showed the double tidal period (τ) of 24.8 hours in the first month of 2 out of 3 downtimes. Cortisol, aldosterone, DHEA, testosterone, estradiol and melatonin were determined 4-hourly around-the-clock for over a year (11,700 salivary assays from 2009010100-2010111804 with few gaps for few hormones). Chronobiologic serial sections of the data with intervals of 48 or 168 hours for each hormone were in keeping with desynchronization from the 24-hour societal routine during the ~2-month-long adynamic depressed downtimes. Scrutiny of the results in 1-month sections allowed the demonstration of two coexisting circadian components, one synchronized by the 24.0-hour society or near that length, the other longer and conceivably pulled by a double tidal period, perhaps via gravity (earth and ionospheric tides resulting in magnetic cycles?). A period of 24.83 (24.59, 25.02) hours characterized salivary aldosterone in a first investigated downtime. The amplitude (A) of the longer-than-24.0-hour τ exceeds the 24.0-hour A during unwellness and vice versa during wellness. A precise 24.8-hour τ during the (long-term, up to 265-day) isolation of clinically healthy individuals suggests that the lunar pull is also present in health when the societal 24.0-hour schedule is eliminated by social isolation. During shorter isolation studies, usually for weeks rather than months in a bunker, the dominant circadian τ was very close to the double tidal τ; it was 24.8 hours in our nonlinear meta-analysis of data from the bunker kindly offered by Dr. Robert B. Sothern. The fact that hormones like testosterone and estradiol desynchronize, as does their precursor DHEA, suggests that the sites of sex hormone production and certainly all three zones of the adrenal cortex are subject to the moon's pull during isolation from society and in JF during life in society with behavioral, including sleep pathology. The desynchronization of melatonin, produced by the pineal and the gut, suggests an even more pervasive lunar effect than its action upon steroids involved in survival and reproduction. On the technical side, the length of the time series exceeding one year provides information relating to duration requirements of sampling for chronomic stress tests and sex hormone panels, among others, while infradian biospheric τs reflecting cosmic τs may also be found.

SOLAR FLARES' CIS-HALF-YEAR (~5-MONTH-LONG) QUINMENSAL CYCLE, CIRCADIANS, AND PERHAPS THE SOLAR WIND'S FAR-TRANSYEAR ALL CHARACTERIZE SALIVARY CORTISOL

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An about (~) 154-day cycle, an ~5-month period, a quinmensal, is characteristic of solar flares and is found in a 15-year series of 17-ketosteroid excretion (17-ketos) and in blood pressure and heart rate monitored for decades around-the-clock. It is here demonstrated for the salivary cortisol of a 62-year-old woman who collected saliva every 4 hours around-the-clock for over 13 months while suffering from adynamic depression. We here report also several circadian components that may coexist and alternate in prominence and/or may characterize different subspans. At ~half-yearly intervals, the prominence of the circadian amplitude (A) alternates between that of an ~24.0-hour component having the largest A (in wellness) vs. one of 24.65 hours dominating during unwellness. In addition, we find an ~1.3-year far-transyear (Table 1) that is not only statistically but also clinically significant since transyears and quinmensals also characterize the incidence of sudden cardiac death in some geographic locations some of the time. The transyear in cortisol is tentative, in view of the brevity of the series that covers only slightly more than 1 year, yet transyears are found in 17-ketos documented by a healthy man for 15 years and may be a contribution only of glucocorticoids. No transyear was found in aldosterone, DHEA, testosterone or estradiol.

Table 1

JF's Hormone Data 2010/01/18 - 2011/02/06 (MESOR ± SE: 0.913 ± 0.014): Cortisol

Years		Days		Hours		Hours		Hours	
Adj Per	FundA	Adj Per	FundA	Adj Per	FundA	Adj Per	FundA	Adj Per	FundA
1.30 (1.02, 1.59)	0.115 (0.077; 0.153)	145.28 (134.52; 156.04)	0.051 (0.009; 0.093)	24.52 (24.51; 24.53)	0.075 (0.037; 0.114)	24.12 (24.11, 24.12)	0.080 (0.040; 0.119)	24.00 (23.98, 24.00)	0.116 (0.077, 0.156)

The danger of extrapolating from time series that do not cover an entire cycle can be illustrated as leading to controversy about the effect of geomagnetics on myocardial infarction. Yet this fact, while rendering results tentative, should not prevent thorough analyses. A transyear in systolic blood pressure was associated with a damping, but not its loss, during the loss of a transyear in solar wind speed. The solar wind's speed has, i.a., prominent non-stationary (aeolian) components with a period (τ) longer than (trans = beyond) a year: near-transyears (1.00 year < [τ - CI {95% confidence interval}] < [τ + CI] < 1.20 years) and far-transyears (1.2 years $\leq$ [τ - CI] < [τ + CI] < 1.9 years) and a quinmensal. These non-stationary aeolian components were demonstrated longitudinally in blood pressure and heart rate measured around-the-clock over decades by several subjects (e.g., 3). Transyears and quinmensals may be partly genetically coded, as are circadians.

SYSTOLIC BLOOD PRESSURE RESPONDS TO LISTENING TO MUSIC IN A CIRCADIAN STAGE-DEPENDENT FASHION

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Aim. To assess the effect of music therapy on blood pressure (BP) and heart rate (HR).

Subject and methods. A 60-year old woman (GC) automatically measures her systolic (S) and diastolic (D) BP and HR around-the-clock, mostly at about 30-minute intervals, with interruptions, with the TM-2430 ambulatory monitor from A&D (Tokyo, Japan). Within a 9-day span, she performed 21 sessions of listening to preprogrammed music designed to lower BP. The program (1D, Sanoson) was the same in all sessions that took place at different times during waking (from 07:00 to 02:00). During the 33 minutes of the musical program and for about 30 minutes before and after each session, her BP and HR were measured every 5 minutes. Linear and quadratic regression models were fitted to pooled data from the 90-minute sessions to assess any trend as a function of time. All data during the 9-day study span were averaged over consecutive 90-minute intervals (the duration of one session). The 90-minute averages during each day as well as over the entire 9-day span were analyzed by cosinor to obtain estimates of the circadian rhythm characteristics: the MESOR (Midline Estimating Statistic Of Rhythm, M, a rhythm-adjusted mean), the double 24-hour amplitude (2A, a measure of the extent of predictable change within a day), and the 24-hour acrophase (phi, a measure of the timing of overall high values recurring each day). Means and standard deviations (SDs) before, during and after each music session were calculated and assigned to the start time of listening to music to determine their respective circadian rhythm characteristics as well as those of differences between spans spent listening to music and the immediately preceding 30 minutes. Parameter tests were also performed to compare the circadian characteristics of BP and HR before, during and after listening to music.

Results. Regression analyses indicate a decrease in HR overall ($P<0.001$), brought about primarily by a decrease before the music session itself, likely related to the decrease in activity associated with a 90-minute session. A robust and stable circadian rhythm characterizes BP and HR when it is assessed on the basis of all data collected around the clock. The 2A of SBP and DBP averages 28.8 and 17.5 mmHg, respectively, and that of HR 16.5 beats/min over the 9-day study span. A circadian rhythm in BP cannot be detected with statistical significance, however, for the average values from the 30-minute spans preceding the 21 music sessions, their 2A being estimated at only 4.4 and 5.0 mmHg for SBP and DBP, respectively. By contrast, a circadian rhythm can be demonstrated for both BP and HR when the data collected while listening to music are analyzed ($P<0.05$). Music was associated with a numerical increase in the 2A of SBP and DBP, estimated at 12.1 and 8.6 mmHg, respectively. The amplification of the circadian rhythm in BP ($P<0.05$) persists during the 30-minute spans following the listening to music, the 2A of SBP and DBP being estimated at 16.8 and 8.8 mmHg, respectively. The difference in (A, phi) pair of SBP after versus before listening to music reaches borderline statistical significance ($P=0.066$), suggesting that music may indeed induce or reinforce the circadian variation in BP. A response rhythm for SBP is also detected ($P=0.025$) by fitting a 24-hour cosine curve to the "during-before" differences computed for the 21 sessions and assigned to the start times of music listening.

Discussion and Conclusion. The response rhythm observed for SBP indicates that, on the average, listening to music is associated with a decrease in SBP of about 2.8 mmHg. With a 2A of 10.2 mmHg and an acrophase occurring between 11:00 and 12:00, it means that listening to music in the morning can be associated with an increase of about 2.2 mmHg, contrasted with an expected decrease of about 7.9 mmHg during evening sessions. The differing response of SBP to a 33-minute session of preprogrammed music as a function of circadian stage was anticipated since earlier a circadian-stage dependence was demonstrated for a variety of stimuli such as noise, X-irradiation, various drugs and the mild stimulus of immersing one's hand into cold water, findings in keeping with generalization, albeit not with numerical extrapolation of the results in the case here examined.

RELIABLE DIAGNOSIS OF VASCULAR VARIABILITY DISORDERS (VVDS) REQUIRES WEEK-LONG ABPM RECORDS

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Automatic around-the-clock measurement of blood pressure (BP) and heart rate (HR) by ambulatory monitoring (ABPM) in clinical health served to derive time-specified reference limits computed as 90% prediction limits specified by gender and age. Data are analyzed by sphygmochron, consisting of parametric and non-parametric assessments. Parametrically, a two-component model, consisting of cosine curves with anticipated periods of 24 and 12 hours, is fitted to the data by least squares, yielding estimates of the MESOR (M), 24-hour and 12-hour double amplitudes (2A) and acrophases (ϕ). Reference limits, also computed as 90% prediction limits separately for men and women of different age groups are derived for M, 2A and ϕ from records in clinical health. This model usually provides a good approximation of the decrease during rest, the small increase around mid-sleep followed by a more rapid increase around awakening, a post-prandial dip that is more accentuated with increasing age, and the evening slower decrease. Non-parametrically, percentage time elevation, area of excess and timing of largest excess are determined by numerical integration. In addition to MESOR-hypertension, deviations from these chronobiological norms lead to diagnoses of CHAT and/or ecphasia when the 24-hour BP-2A is excessive and/or the 24-hour BP-ϕ is outside acceptable limits but the 24-hour HR-ϕ is acceptable. These conditions along with an excessive pulse pressure (above 60 mmHg) and a deficient HR variability (standard deviation of HR <7.5 beats/min) constitute Vascular Variability Anomalies (VVAs) when present during one or a few days, or Vascular Variability Disorders (VVDs) when the abnormalities are confirmed over a repeated week-long record. The presence of two or more VVDs is referred to as Vascular Variability Syndromes (VVSs).

ABPM records from 26 residents (4 men and 22 women 39-74 years of age) of Tosa City, Japan over 6 or 7 days (2 and 24 profiles, respectively) were analyzed overall and day-by-day in order to determine the frequency of occurrence of abnormalities and the extent of reproducibility of the results from one day to another. Among all 26 records, at least one VVA is found on at least one day in all residents. The 3 individuals with abnormality on all 7 days also have an abnormal 7-day record. The number of abnormal days in a weeklong record as such does not tell whether the 7-day record is also abnormal, a finding suggesting that the duration of a VVA is an incomplete measure, to be

complemented by information on the extent of abnormality. Weeklong records were found to be abnormal in over 25% of the residents, a reason for recommending a follow-up 7-day profile once abnormality is detected in the first 7-day record. Until unobtrusive, affordable instrumentation becomes generally available for long-term, notably mental strain monitoring, for the limited purpose of cardiovascular disease risk monitoring, a one-day VVA can be neglected, but a VVD or VVS in a 7-day record analyzed as a whole is an indication for continued monitoring.

SANOSON MUSIC THERAPY OF UNWELLNESS IN A CASE OF RECURRENT ADYNAMIC DEPRESSION WITH CIRCADIAN DIFREQUENTIA

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Music, specially composed to cope with depression, reduced unwell-being, notably pain, for 1 hour or for longer in JF, a woman 62 years of age at start of study with a history of adynamia for 21 years, who during her depressed downtimes lasting over 2 months and recurring about every 6 months (except for the last 6 months) had unsuccessfully tried to obtain relief with drugs and non-drug procedures. Figure 1 is based on the use of SANOSON program 1-D. JF had been given four music programs, with the suggestion that during a downtime only program 1-D may be of benefit. During her winter 2011 downtime she fell asleep during program 1-D and, on a scale of 1-10, deemed music therapy "a real winner with a 10". VB suggests the possible merits of systematic vs. "as needed" timing. A comparison of the two approaches in this case was not done. Any marker rhythm other than discomfort or pain could also be considered to guide treatment timing. The demonstrated fact remains that music, like other stimuli, including drugs, can have drastically different effects in different circadian and other rhythm stages.

Conclusion. SANOSON music therapy with 1-D was subjectively and specifically palliatively and transiently helpful, where other approaches during the preceding two decades were not.

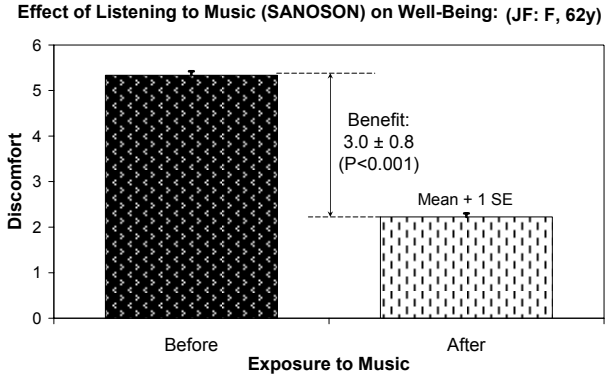

Figure 1. © Halberg.

AN AUTOMATIC INTERNATIONAL MULTILINGUAL CHRONOMIC WEBSITE FOR C-ABPM

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A broad spectrum of photic and non-photic environmental cycles is mirrored in sociological, epidemiological and psychophysiological variables like blood pressure (BP) and heart rate (HR) locally, examined in decades-long around-the-clock still-accumulating time series. Cycles in spirituality, crime, war and terrorism are currently mapped by a project on The BIOsphere and the COSmos, BIOCOS, which also provides worldwide, on a small scale, cost-free analyses of 7-day around-the-clock BP and HR data for detecting Vascular Variability Anomalies (VVAs) or if replicated for weeks Disorders (VVDs) that can coexist to bring about Vascular Variability Syndromes (VVSs). Chronomics implemented by BIOCOS aligns and examines associations among the time structures in and around us. Each structure, environmental or matchingly organismic and, in the sense of similar cycle length, reciprocal, consists of deterministic and other chaos, cycles and trends (the trends often parts of cycles longer than the length of an available time series). Chronomic analyses by BIOCOS aim at strain (as a quantifiable response to stress) and cardiovascular disease risk assessment based on a chronobiologic diagnosis and the timed treatment of the individual's VVAs, VVDs and VVSs. The same data pool for the individual's self-surveillance in chronobiologically-interpreted ABPM and other variables also was used for exploring associations of abnormality with human-made as well as natural environmental cataclysms, including terrorism and earthquakes. This transdisciplinary line of research, beyond seismology is a challenge for the website's eventual human team which is also to manage any problems relating to the individual's health arising in the automatic analyses. The same multilingual website should further serve educational tasks related to the routine health care services and further for examining biospheric associations with space weather, monitored for the benefit of the greater public. This combined personalized clinical service and space weather analysis could be done on a large scale by an automatic website receiving data from self-surveilling individuals for the detection of VVAs as measures of strain, of VVDs and VVSs, and also from governmental sources such as state health departments on natality, morbidities, mortalities and crime, for carrying out research on harbingers of VVDs for individuals and their possible use as warning signals for populations. Scholars of geochange to whom this website proposal is to be submitted for a consensus along with inferential statisticians can play a pivotal role in optimizing the individual's health care: current exclusive reliance on spotcheck-based intermittent professional consultations, sometimes at long intervals, even of a year or longer, using experience and intuition to bridge the gap of data, can be complemented by care based on added continuous computer-aided sequentially (e.g., weekly CUSUM) examined as-one-goes self- and population-surveillance, the latter by the data flow from government sources, such as health and police departments.

INDIVIDUALIZED CHRONOTHERAPY OF BLOOD PRESSURE

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Aims. To determine whether the timing of administration of Losartan potassium/Hydrochlorothiazide (L/H or Hyzaar) can be optimized along the circadian scale and to assess the extent to which the optimal circadian stage differs from one patient to another.

Background. Large animal studies amply documented that treatment timing can make a large difference in outcomes, sometimes between life and death . Small pilot studies in humans have also demonstrated the gain that can be obtained from optimizing the circadian stage of treatment administration. In the case of low-dose aspirin, we also learned that the best treatment time to reduce toxicity differs from that to lower blood pressure (BP) or to prevent blood coagulation.

Subjects and methods. Fifteen patients automatically measured their systolic (S) and diastolic (D) blood pressure (BP) and heart rate (HR) around-the-clock at 30-minute intervals for 7 days first without hyzaar and thereafter after at least one month on hyzaar administered at a given circadian stage, at awakening and 3, 6, 9, 12 and 15 hours after awakening, with monitoring during the last week on a given timed treatment. Each record was analyzed by sphygmochron overall and separately for each day of the 7-day profiles. Estimates of the MESOR (M) and 24-hour amplitude (A) corresponding to the 6 treatment times were compared by one-way ANOVA and by cosinor (parameters being assigned to the time of treatment in relation to awakening) separately for each patient as well as for all 15 patients.

Results. On the average, a lower MESOR of DBP and a smaller circadian amplitude of SBP and DBP are associated with Hyzaar administration upon awakening. An effect of circadian stage of Hyzaar administration can also be demonstrated on an individual basis for some patients: For MA (M, 61y), SBP-M, DBP-M and pulse pressure (PP) are lowest around 6 hours after awakening ($P<0.001$), while his SBP-A and DBP-A reach the upper level of acceptability when Hyzaar is taken 3 hours before bedtime (SBP: $P<0.001$; DBP: $P=0.003$). For Os (M, 73y), SBP-A and DBP-A are excessive (corresponding to CHAT) when Hyzaar is taken around mid-day (SBP: P=-.004; DBP: $P=0.013$).

Discussion and Conclusion. Patient Su discussed earlier is no exception. There are other patients for whom Hyzaar can help or hurt depending on when it is taken by decreasing or increasing the circadian BP-A. Individual differences in terms of optimal timing on the BP-M as well as on the BP-A are sufficiently large to advocate optimization for each patient separately. With inter-individual differences, an overall time effect is demonstrated for DBP-M ($P<0.05$).

SELF-MONITORING OF A BOY'S BLOOD PRESSURE DURING 10 YEARS REVEALS TRANSYEAR DOMINATING OVER CALENDAR YEAR

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For 10 years, FW, a now 18-year-old male subject, measured his blood pressure (BP) and heart rate (HR), first mornings-only starting at 8 years of age, and later twice a day (in the morning and the evening). His evening data in 2011 were usually higher than those in

the morning (P<0.001) for systolic (S) and diastolic (D) BP, HR and pulse pressure. SBP and DBP showed a slight increasing trend, while HR decreased, which changes were particularly pronounced when compared with neonatal monitoring of FW in all 3 variables. In keeping with an earlier report, spectra showed transyears, a far-transyear (1.2 years ≤ [τ (period) - CI (95% confidence interval)] < [τ + CI] < 1.9 years) in BP and a near-transyear (1.00 year < [τ - CI] < [τ + CI] < 1.2 years) in HR, Figure 1. In BP, the far-transyear's amplitude was much larger than that of the yearly component; there was a cis-half-year of ~4.5 months in length; and the second and fourth components of a circadecadal cycle (not distinguished from a trend) were prominent whereas the third harmonic of the circadecadal dominated in HR. The transyears were all significant in serial sections (P<0.01) most of the time and, nonlinearly, the 95% confidence intervals of the year and transyear did not overlap for BP.

Conclusion. Non-trivial built-in transyears, to some extent dependent upon components in solar wind speed, are best considered when one focuses on about-yearly changes. Components of space weather can dominate over the seasons and can be of critical importance for health .

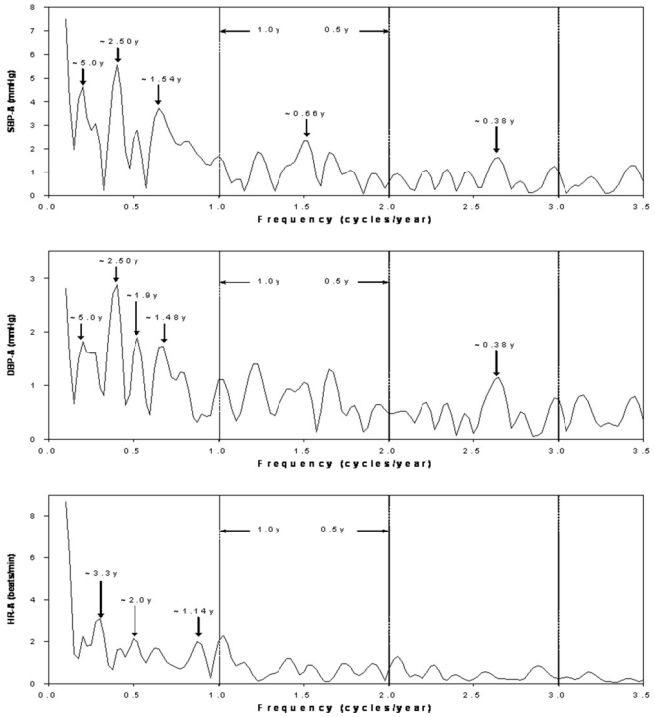

Figure 1. **Spectra of morning measurements of a boy from 8-18 years of age. © Halberg.**

ACUTE AND CHRONIC DEPRESSION, ANXIETY, PANIC DISORDER, POST TRAUMATIC STRESS – MUSIC-BASED AUDITORY STIMULATION CAN HELP RESTORE MENTAL AND PHYSICAL HEALTH

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Music's ability to soothe in moments of great despair has led to the the systematic use of music interventions in crisis situations rendered by music therapists worldwide.

Besides the traditional practices of active music therapy supporting communities with interactive interventions, newly developed methods of music-based auditory stimulation have proven to be effective in the treatment of acute and chronic Depression, anxiety, panic disorder and post traumatic stress.

The effectiveness of these methods have been demonstrated in a large randomized, placebo-controlled double-blind study, proving that is is possible to treat many patients at the same time with less effort compared to traditional treatment and with no side effects. The methods are based on the combination of psychological aspects which are addressed by the use of certain music elements and the immediate physiological effects of specifically developed compositions resulting in the significant reduction of psychsomatic symptoms, the improvement of the severity of depression and anxiety as well as the significant increase of healthy heart rate variability and improved sleep quality.

Besides the apparent impact of distasters on the state of mental health of the population, statistical evidence confirms the correlation of natural cataclysms and changes in the earth's natural magnetic field which influences the magnetic frequencies and bio-field patterns of the human body. Each individual cell and entire organisms senses and derives essential timing information from the natural cycles of the geomagnetic field which creates biological rhythms as a result of the daily rise and fall in the strength of the magnetosphere surrounding the earth. Changes in the earth's natural magnetic field can cause severe physical effects and cause psychological distress.

Our recent research results rendered evidence to the potential of music-based auditory stimulation to restore and stabilize circadian rhythms. With a global delivery system developed for the distribution of personalized music-based auditory stimulation programs, physically and psychologically compromised populations can be assisted in critical situations.

MUSIC THERAPY AND GLOBAL CRISES

Lucanne Magill
LCAT, MT-BC, MTA, The Music Therapy Trust India/Nepal

Global crises are prevalent in today's society. Humans around the world are impacted by the numerous social and environmental issues of modern times, such as hunger, poverty, war, natural disasters, social violence and public health diseases. These global crises drastically affect the biopsychosocial and spiritual well-being and quality of life of victims, survivors, witnesses and caregivers. It is known that the challenges inherent in these international crises have immediate and long term ramifications, requiring efforts to enhance preparedness, response, relief and recovery.

In 2005, the World Federation of Music Therapy created the Commission on Global Crisis Intervention out of its growing concern for the numerous crises affecting individuals around our globe in this millennium. It was organized to enhance the welfare of individuals by supporting and acknowledging the efforts of music therapy work in all areas of global crises. Since music therapists offer creative and expressive strategies to help empower survivors and to help improve coping, recovery and rehabilitation, our Commission has been developing strategic plans and educational resources for music therapists interested in serving individuals affected by crises.

This presentation will provide an overview of the services music therapists have been offering before, during and after times of global crises, including work post natural

disasters, post war, in impoverished and marginalized communities and with disease pandemics. It will also report the work that is being done to train and prepare music therapists to serve in areas in which people are recovering and striving to survive. In addition, this author will describe the trauma and disaster relief work that she and her colleagues are conducting in India and surrounding areas.

INNOVATIVE BLOOD PRESSURE MEASUREMENTS FOR PROPER RISK STRATIFICATION CONSIDERING SPACE WEATHER EFFECTS

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Outcome studies revealed new vascular variability disorders consisting of abnormal patterns of variability in blood pressure and/or heart rate, associated with a cardiovascular disease risk higher than an elevated blood pressure itself and affecting a large fraction of the population.These conditions cannot be diagnosed in current practice relying on single measurements. Their diagnosis requires around-the-clock monitoring, preferably for 7 days at the outset complemented by a chronobiologic analysis of the data. The latter consists of the estimation of circadian rhythm characteristics and of stacking the data over an idealized 24-hourday for comparison with time- specified reference limits. In each approach, reference values are computed as 90% prediction limits qualified by gender and age, and eventually also by ethnicity.

To automatically obtain data at 30-minute intervals for 7 days, ambulatory monitors (TM-2430 from the A&D Company, Tokyo, Japan) are available at a greatly reduced cost to participants in the BIOCOS coordinated by the Halberg Chronobiology Center at the University of Minnesota (Minneapolis, MN, USA).

We propose to develop a secure website with three major applications.First, its purpose will aim at stroke prevention. This will be accomplished by a large-scale screening for vascular variability disorders. Ambulatory BP monitors will be made available to everyone through clinics and other public places, with a provision to upload the data to the website. Available software currently used to analyze such data will be modified for use on the website. Access will be secured by use of a password to login to the site. To safeguard privacy, data will be de-identified by using unique codenames to allow a user to be recognized during sequential accesses, so that BP profiles obtained on different occasions may be compared. This would be particularly useful to check on the efficacy of treatment after a given intervention has been initiated and to guide the optimization of treatment by timing the administration of medication. Results will automatically be readied for downloading by the user and his/her treating physician. Second, educational materials will be prepared to be posted on the website. Separate materials will be addressed to physicians and other healthcare professionals on the one hand and to lay people on the other hand. Instructions on how to upload the data and information needed for their analysis will also be posted, as will research news in the form of a quarterly newsletter. Third, data, once uploaded and analyzed, will be included in a comprehensive database.

BP profiles found to be within acceptable limits will become part of the reference database, from which refined reference values will be derived and new vascular variability disorders defined. Abnormal BP profiles will be kept separately for further interpretation in the light of outcomes to be obtained from treating physicians and from questionnaires that

users will have the option to answer when uploading their data. The entire database will also serve the special purpose of investigating putative effects of space weather on BP and HR.

EFFECTS OF SOLAR ACTIVITY AND THE EARTH'S MAGNETIC FIELD ON SOCIAL UPRISINGS, TERRORISM, AND HUMAN HEALTH: AN EARLY

Abdullah Alabdulgader[1], Rollin McCraty[2]

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Warning System

The primary long-term goals of this project are twofold. Solar activity and the Earth's magnetic field will be monitored to help predict times of greater emotional disturbance in the local and world's populations, which has been strongly linked to increased crime, terrorism and revolts. Secondly, the project aims to aid in the prevention and reduction of avoidable heart attacks, strokes and other adverse health events. The proposed innovative approach combines the study on the influence of natural factors on human mass behavior and public and health care worker education with the automated monitoring of earth's magnetic resonances. Human health and wellness, especially the brain and cardiovascular system, are directly impacted by geo-magnetic resonances and we can provide a low-cost system that forecasts such external influences. This approach will serve to inform appropriate law enforcement and security agencies when increases in aggression and emotional turmoil in the population are most likely to occur and through public and health care worker education reduce the number of avoidable adverse health effects and increased mortality of the population.

Every cell in our body is bathed in an external and internal environment of fluctuating invisible magnetic forces that affect virtually every circuit. Therefore, it should not be surprising that changes in geomagnetic activity have been linked to numerous aspects of health and wellness as well as social unrest. Changes in geomagnetic activity are correlated with hospital admissions and mortality from heart attacks and strokes, as well as numerous other health indications such as depression, fatigue, mental confusion, and number of traffic accidents that occur. There is a voluminous scientific literature indicating important biological processes such as heart rate, blood pressure and hormonal levels are affected by geomagnetic and ionospheric fields. Previous research has shown that changes in heart rate variability (HRV), especially the lower frequency rhythms provide an ideal indicator of the impact of geomagnetic forces on the human nervous system and health. These nervous system changes that occur in response to disturbances in natural geomagnetic fields also lead to increases in human aggression, crime and terrorism.

The most likely mechanism for explaining how solar and geomagnetic influences affect human behavior and health are a coupling between the human nervous system and the resonant frequencies generated by geomagnetic field line resonances and the globally propagating magnetic waves called Schumann resonances which occur in the earth-ionosphere resonant cavity. It is well established that the earth and ionosphere generate a symphony of resonant frequencies that directly overlap with those of the human brain and cardiovascular system. The central hypothesis is that changes in these resonances can in turn influence the function of the human autonomic nervous system, brain, and cardiovascular system. It has not been possible to test this central hypothesis scientifically until now due to the unavailability of reliable continuous measures of ionospheric and field

line resonances in combination with monitoring of peoples nervous system activity and health and social indicators. Fortunately, this limitation has recently been resolved. Data expressing amazing correlation between geomagnitic activities and the recent social upraising in Eygpt is going to be presented as well as our views to develop intelligent and accurate alarm system for world security.

DETECTION OF EMERGING SUNSPOT REGIONS IN THE SOLAR INTERIOR

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Sunspots are regions where strong magnetic fields emerge from the solar interior and where major eruptive events occur. These energetic events can cause power outages, interrupt telecommunication and navigation services, and pose hazards to astronauts. We detected subsurface signatures of emerging sunspot regions before they appeared on the solar disc. Strong acoustic travel-time anomalies of an order of 12 to 16 seconds were detected as deep as 65,000 kilometers. These anomalies were associated with magnetic structures that emerged with an average speed of 0.3 to 0.6 kilometer per second and caused high peaks in the photospheric magnetic flux rate 1 to 2 days after the detection of the anomalies. Thus, synoptic imaging of subsurface magnetic activity may allow anticipation of large sunspot regions before they become visible, improving space weather forecast.

THE TERM ASTROLOGY AS SYSTEM TO SAFETY

A.V. Karkov
The Course to astrologies Munich institute of parapsychology, Russia

1. The Astrology - a biochemistry. The Planets accelerate or slow metabolism.
2. The Planet Land complex bio-energy formation.
3. The Planets by some means or other influence upon processes on planet Land.

Cosmic influences bring about changes to metabolism of the person, as follows, such sort that wholly determined cosmic influences determined by image change the process a metabolism. Each influence on metabolism, no difference what sort, has more or less deep influence on nature and hereunder on attitude of the person to surrounding its world. Since Land is much more complex bio-energy formation, than person (the Motivations are brought below in endurance from course of the astrologies. The Munich), that processes of the interaction Terrestrial magnetic, energy and information field with cosmic fields, fields of the planets and fcompanion (satellite) of the Solar system, fields Sun, certainly, much more complex in exploratory plan and collection statistical given on this subject. But all, for beginning follows to formulate the main terms at study of the possibility of the using to astrologies as systems to safety in plan of the forecasting and warning the natural disasters, technological, transport, aircraft, cosmic catastrophes, that or other critical moments in development of the civilizations. For instance, forecast critical effect in economy and geopolitics, intensification of the international relations.

VARIATIONS OF THE TOTAL SOLAR AND SPECTRAL IRRADIANCE DURING UNUSUAL DECREASING PHASE OF THE SOLAR CYCLE 23

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The Sun emits a wide variety of electro-magnetic emission. Variations of its intensity have a significant impact on the space weather, the Earth's close environment, Earth magnetosphere and upper atmosphere layers. Solar irradiance affects human life and activities, influencing upon human health and bio and techno spheres. The solar radiation energy absorbed in the Earth's upper atmosphere changes its chemical and dynamical parameters and causes fluctuations in the earth climate system. The problem of quantitative estimation of the influence on the Earth climate system and the global warming effect is one of the most actual problems of solar-terrestrial physics nowadays.

We have investigated the solar spectral irradiance (SSI) during 2003-2008, using the daily spectra of far ultraviolet (FUV) recorded by the TIMED/SEE satellite. Using the software developed by us, we chose discrete wavelengths in the range of 122-420 nm. We have revealed a peculiar behavior of some regions of FUV spectral narrow-band differing from the usual behavior of other ranges. We have found that the selected spectral narrow-band emissions do not agree equally well with other indices of the solar activity during descending phase of the solar activity 23. In this connection, we investigated descending phases of cycles 21 and 22. We have found that the anti-correlation between some narrow bands of spectral lines and solar activity proxies takes place only in the cycle 23. By our opinion, the reason of this anomalous behavior is the unusual variations of solar magnetic field and the task requires further detailed investigations.

INFLUENCE OF LUNAR-SOLAR TIDES ON THE GEODYNAMIC PROCESSES AT THE MAXIMUM APPROACH OF THE MOON TO THE EARTH

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The article is devoted to lunar-solar tide at the maximum approach of the Moon to the Earth and tectonic consequences. Analyzing the numerous facts, it is assumed that the tragic earthquake occurring in 2004 and 2005 in Indonesia in 2011 in Japan, have been associated with subduction huge tectonic plates, the reason of the trigger mechanism which became tidal influences through gravitational interaction of the Moon and Earth. The question of the influence of the lunar-solar tides on the geodynamic phenomena has sesquicentennial history. The question of the relation of seismicity of the Earth to the tidal effects of the moon and the sun was considered in the middle of the XIX century. French scientist A. Perrey, established communication frequency of earthquakes with lunar phases, the distance of the Moon from the Earth and its culmination. Data on the relation of earthquakes with periodic changes in tide forces leads N.N. Volodicheva, A.N. Podo-rol'skii, R.B.Hoffman, A. Ryall, T.H.Heaton, A. Polumbo, R.E.Weems. At the same time

there are works by authors who do not share this view - L. Knopoff, J.F.Simpson, S. Shlien, P.A.Rydelek, H. Tsuruoka, J.E.Vidale.

Consequently, the results on the relationship lunar-solar tides with geodynamic phenomena is ambiguous, and are controversial for a number of issues. According to the Laboratory Gravimetry Sternberg Astronomical Institute of the Sternberg State University (SAI) Leonid Zotov, the assumption that an earthquake in Japan triggered a forthcoming unusually strong convergence of the Earth and Moon may be without foundation: "a kind of" trigger "of the disaster might lunar tides Ocean, scientists say.

As objective evidence of tectonic activity, the Earth was established (B. Middlherst, 1967.) Existence of two types of coupling between tectonic events of the Earth and the Moon:

1) trigger tidal influences through gravitational interaction of the Moon and Earth,

2) a direct causal relationship of tectonic processes of the Earth and Moon that can be carried through the material properties of time.

What causes tides?

Tides, occur because of gravitational force, which the Moon affects the Earth. Gravitational force of the Sun also have an influence on the tides, but to a much lesser extent. Another thing: - the gravitational field itself is not homogeneous and has a center in attracting mass - on the one hand, on the other hand, the interior of the Earth and Moon are not a homogeneous sphere. Accordingly, whenever Earth's gravity from other planets, in particular with the Moon, heterogeneous composition, i.e., tectonic structure of the Earth and Moon, of course, once again distorted.

As an earthquake occurs?

Earthquakes tend to occur when because of stress in the crust is a gap. The main source of stress - "friction" component lithosphere blocks, or tectonic plates that make slow motion relative to each other. Where are plate boundaries, earthquakes are most likely. It is in this place - west of Sumatra, on the border of the Sunda microplate and the Australian plate - there are the epicenters of the last two disasters (2004 and 2005.) In the Indian Ocean, separated from each other by less than 300 kilometers.

In the continental area of Japan is the following.

Australian seismologist, a member of a government agency «Geoscience» D. Jepsen, believes that "so shakes Japan, and how a tsunami occurs." Geomechanics this can be explained as follows: - 150 km to the east of Honshu Island from the north to the south of the border (deep-seated fault), two giant tectonic plates (Fig. 5). Pacific Plate, on which both the plate "poured" Pacific Ocean - creeps under the Asian plate at a speed of 9 cm per year. This process is called subduction. The Asia and is the island of Honshu. Since the Asian plate is heavy and large friction, slide plates relative to each other is not smooth: the lower plate is constantly drags deep into the edge of the upper plate, and crushes it. The water is above springing plates, gets a sharp boost - hence the tsunami. Of course, the seismic "life" is concentrated at the bottom of the Pacific Ocean and consists of several panels: Asian, Pacific and Indonesian.

Thus, analyzing the above mentioned features, it seems to us that as a result of the lunar-solar tides in 2004 and 2005 and 2011, above mentioned tectonic blocks, "fell" to each other. With a sharp drop in these blocks, there was a loosening of the seabed, and the sharp jolt was sea water, which subsequently formed the tsunami.

Naturally, there is another issue: why in other times (1955, 1974, 1992) does not place such an earthquake? The answer to this question can be summarized in the following areas: Astronomy and tectonic, i.e.:

• The lunar-solar tides, which may be a triggering mechanism for those conditions, when an earthquake has matured - that it is already ripe, and a push there - but this may be the trigger.

• Nodes paths climbing the Sun and Moon should coincide with one another;

• Structural-tectonic structure should consist of a disjunctive folding.

Next "superlunie" can be observed on Nov. 14, 2016, when the convergence of the Moon and the Earth will be 356,511 kilometers, and then - November 25, 2034 (356,447 kilometers).

INVESTIGATION OF SELECTED NARROW BANDS INTENSITY VARIATIONS OF THE SOLAR SPECTRAL IRRADIANCE DURING YEARS 1981-2008

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We investigate the solar spectral irradiance in the range of 122-420 nm during 1981-2008, using the daily FUV spectra recorded by the TIMED/SEE satellite. The narrow bands of spectral emission had been chosen. The special software developed by us had been used. We have noticed a peculiar behavior amongst FUV spectral lines. We found that different solar spectral lines of narrow bands emission not agree equally well with solar activity's other indices during descending phase of the solar activity. In this connection, we have compared our results of descending phase of solar cycle 23 with behavior of the solar activities for the descending phases of cycles 21 and 22. We investigated ascending phases of solar cycles 22 and 23, as well. We found that only in the cycle 23 is take place the anti-correlation in some narrow bands of spectral lines with other indices of solar activity. Revealed by us anti-correlation with solar activity is not the measurements error of changes of optical characteristics of measuring instruments. We try to find what the reason of such results is. By our opinion, the reason of it there is magnetic fields. Data set investigated by us covered period more than full magnetic cycle in 22 years. Alternatively, maybe emission of different molecules or other different reason takes place. We hope further investigations will resolve these problems.

SECTION 4.
Health care

SPATIAL ANALYSIS OF EARTHQUAKE FATALITIES IN THE MIDDLE EAST, 1970-2008

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Fatalities due to earthquakes in the Middle East are roughly 20 % of the total yearly fatalities of the World. In the first step of this project we introduced a new conceptual model for life loss that includes hazard (earthquake magnitude and focal depth), vulnerability (GDP value of countries and elapsed time since 1970 as proxy variables) and exposed population in the affected area of a given earthquake.

In continuation of this research, we focus on a more detailed analysis of particular indicators of vulnerability and on the spatial disaggregation of exposed population and the attenuation of earthquake magnitude in the form of Peak Ground Acceleration (PGA). PAGER_CAT is a global catalog (http://earthquake.usgs.gov/research/data/pager/) that presents information on casualties of earthquakes since 1900. Although, the catalog itself is almost a complete record of fatal earthquakes, the data on number of deaths is not complete. We use PAGER_CAT to assemble a Middle East (10°- 42° N, 24°- 64° E) catalog for the period 1970-2008 that includes 202 earthquake events with published number of fatalities, including those events with zero recorded casualties. We investigated the relationship between socioeconomic and natural characteristics of each event (e.g. exposed population, PGA, date (year of event) and GDP) and earthquake fatalities in Middle East in the 202 events. To estimate the number of people exposed to each event, we use a fatality threshold of peak ground acceleration of 0.1g to calculate the radius of the affected area for the 202 events. The exposed population of each event is the enclosed population of each circle calculated from gridded population data available from SEDAC (http://sedac.ciesin.columbia.edu/gpw/global.jsp) using ArcGIS. We also calculate the spatial variation of PGA in the vicinity of the epicenter using the recorded instrumental magnitude and focal depth recorded in the PAGER_CAT and an attenuation rule. GDP per capita of the countries is used for better estimation of a vulnerability indicator. Poisson regression analysis is used to explore the variables affecting earthquake casualties and to develop an earthquake disaster system paradigm for the region.

FACTORS AFFECTING THE FIRST ATTEMPT STANDARD TEST ACHIEVEMENT FOR PUBLIC HEALTH STUDENTS IN THAILAND

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This study aimed to verify relationship between the grade point average (GPA), preparation, learning and teaching management, learning and teaching environment, and the first attempt achievement of the standard test, and to investigate factors affecting the first standard test achievement. Populations of the study were 234 students of the Higher Professional of Certificate of Public Health Program. Research tool was a questionnaire with alpha coefficient at .87. Since the ethical consideration was a new concept in the country and the research results were revealed as an overall not specified to any sample to protect the sample's rights. Therefore, this research design had only proposed and approved by the college's research committee before the operation. Analysis statistics were percentage, mean, standard deviation, Pearson's product moment correlation coefficient, and stepwise multiple regression. Research results found that most students had GPAs 2.29-3.00 (53.4 percent). They completed the first attempt achievement of the standard test at 93.20 percent. GPAs and learning and teaching method related to the first attempt achievement of the standard test at .05 level. GPAs and learning and teaching method were factors affecting the first attempt achievement of the standard test at 5.90 percent. The GPAs and learning and teaching related to the standard test achievement, and affected to the standard test achievement. Research results implied that the college should support learning and teaching management for students' experience. Learning and teaching process should be developed consequently according to students' interest and aptitude for higher GPAs and learning outcomes advocating.

Key words: factors affecting, standard exam, public health student

DETERMINATION OF THE INCIDENCE OF DEATH AND CONGENITAL MALFORMATIONS BY VARIATIONS OF GEOCOSMICAL AGENTS

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In the present research the analysis of degree of determination by variations of the geocosmic agents of the incidence of adult person death and congenital malformations in the newborns was performed. The data about daily incidence of the death in the psycho-neurological boarding during the span from1984 to 2009 and daily incidence of congenital malformations in the newborns from 1972 to 2005 (Murmansk region) were included in

the study. Geocosmic agents were characterized by 28 parameters of solar activity and the state of the interplanetary space, geomagnetic activity and the neutron count rate of the neutron monitor (station of the neutron monitor in Apatity, PGI KSC RAS). We found that incidence of death in the psycho-neurological boarding correlate with proton density ($r=0.66$, $p<0.05$), flow pressure of the solar wind ($r=0.50$, $p<0.05$) and Alfven mach number ($r=0.54$, $p<0.05$) in the interplanetary space. Dynamics of incidence of congenital malformations, also as well as the death in the psycho-neurological boarding, were associated with proton density and flow pressure. In addition it was found, that incidence of congenital malformations in the newborns were coupled with variations of Cosmic rays ($r=0.41$, $p<0,05$) and solar proton events accompanied by Ground Level Enhancement of the secondary solar cosmic rays (GLE). The maximum values of incidence of congenital malformations in the newborns (6,2 % of newborns on 1000 births) corresponded to 1991 year with two events of GLE, to which 7 events of GLE in 1989 and 4 events of GLE in 1990 years were preceded. The analysis of correlations between incidences of separate classes (according to International Classification of Diseases) of the congenital malformations in the newborns and variations of geocosmic agents has shown that incidences of such anomalies as congenital malformations of the musculoskeletal system (Q65-Q79), cardio-vascular system (Q20-Q25), lip and sky crevices (the harelip, the wolf mouth) (Q35-Q37), as well as incidences of death in the psycho-neurological boarding increase under arising of proton density in the interplanetary space. Congenital anomalies of genitals (Q50-Q56) in the newborns correlate (significant level $p<0.05$) with geomagnetic activity. Thus, variations of the geocosmic agents associated with CA, can dramatic impact on the human body, determining the incidences of the death and congenital malformations in the newborns. The increase of the Solar flare activity, especially associated with the increase of the secondary solar cosmic rays near the Earth's surface, can lead to serious consequences for the human population due to the heavy genetic load from the genetic disorders and due to weakening of the organism viability. The work was supported by RFBR and the Administration of the Murmansk region, project number 10-04-98809-r_sever_a.

VOLCANIC ERUPTIONS AND URBAN LANDSLIDES: HEALTH FOLLOWING DISASTERS

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This presentation offers a comparison of health and well-being in two communities following two different types of geophysical and social disasters. Both communities are in the state of Puebla, Mexico, but are very different kinds of communities and very different kinds of disasters. In-depth interviews, focus group sessions, and questionnaire surveys were conducted in three communities near Puebla, Mexico: San Pedro Benito Juarez, a small agricultural village where people live under the constant threat of volcanic activity from Popocatépetl and occasionally experience damage from ash falls and pyroclastic flows, and are intermittently required to evacuate their community; Tezuitlan, a resettlement site whose residents had been relocated after devastating landslides in 1999; and San Miguel Canoa, a village near Puebla that has various similar demographic

characteristics as the other two, but that is not exposed to chronic hazards and hence served as a control site.

Significant differences between the variable groups were determined using the Kruskal-Wallis test for nonparametric independent samples. Regression analysis was conducted for two scaled variables: total physical health symptoms and total post-traumatic stress criterion symptoms. Results indicated that well-being can be addressed from different outcomes concerning mental and physical health, economic status, ecological stress, and social support, determined in part by the characteristics of individuals' social networks. For example, mental health symptoms such as life feeling difficult, feeling less animo, trouble sleeping, uncontrolled crying, were predicted by how bridging a person's network was, or to what extent the network was comprised of identifiable subgroups with connections between groups. Individuals in dense networks tended to have reduced appetites and felt less likely to feel capable of doing things as well as others. Our analysis suggests that in the volcano hazard site, education appears to be good predictor of health symptoms, while in the landslide site, sex and age were factors related to more health symptoms. Overall, more health and stress symptoms were reported in the landslide site than the volcanic site. While we are still analyzing the data, we intend that the results of this research can be used to inform and improve risk communication and educational policies in natural disaster prone regions.

Key words: Health, Volcanic Eruptions, Urban Landslides

MOBILE CELL MEDICAL COMPLEX, A NEW FORM OF IMPROVING PRIMARY HEALTH CARE TO PREVENT AND REDUCE THE RISK OF THE CONSEQUENCES OF EMERGENCIES AND NATURAL DISASTERS

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In recent decades, due to the increasing number and scale of emergencies on the planet Earth natural and man-acquired significance to the problem of improving the organization of first aid for the elimination of their consequences. Besides the enormous economic damage emergencies in the region of disasters, the main component of any disaster is human. The economic cost of population losses in the emergency consists of damage to the national economy of the loss of people and lifelong disability, medical expenses and welfare of victims, the cost of reparation to victims and their families caused by death, injury or loss of a breadwinner. Analysis of previous disasters and large-scale disasters has shown a lack of preparedness and public health agencies, medical personnel at all levels to work in extreme situations. The territory of Kazakhstan by reason of the climatic conditions and a large area (2,725 square kilometers, or 2.7% of the land of the Earth) has a number of areas of natural and technological risks and significantly exposed to a variety of disasters. Given the specificity of spatial and natural environment of the Republic of Kazakhstan, in order to reduce the time emergency medical care, reducing the stages of evacuation and the approximation of specialized medical care to the fire disaster to the present research is scientific justification for the creation of wireless mobile cell medical complex (MCMC). This important aspect of a mobile medicine in the Republic of Kazakhstan is dictated by the times and marked in the Message of the President of Kazakhstan Nursultan Nazarbayev, where before the three departments - the Ministry of

Health, the Ministry of Transport and Communications, Ministry of Emergency Situations - has been tasked to make primary health care (PHC) available to all without exceptions and at any point in the country by creating a health-and-rescue-route points, control units, authorized to take appropriate decisions for emergency measures.

Research in this direction are carried out since 2000, when the first was obtained expertise in the deployment of medical units, which showed high performance and prospects of the use of mobile medical complexes for large-scale emergency situations of natural and man-made order. Currently, research has developed a system of recruitment of health systems in rail, road and air transport, have to deal with the organization of medical care in emergencies. To properly and effectively address the practical problems of organization of PHC has developed special training programs designed mobile medical complex, training of doctors basic profiles. Beginning in September 2009 launched a project to provide affordable tertiary care population, using mobile medical complex. Thus, the improvement of primary health care, through the introduction of new mobile technologies of medicine, will raise first-aid, to provide specialized medical care of victims at the crash site and to predict the health consequences of emergencies.

ZEOLITE-CONTAINING PRODUCTS "LITOVIT" SERIES. SORPTION ACTIVITY STUDIES

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Work related to the studies of BAFS properties, particularly studying the effectiveness of the agent in removing radioactive elements from living organisms, was conducted in *the Russian Academy of Medical Sciences Siberian Department Experimental and Clinical Cardiology Institute* in collaboration with the specialists from the *ecological endocrinology laboratory of the Russian Academy of Medical Sciences Siberian Department Scientific Center of Clinical and Experimental Medicine, specialists of the Novosibirsk State Medical Academy and the staff of the Siberian Federal Center of Healthy Nutrition.* The experiment of injecting radioactive cesium into the organisms of rats confirmed that the animals receiving "Litovit-M" demonstrated more significant decrease in radioactivity of all organs in comparison with the animals that did not receive the test agent. Radioactivity of their seminal glands was 40% lower; their brain radioactivity was 28% lower compared to the animals that were on a standard diet. Experimental data clearly demonstrate that adding BAFS "Litovit-M" to meals stimulates the removal of radioactive cesium most effectively in comparison with other sorbents.

USAGE OF THE PRODUCTS "LITOVIT" SERIES IN MULTIMODALUTY TREATMENT OF PATIENTS WITH BURNS

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In the course of a clinical research conducted in the Novosibirsk State Regional Clinical Hospital the influence of "Litovit" (a remedy consisting of natural sorbents and ion-exchanger zeolite and wheat and rye bran) used as a part of a multimodality treatment was tested. 26 patients at the average age of 46, with a total area of burns of 18.5 % in average, and with the burn depth of III-B – IV degree took part in the test. The received data were compared with the data of a control group consisting of 12 people who did not take "Litovit". It was found out that on the 25^{th} day since the beginning of the research the average amount of haemoglobin among the patients of the experimental group increased by 23% (the initial data equaled 99 g/l), while in the control group this index increased only by 2% ($p < 0.05$). Blood protein in the experimental group increased by 18% (the initial level – 60.2 g/l), and in the control group it increased by 4% within the same period of time ($p < 0,05$). The amount of white blood sells on the 25^{th} day of the test decreased by 48% in the experimental group (the initial level was 16.2×10^9 l), and by 39% in the control group. The amount of white blood sells in urine decreased by 87% in the experimental group (the initial level was 12 per field of vision), and by 71% in the control group ($p < 0,05$). The decrease of the average leucocytal and intoxication data in the experimental group made 70% (the initial data were 6.3), and 58% in the control group ($p > 0,05$). The average content of urea by the 25^{th} day decreased by 42% in the experimental group (the initial level was 6.9 mmoll/L), and by 18% in the control group ($p < 0,05$). The average amount of bilirubin in blood by the 25^{th} day decreased by 32% in the experimental group (the initial data were 12.5 mmoll/L), and by 26% in the control group ($p > 0,05$).

The examination of the analysis data of the blood samples taken from the patients of the experimental and control groups to check the content of macro- and microelements gave us the opportunity to estimate the processes progressing in the course of an electrolyte metabolism in the human body when that person had a burn, and also estimate the corrective influence of "Litovit" on mineral homeostasis. Just after a burning injury the amount of intracellular cations (potassium, magnesium, etc.) can increase and it tells about thermal injury (which reveals itself as an increased permeability of biologic membranes) of muscular tissue which sells have considerable internal volume. After that one can see the decrease of intracellular and extracellular electrolytes in blood because a human body loses them through the burnt tissue. On the basis of the conducted research we can say that the products of "Litovit" series can help restore iron, potassium, sodium and other micro- and macroelements in a human body.

The point of taking "Litovit" is proved by patients who stayed at hospitals much less if they took it (in average 8 days less than the other patients having traditional treatment).

ZEOLITE-CONTAINING PRODUCTS "LITOVIT" SERIES ADAPTATION OF ORGANISMS IN HIGH LOAD CONDITIONS

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The most important task in rendering help and rehabilitation for specialists of extreme professions and for people living in natural extreme areas and appeared to be in extreme conditions provoked by natural disasters consists in effort to find and practical application of effective preventing measures and adaptation to harmful effects of the high load conditions on a human body. For this purpose we use various specific and nonspecific immunomodulators biostimulants of natural origin. Remedies of "Litovit" series take a special place among the wide range of adaptogenes and immunomodulators of natural origin. Their main component is a natural mineral zeolite that has unique properties of selective ionic exchange, selective sorption and catalysis which possess adaptogene properties and properties of nonspecific regulators of nonspecific protective and specific immune mechanisms. Products series "Litovit" were fully tested in the Research Institute of Nutrition of the Russian Academy of Medical Sciences, in the Novosibirsk State Medical Academy, in the Siberian Branch of the Russian Academy of Medical Sciences – Institute of Clinical and Experimental Lymphology, in the Emergency Service Research and Development Institute named after N.V. Sklifosovsky, in the Siberian Medical University (Tomsk city), Commission on carcinogens of the Ministry of Health of the Russian Federation (Moscow city), Institute of General Pathology and Human Ecology (Novosibirsk city), the research of means and methods was also conducted within the scope of the Federal program "Health of a healthy person", section "Overcoming" together with the Anti-doping Centre of the Ministry of Health of the Russian Federation. The work of these scientific institutes together with the leading hospitals of Russia shows that products of "Litovit" series increase adaptation abilities of a human body, help improve stress-resistance (at the moment of critical sports loads), excretion of heavy metals out of a human body, and also have an ammunomodulatory and antianemic effects. The products of "Litovit" series have a wide range of biological effects and solve almost every problem associated with general health-improving effects on a human body. Adaptogene effects of "Litovit" are based on development of the organism stress-readiness (making the main stress-limiting component of an organism more active which is suprarenal cortex, especially two of its components – glucocorticoid and mineralcorticoid) by means of regulation of biological metals distribution, and first of all providing the main antioxidant enzymes of an organism with them, by means of enterosorption which is excretion of toxic products of exogenous and endogenous origin out of a human body. "Litovit" can be considered an adaptogene that increases the level of endogenous protective resources of an organism thereby taking it to the state of nonspecifically high resistibility or increased resistance. The above mentioned characteristics of the products of "Litovit" series are considered to be a powerful preventive means of supporting the endoecological state of a human body in its physical form, and improving the organism's resistance to extreme conditions.

ASSESSING MEDICAL AND BIOLOGICAL VALUE OF 'LITOVIT' SERIES PRODUCTS

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Medical and biological value of zeolite-containing products of LITOVIT series is conditioned by:

- The presence of mineral constituents that originate from natural zeolites of clinoptololite row of carcass aluminosilicates;
- Technological manufacturing process that includes thermo-mechanical activation operations.

Biologically active food supplements present at the territory of the Russian Federation are subject to mandatory state registration and declaration. The confirmation of medical and biological value of the products being purchased, apart from the product's safety, is of great importance to customers. In order to provide customers with true information about properties and quality of products, the unified national system of food products' quality monitoring called "Healthy Nutrition Is the Health of the Nation" controlling the compliance of products with the set requirements, has been established in Russia. Being an enterosorbent LITOVIT product line has undergone the voluntary certification procedure in the sphere of medical and biological value as well as quality management system ISO 9001:2008 international voluntary certification. Confirmation of the declared medical and biological value and the quality management system compliance with the set requirements has been received.

The Litovit series products can be used at all stages of the organism internal environment homeostasis:

- Rehabilitation of pericellular space
- Catalysis
- Mineral substance exchange correction

On the basis of the results of medical and biological value assessment performed for the product line, 'Litovit' is included into the Methodic recommendations formulated and approved according to the requirements of the Russian Academy of Medical Science Scientific Council for Medical Nutrition Problems of the Russian Federation Ministry of Health and Social Development.

According to numerous experimental studies:

- Products of LITOVIT series are the primary catalysts of biochemical processes (I.A. Belitsky, 1990), they are able to compensate for syndrome of insufficient adaptation in modern conditions, including the periods of increased load and natural cataclysms;
- Using LITOVIT causes no side effects unlike sorbents with large absorbing surface.
- Another important aspect of product effectiveness is cellular and molecular mechanisms of LITOVIT's influence on biocidal properties of blood neutrophils. In the course of studying the effects of Litovit on the volunteers with inflammatory processes of infectious and non-infectious origin, it was found that the volunteers who were administered Litovit showed more active recovery of micro- and macro-

elements in the blood that resulted in an increase of energy production as well as the organism antioxidant activity, which ensured more active progression of regeneration processes and reduced the hospitalization period by 1.3-2.5 times.

Features of Biologically Active Food Supplement 'LITOVIT-M':

1. The product has no pharmacokinetic properties, i.e. none of its concentrations can be found in biological fluids of the organism.
2. Overdose is impossible: this fact was clearly proven by clinical and pre-clinical studies.
3. The product can be used not only as part of complex therapy but also as a food supplement in order to compensate for the insufficient adaptation syndrome.

Conclusion: The value of LITOVIT and its effectiveness is based on the complex impact of its properties, which conditions the immunomodulating and antioxidant influence of Litovit and the increase of regeneration processes in the organism. All this allows us to recommend using Litovit as entero-donorsorbent to different categories of the population living in a certain environment and having various health condition, including taking Litovit during periods of natural cataclysms.

«VIRAL-BACTERIAL MIXED INFECTIONS AND THEIRS CLINICAL AND CYTOMORPHOLOGICAL APPEARANCE»

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The results of virological and bacteriological researches made on the materials taken from sick children of postnatal period have been presented in this article. Revealed a significant percentage of mixed infections with aggravated disease clinic.

Key words: mixed infection, pneumonia, virus, bacteria, express- diagnostics

CONCERNING ISSUES, ASSOCIATED WITH SPREAD AND INDICATION OF VIRUS FLORA IN AQUEOUS MEDIUMS

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The results of virologic investigation of material from ill children with acute flaccid paralysis (AFP), persons contacting with them, healthy contingent of children and samples of wastewater in Azerbaijan for period from 2008-2010 have been presented in Article. The spectrum of enteroviruses, circulating among population in indicated region with determination of fact of "wild" poliovirus strain absence has been determined. Water is the most important element of natural resources. It is the main component of organisms and also it serves as the habitat of human being. Human being shall be provided with fresh water, which corresponds to the requirements currently valid. Together with that, under

condition of anthropogenic pollution, it is very difficult to achieve such situation. The extreme hazard is microbial water pollution. Due to abovementioned, one of the actual problems of modern time is necessity of regular monitoring of water bacterization, including monitoring of wastewaters, which are partially used in agriculture. Concerning abovementioned, it is necessary to add the very important fact, which increases actuality of problem, regarding monitoring with viruses indication in aqueous mediums - fact of existence of biological terrorism, presupposed local distribution of biological agents (BA).

Abovementioned presupposes permanent control over implementation of provisions of Biological Weapons Convention and its improvement. It is necessary to reconsider the tactics of epidemiological observation, the task of which is identification of reasons of infectious patients (artificial or natural) in combination with regular monitoring and studying of virus flora spectrum in used water. Taking into consideration the specifics of virus infections, one of the actual problems in the framework modern medicine is necessity of regular monitoring and taking of currently possible preventive measures regarding prevention of occurrence of virus infections, which can be epidemically spread.

Especially, it is necessary to outline poliomyelitis, which is pregnant with known consequences. It is necessary to mention that for the last 10 years due to initiative of WHO, the liquidation of poliomyelitis has been achieved in many countries and in 2002, the European Region has been certified as region, which is free from poliomyelitis.

Nevertheless, it is necessary to mention the situation in the world, when the risk of "wild" polioviruses importation from countries, where poliomyelitis has not been liquidate yet, is significant. In connection with abovementioned, during the postliquidation period of poliomyelitis, the issue concerning regular monitoring over acute flaccid paralysis (AFP) in order to follow-up the movement of enterovirus formation is actual, particularly regarding poliomyelitis viruses and prevention of "wild" poliovirus strain importation into the regions, which are free from present infection.

Identification of patients with acute flaccid paralysis (AFP) is the standard method of epidemiological supervision over polioviruses on the endemic territories or in countries, which recently were endemic. Taking into consideration all above-mentioned facts, the virologic laboratory for diagnosis of poliomyelitis has been created in Azerbaijan in 1996 under guiding and with assistance of the Ministry of Health of Azerbaijan Republic and European Regional Bureau (ERB) of WHO.

From 1996 till present time, virologic diagnosis of acute flaccid paralysis (AFP) is performed on the whole territory of Azerbaijan Republic with systematic epidemiological and virologic studying of enteroviruses spectrum, separated from wastewater and healthy child contingent.

Considering wastewater as permanent receiver of enteroviruses in ambient environment and taking into consideration relatively insignificant labour intensity of investigations under application of wastewater observation method in comparison with method of individual examination, we applied Riordan method – method of enteroviruses concentration from wastewaters. In the process of virologic investigations we have applied research methods, which are common-used in virology, with application of tissue culture HeLa, Hep_2, RD.

In the result, the spectrum of viruses, circulating among population of Azerbaijan has been determined and absence of "wild" poliovirus in circulation has been confirmed. Finally it is necessary to note that according to the WHO data, the main priority task for the nearest year shall be liquidation of breakouts and termination of circulation of wild" poliovirus of the 1^{st} type in the endemic countries. The second priority task is necessity to achieve real operative progress in the framework of epidemic fighting. The third global priority is immediate introduction of innovations and results of scientific researches.

THE RELEVANCE OF AZEOMED IN MEDICINE

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Zeolites are natural microporous silicon crystals. There are about 200 zeolite species in nature. Natural zeolites are a product of volcanic activity when stones, ash and aqueous solutions of salts are fused and crystallized. Zeolites are natural microporous silicon crystals with a property to absorb and retain firmly within its structure. Zeolite's uniqueness is that it selectively absorbs harmful substances without directly interacting with vitamins and amino acids.

Thus, unlike many sorbents with the classic usage time not exceeding 2 weeks, zeolites can be used for a long time because they do not absorb nutrients (vitamins, amino acids, fatty acids) from the human body. Zeolite just cannot absorb them because of the small size of its pores. AZEOMED is capable of selective exchange of particles; while taking away harmful substances,

AZEOMED simultaneously supplies the body with missing micro- and macroelements. This mineral is completely harmless for human use as demonstrated by chemical analysis and toxicological studies verified by scientists around the world.

ANTHRAX AND THE POSSIBILITY OF ADSORPTION OF NATURAL ZEOLITE

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In the report are presented the results of a study of a study of the adsorption capacity of natural zeolite on the causative agent of anthrax.

The result of an experiment shows that the natural zeolite "Azeomed" can be use as a sorbent of B. anthracis in the skin, intestinal form of infection.

Key words: *B.anthracis*, natural zeolite, sorbent.

APPLICATION OF NATURAL ZEOLITE "AZEOMED" AS AN ADSORBENT OF CYTOMEGALOVIRUSES

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Increasing concerns about the danger of bioterrorism provides for the need to protect the public as well as develop effective counter-measures. In this regard, our research focused on identifying methods how to treat medical cases of infectious pathologies. Laboratory tests show that one specific approach could be found in the application of the adsorption

methodology, provided through the use of effective agent (BPA) activators of infectious diseases. Moreover, laboratory tests and studies show that the process of adsorption through a natural process can function as an effective neutralizing agent of the virus-bacterial flora. In short, our laboratory research aimed at studying the actual effectiveness of the naturally-occurring zeolite mineral deposit found in the region of Tauz in Azerbaijan. The mineral is currently used in the preparation of "Azeomed" medication which is found clinically effective in the treatment of infections caused by the cytomegavirus through the process of adsorption. Studying viral infections which account for more than 80% of human infectious pathology is one of the topical issues of medicine. Human cytomegaly virus (HCV) Cytomegalovirus hominis) was first singled out in 1956 in children who died from a generalized infection. Cytomegaly is an opportunistic infection. The virus can exist in the human body for a long time, neither revealing itself at all nor causing any pathologic symptoms. It can be found in healthy children's tonsillar tissue, urine and salivary glands. It is only when the balance between the human body and the virus is disturbed as a result of weakened defense factors than the virus begins to multiply intensively and can lead to lesions of various organs. Although the majority of women of reproductive age are infected with the cytomegalovirus, the infection is mostly latent. However, the cytomegalovirus can be reactivated during pregnancy. The reactivation course may be symptomless, but in pregnant women the virus can be transmitted vertically with subsequent miscarriage, premature birth, maldevelopment, and fetal death caused by congenital defects. Special attention should be paid to women of reproductive age with compromised obstetric history (spontaneous miscarriage, stillbirth, congenital diseases etc.). The problem of detecting the active cytomegalovirus infection (ACVI) in women belonging to the category as well as reducing or even eliminating ACVI activity prior to planned pregnancy is considered a topical issue. From this point of view, it is possible to use natural absorbents as a sorbent of an infected person's contaminated cells.

ABOUT THE PROBLEM Y.ENTEROCOLITICA

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The problem of probable using of infectious agents as biologically afflicting agents (BAA) during terroristic acts with deliberate application of biological formulations is urgent presently. In connection with the aforesaid, it is required to practice primary measures for prevention of biological terrorism.

It is known that the concept of biological war has been existing for a long time and in a certain extent develops in present times, having different content in dependence on political environment, level of biological sciences development and technical achievements.

AN EXAMINATION OF WORK ACCIDENTS IN THE TURKISH CONSTRUCTION SECTOR USING FAILURE MODE AND EFFECT ANALYSIS AND THE DEVELOPMENT OF A SUSTAINABLE MODEL FOR MINIMIZING ACCIDENTS

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In recent years, new laws and regulations have been enacted in Turkey on occupational health and safety, which brought legal obligations for the construction sector as well. These new regulations were expected to result in a significant decrease in the number of work accidents, but these expectations were not met. Studies on the subject show that the number of work accidents in the construction sector did not decrease to desired levels due to a lack of sector-specific and sustainable methods for minimizing work accidents. This study classifies work accidents in the Turkish construction sector and identifies risk priority levels of accidents using the Failure Mode and Effect Analysis (FMEA) method. In addition, appropriate accident risk management models were examined taking the general characteristics and skills of the firms into account, and a sustainable model for minimizing accidents was discussed.

Key words: Work Accidents, Failure Mode and Effect Analysis, Construction Sector, Risk Analysis

MOBILE CELL MEDICAL COMPLEX, A NEW FORM OF IMPROVING PRIMARY HEALTH CARE TO PREVENT AND REDUCE THE RISK OF THE CONSEQUENCES OF EMERGENCIES AND NATURAL DISASTERS

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The present research is devoted to the actual problem - the development of new adapted and efficient organization of primary health care in emergency situations. Proposed, approved on mass exercises and high efficiency of new medical units with the use of mobile forces, with the provision of specialized care.

In recent decades, due to the increasing number and scale of emergencies on the planet Earth natural and man-acquired significance to the problem of improving the organization of first aid for the elimination of their consequences. According to the UN, only the last 20 years in the world as a result of natural disasters (earthquakes, floods, hurricanes, typhoons, etc.) affected about 1 billion people, nearly 3 million died. According to expert data, WHO notes that if a few decades ago was dominated by natural factors in injuries and deaths, but today, the share of anthropogenic and technogenic disasters associated with human activities in the production, transport and other spheres. At the beginning of the XXI century the problem of emergencies has taken on even greater urgency due to the fact that for natural and man-made causes of emergency has joined a

factor of direct violence, threatening the individual regions, population groups and society as a whole - the terrorist attacks, local armed conflicts.

***Key words**: Primary Health Care, Emergencies, Mobile medical units,* Mobile cell medical complex

TRACE ELEMENTS IN MEDICINE

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Trace elements have important and extensive effects on the body, the ability of micro-and macro-elements which increase the intensity of energetic processes in living organisms and enhance its protective function are well known. In certain amounts, without causing toxic effects, they have a high biological activity, as an essential part in many enzymatic reactions, they can be used not only as a prophylactic, but also for therapeutic purposes, and they take their rightful place in the field of alternative medicine. One of the great representatives of this complex is the biologically active mineral Azeomed created from natural zeolite of Aydagsk deposit in Tauz region of Azerbaijan. It has been known for a long time that the intake of many drugs is positive and dangerous at the same time, sometimes lethal, artificially suppressing or stimulating the function of various systems of the body. The toxic effect of drugs is regarded as a side effect very often. The diagnosis: Drug disease has become quite common in recent years, which is also requires serious consideration in choosing treatment methods for general practitioners. On the other hand, man has always sought to have a healthy body and the search of the elixir of youth and longevity shook the brain of everybody.

Commonly used antibiotics have changed the responsiveness of the organism, infectious diseases are often asymptomatic, and the disease findings of many diseases are atypical. A lot of diseases are appeared nowadays which were not diagnosed earlier and not included in the existing classifications. This is atonement for the mindless human impact on the nature, which destroys the ecological balance, pollutes the atmosphere. The ecological situation is becoming threatening to humankind every day. The man has no time to adapt to changes of the nature which he created himself.

It is possible to use this amazing set of micro and macro-elements and its compounds that are given to us by nature, "Azeomed" can be used in many areas of medicine. I used it in different age groups as an independent agent in mototherapy for preventive measures or in multimodality therapy to enhance the effect of drugs, to reduce side effects and to shorten period of treatment. This good source of calcium ion-exchange and other micro and macro-elements has a greater effect in the complex use than every element taken separately. Every of them has its own point of application which does not interfere the action of another, thus their complex effect increase the function of the organ and body in whole. I used "Azeomed" extensively in pediatric practice: for newborns it was used to close the fontanel timely, to form the skeleton in correct way, to have teething less painful. It was also used in the treatment of childhood functional diarrhea, and problems of infants' adaptation in the first months of their life, where it is very important not to destroy the inherent immune capabilities of the organism. These children were developing actively, almost without any kind of diseases, and if they were ill, they recovered easily and quickly. It was noticed a good appetite, a positive emotional state,

less painful teething, self-correct movements. These children began to walk, sit, and have better developed verbal skills before their peers.

Children from 1 year to 3 years old and a 3 to 6-7 - years were distinguished by the fact that during the seasonal viral infection, they had short-term temperature and rapid recovery, without complications, recovery of physical condition of the body. Relapses were observed during further intake of "Azeomed". In a family where there were ill children and adults - parents got ill repeatedly. School-age children receiving "Azeomed" for preventive measures had good academic results, less fatigue, good sleep, less irritability, normalization of body-weight indicators. I recommended "Azeomed" to elderly patients as preventive measures. It is necessary to take into account that aging is, paradoxically, a condition which the young child or young person can not understand, who are full of strength and energy, a middle-aged man who has neither the time nor the wish to stop for a moment and ask yourself this question and the elderly person, who does not want to believe that his age is not distant, unattainable future, but a reality at the door. So what is it? Aging affects all organs and systems, all organic structures and their functions. Immune mechanisms and adaptation of an organism are broken; it can lead to memory impairment, decreased mental and physical abilities of the body. The muscle and bone mass, weight are lost, the blood pressure, pulse, hemoglobin are changed, the transport of oxygen into the tissues is disrupted with age, the brain is particularly affected in this case. Over-nutrition or malnutrition, dehydration or excessive fluid intake cause serious harm to health of the man. Unfortunately, aging and diseases in this age group are distinguished by a slow start, without marked symptoms. And visit to a doctor as a rule it is often already in neglected conditions. Tendency to believe that the old man has had his day it is wrong, but it will be possible to keep the activity for a long period of time if the mechanisms of aging study in depth. The most notable changes take place in the period from 60-70 years.

The person retires during this period, he has some free time, and he begins to feel the "irrelevance". Experiences of this kind can lead to permanent stress. It can be very useful to recommend "Azeomed" to such patients as a constant mineral dietary supplement in small quantities with a variable intake of nutritious food. A necessary condition is also a healthy lifestyle, muscle activity. The disease makes the man older, and intake of trace elements helps to resist this process. They have a positive effect on the body, help to regulate and stimulate metabolism. The question of longevity for the elderly is reduced to the treatment of chronic diseases in which one of the first places belong to the intake of micro and macro-elements. For example, "Azeomed" has been added to elderly patients who were treated for one or another disease. Persistent improvement of health, with a fairly long-term remission, stabilization of the blood pressure, cheerfulness during the day, getting adequate sleep at night, improved memory, fewer dissatisfaction, and increased overall life status were indicated in the course of treatment. Usually I recommend them small doses to suit the individual characteristics of each patient - 1 tab. 1-2 times a day for one month with the intervals between doses is 2-3 weeks, because chronic administration may reduce reactivity of medicine.

Unfortunately, the intake of "Azeomed" at a young age is not suitable as preventive measures. But it is necessary to start the fight for the longevity in the youth, systematically and steadily trying to improve, support the work of the internal mechanisms at the level as in the flush of youth. Good results were obtained in the complex treatment of patients with diseases locomotor system: arthrosis, arthritis, osteoarthritis, fractures, and sprains. The treatment time is reduced, quality of life is improved in patients. In athletes' member teams of male and female who received "Azeomed" were marked the best performance while still maintaining its strength and quick recovery of shape, "Azeomed" has the Anti-Doping certificate of international Anti-Doping Committee.

In the treatment of somatic illnesses it was traced the positive dynamics of the chronically ill people of disbacteriosis: the number of coliform bacteria and intestines bifidobacterium flora restored within 1 to 2 months when the usual treatment is required more time. "Azeomed" was recommended in gastrointestinal disease: viral hepatitis A, B, C, chronic pancreatitis, cholecystitis, colitis, enterocolitis, gastritis, peptic ulcer disease with increased secretion of acidity, ulcers, duodenal ulcer, constipation, and tendency to diarrhea as a sorbent, the activator, the amplifier of chemicals, while creating an immunomodulator by altering their functional properties at the same time. I recommended it to patients with cancer, to reduce the negative effect of chemicals or radiation therapy, to improve the quality of life taking into account the absolute proven safety of the medicine. There were more 700 patients during the period of my observation. Some of them were,

Children – 240, boys – 125, girls – 115.

Diarrhea – 176, anemia – 193, cerebral palsy – 2, Rachitis – 64, viral infection season - 204, and childhood diseases - 37, upper respiratory tract infection – 29, lower respiratory tract disease – 18, Kidney diseases – 11, Cystitis – 5, Rheumatism – 16, locomotor system: lordosis, kyphosis, myasthenia, retarded physical development – 9, Newborn – 24, Disbacteriosis – 21, Enuresis – 16, Allergy –32.

Adults – 537. Men – 364. Women – 173.

Diseases of the digestive tract – 453. Urogenital system – 289, Oncology – 9, Diseases of the nervous system – 167, Viral infections – 341, Pregnant – 27, cardiovascular system – the 42 diseases of joints and spine -165, Systemic diseases – 3, Diabetes mellitus – 5, TB – 2, Poisoning – 15, Anemia – 49, Allergy – 18, Parasitic diseases – 98, Skin diseases – 54.

It is recommended to intake in tablet form, or in the form dissolved in water which is necessary to be dusted off and given according to the Tibetan method, in small doses. Intake can also be as before, during, and after having meal, or during daylight hours. In conclusion, we try to draw attention to the value of the expansion of clinical research and studies of micro and macro-elements in people as for prophylactic and therapeutic purposes. Taking into account that the twenty-first century is the century of struggle for health and microelementology is a science of the future.

The correction of the imbalance of micro and macro-elements in the healthy and the sick person can be compared with the role of genetic factors in shaping health. And we are able to use a unique product that was given us by nature for use in our daily work of healing. It's worth it.

LITHOPHAGIAL METHODS ADAPTATION TO ADVERS ENVIRONMENTAL FACTORS

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Carried us over a 35-year study of various aspects of the phenomenon of instinctive lithophagy among different groups of animals (birds, reptiles, herbivorous mammals, some predators) in different regions of the former Soviet Union, as well as analysis of published materials that examine different aspects of instinctive lithophagy among animals and humans in other regions of the world, allow us to make a generalized conclusion that the cause of instinct in lithophagy always striving of organisms eaten by common natural

minerals of the weathering crust of rock to adjust the material composition and functions of its various systems, which may be a mismatch due to various adverse environmental stress factors. In fact, it is a recurring problem of adaptation of organisms to the development of stress under the influence of adverse geological, geophysical, space physical and evolutionary factors prevailing instinctive universal method of correction of such violations with the use of natural minerals. Stress in animals caused by environmental factors, may be exacerbated by pregnancy, molting, as well as injuries and other pathological conditions. Reasons of lithophagy applied to specific cases may be quite different.

These differences can be distinguished on the basis either of the primary causes of stress factors (such as geochemistry and biogeochemistry, especially given the area's climate, the proportion of toxic plants in the feed, etc.), or from a secondary set of relevant causal violations in the body.

The very possibility of correcting the body through the same type of properties due to lithophagy enjoyed by many supergene minerals (formed in the weathering zone of rocks) in terms of regulation of physiological, informational and energetic processes in living organisms.

For minerals, have a pronounced adjusting-stabilizing properties in relation to living systems, is safe to carry minerals of smectite and kaolinite, chlorite, hydromicas, vermiculite, some types of zeolites (mainly heulandite, clinoptilolite, mordenite, phillipsite and natrolite), and also - some form of silicon.

Favorable in relation to their activity in mammals has numerous experimental confirmation. Among the already identified properties of the above minerals, which can be used to compensate for the different disorders in mammals can note the following: the ability to adjust to the body of the alkali and alkaline earth elements (due to ion-exchange reactions and sorption processes on lattices of frame-and mineral-gel ion exchangers, formed in the intestine); the ability to supply the necessary and remove excess biophylic trace elements, as well as bioactive form of silicon - impact on the overall metabolism by activating and prolonging the action of enzyme systems in the digestive tract; a beneficial effect on the symbiotic microflora and water balance in the digestive tract, the immune status, the processes of tissue regeneration.

All of the above minerals also have the ability to detoxify the body. Here you can see that the biological activity possessed by all, without exception, natural minerals, but not all of this activity is aimed at stabilizing the structure and functions of body systems (not utility or harm caused by dose).

The choice of minerals animals (and man) is determined by geological and geochemical features of lithogenic mineral complexes that are distributed in their habitats. Thus, in regions dominated by relatively young volcanic rocks of granitoid composition of herbivorous mammals consumed by man and is dominated by minerals zeolites, smectites and opal-like variety of silicon oxide.

In the territories of ancient platforms and in the mountains, composed of ancient metamorphosed volcanic and sedimentary complexes in the intake of minerals is dominated by finely dispersed form of quartz, hydromicas, chlorite, and kaolinite group minerals.

Lithophagy in herbivorous birds and other cloaca animals, unlike mammals, is more regular. At the same time often consumed widely used in the weathering crust silicon-rich minerals (quartz, feldspar). Lithophagy of birds always focused primarily on the regulation of ion balance in the digestive tract by selective removal comes into contact with food excess elements in ionic form in the intestines are accumulating to silicon-oxide gel.

Key words: lithophagy, geophagy, adaptanion.

CORRECTION OF DYSBACTERIOSIS IN APPLICATION OF AZEOMED NATURAL ZEOLITE

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This paper provides data on the revealed selective adsorption of pathogenic and non-pathogenic strains of colon bacillus E. coli on natural zeolite sorbent "Azeomed". The obtained data is the experimental verification of clinical observations a priori on the correction ofdysbacteriosis.

PROJECT "GLOBAL SAFETY SYSTEMS". LONG-TERM SURVIVAL DURING NATURAL CALAMITY AND ANTHROPOGENIC DISASTER

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System of saving technologies and methods in extreme conditions "Wanna live – gotta be ready to survive"

1. **Survival in 2012 and posterior years is going to be difficult** in connection with increasing number of anthropogenic disasters and natural calamities Such a scale of economic detriment and quantity of victims didn't use to be the case!
2. **Purpose of paper** – to inform polulation all round the world how to plan actions in case of catastrophe and thereby to save our lives and help close people.
3. **Main task of the project** - to prepare the population theoretically and practically for rapid saving actions in the case of any danger. To teach by practical methods of rendering of first medical psychological aid.
4. **Methodology,** on which our project based, consists in the wordwide necessity of learning and application in practice of organizational principals and methods of regulation of human activity in extreme conditions. Here are these principals:
   - **philosophical vision**
   - **mental information**
   - **psycho-emotional**
   - **physiological –** is a basic. This principal divides into two levels: **preparatory** and **extreme.**
5. **Realization of project is planning via:**
   - distribution of methodological (visual, audial, text aids) via Internet, and also by periodical press
   - creation of documentary and show television broadcast, with the best survival experts assistacse and on-line translation
   - broadcasting
   - demonstration of film-experiment «Crossing the Atlantic» (crossing without water and nutrition)

- holding the practical workshops, master-classes,showing the principals, underlying the project

6. Our results as of today:

- Creation of practical and methodological textbook called "How to survive in extreme conditions"
- Plan of project's adoption in mass-media
- Creation of methodological textbook "Astrology as system of safety".
- Plan of adoption of this information in mass-media
- Investigation of the saving process in previous civilizations
- The model of autonomous survival in groups of 50-150 like-minded people.
- Creation of copyright methodology « Healing impulse»

SECTION 5
Emergency management and communication systems

SPECIAL SYSTEM OF INFORMATION TRANSFER TO NATURAL DISASTER AREAS "SatPag"

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Recent large-scale natural catastrophes such as devastating earthquakes, tsunamis and floods have demonstrated that failures in regular and special communication systems are one of the most pressing and topical problems of emergency management and search and rescue operations in the areas affected by large-scale natural disasters. This is due to the collapse of receiving and transmitting cellular communication systems, transmitters and other systems of information transfer and receipt.

Effective coordination of activity of all involved public administration systems, rescue services, ministries and agencies during both emergency situations caused by natural and man-made disasters and response efforts largely depends on accurate and failure-free operation of communication systems and telecommunication resources.

In the vast majority of cases, people in disaster areas during large-scale natural disasters find themselves isolated from outside information and have no idea what action to take: whether to wait for on-site assistance; or to move in any direction from the place where danger is expected; or which routes might be the most secure; where and when to wait for humanitarian aid, etc. Not only does that complicate the work of rescue services but also leads to panic and chaos among the people caught in disaster areas, multiplying thus the adverse effects of natural disasters.

Special means of communication such as satellite phones and communications systems cannot be available today to the wide sections of the population and most government officials. Therefore, a fundamentally new technical solution is needed to effectively provide the general public and civil servants who find themselves in large-scale natural disaster areas, with targeted information. This can be said about the International System "SatPag", a basically new type of one-way information communication. Unlike the conventional paging, information transfer in the "SatPag" system includes selective radio transmission of the targeted information to either in divide als, small groups or unlimited number of people in disaster zones, depending on their location. A special activation code enables signal reception in only those SatPag receivers (satpagers) for which the information is intended; the rest do not react. No dedicated channels for pagers are used; there is a direct radio broadcast on the air, which allows sun limited numbers of people to be subscribers of this international network without connecting to it. The "SatPag" system can be used to transmit information to people in natural disaster areas, rescue services, civil servants, for military command, rescue teams in mountains, etc.

NATURAL DISASTERS AND ACTS OF THE POPULATION TO ELIMINATE THE CONSEQUENCES

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Natural disasters are a tragedy for the entire state, and especially for those areas of the country where they occur. As a result of natural disasters affected the economy, as this production facilities are destroyed, destroyed people's wealth and, most importantly, losses occur among people who die of their homes and property.

The correct behavior of the population to natural disasters, based on the fundamentals of civil defense, is the basis for reducing human losses and material damage. Of particular importance is the participation in work on disaster management, as a precondition for the speedy restoration of normal living in areas affected by natural disaster. It should be noted that the actions of people during natural disasters and elimination of their consequences must be carried out in strict accordance with the instructions of the civil defense.

Key words: landslides, natural disasters, circumstances, Earthquake-specific phenomenon.

REMOTE SENSING TECHNOLOGIES APPLIED TO DISASTERS MANAGEMENT IN ALGERIA

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Algeria is affected by fourteen major risks (earthquakes, landslides, floods, forest fires, oil spill, etc) and the means for the management of these disasters are limited and often inadequate. In recent years, Remote Sensing and Geographical Information System (GIS) technologies have been the object of considerable interest to all bodies concerned with space and in particular emergency services and disaster management in Algeria, in collaboration with all other bodies responsible for prevention and management of all major risks in Algeria. Among these risks we can mention the most preoccupying as being the forest fires that ravage thousands of hectares every year, earthquakes that have a devastating effect every time, the industrial risks that are real considering the numerous complex petrochemical and industrial existing in Algeria, coastal and marine pollution at present little recognised but very real considering the 1200 kilometre Algerian coast line, near which many ships empty their tanks offshore as well as the oil industry activity in many Algerian ports. The use of remote sensing and GIS has become an integrated, well developed and successful tool in disaster management. For our part, we are interested in this communication to present our research work concerning the management of risks and we hope to contribute directly or indirectly to putting these new technologies in place in Algeria. This has been done in collaboration with bodies such as the forestry services for the management of the forest fires, the centre for astronomical, astrophysical and geophysical research for the monitoring of earthquakes and so on. For the first risk, a large

earthquake (M_s > 6.8) occurred in May 2003 in the Algiers-Boumerdes area (Algeria). Remote sensing technologies and Synthetic Aperture Radar (SAR) Interferometry (InSAR) have been shown to be a valuable tool for monitoring relative surface displacement due to various crustal movements and for creating accurate DEM's using pairs of SAR images. SAR data of ERS-1/2 and ENVISAT satellites are provided from European Space Agency and are used to create differential interferograms and DEM's of the earthquake area. This research is under study in our laboratory and first results as interferograms are obtained and the work is go on. For the second risk of forests fires, every year, about 30 000 hectares of forests are destroyed by fires in Algeria, fires also take a heavy toll in lives and property and our major preoccupation in to reduce forests fires in the country, thanks to inventory, prevention and management and follow-up. The goal of our work is to set up of a GIS integrating remote sensing data for the prevention and management of the fires. The principal factor of degradation of the Algerian forest is the fire which finds an environment physical and natural favourable to its blossoming and its propagation. The structure and the component of the vegetable formations are as many factors facilitating fires of forests. In this communication, we present our contribution of the Algerian experience in the use of Space technologies for disaster management. Remote Sensing can provide useful information, and create disaster awareness with politicians, concerned decision makers and the public, so that on a national level decisions are taken to set up disaster management organisations.

MINGECHEVIR EMBANKMENT DAM COLLAPSE: CATASTROPHIC RISK ANALYSIS AND MANAGEMENT

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The paper deals with heavy rains, flash floods and dam collapse risk analysis and management in Kura river basin. There are 8,359 rivers in Azerbaijan Republic and 5,141 of those are in the Kura river basin. River Kura flows through regions in Turkey, Georgia, Azerbaijan and falls into Caspian Sea. Rivers of the Kura basin has extremely irregular discharge throughout a year. Last year spring flood became catastrophic, destroying river banks in many places simultaneously water flows have gone to urbanized areas. By the quantity of large dams (height of a dam >60 m and power of HPS >100MW) the Kura river basin with 8 dams, takes 14th place in the world. In Soviet period for hydropower, flood control, irrigation, etc. purposes have been built cascade of four dams on Kura river in Azerbaijan. The largest among them is Mingechevir embankment dam. It is one of the highest dams in Europe that was constructed through sprinkling. The height of dam is 80 m, length 1,550 m and total capacity of soil 15.6 million m^3. The length of the similar reservoir is 70 km, total area 600 km^2 and water storage >16 km^3. The large scale water management efforts have been undertaken in the Azerbaijan during the past 20 years of independence. However, the Soviet environmental legacy and military conflicts in Kura river basin led to unfortunate results. Practically right off after constructions of dam and fillings of reservoir (1953) the safety issues became actually: collected 16km^3 waters can break embankment dam and catastrophic flash flood will carry by Kura river valleys,

destroying all on the way. Unfortunately, for the existence period the dam inspection and modifications was never spent. There is a need for more adequate legal frameworks for dam operation. If to consider, that the flash flood hazards area of downstream valleys is 8000 km^2 with about 3.5 million inhabitants, we can as certain that now, Mingechevir dam and similar reservoir are both a blessing and curse of Azerbaijan! As already mentioned above, like all hydraulic structures also dams hold a potential risk of breaking. Heavy flooding and/or break one of dams in Turkey or Georgia is enough for catastrophic "domino" destruction of Mingechevir dam and all other downstream river banks. In the presented work the following risks have been considered: river valley population; Economy of coastal zone; Environment of downstream coastal zone. Mingechevir dam collapse catastrophic risk analysis and management related to potential flash floods induced or amplified by manmade structures along Kura river, is a problem that calls for the definition of policy guidelines and new technical instruments. A decision support system composed of an information system that will support flood modeling and prediction, dam collapse models, as well as operational safety guidelines under normal, training and emergency situations, may constitute an important instrument that will help decision makers to comply with the legal regulations. This paper presents one of the components of this decision support system, namely the information system that includes elements of aero-space geodetic driven-in markers in the body of dam and digital water level recorder system with GSM/GPRS transmitter established on reservoir. The recommended risk management system is suitable for any transboundary rivers.

AN ANALYSIS OF IRAN'S CITIES DISTRIBUTIONS IN RELATED TO EARTHQUAKE HAZARD

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Natural disasters such as earthquakes often result in extensive casualties and damage. The location of Iran and many other developing countries in active tectonic regions of the world emphasizes the necessity to develop a comprehensive disaster management system. Iran is located in the Alpine-Himalayan seismic belt which is one of the most active tectonic regions of the world. Iran is a country with about 75 million people living and the history of the region indicates strong earthquakes. Population centralization in urban area and metropolitans with environmental disaster, especially in developing countries such as Iran increase metropolitan's vulnerability against earthquake hazard. Iran is a vulnerable against earthquake hazard, because of distribution of cities and population centralization in its metropolitan. But the amount of damage and injured in an earthquake in Iran's cities is different. Population growth with increase of cities number cause to sustain a loss of people and appurtenances. This research tries to help to planning for earthquake crisis. Type of research is applied and method of data collection is documentary and methods of analysis are; population analysis with urban system analysis and urban distribution system in related to earthquake hazard. In beginning the situation of urban system and locations of cities are studied, than the relationship between distribution of cities and earthquake hazard studied. This paper examines the spatial distribution of the population and focusing on urban system patterns.

Key words: Iran's Cities, Distributions of Cities, Earthquake Hazard, Urban System.

FLOOD FIGHTING METHODS IN THE KURA AND ARAZ RIVERS

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Nowadays, in flood-spreading countries and in Azerbaijan, for reducing the damages and destructions, human death caused by floods complex fighting measures were even taken, but still no positive results have been got on this field. Though, for reducing the destructiveness of floods water dumps were constructed on floody rivers, it has been impossible by this means to prevent the floods in Azerbaijan. As Kur and Araz rivers are the most oozy rivers in the world and silt materials filling the water dumps reduce their deepness and displacement. The mentioned facts sharply reduce the risks floods prevention. 1500 km ground dams along Kur and Araz rivers were built in limited areas. But the indifferent attitudes against them, not admission of State Programme about ground dams and other causes have no efficiency on prevention the floods constructed along Kur and Araz rivers. The rivers in the world and as well as in flat areas of Azerbaijan flow in meanders. In the result of this the flowing speed of rivers sharply reduce and the auspicious conditions for floods exist. If many meanders in Kur are set right, it'll be possible fundamentally to reduce the damages and destructions caused by floods. The auspicious conditions for floods are also existed by the regular undeepening of Kur and Araz riverbeds. These works must be conducted in Kur outfall not only in flood –time, but also regularly all the year. The lakes as Sarisu, Aggol and others situated on the banks of Kur and Araz rivers play an important role on cleaning Kur waters during floods. But these lakes and ponds were privatized and they have been used for fishing. In the result the direct connection of these lakes with Kur river has been cut and it becomes impossible to clean Kur river from flood waters. For reducing the floods risk the cleaning role of Kur river during floods by lakes and ponds must be reconstructed. Even if the ways and methods against floods conducted in the world countries with flood risks have been implemented in low streams of Kur and Araz rivers of Azerbaijan, they can not fully prevent the floods, but will be able partly to reduce the economical damages and destructions caused by floods.

EFFECTS OF NATURAL CALAMITIES ON THE AZERBAIJAN TRANSPORT SYSTEM

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Natural calamities taken place in Azerbaijan territory gives harms to economy up to 30-50 million USD dollars every year. There is not an area of economy which is not effected by natural calamities, either directly or indirectly. One of the areas influenced by all natural calamities is transport system. As a result of natural calamities, breaks occur in transport system. Besides major sectors of economy, these breaks negatively affect social conditions, health of population and labor force. Automobile transportation is in the first place in the Azerbaijan. Automobile transportation provides %84 of passenger and %51 of freight transportation. Because of this reason, automobile transportation is major field which is exposed to negative effects of natural calamities. As other transport systems are under-developed in rural regions of the country, especially in the regions which are close

to mountains and foothills, automobile transportation is a leading way. % 50 of roads out of total 25, 8 thousand kilometers is settled in these rural regions. Automobile roads are especially exposed to negative results of flood, landslide and etc. And these kind of natural calamities take place every year with breaks and bring the region roads to the worthless situation and also make it difficult of their normal use. Amount of roads which are subject to negative effects is totaled to 14 thousand kilometers. Relative to other transportation systems, air transport without major breaks is less dependent on natural calamities. In the air transportation system there are other difficulties: foggy weather conditions which happen at every 20-40 days or 200 -400 hours, severe winds with the speed of 25-30 m/s occur 50-75 days during a typical year, in Nakchivan 30-50 days, and in other regions 10-25 days. All these could cause serious problems. In the foggy weather distance vision could decrease to 50 meters, – heavier foggy conditions at which distance vision could come down to 50-100 meters – could bring negative outcomes for air transport system. In the capital city Baku, such days are totaled to 5-10 days, in Nakchivan 10-15 days, and in the other parts of country it is 3-5 days. In Azerbaijan, railway length is totaled to 2100 kms, % 68 percent of total is main, %32 percent of total is secondary railway connections. Railway system is relatively less affected by negative outcomes of natural calamities. However, floods, heavy snow cover and etc. cause railway transport to stop its operations and result with frequent breaks on regular work. On May – June of 2010, floods which took place in Kura and Araz rivers had effected main transport networks and caused grave destruction. As a result of flood, some bridges were destroyed and in these regions transportation had to be taken breaks. On the marine transportation, negative effects happen as a result of strong winds with speed of 25-30 m/s. Also other examples could be hurricane-type winds which cause waves that is very long, heavy fog, freezing sea water. In the Caspian Sea, on the average base, strong winds take place few times during in a given year, reaches to the speed of 25-35 m/s and as a results of these winds wave length reaches to 7-8 meters. During last 10 years, in the Caspian Sea such strong winds and as outcomes of these winds high-length waves had been observed in 1994, 2002, 2004 and 2006. Because of these winds, many difficulties had taken place in the operations of navigation and shipping in Caspian Sea and it brought about million dollars of harmful effects to transportation system. It is very important to take preventive engineering actions used in world experience in constructing transportation lines passing trough floody and slippy territories.

NATURAL RISKS MANAGEMENT

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Natural risks management is the final stage in the procedure of natural hazards analysis, technosphere vulnerability study, and risk assessment. The main goal of managing natural risks is to implement a complex of scientific, technological, regulatory, legislative, and managerial measures aimed at the mitigation of intensity or frequency of abnormal natural phenomena, vulnerability of socio-technosphere as well as the environmental consequences of natural disasters. These measures may be implemented in different ways:

– the direct management of natural hazards;
– the optimization of economic activity and the rational use of territories;
– performing preventive measures on the protection of population and engineering structures;

– arrangement of warning and emergency response system;
– carrying out timely managerial decisions;
– insurance of natural risks.

In every particular case, these measures depend on the type of natural impact, the socio-economic state of the society, legislative support of its safety, and other factors. For the most of natural disasters, their control appears to be a very difficult problem; and such dangerous natural phenomena as earthquakes, volcanic eruptions, tsunamis, etc., are absolutely incontrollable in a direct way. However, a man has successful experience in affecting snow avalanches (by shelling gun fire on them), atmospheric precipitation (by prevention or inducing rain or hail), etc. For example, after the Chernobyl nuclear accident in 1986, the measures were undertaken on preventing atmospheric precipitation in this area. The measures on raising resistance, protection degree, and adaptation to natural hazards of both people themselves and the engineering structures they create seem to be implemented more easily. These measures involve:

– the construction of protective engineering structures resistant to the predicted external impacts;
– engineering geological zoning and seismic microzoning of territories aimed at revealing the safest sites for living and economic activity;
– engineering preparation of territories;
– arrangement of monitoring systems of different levels for prediction of abnormal processes and regular information of population about processes in the environment;
– education of population about natural hazards;
– development of insurance system for people and real estate from natural hazards;
– improvement of governmental system of adopting managerial decisions, which permit to work out the regulatory and legislative base for providing safety and to carry out long-term, short-term, and emergency measures on management of natural risks.

THE MAP OF SOCIAL RISK OF RUSSIA FROM THE HAZARDOUS NATURAL PROCESSES AS THE TOOL OF CONSEQUENCES' REDUCTION FROM EMERGENCY SITUATIONS

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More than 20 hazardous natural processes of various genesis are observed in the territory of Russia. Under such conditions, it is necessary to have the information on the hazard degree of various territories of our country to provide safe development of territories and the population. The most convenient way of presenting such information is a map of possible population losses from natural hazards, or a risk map. We have the map of danger of 22 natural processes in the territory of Russia. This map permits us to estimate in degrees the hazard of each of processes for any taxon of territory. The degree estimation of hazard is determined by a complete set of factors, which describe volume, velocity, and other features of the process, the territory degree of exposure, the frequency of events. Besides, we have a database on the facts and consequences of events of natural hazards in the territory of Russia for last 20 years, which allows obtaining the statistical data about

human losses in each negative event: those killed, wounded, and suffered material damage. These two sources have allowed us to create the map of social risk of Russia from 5 natural hazards, which are the most hazardous in their consequences: landslips, flooding, hurricanes, and avalanches. First, we define the number of inhabitants subject to influence of hazardous process of determined category of danger (N_H), all over the country. This is a sum of inhabitants of all taxons ($i = m_h$) the danger's degree map, with a process h the k category (h_k).

The database stores: quantity of died – n_h^d, injured – n_h^t, and had material loss – n_h^w in all events of process h_k. Thus we can obtain the average of casualties from natural hazards in a year $an_h^{(d,t,w)}$.

Further we define probability for a person to suffer from effect of process h_k we dividing the average of casualties for a year into total number of inhabitants in subject territory (N_H).

$$P_{hi}^{d(t,w)} = an_h^{(d,t,w)} / N_H \ (1)$$

We accept that the individual risk to suffer from natural hazard

$$Ri_h = P_{hi} \cdot F_h, \ (2)$$

where F_h – long-term repeatability of process h_k, p.un./year (data from map).

The collective or social risk – expected quantity of casualties on a certain site of territory as a result of hazardous natural processes for the certain period of time. The social risk (Rs) is calculated as product of individual risk and population of the taxon, expressed in peop./year

$$Rs = N_i \cdot Ri, \ (3)$$

It is more convenient to use specific value of social risk for creation of a map of social risk which is calculated as

$$rs = Rs / S_i, \ (4)$$

where S_i – territory of the taxon (sq. km).

The presented map can be used as a tool to reduce the negative impacts of natural hazards. For example, in accordance with the values of social risk can be carried out the spatial distribution of number of the personnel and material resources departments of the Ministry for Emergencies. This card can serve as a basis for addressing placement of protective structures, the adoption of measures on prevention of natural hazards or reduction of their consequences.

CONSIDERATION OF EXTREME HYDRO-GEOLOGICAL EVENTS IN NUMERICAL FORECASTS OF HYDRO-GEOLOGICAL CONDITIONS CHANGE IN THE TERRITORY OF IMPORTANT INFRASTRUCTURE OBJECTS

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The extreme hydro-geological phenomena are expressed in formation of very high and very low levels of ground waters. The basic influences on ground waters take place at the extreme hydro-geological phenomena. The basic influence of ground waters on an anthropogenous infrastructure also is observed at extreme high waters and low-waters. We consider a possibility of hydrodynamic forecasts production using numerical modeling on the basis of the maps of extreme maximum and minimum levels of ground waters. These maps are made on the basis of single observations received at engineering researches during construction. The geological information for the last years is also widely used. Regime observations on building sites aren't obligatory at use of the given technique as time series of ground waters heads on a basic of state network of hydro-geological monitoring are considered in calculations. According to the Russian standard documents at designing a possibility of change of hydro-geological conditions on the site in the course of construction and operation of buildings should be considered. One of principal causes of the given changes is natural seasonal and long-term fluctuations of ground water's level. Natural fluctuations are complicated by the time variability caused by factors of urbanization in city. The different time data about geological conditions and ground water's level position is used at construction of hydrodynamic models of ground water. It is incorrect to use this data without recalculation it by uniform time. It is also necessary to note an absence of good methodical base for manufacture of long-term hydro-geological forecasts of satisfactory accuracy. The most convenient and informative way of data presentation about hydro-geological conditions changes is the estimation of extreme maximum and minimum possible levels of ground water and also a position of the level received at researches in this range. Extreme levels are made by calculation in which the data of single observations in concrete wells is a necessary component. Maps of hydroisohypses for extreme positions of level in the given territory are constructed on the basis of the processed data. Use of this data as initial at hydro-geological models making allows to estimate influence of a projected construction on ground water in the greatest possible range. This method gives priority in comparison to the decision of a non-stationary filtrational task as complexities with an estimation of accuracy and reliability of the received forecasts are difficultly surmountable in this case. Especially it concerns the urbanized territories characterized by the broken ground water's regime. The range estimation allows to consider all possible changes of environment at various positions of ground water level. It also gives good base for the further construction of more exact forecasts in case of increased requirements to accuracy. The technique has been applied for the prediction of the hydrogeological conditions in the construction of the 3,5 km automobile tunnel in Moscow.

MAIN PROBLEMS ON COMMUNITY BASED DISASTER EDUCATION IN TURKEY

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Earthquake preparedness is a phenomenon has arisen from the 1999 Marmara earthquake where 20.000 people lost their lives. Geological and geopolitical position of Turkey is the cause of many events turning to disaster. Turkey has experienced significant improvements in the planning and preparedness phases after 1999 disasters. The principle of the preparedness period consists of educational programs that plan the public response. Besides existing educational programs of governmental organisations, new projects have been developed in the context of community based disaster education programs. These education programs have developed and renewed all aspects of the disaster preparedness since 1999 earthquake in all parts of the country. Despite all efforts, significant defects are observed following earthquakes. Examples can be given after medium size earthquakes. Educational programs aim firstly giving information and providing level of awareness, while some programs develop response capacity of teams. However all efforts performed has failed to create change of behaviour in the public. Even the worse is the existence of indifferent groups to disaster risks. Such attitudes require re-evaluation of the content, presentation methodology of educational programs and channels of communication with the public. Besides, the response of the community as to why they do not act as predicted should be investigated. In this study, public response during the educations in the last ten years is documented, and especially response of the participants is discussed.

Key words: Community education, disaster awareness, change of behaviour

A SOCIAL NETWORK ANALYSIS OF RESILIENCE IN CHRONIC HAZARD SETTINGS

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A social network framework was employed to determine how external and internal relations, reciprocity, and associated support affect resilience among people in hazardous environments. Four networks were identified: (i) dense networks typified by tight circles where everybody knows everybody else; (ii) extended networks, typified by relatively dense structures where cores are connected with other more loosely connected individuals; (iii) subgroup networks, typified by structures with at least two distinct groups, usually connected, but not always; and (iv) sparse networks typified by low densities and limited connections amongst individuals, as well as having many isolates. The goal was to develop a predictive model to improve post-disaster recovery strategies.

In-depth interviews, focus group sessions, and questionnaire surveys were conducted in three communities near Puebla, Mexico: a small agricultural village where people live under the constant threat of volcanic activity from Popocatépetl, have been

evacuated twice, and occasionally experience damage from ash falls and pyroclastic flows; a resettlement community whose residents have been relocated following devastating landslides in 1999; and a village near Puebla with similar demographic characteristics, that is not exposed to chronic hazards and served as a control site.

Results showed that social network type appears to influence resilience and could have repercussions for disaster-prone communities. The major support offered in most social networks was within networks characterized by high levels of reciprocity, particularly in material or instrumental ways, such as labor sharing, loans of tools, provisioning of food. Other networks exhibited patron-client relationships that facilitated the access of poorer individuals to support from wealthier individuals. Similarly, extensive ties to people within one's own village provided many supporting advantages, although these linkages often proved inadequate and did not provide sufficient diversity of resources or information. This was especially apparent in the case in the agricultural village, where remittances sent home by migrant workers played an important role in the local economy. At the local scale, remittances may have significant ramifications for long-term community sustainability. While migrant workers are often marginalized in source countries, being perceived as "different" from the local populations, they provide critical resources for many impoverished communities. Homogeneity/heterogeneity of social networks also influenced resilience. For instance, ethnicity may play an important role in evacuation strategies and whether people are likely to leave. In conclusion, social network type appears to influence well-being and could have significant repercussions for disaster-prone communities. It was found that people with medium density networks with some duplication of ties and easy access to resources were better adjusted to the rigors of disasters and evacuations, than those with more dense networks with high constraints or more isolated networks where access to resources was difficult.

Key words: Chronic Hazard, resilience, social networks.

IMPACT OF GEOENVIRONMENTAL HAZARDS IN EAST CAIRO, EGYPT

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The effect of natural disasters in establishing new settlements in Egypt is aggravated by the often-noted lack of environmental awareness, insufficiency of warning systems. The present study deals with hazards that have occurred already in El Mokattam area and provides recommendations to minimize future risks. El Mokattam area is an eroded elevated landform that represents the eastern extension of Cairo city. Three fault scarps form three stepwise plateaus in El Mokattam area that are known as; lower-, middle-and upper- plateau belonging to the Middle and Upper Eocene. Geomorphological studies, interpretation of multi temporal aerial photographs and Landsat TM images and field work enabled delineation of thirteen risk sites in El-Mokattam of rockslides, rock falls and slumps. The escarpment slope of the upper plateau varies due to lithological variation; where the hard rocks exhibit steep slope (70°-090°) and the clastic rocks reflect gentle slope (<30°). The upper plateau is composed of alteration of clastic (clay, sand, silt) beds and fractured dolomitic limestone. Paleosol, gypsum and rock salt bands separate between these units. Random buildings were constructed on the upper plateau surface that incised

by dendretic and sub-parallel drainage channels with their down streams to north. The drainage channels in the middle plateau are down streamed to west. Limestone fractures with nearly right angle sets forming blocks. The fractures are exploited pass ways of water and movements, also seeped water yields greased top bedding plane surfaces on soft elastics on which limestone blocks move.

In El Mokattam area, the reasons of land sliding are: The water activity increases by increasing sanitary water and acidity of water rain. Hard limestone rocks alternate with clastic ones; these when exposed to wetness by water seepage, they yield by swelling, leaching and crumbling processes. Fault intersection and narrow fault swarm are recognized as hazard localities. The construction of a highway on the edge of the southern faulted scarp of the upper plateau reactivate hazards and the edge quickly retreated inwards. Extensive quarrying works of limestone near the scarp edge for building stones assist in mass movement and doline collapse. Due to new urban constructions, infiltrations of sanitary water to the clastic beds. Limestone rocks are fractured and develop right angled blocks that subjected to water seepage. These assist and adversely change the geologic environment of the area.

Key words: faults, limestone and rock falls**.**

URBAN FLOOD HAZARD ZONATION IN THE CITY OF BABOLSAR, IRAN

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Flooding in urban areas can be caused by flash or river floods. High intensity rainfall can cause flooding when the city sewage system and draining canals do not have the necessary capacity to drain away the amounts of rain that are falling. Water may even enter the sewage system in one place and then get deposited somewhere else in the city on the streets.

The seasonal variations of rainfall in northern Iran are showing its concentration in fall and winter period. In this period some localities registered the highest floods of the last fifty years. One example is the city of Babolsar, in the north of Iran that has been affected by several flood events during the time frame previously mentioned. There is no reference of these occurrences in the international disaster databases because it is a small scale episode, and no victims were recorded.

However, it is a recurrent situation with considerable direct and indirect damages which affects a small part of the transportation centre which is also an important touristic, educational and commercial area. The purpose of this study is to understand the characteristics of flood risk in Babolsar which is a product of the hazard and the vulnerability of exposed elements (*e.g.* people, environment and structures) in order to improve flood disaster management efficiency.

Key words: flood, urban area, Babolsar, Iran

ASSESSMENT OF THE EXENT OF DANGER TO DAMS IN NORTHEAST ALGERIA FROM SEISMIC AND RELATED FLOOD HAZARD

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A disastrous earthquake that struck Boumerdes on 21/05/2003 (Mw = 6.8) claimed 2278 lives. This natural disaster instigated urgent development of the Project of ORSEC Plan (Organisation de la Réponse de Sécurité Civile), i.e. emergency plan in a case of disaster. This project covered 28 dams in the central and eastern part of North Algeria. Seismic hazard was assessed for each of the dams, including systematization of the existing documents, inspection of structures and evaluation of abidance by the regulations (present laws and regulations, as well as regulations valid at the time of construction). Apart from that, the values of peak ground acceleration

(PGA) calculated for the needs of this project were compared with the values that the dam was designed for, as well as with the values stipulated in the latest Algerian seismic code - Règles Parasismiques Algériennes (RPA-99 révisées 2003) and based on that comparison the design parameters were verified. Based on the results of geo-spatial analyses, conclusions about potential danger to individual structures were made, which was followed by the preparation of flood hazard maps for downstream river stretches in a case of dam break.

Key words: ORSEC Plan, dams, Boumerdes earthquake, North Algeria, evaluation of the state, evaluation of abidance by regulations, flood hazard maps

ASSESSMENT OF HAZARD AND RISK, CAUSED BY GROUNDWATER CONTAMINATION IN THE URBAN TERRITORY IN THE EXTREME EMERGENCY

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The safeguarding of security has always been one of the major problems of individuals, society and state, but this problem became particularly topical in the second half of the twentieth century. The development of civilization led to natural and technonatural hazards increase, disruption of ecological balance, environmental degradation. Significant environmental degradation occurs not only at local and regional, but even at the global level. Ensuring the environmental safety is especially important for the population of cities (especially megalopolis) from the threats caused by environmental contamination. Analysis, evaluation and forecast of anthropogenic environmental changes and associated with them hazards and risks are important elements of sustainable development of urban territories, determining their optimal use and population safety. The probabilistic approach to forecasting and management of hydrogeochemical risk (risk caused by groundwater contamination or by aggressive groundwater formation) in the urban territories is considered. Hydrogeochemical risk includes the following factors: 1) probability of hydrogeochemical hazard formation and its realization; 2) damage caused by hydrogeochemical hazard realization. Hydrogeochemical risk assessment should take into account both risk of groundwater contamination or aggressivity (so called "the risk of exposure" and risk of contaminated or aggressive groundwater impact ("the risk after

exposure"). Risk forecast procedure is suggested, where risk is considered as probabilistic measure of the losses, which can be defined by multiplication of probability of the adverse event by the damage value. The probability of the "final" adverse event from contaminated or aggressive groundwater is considered as complex event. Its decomposition to more simple events allows to value its probability on the base of simple event estimation. General model includes two parts: 1 - model of contaminated or aggressive groundwater resulted from urban sources impact and 2 - model of contaminated or aggressive groundwater impact on the recipients. Forecast of risk is performed at the level of complexity, which depends on projection stage, intensity of potential technogenic source impacts, importance of the objects under consideration, receptivity of groundwater and the objects to external influence, degree of uncertainty and expected value of risk. According to it the method of hydrogeochemical risk forecast is selected. Different methods are used for probability estimation: from method of subjective estimate of probability, method of analogy and expert methods to complex statistical procedures and numerical stochastic modeling. In represented example risk forecast was evaluated with the use of numerical simulation. An approach mentioned above was used for risk assessment of groundwater contamination by oil products in extreme emergency in the territory of large motor car complex in Moscow. Probabilistic modeling of oil products transport via lithological windows with estimate of risk of target aquifer contamination was carried out. Stochastic simulation was used for risk forecast. Probability of the water intake contamination, damage from contamination of drinking water to population and value of the risk are calculated.

FOOD SAFETY IN TERMS OF GLOBAL CLIMATE CHANGE AND TECHNOGENESIS: ACTUAL ISSUES AND WAYS OF THEIR SOLUTION

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Food safety as constituent part of national security of the state is obligatory condition of steady development and is basis of support of high quality of environment and production of ecologically safe and biologically full-value food products and protection of population. It is generally accepted that global climate changes which are objectively registered in all regions of the planet and have become evident at the turn of XX and XXI centuries, were caused by technogenic development of biosphere at the result of life activity of human society. Summarizing the results of researches which were carried out in Russia, it is possible to distinguish main expected global changes:

1. Climate warming on the territory of Russia, which is especially noticeable in dynamics of winter temperatures and rainfall enhancement in areas to the north of the 50th parallel together with conjoined increase of aridity in some south regions connected with this.

2. Gradual change of latitudinal zonality, which leads to shift to the north and decrease of tundra (cold desert) zone up to its disappearance in European area, shift and decrease of taiga (boreal forest) zone, widening of belt of broad-leaved forests primarily to the east towards the Pacific ocean. In general there is increased threat of further reduction of landscape and biological diversity of certain landscapes and species of flora and fauna on the territory of Russia.

3. Enhancement of rainfall, primarily in winter, in the north-west and north of the country with more frequent appearance of thaws and decrease of depth of soil freezing.

4. Threat of catastrophe floods and overflows increases sufficiently.

5. Everywhere in the North circumpolar belt degradation of permafrost will take place, and at the south boundary conditions for widening of local farmer areas and development of cattle breeding will appear.

In terms of technogenic pollution of territory, sufficient pollution of agricultural ecosphere by toxicants which further not only migrate in habitat, but also transfer on food chains to productive animals and people, was detected. In this respect agricultural products as main resource of formation of technogenic load and entry of toxicants to human body, determine specific influence to development and implementation of system of protection measures. To the present time 11 types of technogenesis were distinguished (Ilyazov R.G. and others 2006, 2008, 2010): ***agricultural toxic chemicalization type*** – deep transformation of landscape and soil covering under the influence of agricultural production with use of agricultural chemicals which is widespread in rural areas; ***radiation type*** – technogenesis which covers territories damaged by emissions of radioactive substances, after radiation catastrophes in Kyshtym and Chernobyl; ***oil and gas type*** – technogenesis spread in regions of extraction and refinery of oil and gas, and also in areas of heat power plants based on this fuel; ***coal mining type*** – covers territories of coal mining and also areas of power plants based on this fuel; ***ferrous type*** – in regions of extraction, processing of iron stones and location of cast iron, steel, rolled metal etc. production plants; ***non-ferrous type*** – on territories of extraction, processing of non-ferrous metal ores and lotion of enterprises specializing on their extraction; ***cellulose-wood processing type*** – in places of location of cellulose-paper mills and plants producing wood, construction materials; ***transport type*** – usually overlaps other types of technogenesis, but there are territories where its impact is in its pure form: intercity highways, logistic centers, airports, sea, lake and river ports, pipeline system facilities; ***megapolis type*** – covers landscapes in areas of big cities; ***hydro-power type*** – on territories of facilities exposed to influence of major hydro-power facilities; ***war type*** – in regions of habitat which sufficiently transformed by war activity. Actually 8 of the aforesaid 11 types of technogenesis facilitate growth of concentration of the so called greenhouse gases in the atmosphere, and radiation and hydro-power types take part in its direct warming up, besides the latter takes part in mitigation of continentality at the expense of reinforcement of intercontinental hydrological cycle from increase of evaporating water surface. Due to the aforesaid it is necessary to develop and implement systems of countermeasures. It is not possible to solve arising problems at the expense of current set of civilization means. Brand new approaches and technologies are needed for stabilization of landscape-ecologic balances in new conditions. For adaptation of agricultural production to altered conditions it is necessary to differentiate two completely different groups to actions:

1) biosphere-compatible actions aimed at restoration of ecological balance of agricultural landscapes, agrobiocenosis and agricultural ecosystems by means of transformation of territorial-ecologic, technological and technical conditions of agricultural production, i.e. these all are elements of future agricultural landscape systems of farming and cattle breeding;

2) rehabilitation actions, i.e. aimed at overcoming of consequences of manmade accidents, catastrophes, and at partial decontamination of technogenic pollutions.

In terms of technogenic pollution of agricultural ecosphere, organization of production of agricultural products should guarantee ecologic safety and biologic al full-value of food products for population that lives on this territory. For decrease of concentration of toxicants in products of plant production and cattle breeding it is necessary to apply different protection

actions which on the one hand are aimed at decrease of migration of toxicants in the system soil-plants, reduction of use of radionuclides and salts of heavy metals together with feed stuff by animals, and on the other hand – at prevention of absorption of pollutants in gastrointestinal tract and acceleration of their washout from the body of animals and processing of polluted agricultural products for obtaining of ecologically safe food products for population. Development of technologies of conducting agricultural production which provide production of normatively clean products and non-malignant food products for population at the present time became one of the most important tasks. Algorithm of actions and technologies of adaptive agricultural production in terms of global climate change and technogenesis is shown at the picture. Herewith it is necessary to consider that this or that type of technogenesis with peculiar range of pollutants overlaps peculiarities of certain biogeochemical provinces every one of which is distinguished by its geochemical singularity.

MANMADE CATASTROPHE OF XX CENTURY (CHERNOBYL, 1986): PHILOSOPHIC MORAL AND COUNTERMEASURES

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Accident at Chernobyl Nuclear Power Plant (NPP) in 1986 was the most severe accident in the world history of nuclear power industry and was recognized as the most major radiation manmade catastrophe in human history. It lead to radionuclide pollution of large territories, caused serious ecologic, radiologic, medical-biological and social-economic consequences, affected lives of millions of people who live in this area, and for Russia, Belarus and Ukraine it became nation-wide disaster and continues to affect all spheres of life activity in devastating way. Territories of countries of Central and West Europe, Scandinavia, China, USA and Japan have also undergone radioactive pollution. Whereas XX century can be reasonably called as *epoch of catastrophes*, XXI century can be called as *epoch of highly increased risk of catastrophes,* to which the following three circumstances lead:

The first one. Increased population of the Earth lead to multiple increase of number of victims and extent of damage from catastrophes.

The second one. Number of hazardous technogenic facilities increased dramatically, and it continues to grow almost without control; there is also risk of nuclear war preserved.

The third one. Some astrophysicists express concern and even forecast occurrence of various cosmic affects to the planet in the nearest future, including falling of large asteroid on the Earth or possible encounter with quite exotic and unexplored cosmic formation as "black hole". Therefore new threats for survival of mankind are showing up in relatively close future years, countermeasures to which still have to be developed.

The most important conclusion from this new reality is that people of the Earth should immediately unite for consolidated protection, and the threat is so serious that people of the Earth should urgently abandon preparation to initiation of wars between themselves, and devote all intellectual and material resources to the matter of saving

humankind in the future cataclysms which can occur on the planet. The main philosophic moral comprehended by humankind in Chernobyl is that almost everybody is destined to meet "own catastrophe", which for many of people shall become their main examination in life and shall detect the true nature and value of personality.

That is why one should prepare physically and morally to such possible meeting with catastrophe from early childhood – in order to:

– to survive himself/herself;

– to protect, to save close people;

– to help others;

– to show (to the full extent) maximum organization, engineering-inventory skills and other talents for counteraction to catastrophes and overcoming of their consequences, to protect people.

It is necessary to develop on regular basis "algorithms of welfare recovery" in relation to possible scenarios of accidents and catastrophes in order to edit previous calculations regularly on the grounds of monitoring data.

Structure of such scenarios should include five aspects: prophylactics – prediction – survival (after catastrophe) – consequences (their detection) – overcoming of the consequences. For example in relation to major technogenic facilities welfare algorithm should include the following set of actions:

prophylactics – includes structurally set elements of safety and provision of conditions for their normal functioning;

prediction – monitoring of situation and analysis of received data with timely input of editions and informing of administration and population;

survival (after catastrophe) – social-psychological preparation of personnel of the facility and neighboring population to actions in case of occurrence of extreme situations in order to provide adequate reaction and avoid panic (even training is permitted – in administrative sphere and sometimes massive training);

consequences – detection of the whole list of consequences including – forehanded preparation of them according to possible scenarios;

overcoming – development and step-by-step implementation of the whole system of overcoming of possible consequences up to distant ones and rehabilitation of damaged landscapes.

For development of complex of anti-catastrophe countermeasures unique scientific schools, which theoretically comprehended national experience of counteraction to accidents and catastrophes in various branches of industry, power production, transport, public utilities, agriculture and forestry, will be helpful. And firstly – internationally acclaimed schools of radio ecology: this is a school founded by N.V. Timofeev-Resovsky, distinguished by biogeocenological specialization and also numerous cohort of school of V.M. Klechkovsky, academic of the All-Union Academy of Agricultural Sciences named after Lenin which had distinct radio ecological specialization. According to which in case of radiation pollution of habitat radioactive pollution of agricultural products is of greater importance, than radiation damage of plants and animals. Workers educated by him bore the main burden of overcoming consequences of catastrophes in Kyshtym (1957) and Chernobyl (1986). They accumulated experience of several generations of researchers who showed unprecedented dedication in liquidation of the most major manmade catastrophes of XX century.

Radio ecological, social-psychological consequences and philosophic morals of catastrophe in Chernobyl were published in the author's monograph "Chernobyl catastrophe and agricultural ecosphere: consequences and countermeasures (2011)" in which results of 25 years of research and practical experience of works executed in terms

of radioactive pollution of territory are summarized and shown in dynamics of radio ecological condition of environment, regularity of accumulation of radionuclide in plants, in body of productive animals, and countermeasures are suggested which guarantee production of normatively clear agricultural products and radiation safety of population living on polluted territory. Chronic combined radiation damages and their distant consequences for farm and wild animals were studied for the first time in world scientific practice.

GLOBALIZATION AND MODERN URBAN-PLANNING POLICY

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"People of the country…" – that is how usually starts constitution of many democratic states. Thus, a man is underlined as primary value of the state. At that, majority of the state problems is overcome in favor of a man – preservation of rights, welfare and life quality. Day by day the population of the World is increasing for a quarter of a million. Starting from of 50-ies and the beginning of 90-ies of XX century the population of the World has doubled.

Rapid cities growth is observed. Situation today dictates a range of conditions for the further development of urban-planning policy, offering, thus, fundamentally new complex of problems that should be solved not only at local and regional levels, but with the help of the mutual efforts within frameworks of interregional and international programmes as well.

The paper offered below mostly investigates key administrative tools and conditions favourable for successful implementation of administrative regulations in the field of urban-planning policy. Alongside with competent policy, carrying out of respective reforms strengthens worked-out policy. In this long term and complicated process importance of cooperation at international/interregional level, both within local administrative units and as result of organizational interaction, positive feedbacks and mutual benefits are also stressed.

Considering benefits and returns one should not ignore all negative affects and primary concerns arising with rapid urbanization and growth of the cities, such as wastes, unrecoverable products, pollution, cost rising and others that are also reflected in the given paper. At the same time this paper separates role of state and private sector activities and their role in this factor as well as points out possible ways of their cooperation and how they both can profit.

Key words: administrative tools, urban-planning policy, initiatives, innovations, investments.

URBAN SLOPE FAILURE THREAT AND PEOPLE-FRIENDLY EARLY WARNING SYSTEM IN THE KLANG VALLEY REGION MALAYSIA

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This paper is an outcome of a research conducted in the Klang Valley Region (KVR) on the investigation of slope failure threat and people-friendly slope failure early warning system (EWS). Rapid urban development and concentration of population has caused tremendous shear stresses on urban slopes in the Klang Valley Region. The natural and human-related stresses eventually have increased vulnerability of slopes as well as exposed settlers in this region to slope failure threats. Over the past decade or so the KVR has recorded increase in slope failures which justified the requirement for a people-friendly EWS for the slope failure threaten populaces in the urban areas. In order to reduce to impact of slope failures, slope failure early warning system should encompass not only technological components but also address the requirement of slope failure assessment, hazard management and EWS. The study therefore has undertaken the task of examining the current situation of the early warning system for slope failure in Klang Valley Region. The article collected information from reports by the Public Works Department (PWD), archival research, and by interviewing the officers who manage slope failures in PWD. The article proposes a people-friendly slope failure EWS model which could increase awareness and ensure sustainable living conditions in Klang Valley Region.

Key words: slope failures, early warning system, urban dwellers, Klang Valley Region.

APPLICATION OF URBAN DESIGN TO VITALIZE THE LOST WATERFRONTS IN DROUGHT SITUATION OF IRAN MEGACITIES

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The aim of this paper is to identify urban design approach and methods to design the lost waterfronts in center of Iranian cities in case to drought. Changing climate in recent years in Iran changed mental image and real perception of laypeople in cities; therefore, those waterfronts were places for recreational activities of civilians lost the attributes and characteristics to invite laypeople. The megacities have more impacted by the drought situation and there are not any visions to solve the climate. To consider this agenda, in research was applied qualitative methods especially documentary, site reconnaissance, and in depth interview by researcher to analyze status quo of places. Findings of this paper show that with application urban design methods could create those qualities that users looking for them and could vitalize the metal image of laypeople with design codes. Results of this research could identify that qualities in cities are vital and with design codes could innovate and save qualities with new approaches in application the techniques and methods however in drought time and without water in those places.

Key words: waterfronts, urban design, qualities.

DISASTER MANAGEMENT IN ISTANBUL RAILWAYS

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Istanbul is the most populated city of Turkey with a population of around 12.0 M (2010) living on around 5,750 km^2. In 1980, the population was only 4.7 M and then it has been more than doubled in only two decades. Uncontrolled, illegal and rapid urban development in last 30 years caused destruction on green areas, water basins and agricultural areas. Developing transportation network has also accelerated land use change in Istanbul, so natural resources on these areas have been affected negatively. Because of the location and topographical structure of the city, it is very hard to create sustainable and effective transportation networks. Railway transportation will be the most important mode of transport in 2023, the 100th year of Turkish Republic. A perfect disaster management system is mandatory for safety of both the system and the passengers. For this purpose, Istanbul uses international rules and procedures in accordance with local needs. This artcile will summarize what kind of disaster management rules and techniques are applied in design, construction and operation processes of railway systems. Especially the precautions for earthquakes, floods, fires and etc. disasters will be analysed.

IGMASS AS A TOOL FOR EVOLVING GLOBAL AND REGIONAL DISASTER SECURITY INFORMATION AREAS

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The capabilities of astronautics in the permanent global monitoring of all layers of the geo-sphere, geo-information technologies and space means of rescue in emergencies are well known. These achievements, now in use across the globe, are hard to overestimate. Those include satellite geodesy, navigation, meteorology, communication and television, satellite relaying information, Internet, distance learning and universal education. Without them it is hard to imagine today the daily life of "the planet of people". The combination of achievements in space and information technologies integrates the world community into "a global village" and promotes the steady development. However, in order to avoid unpleasant surprises in this area in the form of unpredictable consequences, it is necessary to look into the future, for which purpose the services of sociologists and political analysts are unavoidable. The space exploration today starts socialization of space. With the growth of applied use of space, new questions arise spontaneously and new aspects become obvious in the system of social and political priorities. The classical political and economic problems come to be regarded in a new light and the economy comes to grips with new tasks. Thus we have not yet learned how to adequately measure and plan the funding of space exploration, how to assess the ecological damage sustained from this and how to handle such issues in terms of economy and

engineering. Also, we need to learn how to forecast the pricing of space products and services and how to calculate the economic effect of each space launch. Contemporary multi-faceted space exploration rests on a single foundation whereas its components supplement one another. The ultimate goal of space exploration is to serve mankind in general and each individual in particular, primarily in the sphere of security. The better understanding of Nature by man helps to enhance both environmental and social security. That is why space exploration issues have become vital today. Addressing them adequately and quickly is a top priority task for understanding the social genesis of progress of science, technology and civilization in general. Without this it is impossible to map out the strategy and tactics of advance of science and technology, to improve forecasting, programming, planning, decision-making in any sphere of material and spiritual production, including applied astronautics, which from the theoretical point of view is today *a humanistic value that ensures global security and means much more than the conventional interpretations*. Thus, one of the urgently important tasks may become the formation of "the secure information space" as part of the above mentioned "information sphere" that thwarts global threats and reduces the risk of their emergence. It's common knowledge that mankind has always lived in zones of internal and external risks, which have become part of people's everyday life. As a source of tension and apprehension, such risks stimulate the progress of civilization. With the change of epochs and technologies some of them disappeared (softened), whereas others were handed down as "legacy" to the next generations. Such risks often turned into new, more formidable ones, which time and again materialized in the form of outer and inner threats to civilization. Outer threats are those coming from outer space. So, the cycles of anomalous solar activity were followed by cycles of global climatic changes with glaciations, floods, which led to global cataclysms. The inner threats are natural calamities and man-made disasters (accidents resulting from human activities). Dangerous natural phenomena are often triggered by man's actions whereas natural calamities, in their turn, often cause man-made catastrophes. In any case, such dangerous natural phenomena as the sinking and under-flooding of terrain, landslides, tropical hurricanes and even increased seismic activity may result from mankind's intensified attempts "to transform nature". At the turn of the century the risks from man's impacts came close to a crisis which may become a threat capable of irreversible processes with the most deleterious consequences for mankind. In the current conditions, the elaboration and realization of balanced decisions by authoritative international institutions (the UN being the main one), it is necessary to possess relevant information whose amount, the rate of delivery and update correspond to the dynamics of the global on-going processes. Such information could be obtained using the resources of space facilities belonging to national and transnational institutions. The latter, being territorially separated, could be united under the IGMASS project, which is being implemented under the auspices and supervision of the United Nations. The current globalization gives any user of communication facilities a convenient opportunity, on the one hand, to access an aggregate information resource (which in some cases may be anonymous), and on the other, to distribute information freely among a vast number of users. In this case, the transnational information traffic in science, technology, economics, education, culture, business, advertizing, etc, eliminates the historically established value system, and levels the mentality, thus turning political borders into artificial obstacles. If brought to the extreme, this process may lead to an information war. The trend can be prevented by further development of purely humanitarian aspects of IGMASS by uniting telecommunication resources for addressing mankind's issues of spreading education and preserving cultural and moral values. Thus, "the information space of global and regional security" may be converted from a philosophic and futuristic notion to a practical one. For

this purpose, the rightly organized power, which ordinarily supports direct and indirect information links, must draw up a compromise that would ensure a steady advance. This can only be achieved if all the operators have an adequate access to information that can be placed in the global security space created with the help of modern and future space systems of all countries.

INTERNATIONAL GLOBAL MONITORING AEROSPACE SYSTEM IGMASS – NEW APPROACH TO THE DISASTER MANAGEMENT ISSUE

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The report is devoted to the Project of the International Global Monitoring Aerospace System (IGMASS) - an initiative of Russian scientific and public organizations, actively promoted during last two years at the interstate level, to create the system of systems for effective warning of the world community about global threats of natural disasters and man-made catastrophes, including risks of space origin. Scientific background of the Project is the concept of detecting (with the use of special space, aviation and land based equipment) so-called "premonitory signs" of natural disasters, which appear in the form of anomalies at lithosphere, hydrosphere, atmosphere and ionosphere and could be used for forecasting of coming catastrophic phenomena of geological or meteorological origin. Among advanced IGMASS missions are: early prevention about meteoric and asteroid threats, and also - about dangerous situations on the near-Earth orbits, caused by man-made objects (well-known phenomena of "space junk") with future farsighted formation of "informational spatio of global security". The project was actively supported by the Russian Academy of Cosmonautics named after K.E.Tsiolkovskiy, International Academy of Astronautics, some profile UN institutions, space agencies, well known scientists and authorities. According to common understanding the system is not an alternative to existing projects and programs of disaster management, but an attempt to unify efforts of the international community on so important issue mentioned above. However, the Project's implementation connected with a complex of scientific and technical, technological, organizational, political-legal and economic problems that should be solved in wide international cooperation. At the same time two international specialized symposiums in Cyprus and in Latvia, eighteen profile presentations of the IGMASS concept at international conferences and seminars, on the COPUOS and its technical-scientific subcommittee, and, at last – formation of "The International Committee on the IGMASS Project Implementation" as supervising body of the Project, which has signed more than fifty MOU about cooperation with various organizations worldwide, all that brought popularity to IGMASS ideas both in Russia, and abroad. That genuine interest to the IGMASS Project allows to start our R & D in practice, to overturn advanced ideas of Russian scientists into subject matter. Therefore, the IGMASS Project could became in the nearest future a large-scale international initiative in the field of peaceful outer space exploration, based on principles of multilateral, mutually advantageous cooperation.

INTERNET AS A TOOL FOR FORMING GLOBAL NETWORK FOR PREVENTION AND COMBATING THE EFFECTS OF GLOBAL NATURAL DISASTERS

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The beginning of the XXI century, literally brought down on us series of natural and technological disasters, which seem to have no end. News from around the world about new natural disasters comes every day: eruptions, earthquakes, tsunamis, tornadoes, and forest fires. With an increasing number of disasters has risen also an interest in their forecast. Have been created new technologies to predict the earthquakes, tsunamis prognostic system, floods, fires and other natural disasters. Examples include DART system (Deep-ocean Assessment and Reporting of Tsunamis), the Global Network for the Forecasting of Earthquakes (GNFE), Numerical weather prediction systems. Many of them went further and withdrew their technology on the Internet, what allowed them to go from local to global. The Global Network for the Forecasting of Earthquakes one of the first took this initiative. Since the beginning of 2009, began the installation of the earthquake forecasting stations around the globe, and sharing them would be impossible without the use of advanced Internet technologies. GNFE has connected all of its stations to a single network via Internet. This allowed unite the research centers in different parts of the world into a single network, in which each member of the network in real time can get an earthquake prediction by using the tools and programs available in online mode and using information coming from all stations including those which are in thousand kilometers away.

ALMATY – SEISMIC AND MUDFLOW ZONE

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Almaty – the city in Central Asia, is situated in in a seismic zone. Earthquakes, mudflows - are the most important threats in Almaty. In June 2011, in Almaty there were number of strong earthquakes up to 5.5 points. The tremors were not strong enough to cause damage. The epicenter was in the eastern Kazakhstan which is 225 km from Almaty. In June 5 in the East Kazakhstan there was four points earthquake. The epicenter was located 223 kilometers from the city Zaisan. April 19 morning, in Almaty, there were two tremors with magnitude of three to four points. The epicenter was located 260 kilometers from Almaty on the Kyrgyz-Chinese border. Strength of the tremors was 5.2 points. There were no casualties. All the prominent Russian scientists ascertain about the Earth joining in 2012-2015 years in the stage of global seismicity. In this connection, there is a real threat of a devastating earthquake in Almaty, which is located in an active seismic zone. Journalists should sound the alarm first.

Last catastrophic earthquakes occurred in Almaty in 1887 and 1911 and regarding to all forecasts should be repeated again, but since the explosion at Medeo this has not happened.

Looking to the facts, it is a very high possibility that the tremendous explosion in Medeo (1963) which was made for the construction of the dam antimud slide, played an important role not only in reducing, but also in preventing the number of devasting earthquakes in Almaty. - said Doctor of Geological and Mineralogical Sciences Kazantsev. He calls for measures to prevent the disaster. And also to solve the evacuation issues, increased seismic resistance of buildings, disaster destruction, etc.

Important problem for the residents of Almaty is the threat of landslides, which comes from the mountain lakes of Manshuk Mametova (lake number 6) and others, which are located above the town.

The most dangerous hotbed of mudflow is directly over the heads of Almaty citizens. This lake is number 6 on the glacier of Manshuk Mametova. However, "Kazselezaschita" is not in hurry to remove the danger, making the artificial draining of the lake.

Scary mudflow in 1921, which struck Alma-Ata, described the scientist and naturalist, V.N. Shnitnikov. Stream mudflow broke into the city along the street Kolpakovsky (Dostyk Avenue), and then moved on to the street Pushkinskaya Naryn (Krasin). Mud mass covered Kopal (Kunayev) and Sergiopolskiy (Tulebaev) streets. All the houses, gardens were destroyed, and the terrain was completely unrecognizable. The streets were covered with a layer of dirt meter thick! Mudflow turned the stones several tons of weight - wrote Shnitnikov .The huge mass of mud with boulders and ice could collapse at Almaty, sweeping away everything in its path! The number of victims could amount to tens of thousands of people! It has been almost 40 years after the city rushed catastrophic mudflow wave height above the seven-storey building - then a terrible element kept the dam in Medeu. This time, scientists have questioned that the main mudflow protection of the city can withstand.

This is a list of problems facing not only the organizations directly responsible for protecting the public from natural disasters. All services, especially the media should help to prevent the cataclysm, to teach people how to behave during the cataclysm.

SECTION 6
Construction

NEW TECHNOLOGY OF SEISMIC STAIBLE CONSTRACTION "DANCING BUILDING TECHNOLOGY"

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NEW TECHNOLOGY FOR SEISMIC RESISTANT CONSTRUCTION (Short Title: Seismic Resistant Building, Project Code Number: SfP-982167) is a 4-year multinational NATO-sponsored research project aimed to develop a new effective technology of seismic-resistant construction (www.sfp-982167.org).

The Project involved scientists and experts from Azerbaijan and Turkey.

The main idea behind the Project has been to develop and introduce a simple and affordable technique of designing and building brick houses as well as walls and other structures to prevent them from collapsing during high magnitude earthquakes and strong explosions of various nature, minimizing thereby the number of victims, with the ultimate goal to secure seismic safety of people all over the world, especially in least developed countries.

The Project's objectives are in line with NATO policy for providing people's security and reducing human victims and damage caused by earthquakes and terrorist acts.

The technology has its name commercially patented as "DANCING BUILDINGS TECHNOLOGY" (short: DBT) with the reference to the fact that during strong earthquakes, those buildings are distorted rather than destroyed and the deformations resemble dancing movements.

Following the implementation of the 48-month Project, several goals have been achieved

- A new, simple and affordable technology allowing construction of low-rise (1-3 storey) seismically stable houses capable of withstanding earthquakes and explosions has been created.
- A seismic platform (shake table) unique for the regionwith an area over 10 sqm has been designed and its operation started to simulate vibrations similar to those of strong earthquakes.
- Model buildings constructed under the new technology has been built and tested on the platform.

- Machine tools for production of seismic-resistant construction blocks and damping elements with low prime cost have been designed and made.
- Technical specifications (state standards) and several patents for the seismic-resistant construction blocks have been obtained.

EXPERIMENTAL RESEARCH OF THE DYNAMIC PARAMETERS OF HIGH-RISE SKELETON-TYPE BUILDINGS AT VIBRATING SEISMIC LOADINGS

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Research of dynamic properties of various materials and elements of structures at shock affecting and on the waves so many scientific works of the Azerbaijani scientists are devoted [1-10]. However, experimental definition of dynamic parameters of fluctuations of constructions and buildings while carries estimated character.

The purpose of the present experimental researches is definition of parameters of fluctuations of installation of observations, in this case, a mockup of four floor buildings and sixteen floor skeleton-type buildings built in the Baku with the stiffening diaphragm at natural vibrating seismic affectings.

Key words: fluctuations, seismoreceivers, dynamic experiments, acceleration

THE ELEMENTS OF BIOHARMOLOGICAL BUILDING DESIGN

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In this study the field of bioharmology was introduced while also indicating the points required to be made by the respective parties for the building design to be appropriate and well-balanced for users' properties, needs and expectations. In addition, the fundamental points in terms of theoretical basis of bioharmology and the subject of balance and harmony in material selection were touched upon in the study. In this context, the factors such as planning, project designing, process steps of implementation spatial properties and their architectural reflections were presented. Bioharmology can shortly be defined as the science of harmony and balance in building design. In this sense, the buildings which are in harmony and balanced with their users are called "bioharmological buildings".

Key words: Bioharmology, sustainable building production, building design, harmony and balance in building, comfort conditions.

UNDERGROUND METALLIC EQUIPMENT'S CATHODIC PROTECTION FROM ELECTROCHEMICAL CORROSION USING SOLAR ENERGY

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Corrosion appears as the main reason of different type metallic equipments' destruction in junctures, particularly in mass fires, floods, tsunami and especially in earthquakes with big magnitude. Yearly material resources, spent only on recovery of corrosion losses in defense technology, oil-gas sector and communal services, are estimated at a hundred billion dollars. But when the matter is the human facto that is human life is under threat because of the corrosion of cistern or pipelines, with which is transported highly inflammable toxic substances, it is difficult to estimate the quantity of material damage caused by corrosion. Theoretically it's shown that metallic equipments' protection from electrochemical corrosion can only be by application of cathode, tread, drain and in number of cases combined protection.

The possibilities of underground metallic equipments' protection from electrochemical corrosion by using solar cathodic system (SCS), supplied with photoelectric current sources (PCS), are considered in the current work. Photoelectric current sources' selection is conditioned on that they are noiseless and their usage is not connected with environment pollution, as well as disturbance of planet's warm balance. Photoelctric current sources do not demand routine service, safe in work and durable. Therefore they are irreplaceable current sources for number of strategic objects' power, as well as cathode systems located in hard-to-reach areas. For studying corrosion process and subsequent selection of optimization parameters SCS, we have carried out labaratory experiments with accounting of different operating conditions. The experiments have been carried out within 50 days in five polymer vessels, filled with brackish, sandy-clay soil. Inside of each vessel has been established 10 protected (cathode) and one sacrificial (anode) electrodes from steel, which have been strictly placed in circle and vertical direction. In the capacity of electrode comparisons have been used saturated copper-sulphate half-cell. Power supply regime of electrodes (duration and repetition period of pulsed regime of power supply) has been selected with regime accounting of PCS's work in different weather conditions of summer, spring-autumn and winter seasons of year. In the period of experiment's carrying out in all steels, humidity and temperature of soil maintained in established level. For samples' cleaning from corrosion products, has been used hydrochloric acid (HCl) and with the aim of prevention dissolution of metal itself, in the capacity of inhibitor it has been added 1-2% solution of formaldehyde to hydrochloric acid (HCl). Within carrying out practices protective current changed within the scope of 0,5-2,0 A/m^2, potentials' difference between anode and cathode maintained in the level -1,1÷ -1,2 V. For all concerned cases has been defined levels of protection from corrosion, corrosion speed and mass loss. In the result of carried out experiments, has been established that in intermittent regime of power supply, as well as after prolonged polarization of protective electrodes (more than 20 days) high level protection from electrochemical corrosion is achieved. In this quantity of level corrosion decreases to only 2-5%, comparing with continuous operation, which shows their high level protection in comparison with chemical methods of protection. Further with accounting of achieved experimental results, has been worked out automatic SCS, which as opposed to similar systems, is able to work both in "cathode" and "anode" regimes, that is the base of its advantage. In the work is presented diagrams and principles of work developed by SCS.

GEOCHEMICAL EVALUATION OF ARSENIC IN EFFLUENTS, SURFACE AND GROUNDWATER IN IBADAN METROPOLIS AND POSSIBLE REMEDIATION METHODS

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Arsenic, a toxic metal, constitutes critical quality index regarding pollution of drinking water sources and attendant health problems, such as, skin and lung cancer. There is limited information about arsenic concentration in effluents, surface and groundwater in Ibadan metropolis. Hence, the need for geochemical evaluation of the water sources, to determine the level of arsenic concentration and to assess possible remediation methods. Geochemical analysis was carried out on six rock samples using Inductively Coupled Plasma - Mass Spectrometry (ICP-MS) method. Forty-four water samples from surface water (19), groundwater (11) and effluents (14) were subjected to hydro-chemical analyses to determine their metal contents using Inductively Coupled Plasma - Optical Emission Spectrometry (ICP-OES), with in-situ field measurements. Remediation studies using filtration and phytoremediation methods were carried out. Arsenic acid (100 ml) of 10.0 mg/l, 20.0 mg/l, 50.0 mg/l and 100.0 mg/l was passed through four different geo-materials (marble, activated charcoal, filtration carbon and clay) placed on layers of different grain sizes of sand in glass filtration tanks. Filtrates collected were analyzed for arsenic using ICP-OES. Phytoremediation was done by cultivation of matured water hyacinth (*Eichhornia crassipes)* in 10.0 mg/l, 20.0 mg/l, 50.0 mg/l and 100.0 mg/l of arsenic acid. Sprouting, flowering and matured water hyacinth were grown in arsenic acid solution of equal concentration (100.0 mg/l) for different durations in hours (0, 2, 12, 24, 48 and 120). The plants were harvested, dried, pulverized and analysed for metal content using Inductively Coupled - Ion Chromatograph. Geochemical analyses of rocks revealed that quartzite has highest arsenic concentration (0.8 ppm) compared to banded and augen gneisses (0.01 ppm). Thus, areas underlain by quartzite are susceptible to arsenic contamination. Other metals in the rocks include Cu (0.3-6.4 ppm), Zn (11.0-9.0 ppm), Pb (4.1-19.6 ppm) and Ba (445-1188 ppm). Ruxton Ratio (6.8) shows medium – high rate of chemical weathering. The pH values of the different water sources ranged from 5.9 to 7.2 with the lowest value (5.9) observed in effluents. Electrical Conductivity and Total Dissolved Solid for the different water sources ranged from 0.2-124.0 (μS/cm) and 0.3-191.0 (mg/l), with the highest values in effluents. Hydro-chemical analyses indicated that As, Zn, Cu, Pb and Ba concentrations are within the stipulated limits for drinking water, however, high arsenic (0.02 mg/l) was recorded in effluents. Inter-elemental analysis in effluents revealed strong correlation between As and some of the metals Cu (0.7), Pb (0.9). High pollution index (6.57 mg/l) obtained for As confirmed high level of pollution. Arsenic concentration in filtrates showed no arsenic loss, indicating poor absorption capacity of the geo-materials. Highest uptake of arsenic was recorded in the roots of matured and leaves of sprouting water hyacinth, at period ranging from 12 to 120 hours, while low arsenic concentration was observed in the stems. Water hyacinths also bio-accumulate Cu, Ba, Zn, and Pb. Water sources in Ibadan metropolis are prone to arsenic

contamination from leaching of weathered bedrocks and effluents. Phytoremediation with water hyacinth compared to filtration is a better remediation method for arsenic removal.

Key words: Phytoremediation, Contamination, Arsenic, Filtration.

ASSESSMENT OF RISK CAUSED BY THE NATURAL HAZARDS AT THE SANATORIUM CONSTRUCTION SITE IN THE COASTAL ZONE OF THE BLACK SEA, THE PITSUNDA PENINSULA

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The Pitsunda Peninsula belongs to the Abkhazia territory. It is situated on the Black Sea coast of the Caucasus and represents an ancient accumulative landform resulted from the Holocene transgression of the Black Sea. The engineering geological conditions of the peninsula are controlled by the following specific features:

- a relatively even surface at -0.7–6.5 m a.s.l. with marine beach ridges, lagoon depressions, and ancient lagoon relic lakes;
- location within the seismically active zone with the initial seismicity 9 M and the earthquakes recurrence once in 1000 years;
- a thick massif of marine and alluvial–marine deposits of late Pleistocene and Holocene age composing the upper part of the geological cross-section, which consists of pebble, sand, silty clay and silt;
- groundwater level close to the surface, unfavorable conditions for surface- and subsurface-water runoff, development of waterlogging and bogging, and technogenic impact of drainage network involving more than half of peninsula territory.

The sanatorium is designed in the peninsula southwest, 300 m far from the Black Sea coast. This will be a building of variable number of storeys (maximally, 9 above-surface storeys) and deepened for 2 m. Hydraulic isolation and tubular ring drainage around the building are proposed as protective measures against waterlogging. Bearing structures are performed as a monolithic reinforced concrete carcass. To protect the building from seismic impact, the building will be subdivided into blocks of different size by seismic-control deformational seams. The natural marine, atmospheric, and geological processes and phenomena manifested in the Black Sea basin that exert considerable harm to the economy and ecology in the region have been analyzed. The study of natural hazards that may develop in the Pitsunda Peninsula brought us to the conclusion that the risk of waterlogging, seismicity and whirlwinds should be assessed at the construction site. This assessment was performed according to A.L. Ragozin procedure. As proceeds from our calculations, the designed measures for protection from natural hazards will provide the adequate operation of this engineering structure.

ESTIMATION OF SEISMIC TREATMENTS IN HIMALAY REGIONS OF INDIA USING THE STATISTIC OF THE EMPIRICAL DATA

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The Himalayan areas of India are ones of the most seismically active regions of the world. There are some strong ground motions networks at this territory. But the library of strong ground motion records is not too rich. This circumstance has made use of a stochastic technique for estimating the seismic hazard traditional in India. The given research represents it the first experience in India to a counterbalance according to seismic hazard of the specified territory using statistics of the empirical data. Before semi-empirical relations were used (pre-selected mathematical expression with empirically estimated coefficients). One of regions under investigations was Shillong – Assam, the part of Northeastern Region (NER) of India. Two networks of the strong ground motion recording stations are under operation in the area of Shillong - Assam. The local records obtained by these seismic stations since 1986 compiled our dataset.

The records from distant earthquakes were excluded from analysis to reduce influence of different source zones peculiarities. The ground type in the recording point was taken into account. Because of shortige of local felt earthquake records, it is possible to develop the regional empirical relations for the logarithmic spectral bandwidth and coefficient of dynamic amplification only. These parameters practically not depend on earthquake magnitude and distance. For the peak ground acceleration, predominant period and shaking duration is proved the application of the empirical relations obtained earlier using world-wide records.

The main parameters of the expected earthquake were estimated. The reconstruction of accelerogram due to Great Assam earthquake is provided. Another region is situated at the Northwestern Region (NWR) of India. Here are more local strong ground motion records including Dharmsala, April, 26, 1986, (M_S = 5.4), Uttarkashi, October, 20, 1991 (M_S = 6.8) and Chamoli, March, 28, 1999 (M_S = 6.7). Besides, 151 strong motion records obtained in this area since 2005 has been used to develop the empirical relations for the prognosis of the parameters of the strong ground motion. The used real database has limited within distance and magnitude ranges of $1.0 < R < 100.0$ km and $3.5 \leq M_w \leq 5.3$, respectively. But nevertheless using the world data together with these local data it is possible to develop the pure empirical attenuation law for earthquakes of NW Himalaya. Obtained results allow to predict seismic treatments due to expected strong earthquakes and very easy mapping of expected ground acceleration. This method can be applied to the seismic hazard assessments and especially for the seismic treatments evaluations in other regions of world.

Key words: Seismic hazard, peak ground acceleration, predominant period of ground vibration, duration of seismic vibration, coefficient of dynamic amplification, logarithmic spectra bandwidth, synthetic accelerogram.

CONSTRUCTION SAFETY AND BUILDING CODES

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Every Building Code must contain two parts: expected seismic treatment and rules for construction design using expected ground motion. But there is practically no information about parameters of ground motion in recent Codes. Structure engineers believe only ground acceleration determines the building damage.

The periods of vibration according to Building Codes depend on ground type only. But predominant period of ground shaking more depend on the earthquake magnitude and distance. The parameters of ground motion which should be included into Building Codes are determined. It is shown that the ground velocity and displacement are correlated with damage degree practically with the same accuracy as the acceleration. The duration of seismic vibration is very important also.

The correlation of seismic intensity I and different parameters of ground motion is examined: PGA - peak ground acceleration, PGV - peak ground velocity, PGD – peak ground displacement, d - shaking duration determined as the time interval between first and last time the oscillation envelope is half of maximum amplitude.

The standard deviations σ are expressed in the intensity units. For example, for $I = 8$ it is obtained: $\sigma(PGA) = 0.60$; $\sigma(PGV) = 0.55$; $\sigma(PGD) = 0.70$; $\sigma((PGA)^2 \times d) = 0.35$; $\sigma(PGA \times PGV) = 0.26$. It is easy to see, that the PGA isn't the best characteristic of seismic treatment. The best one is the wave power (PGA×PGV). It should be noted that in epicenter area for subduction zones the level of acceleration is much higher than in other regions.

Key words: Seismic intensity, peak ground acceleration, peak ground velocity, peak ground displacement, wave power, wave energy, standard deviation.

PROBABILISTIC SEISMIC HAZARD ASSESSMENT OF METROPOLITAN TEHRAN

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Seismic hazard assessment and zoning of the metropolitan Tehran, the capital city of Iran, is conducted using probabilistic approach. Two maps have been prepared to indicate the earthquake hazard of the region in the form of iso-acceleration contour lines. They display a probabilistic estimate of peak ground acceleration –PGA- over bedrock for the return periods of 475 and 50 years. Tehran is a densely populated metropolitan in which more than 10 million people live. Many destructive earthquakes happened in Iran in last centuries. It comes from historical references that at least 6 times, Tehran has been destroyed by catastrophic earthquakes. The oldest one happened in the 4th century BC. A uniform catalog of earthquakes containing historical and instrumental events covering the period from the eleventh century A.D. to 2003 is used. Twenty potential seismic sources are modeled as area sources in the region. Seismicity parameters are evaluated using the method in which magnitude uncertainty and incompleteness of earthquake data are considered. The calculations were performed using the attenuation relationship developed by Ambraseys et al. (2005). Seismic hazard assessment is carried out for a grid of 1350 points with 0.1° intervals using a program developed in Matlab program for the study area

encompassed by the 49.5–54°E longitudes and 34–37°N latitudes. PGA values for this region are estimated to be 0.34-036 g and 0.15-016 g for 475- and 50-years return periods, respectively.

STATISTICAL FEATURES OF EARTHQUAKE WAITING TIMES

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For the understanding of the long-term variation in earthquake occurrences, earthquake predictions, and seismic risk estimates, it is necessary to study the frequency or probability distribution of time intervals between successive earthquakes (interoccurrence times). The features of interoccurrence times of earthquakes are studied by analysing the seismic catalog of Iran. We divided the spatial areas into a window of L degrees in longitude and L degrees in latitude. For each bin, earthquakes with magnitude m above a certain cutoff magnitude were considered. We analyzed the interoccurrence times and then performed the data fitting in the time domain. Appropriate distributions were chosen via goodness of fit tests. We have found that the probability distributions of time intervals between successive earthquakes can be described by the gamma distribution. In other word, the calm times obey the non-exponential distribution, even though the tectonic conditions, the cut off magnitudes and the size of the bins are different. This indicates that the sequence of earthquakes is not a Poisson process. By decreasing threshold magnitude, the interoccurrence time distribution changes from the gamma to the generalized normal distribution. This infers that that gamma statistics and generalized normal statistics coexist in the interoccurrence time statistics of different seismotectonic regions of Iran.

RESEARCH OF MOVEMENT CYLINDRICAL INCLUSIONS IN THE VISCOELASTIC MEDIUM DESCRIBED MODEL FOIGHT

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A large number of works is devoted movement of cylindrical inclusion in the elastic medium [1-3]. The problem about cylinder movement in the viscoelastic medium is considered and dares in the given work. Decisions answering to the necessary boundary conditions are connected with analytical difficulties. Therefore at reception of originals of the problems solved to operational methods numerical decisions or the approached satisfaction boundary conditions are used. Received the solution in work [4] is limited in time. The solution not restricted on a time is created, however, the boundary conditions are dictated by possibility of reception of simple analytical forms.

THE NONLINEAR THEORY OF INTERACTION UNDERGROUND CONSTRUCTIONS WITH A SOIL ROCK UNDER VARIOUS EXTREME SITUATIONS

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Authentic computer modelling and forecasting on the basis of developed mathematical equivalent management model with soil and rock massifs conditions under various extreme situations is actual and progressive directions in the solution of the industrial safety maintenance problem. In the given work it has been made an attempt to do the analysis of the underground spherical cavities condition and a cylindrical vertical operational chink with mathematical methods for the purpose of definition of the their intense-deformed condition, the reason of a cavities collapses and changes of their geometrical parameters within the time. The considered problem comes to the solution of non-uniform differential equation of the second order with variable factors.

THE PARAMETERS THAT CAUSE TORSIONAL IRREGULARITY IN RC BUILDING UNDER EARTHQUAKE EFFECT

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It is known that in large measure of the existing structures in Turkey is RC buildings. Because of the Turkey is a earthquake-prone country, seismic forces play an important role in structural design. One of the main reason of structure damage occur during earthquake, it is caused by the behavior of structure on floor level against ground motion. In point of structure engineering it is easy to calculate displacement and member forces under static loading, but when investigating the effect of dynamic loading on structure, the different parameters is being the point of question. It is accepted that the torsional effect is one of the mentioned parameters and the torsional behavior is the main reason why the most RC building has weak earthquake performance. In this respect it is important that take into account torsional behavior under seismic forces effect and reflects to the analysis results. Torsional behavior cause to increase displacement on flexible side of building to decrease rigid side for such building has additionally eccentricity between mass and rigidity center on acceptable limit. The designs that torsional effect is ignored, end up heavy damage or collapse, especially in high-rise buildings and torsional behavior has effect on storey drift. This situation brings out collapsing over loaded bearing member and so buildings. In the presented study it is aimed to determine the parameter of effecting torsional behavior by the help of three dimensional finite element analyses and to take into consideration torsional effect in all its parts in structural design.

Key words: Torsional behaviour, RC building, Seismic effect, Earthquake codes

INVESTIGASTION OF SDOF IDEALISATION FOR STRUCTURES WITH OPTIMUM TUNED MASS DAMPERS

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In this research paper, single degree of freedom (SDOF) and multiple degrees of freedom (MDOF) idealization of superstructures were compared for optimization of tuned mass damper (TMD) implemented on top of superstructures. A metaheuristic optimization algorithm, harmony search (HS) was used for optimization process. Several earthquake data recorded from various locations of the world were used as external excitation during the optimization. Two different seven storey structural model were investigated. One of them has the same characteristics for all storey and the frequencies of the structural modes are not close to each other at the MDOF model. The other one has different properties for each storey and the frequencies of the structural modes are closer than the other structure. These structures were also modeled as SDOF system according to their first natural frequency. The optimum parameters of the SDOF systems were applied to the MDOF systems and the results compared with that obtained by using the MDOF structures in the optimization process. Results showed that structural vibrations are reduced with the nearly same amount by using the two approach for the structure with distant frequencies. For the structure with close frequencies, MDOF idealization seems more important for a precise optimization. As a result of the study, TMD optimization with idealized SDOF model is suitable if the structure with multiple degrees of freedom has distant frequencies for structural modes.

Key words: SDOF, MDOF, Tuned Mass Damper, Optimization, Harmony Search.

NATURAL STRUCTURAL PROTECTION OF STRUCTURES IN NATURAL CATACLYSM: STRUCTURAL RESISTIVITY SECRET OF "WALLED OBELISK" MONUMENT AGAINST STRONG EARTHQUAKE ACTIONS FOR TEN CENTURIES AND ITS MATHEMATICAL MODEL FOR APPLICATION

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"Örme Dikilitaş" – "Walled Obelisk" (Column of Constantine Porphyrogenetus) is a monument, whose height is 32.77 m., and which roughly may be considered in two parts: a) bottom part with a height of 3.44m is formed from the three step marble stone and massive marble stone (enablement) with Horasan mortar between it; b) upper part is formed from the rough-cut limestone (with Horasan mortar between it) getting thinner to the four-sided hill with mean area of 2x2m. This monument is placed in one of the very sensitive seismic regions of the world-Istanbul -and from the construction date (approximately tenth century) until now it has been withstanding against all the strong earthquake actions. For discovering the secret of structural resistivity during its lifetime

(1000 years), the system is modeled by the finite element method in nonlinear-contact studies under strong earthquake action in time and frequency domain respectively. The mathematical model of the monument has been obtained and investigated. It has been shown that, in the obtained model ,support of the structure undertake a NFRNSI (Nonlinear Frictional Responsive Natural Seismic Isolator) and show "similar" behaviour to that of the current LRB (Lead Rubber Bearings or lead-core rubber bearings isolator). The total height of the NFRNSI is 3.44 m. The upper part of the structure which acts as an NFRNSI consists of three step marble stone and massive marble stone (enablement) that form four friction/sliding surfaces and Horasan mortar in it is taken into consideration by the nonlinear contact finite elements. NFRNSI appears as a "similar" function with LRB combined with layers of steel plates and hard rubber. Massive marble stone appears as a "similar" function with LRB lead cylinder core. NFRNSI shows fully frictional/sliding behaviour different than the LRB and keeps the upper part of the monument around the equilibrium (balance) state by the earthquake excitation which also varies around zero-equilibrium (balance) state. During the comparison of the mentioned isolators "similar" expression is used mainly in this meaning. For the comparison, the used fixed base model of the monument cannot reciprocate the recovered earthquake actions during its lifetime (1000 years). That has been shown comparatively. The devised and presented model, by the authors, of the NFRNSI (Nonlinear Frictional Responsive Natural Seismic Isolator) proved, itself through historical experience (in this monument's example 1000 years). It is easy to construct, moreover does not requireany special maintenance, and can be usable also in today's structures in seismic regions.

Key words: Seismic isolation-structure interaction, base isolation, nonlinear- finite element contact analysis, dynamic response to seismic excitation in time and frequency domain, LRB (lead-core rubber bearing) isolator, NFRNSI (Nonlinear Frictional Responsive Natural Seismic Isolator).

INTEGRATED APPROACHES FOR THE EVALUATION OF THE DAMAGES AND RETRAINING OF HISTORICAL CENTRES: THE CASE OF PAGANICA (AQUILA)

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The traditional topic of the retraining, as perception tool of the urban context, becomes more complex in urban centres damaged by an earthquake.

Usually, the survey activity follows different approaches on depending by buildings peculiarities, for instance. The dimension, the form, but also the state of degrade and conservation, could suggest different survey approaches, graphic design and data management. The survey of the historical centre of Paganica made by the Task Group of Reggio Calabria, is included in the PRO.PAGA Project "Paganica Project – Propose of a Historical centre plan" promoted by ReLUIS (The Laboratories University

Network of seismic engineering). During the Aquila earthquake (2009), the cultural heritage of the historical centre of Paganica, of medieval origin and hamlet of Aquila city, suffered the most structural damage. The survey involved task forces coming from different Italian Universities, among them the Faculty of Architecture and Engineering of Reggio Calabria. The survey followed innovative proceedings by means of particular conditions post-earthquake of the historical heritage. The known approach was directed to identify an integrated methodology with different experiences: conservation and architectural restoration, Aseismic adjustment and social retraining.

NONLINEAR THEORY OF THE INTERACTION BETWEEN UNDERGROUND CONSTRUCTIONS AND GROUND MASSIVE AT VARIOUS EMERGENCY SITUATIONS

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All-round study of the mechanical processes in the vicinity of underground vesicles is of paramount importance for construction and mining. Also it is one of the basic issues in the modernization way of the methods of strength estimation and reliability of soil and rock massive which are the basic objects of underground constructions with various purposes. First of all, reliable and economical design of constructions and facilities is connected with stressed and strained condition and strength estimation of construction elements and whole construction with various pressure conditions according to natural properties of materials. The task confronting the designers is choice of optimal sizes for constructions that provide required solidity as well as minimal consumption of materials. It required the most accurate descriprion of stressed and strained condition according to real operation conditions and properties of material.

In this article we attempt to analyze the statement of the underground spherical vesicles created by a nuclear explosion, and a cylindrical vertical production well using the mathematical methods. Purpose of this analysis is to determine stressed and strained condition, the cause of the vesicles failure and changes of geometrical parameters over time. Such task have to decide taking into account materials heterogeneity, physical and geometrical nonlinear statement, cracks and rock creep.

SECTION 7
Ecology and Environment

USE OF NEW TECHNOLOGIES IN SOLLUTION OF ENVIRONMENTAL PROBLEMS IN AZERBAIIJAN

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Changes in dynamics of environment condition are global and inevitable, it is impossible to stop or influence them not only in present time but also in highly developed scientific and technical future. The problem becomes more delicate with the fact that in the last one and a half century people's irresponsible actions caused global changes. Changes of environment increases rapidly in the result of application of new technologies in production. The foundation of industrial corporations, extraction of natural minerals caused global destructions in natural landscape and pollution of land, water and air with different industrial waste. It is obvious that natural cataclysm influences negatively to the development of world economy causing great economical losses in countries where it take place. Not all countries could face with the economical losses from natural disaster independently. In the recent years more various catastrophes happened in Azerbaijan: floods, landslide and others. We'll speak about it more detailed just in context of solution of problems which we face.

At the result of intensive rains for days at the same time over the whole territory of Azerbaijan in a short time above an average monthly norm, water level in some regions increased and people of most regions faced with serious problem. In solution of these problems new technologies play an important part. They are GPS systems-AZPOS (Azerbaijan Continually Operating Stations), Orthophoto plan, aero photos and others. In modern, dynamically developing world of new technologies one of the key directions of development is GPS-Global Positioning System. Station base is ideal for infrastructure projects and is appointed for organization of autonomy GPS base or creation of constantly working station set for geodesy and monitoring. According to World Bank in Azerbaijan 37 constantly working GPS stations were created. Basic station for management of AZPOS is State Committee of Land and Cartography. These stations situates 65-70 km apart from each other. That is why it gives opportunity for exact definition of coordination of the necessary objects. Data of these stations could be useful in all sections of agriculture. In the process of natural cataclysm and emergency situation stations give opportunity to define coordinates of territory and create catastrophe zone map. Orthophoto plan plays an important part in monitoring of environment. It is used for updating of cadastral system, map of arable land and others. With the help of Orthophoto we can investigate hardly accessible territories. Besides by using Ortophoto we can define lands polluted with oil, oil products and other industrial wastes. By using aero photo we can also evaluate catastrophe scale in regions.

Today in our country important steps have been taken for the solution of the ecological problems. Global projects of the WB are under implementation in the country.

Application of new communication systems and information technologies is one of the important tasks of the government in solution of problems in catastrophe regions. To prevent the problems is beyond our power but we can react on time if we possess reliable data about present condition of environment.

ECO ETHIC PROBLEMS IN AZERBAIJAN AGRICULTURE

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The ecological problems faced by the world starting the second half of the 20th century didn't pass off our republic. The pollution of air, water basin and soil reached the limits, process of degradation of winter and summer pastures, in the result of erosion and salinization forest reserves in some regions of the republic were totally destroyed or left only fragmentarily. In this material the approach made is from the point of view of the solution of eco ethic problems of Azerbaijan, some problems have been examined and the way of their solution found. Today some thousand ha soil of all Azerbaijan's land area is exposed to degradation. According to some data more than thousand ha productive land exposed salinization. At the result of agriculture 30 thousand soil destructed, 40% territory exposed erosion processes and wrong melioration processes causes to the increase of underground water layer and salinization of arable land. With the beginning of Armenian aggression 20% of invaded lands of Azerbaijan exposed to total destruction. Agricultural products were taken from alternate cultivation and irrigation infrastructure was completely destructed. The scientific basis of systematical approach in investigation and solution of ecological problems is formed by "basin method". Ecological method of basin gives opportunity to define quantity and source of pollution.

In material was defined the specific approach to the substance of "eco ethic" and was expressed as a system which connects human environment and nature, also systems connecting economic, cultural, legal and other relations. According to this relation of nature and community in connection with complex characteristics of eco ethic problems in Azerbaijan and ways of their solution divides into three groups:

1. Ecological problems of Azerbaijan and their ways of solution: protection of forests and problem of their restoration, soil erosion and fight against erosion, degradation of natural forage squares and their purposeful use, problems of techno genetic pollution of soil and process of their re cultivation, salinization.

2. Organizational questions which could be helpful in solution of ecological problems and in work based on scientific and scientific-production character, organization of ecological monitoring of soil, creation of maps of ecological evaluation, creation of certificate for the ecological improvement of soil.

3. Problems which could be helpful in solution of the ecological problems: works connected with the improvement of norm of criminal codex especially ecological law and

ecological crimes, creation of ecological aid fond, creation bank of ecological information, creation centers of ecological coordination.

To find the ways of solution of ecological problems the author used results of research works which he carried out for many years not only in the republic but also abroad.

OIL SPILL DETECTION AND IDENTIFICATION USING RADAR SAR IMAGES APPLIED TO THE ALGERIAN COASTS

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The problem of the marine pollution is probably one of the most worrying aspects of the deterioration of the environment. The sea surface is frequently confronted to a provoked pollution, caused on large part, by the illicit discharge of hydrocarbons by the ships. Hydrocarbons are the most noted pollutants and the Mediterranean Sea contain about 20% of the world's pollution. The difference of roughness between the polluted surface and water makes the power of the signal backscattered by the oil spills toward the radar less than the one backscattered the water. It results in a dark surface on the acquired images. Nevertheless, look-alike provoked by natural phenomena present a similar radar signature to oil spills. In this paper, we present a complete methodology in order to differentiate oil spills from look-alike on the radar images. We developed an detection and identification process using neural network analysing the physical and geometric parameters of the suspected object. But these are not always sufficient to recognise the nature of the spill. Additional data, as the wind speed, prove to be necessary to improve the performances of this process. We developed a second neural network that considers, in addition to the physical and geometric parameters, the wind speed in the process of identification. We calculated the wind speed using to the CMOD4 model, empirical model that determines the radar backscattering coefficient according to the wind vector speed and the direction, and of the incidence angle of the satellite. We inverse this model for calculate the wind speed with a pre-evaluation of the direction of its vector. We developed a study to estimate the wind direction visually from the radar images. This evaluation is based on the inspection and the interpretation of atmospheric and oceanic phenomena.

We compared the results of identification obtained with the two networks; the process including the speed of wind provides more successful results with 89% of success rate against 83% for the first network. This work allowed us to appreciate the contribution of the evaluation and the interpretation of the atmospheric phenomena in the identification of the oil spills. We propose an application of oil spill detection service, through reception and analysis of the near real time satellite data, for early warning alerts the coast guard.

Key words: oil spill, detection, identification, Neural Network, CMOD4 model, ERS SAR data.

DISTRIBUTION AND NATURAL TRANSFORMATION OF FUEL OIL SPILLED IN THE STRAIT OF KERCH IN NOVEMBER 2007 (THREE-YEAR OBSERVATIONAL RESULTS)

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On the 11th of November 2007 in the Strait of Kerch connecting the Black Sea and the Sea of Azov a strong storm caused a series of shipwrecks. Three dry cargo ships sank, two barges ran aground, the tanker "Volgoneft-123" was damaged and the tanker "Volgoneft-139" split in half resulting in a major oil spill. In total, 6,800 tons of sulphur cargo and 1,300 tons of heavy fuel oil were released. The present paper is devoted to the analysis of results of three-year study of the pollutant distribution and natural transformation in the oil spill zone. The observations were started in 2007 and at present they are being continued. Since the accident, five scientific expeditions were carried out. The investigations included visual assessment and sampling of oil slicks, seawater and sediment cores. In totality 10 coastal and 11 maritime points were observed, 35 samples of water, 51 samples of oil slicks and 70 samples of bottom and coastal sediments were taken. Their analysis were carried out with the use of thin layer and column chromatography, optical and gravimetric methods making possible to determine separately the sum of saturated, mono- and di-aromatic hydrocarbons, the sum of polycyclic aromatic hydrocarbons and the sum of asphaltic components as well as the presence of hydrocarbons of contemporary biological origin. The results of the investigations show that the spill of heavy fuel oil composed mostly of macromolecular, non-volatile and insoluble substances hasn't increased considerably the water pollution level. The average concentrations of hydrocarbons were stably high: 0.16−0.21 mg/l in winter, 0.25−0.44 mg/l in summer. However such an important level of oil pollution has always been observed here because of intensive navigation and port activity. Nevertheless the notable augmentation of concentrations in summer might be caused by natural destruction of oil slicks stranded on the shore. As the density of fresh fuel oil is slightly inferior to the seawater, almost all the released pollutant drifted on the surface of water in concordance with the storm wind direction and was stranded on the shoreline during the first three days after the accident. Therefore apparently the bottom sediments were not contaminated. In the sandy-silty sediment cores up to 40 cm thick taken in the fairway of the Strait of Kerch the concentrations of the sum of oil components didn't exceed 0.15 mg/g of dry weight. Light-blue luminescence of thin layer chromatographic plates indicates that the most of these substances are of contemporary biological origin. In contrast with water column and bottom sediments, the coastal zone was hardly polluted by the spilled oil. Even after the termination of clean-up operations, numerous weathered oil slicks are still present in certain sectors, especially on limestone blocks of the Tuzla dam. In the course of time it's revealed an exponential decrease in their quantities and in the ratio between hydrocarbons and asphaltic components. The values of half-period of oil pollution transformation varied from 350 to 1020 days. The highest activity of natural cleansing process was observed on the rocky substrate and sandy beaches exposed to the influence of fresh air, solar radiation, storm waves and surf action. The study was supported by the Ministry of Education and Science of the Russian Federation (Government contract no. 02.740.11.0334, grants of the President of the Russian Federation nos. NSh-8030.2010.5, MK-4216.2010.5).

Key words: oil pollution, fuel oil, transformation, coastal zone, natural cleansing

COMPARATIVE STUDY OF THE INFLUENCE OF THE IONS NA^+ AND K^+ IN THE INHIBITION PROCESS BY MASS LOSS

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The effect of variation of the corrosion levels has been studied experimentally by mass loss that proves to be a first approach in the study of the inhibition of corrosion of a metal in an electrolytic solution in order to determine the inhibitory efficiency of the tested product. Two inhibitors to basis of Na+ and K+, derivatives of phosphate and that didn't show effects of toxicity in the literature have been used: the sodium phosphate and the potassium monohydrogenophosphate. Four other inhibitory products have been tested in order to compare their inhibitory efficiency to the first two inhibitors. Tests have been led in three different environs, the first simulates the marine environment of the Mediterranean (3% NaCl), the second environ represents a solution of saturated calcium hydroxide $Ca(OH)_2$ simulates the concrete pore and the third one represents the concrete synthetic environment in the same conditions of temperature and relative humidity. Maximal value of the inhibitory efficiency has been valued respectively formerly to 80%, 75% and 74% for the sodium phosphate in the three environs; while for the potassium monohydrogenophosphate, this efficiency has been evaluated at 65,5%, 66% and 51,5% in the same three surroundings of the study. The influence of the concentration as well as the effect of the PH have been interpreted.

Key words: concrete, corrosion, inhibitory, ph, phosphate, mass loss.

CLASSIFICATION OF ENVIRONMENTAL IMPACTS ON VITAL ACTIVITY OBJECTS AND OF RECOMMENDATIONS FOR DECISION MAKING

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To automate knowledge discovery in the decision support systems (DSS) the classification of environmental impacts on vital activity objects and of recommendations for decision making is required. In terms of time impacts of the environments can be classified as follows: possible negative impacts expected in the far future; possible negative impacts expected in the near future; immediate or direct impacts (at the time of disaster occurrence); impacts identified after disaster (post-disaster). The following are considered as objects that can be exposed to impacts: soil, forests (vegetation), water, air, biota; social economic spheres-sectors and related business processes; trade, communication, recreation; public organization and associations, state government and administration bodies; population, municipal services. Impacts may affect climate, safety of people and property, living standards, ecological, economic and social conditions.

By the type of influence they can be natural-anthropogenic, political, psychological, physical (mechanical, thermal, and acoustic), chemical, and sector specific. Recommendations in case of natural disaster should be prepared for the following phases: mitigation, preparedness, response and recovery.

Mitigation based on the knowledge of possible impacts involves the determination of specific measures to minimize risks. Mitigation in fact is a long-term planning at all levels of the country management in design and decommission of objects. Preparedness is the need for a decision maker to initiate disaster preparedness measures based on the prediction and knowledge of the environmental impact character.

Response in the time of disaster occurrence includes taking measures by emergency, health and social services and by volunteers and population. Recovery includes measures taken after disasters to relieve consequences and restore settlements.

Mitigation recommendations can be legal, awareness-related, organizational, science-technological, personnel-related, preparatory, ecological, economic, compensatory, warning, prohibitive, corrective, decontamination, protective, political, psychological.

Preparedness recommendations based on short- or long-range forecasts may be organizational, informational, prescriptive, warning, restrictive, prohibitive, preparatory-for-evacuation. Response (in the time of disaster occurrence) recommendations may be recommendations to localize the disaster, recommendations to evacuate people, recommendations to use physical and chemical methods to prevent impact.

Post-disaster recovery recommendations are divided into search-and-rescue, emergency recovery, social, restrictive, involving various specialized services.

The above classifications will be further developed in the course of accumulation of new information on impacts and recommendations.

THE INFLUENCE OF ANTHROPOGENIC FACTORS TO THE HYDROLOGICAL REGIME OF RIVERS AND THE ESTIMATION OF ECOLOGICAL FLOW

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By the human economy activity the water regime of rivers, the condition of flows' formation subject to specific changes. Taking of subsurface waters for the usage in different fields of the economy, their returning into the rivers after changing of their quantity and the quality, the regulation of river flow by the river reservoir, changing of the flow direction, a deforestation or a reforestation, the drought of swamps and etc.may be belonged to such economical fields. In result of such huge human activities the natural regime and the quality of rivers' water subject to changes. The increasing of the anthropogenic factor's role by the implementation of different water management measures on the river basins in its turn requires the detailed study of happened and expecting changes. In result of human economy activity on the basins of many rivers of our republic the ecological condition has been subjected to serious destructions: the natural regime of rivers are destructed, the development of their biological environment aren't secured. In this point of view there requires to save the ecological minimal necessary flow volume in rivers. The security of ecological flow along the river may lead to save an important geographical landscape factor, normal hydrological condition. By this aim on using the water resources of rivers over the minimal flow period it is necessary to secure their certain quantity on the rivers' channel. In rivers, where have been created water reservoirs, on using a great quantity of water for irrigation there not observe a flow on their lower reach for a long time. So, these features are observed in Khachinchay, Terterchay, Gargarchay, Pirsaatchay, Agsuchay, Zogalavaychay, Devechichay and etc. It is necessary

to held complex hydrological, hydrodynamic and hydro chemical researches by the aim to calculate the ecological flow for above mentioned rivers and the rivers, the source of which is on north-east (Gusarchay, Gudyalchay, Velvelechay) and south slopes (Alazanchay, Talachay, Kurmukchay, Balakenchay, Shirvanchay and Gobustanchay) of Major Caucasus mountains. The hydrological regime features and the type, the intensity of human economy activity of these rivers are studying, the influence anthropogenic factors to the river regime has been estimated. Ecological flow must be purposed for rivers, the anthropogenic load of which is increasing. The ecological condition of rivers is considered as acceptable, when the ecological flow is slow than the natural regime on flow's natural regime destructing period. It is impossible to rationally use the water resources of the territory and correctly estimate the human economy activity without the investigation all of these problems. Therefore the investigation of the influence of human economy activity to the hydrological regime and water resources of rivers, the estimation of the ecological flow are considered as the very important problem of contemporary hydrology. The flow of rivers of researching region has been few studied for the human economy activity. These research works has been developed Kur and Araz rivers. These is an impotance, possibility of the estimation of research work about mean and short mountain rivers problems in Azerbaijan. On saying "the change of the river flow in result of human economy activity" we usually mean two directions of the problem: the first of them is the quality change of natural waters in result of the pollution, the another one is the quantity change of water resources for the immediate use of water and the change of its forming condition. For the forecast of the anthropogenic change of river flow and its quantity estimation different calculation methods have been grouped as a statistical, water balance, mathematical, modeling and active experimental methods. In mountain rivers, which flow is formed on the mountain part of the basin and is used on plain part of the basin the application of the statistical (regression) method gives good results.

On researching of the problem rivers' flow of the territory has been analysed, the influence of rivers to the hydrological regime has been studied. So, in the main rivers of the territory – Alazan, Kurmukchay, Alijanchay, Turyanchay, Goychay and etc.the natural water regime has been generally destructed in result of human economy activity in the period after 1955-1960 y.y. The flow of rivers forms usually at the mountain part and after this part there has been created the water intake equipments and artificial channel. The water of these rivers has been used for different problems (people water provision, irrigation and etc.). There has been used the hydrological similar method by the aim to quantifiably estimate the influence of the human economy activity to rivers' annual flow.

OIL PRODUCTION AND ECOLOGY OF THE CASPIAN BASIN

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At present time, one of the basic problems in ecology is pollutions from oil processes (on the whole, oil production and ending with use of oil products), as all of them finally promote strong environmental contaminations of the Caspian Sea. The intensive production of oil and gas fields in the Caspian Sea results in strong negative impact on ecology of the sea that is a serious problem for all countries of the Caspian basin – Azerbaijan, Iran, Kazakhstan, Russia and Turkmenistan. It should be reminded, that the

Caspian Sea is the world's largest lake, stretching for 1030 m from the North to the South; it is closed water reservoir with relatively low percentage of salt, the surface of which is 27 m below the ocean. Now, there are 59 oil and gas fields in Azerbaijan, 18 out of which are offshore deposits, and the remaining 41 are onshore fields. There have been produced 190 million tones of oil at the Azeri-Chirag-Guneshli block of offshore fields since the start of oil production of the block in 1997. According to the State Oil Company of Azerbaijan Republic's forecasts, the oil production in Azerbaijan will have reached 60 million tones per year by 2015, and the gas production will have been 35-40 billion cubic m by the same time. The basic operational stages of oil are as follow: exploration, oil production, transport of oil, oil refining and oil chemistry, use of oil products and recycling waste products. All above-mentioned stages to some extent fatally impact on ecology of the Caspian Sea. At exploration of oil deposits (drilling of wells), there is a strong pollution of ground and water with drilling slurry containing polymers, hydrocarbons and heavy metals. During oil production, the greatest danger among the all kinds of pollution is emission to an atmosphere of oil hydrocarbons, dump of sewage and also, floods of oil on a ground's surface. During oil refining and oil chemistry, negative impact on ecology is like on oil production. Recycling of waste products of the oil refining and oil chemistry industry is, also, major problem in environment's pollution. It should be noted, that the strongest pollution's source of the Caspian Sea is, also, the oldest onshore oilfields – Bibi-Heybat, Surakhani, Balakhani etc. In particular Bibi-Heybat: the first well with 21 m deep for oil production was drilled in Bibi-Heybat with a positive result (for the first time in the world in 1846). The basic sources of the sea's pollution are drilling slurry, drilling fluid, oil pool waters and oil pool sand, which accumulate as waste in the process of exploration and drilling. An impact of waste products from oil industry on the Caspian Sea's ecology is very great; we'll especially note the drilling slurry, high volumes of which are produced by production and drilling. In summary it's worthwhile to note, that intensive development of oil production and oil chemical industry without full-scale implementation of purification devices lead to the sharp increase of pollution in the coastal zone of the sea. For reduction of pollution (contamination) of the Caspian basin at carrying out of production's and drilling works, it's extremely necessary: to use less toxic chemicals to carry out these activities; decrease the volume of toxic released during production, drilling and production by proper storage with subsequent recycling by various ways (chemical, technical and mechanical); and at last it must be used waste-free technologies, including the complete detoxification of waste and their further re-use in the different industries.

BIOTECHNOLOGY OF AQUACULTURE FOR REHABILITATION OF STURGEON SPECIES' GENE POOL

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It is very important today both to rehabilitate the endangered species in the wild and to preserve their gene pool. Existing sturgeon hatcheries cannot increase the production of fry due to the shortage of sturgeon spawners.

Experts of the Southern Scientific Center of the Russian Academy of Sciences (SSC RAS) have been involved in the studies on the preservation of rear and endangered fish

species since 2004 within the framework of the RAS Programme "Biological resources of Russia: estimation of current status and fundamental basis of monitoring". A pilot experimental complex was established and developed at the SSC RAS Research Station in Rostov Region in 2004-2011 where the best elaborations of scientists in the field of biotechnologies of artificial reproduction and commercial cultivation of sturgeons have being carried out, using modern equipment. A complex of flexible intensive methods has been developed, certified, and patented forming a single biotechnology of sturgeon cultivation in modular controlled systems, leading to obtaining commercial production of high quality at every stage of industrial process and preservation of rear and endangered species for rehabilitation of the wild population. Unique modular system allows regulating the parameters of water environment, simulating different environmental conditions close to the ones of natural marine and freshwater bodies, and conducting investigations under the human control with 100% load the year round. Uniqueness of the system is in the right selected blocks and modules allowing conducting the water cleaning successively with minimal water consumption of 3% per day of the total volume of water in the system. The studies resulted in the improvement of standard technological cycle of industrial sturgeon cultivation demonstrating that commercial fish with the average weight of 1.5 kg can be cultivated for one year, with the weight of 3.5 kg – for two years. It is also possible to get highly reproductive brood stock (sterlet, hybrids) within recirculation system for 2-3 years, which is 3-4 times faster than in the wild. The method of cryopreservation of sturgeon fishes' sex cells including two new sections of electrostimulation and defrosting with excretion of cryoprotector was developed. The method increases the survival rate of cells and decreases the negative consequences of double thermal shock. The method allows long-term preservation of viable sex cells and their use for artificial reproduction of sturgeon fishes, formation of cryobank and brood stock with selected characteristics. The collection of live reproductive cells of rear and endangered fish species of the Russian southern seas has been formed consisting of 47131 mln sperm cells, 8977.5 ml. The collection is kept in liquid nitrogen with temperature of - 196ºC, frozen according to a new method. The technique of stage adaptation of sturgeon fishes to artificial conditions of water environment has also been developed.

The scheme of formation of highly reproductive sturgeon brood stock and complex method of spawning control applying biologically active substances, hormonal stimulation and regulation of temperature conditions has been proposed.

As a result of studies, aquaculture methods, based on adaptive specific features of sturgeon fishes at different ontogenesis stages, has been developed allowing preservation of gene pool of rear and endangered fish species and reduction of rehabilitation time of populations in the wild.

THE INFLUENCE OF HORSERADISH (ARMORACIA RUSTICANA) AND COMMON COMFREY (SYMPHYTUM OFFICINALE) UPON THE EDIBLE TERRESTRIAL SNAILS HELIX ASPERSA MULLER (CORNU ASPERSUM) DURING HEAT WAVE AND DROUGHT AS MEANS TO IMPROVE SNAIL FARMING TECHNOLOGIES

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Many perennial plants are often huge biomass producers capable of capturing the solar energy and producing valuable nutrients, plants that represent food source for many herbivores. Some plants have toxic properties to some animal species whereas to others they represent a priority in herbivore's diet. We investigated the influence of *Armoracia rusticana* and Symphytum officinale upon the development of one of the most farmed and consumed terrestrial snails Helix aspersa Muller (Cornu aspersum), an excellent animal protein source for humans. The experiments took place in town of Băişoara, Cluj County, Romania in the June – August 2010 interval. The adult Helix aspersa Muller snail populations in the witness lots display a survival mean rate under extreme heat wave and drought conditions of just 6.50 ± 1.29 while the population in the experimental lots with *Armoracia rusticana* and Symphytum officinale presented higher survival mean rate of 14.00 ±0.82 and 16.75 ±1.50 respectively. As far as prolificacy, the witness enclosure batches accounted for 100 ±5.72 while the batches in experimental enclosures accounted for 248.00 ±8.29 and 140.00 ±5.10 respectively. We included the fitness component test, as an indicative of snail's vitality and energetic condition, measuring their crawling mean speed and the mean heart bit rate of new born baby snails that have similar body weights. While the heart bit rate differences between the different batches were not significant, the mean speed presented significant differences directing us to the conclusion that plants such as *Armoracia rusticana* and Symphytum officinale not only represent valuable nutritive foods to Helix aspersa Muller adults and youngsters but also have protective values against stress conditions such as severe drought and prolonged heat waves. Such plants can represent an additional assurance for an efficient and ecological snail farming technology as an important source of quality animal protein for human consumption, capable to deliver a high quantity of animal protein from a given land surface, representing a venue towards sustainable agro-economical development.

Key words: food selection, ecological farm management, sustainable development, agro-economics, bioeconomics, mollusk, *Cornu aspersum*, *Helix aspersa,* Băişoara, Cluj-Napoca, helicicultura, energy budget, fitness component, performance, standard metabolic rate, survival, brown garden snail, HBR, heartbeat rate, crawling, speed.

THE INFLUENCE OF SOME PERENNIAL PLANTS AND SEL-PLEX UPON THE DEVELOPMENT, RESISTANCE TO EXTREME CLIMATE CONDITIONS AND MEAT QUALITY OF THE EDIBLE TERRESTRIAL SNAILS AS ONE OF THE MOST EFFICIENT AND ECOLOGICAL SOUND ANIMAL PROTEIN SOURCE FOR HUMAN CONSUMPTION

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One of the most acute problems the humanity is confronting with in the light of Global warming is the availability of food to the ever-growing population. Quality foods respecting the food hygiene and offering the proper nutrients are becoming a scarce commodity. Considering the ecological impact that the agro-food production sector has upon the carbon footprint, we investigated the potential that farming of edible terrestrial snail *Helix pomatia* and *Helix aspersa* Muller (*Cornu aspersum*) can provide humanity the necessary animal protein while reducing the need for energy input. Observing the feeding behavior of snails preferred perennial plants were identified. From those plants we selected the species with the highest productivity of biomass and the most resistant to extreme conditions without the need for energy and human resources input to maintain them. Snail's development, survival rate, prolificacy, meat quality and resistance during stress conditions such as hibernation and aestivation were measured while and after being exposed to different feeding conditions and extreme climate conditions such as high air temperature and draught. Temperatures such as 32^0 C – 37^0 C were frequent and lasting for long periods during the 91 days of the experiments that were conducted from month of June to August 2010 in the town of Crăieşti, Cluj County, Romania. Considering the fact that for *Helix* (sp) the edible part of the plants represents the leaves, the availability lipids and organic nitrogen expressed here as crude protein content in the leaves of seven different perennial plants have been determined. Alternative animal protein production can be integral part of a Global strategy as to implement the real value and non-monetary value concepts as basic reference to be the Global economy; a strategy that is aimed to provide non-monetary economical means for survival of human species while protecting the environment and sustaining overall life on Earth. The article presents just an aspect of an agricultural activity and it is intended to be viewed also as a brief and provoking model concept of efficient alternative means for producing food of the highest quality while using the natural resources at their potential without disrupting the ecosystems. Proper natural resources management makes the foundation of sustainable agro-economic development.

Key words: *Helix pomatia, Helix aspersa*, brown garden snail, *Cornu aspersum*, Cluj-Napoca, helicicultura, food selection, ecological farm management, mollusk, performance, survival, non-monetary, organic foods, snail breeding, escargot, USAMV, economy, public health, food safety, food security, sustainable development, agro-economics, bioeconomics.

TREATMENT OF URBAN WASTEWATER TREATMENT (CITY OF ANNABA IN ALGERIA) BY THE LIME WASTE FROM THE ENGI

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The method used at the National Industrial Gases Company (ENGI) Annaba, for the manufacture of acetylene is reacting calcium carbide with excess water. Such a process necessarily leads to the parallel fabrication of lime slurries. The amount of this by product, which is considered industrial waste, increasing day by day. This residue, no commercial value, raises problems of landfill or long-term storage. This rejection, highly alkaline, has led to disasters affecting the soil, water, wildlife, plants and even animals. These findings led us to assign primary objective of our work to enhance this by-product in the protection of the environment, especially in water treatment. The widespread use of this product in water treatment would provide a very large market and simultaneously allow a dual action favorable to the environment: the elimination of waste and water treatment.

The main objective of this study is to assess the performance of the lime waste, a byproduct of the manufacture of acetylene, nival in the elimination of suspended solids and removal of organic matter in wastewater city of Annaba.

Key words: coagulation-flocculation, milk of lime, organic matter, wastewater, pollution.

PROBABILITY DISTRIBUTION ON FAULTS NEAR THE CITY OF THESSALONIKI (NORTHERN GREECE)

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Many studies found that stress triggering and fault interaction theories can be incorporated into quantitative earthquake probability estimates. Using two methods of time dependent probability estimates this work aims at the evaluation of the occurrence probability of anticipated earthquakes in the city of Thessaloniki, an urban center of 1 million people located in northern Greece, conditional to the time elapsed since the last stronger event on each fault of the study area and to the history of the following events on adjacent active faults. The city of Thessaloniki was chosen as a case study because is the second largest city in the territory of Greece surrounded by several small towns and villages. It has suffered significant damage due to strong earthquakes several times in the past. The latest destructive earthquake occurred in 1978 (M=6.5) and caused the collapse of buildings and loss of life in the city and nearby villages. In this study we start from the estimate of the probability of occurrence for the stronger known earthquake on a fault in the period 2011-2041 (30 years) based on a time-dependent renewal model. For this probabilistic earthquake forecast the coseismic stress changes of strong earthquakes ($M \geq 6.5$) that occurred since the beginning of 20^{th} century in the study area are calculated.

The coseismic stress changes are translated into earthquake probability using an earthquake nucleation constitutive relation. According to this the occurrence rate of the anticipated earthquake is calculated taking into account both permanent (clock advance) and temporary (rate-and-state) perturbations. Earthquake probability on a fault is lowest after the last event but as tectonic stress grows the odds of another earthquake increase. For all needed calculations a probability density function (pdf) for the time of failure for an earthquake of defined magnitude on the fault of interest must be taken into account along with the calculated stress changes on the fault. The technique for incorporating stress changes into the estimation of earthquake probability has introduced some uncertainties on the input parameters that affect our results. In order to check if our results are reliable and to confirm the consistency of the model another method is used, giving the option to compare the results of both methods. This new technique can be used with any physical model of earthquake nucleation and can also be used to directly compare the implications of different physical models. This method is modular in that it can be used for any probability density function, any stress change and any quantitative nucleation model. The estimated probability values that obtained using the above methods concern the probability in each part of a given fault or fault segment, and the probability distribution is illustrated across the specific fault. All calculations were performed at 10km depth but it was necessary to check whether the estimated probability values vary with depth. Therefore, all estimations were performed for each fault or fault segment at the depth of 8, 12 and 15km. The probability calculations were carried out and given for the entire study area during the next 30 years, in the form of tables and maps.

ENVIRONMENTAL PROCESS BASED EDUCATION AND RESEARCH FOR BETTER LIFE AND ENACTMENT OF INTERNATIONAL POLICY ACT ON ENVIRONMENT 2011

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During the last two centuries along with advancement of Science, Engineering and Technology, there has been considerable developments in different sectors viz., industry, agriculture, entrepreneurship, business, infrastructures, utility services etc. , subsequently, it was realized that there were many adverse impacts on environment and society. These developments have sustained the environmental growth. Sustainability of design and development, quality of life, safety on earth and continuous improvement of our environment is of utmost important. Sustainable development means industrial development should occur and must be continued without damages to the environment. Hence, hectic industrial developmental activities during the last two centuries have caused considerable environmental and social impacts. These impacts can be measured, monitored and mitigated by imparting environmental process based education and research for better life. While planning and decision making process of developed and developing of the most of the world projects, the potential adverse impacts on environment and society should be scrupulously assessed, evaluated and mitigated. Therefore, project planning and decision-making should include the integrative consideration of engineering or technical, economical, environmental, ethical and social factors. The most important of these considerations can be referred to as "Concept of the Four Es and 1 S" which must be

involved in any organizational planning and decision making process. As per the recent research results in some case studies, environmental contamination and pollution has reached beyond safe limits which seriously affects the life on the earth. Toxic emissions from industries, thermal power plants, auto exhaust pollution in large metropolitan areas, photo chemical smog etc., have been poisoning the atmosphere beyond the permissible levels which causes serious health hazards. Air pollution problems result in adverse environmental health and social impacts. Mindless disposal of untreated industrial wastes, radio-active wastes, municipal wastes, solid wastes, agricultural wastes, domestic wastes etc. have contaminated and polluted the water, soil and land beyond the tolerable limits, which adversely affects land fertility, water quality, vegetation, aquatic and marine life. This is proving more and more hazardous as this development continuously damaging the environment viz., melting of glaciers, climate change, carbon tetra chloride emission, green house gas emission, ozone layer depletion etc. For example, due to continuous increase in CO_2 concentration in the atmosphere due to industrial emission which lead to climate change. This decrease in glaciers contribute about 29.5 % of sea level rise since 1991. Water supplies stored in the glaciers were projected to decline. Besides contaminating and polluting air, water, soil and land, intensive technological activities lead to depletion of natural resources. What was required was to bring our energy and intellectual capacity in tandem whereby we can meet the challenge effectively and efficiently without major disruption, without compromising on the livelihood of future generation of their needs. Development would have occurred without damages to the environment and major disruption, and the process of industrialization would have occurred in an innocuous manner by utilizing the resources effectively and efficiently in an environmental friendly manner. Now, these environmental problems are the present environmental challenges and opportunities for improvement. We have to be conscious about these environmental issues individually. In order to overcome these environmental problems and to move forward, will require new and more effective and efficient solutions, technologies, processes and products alongside behavioral change. Reemphasizing that prior to the enactment of National Policy Act on Environmental 1970 in USA, only technical or engineering and economical factors dominant the planning and decision making process in most of the world projects. As per the research results in some case studies elucidate that project planning and decision-making process must include the integrated consideration of engineering or technical, economical, environmental, ethical and social factors. This important consideration can be referred to as "Concept of the Four Es and 1 S" in organizational planning and decision making process. There are ecological and biogeochemical principles and tools such as energy flows and material cycling, element ratios, mass balance , element cycling etc. available in order to solve major environmental problems that we face in our world today such as global warming, acid rain, environmental pollution, and increasing greenhouse gases. Based on research conducted on this principles and tools, it may be noted that about 80% of the biogeo cataclysm disasters are preventable.

Key words: environmental act, biogeochemistry, cataclysm, education, environment, policy, impact assessment

MODELING OF CONSEQUENCES ON ENVIRONMENT THROUGH ANALYSIS OF INDUSTRIAL RISKS

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Industrial activities involve risks and dangers that cannot be always defined. The risks must be identified and reduced to minimum for the success and safety of the factories. The process of risk management represents a method that involves all the main components affecting risk. The consequences on the environment are therefore modelled for the purpose of evaluating the different risk effects. Presented further will be the possibilities for occurrence of adverse effects in operative conditions and during accidents.

Key words: industrial risks, environment, modeling of consequences, operative condditions, initiating event.

RISK REDUCTION DUE TO INDUSTRIAL POLLUTION BY GEOSPATIAL MODELING

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Selection an appropriate location for establishment of the industries, the process is too complicated for decision makers and analysts' persons. Simultaneous attention to the criteria of technical, economic, social, environmental and political are principal needs of this process. Due to the combined nature of this process, simultaneously applying of several decision-making tools such as Geospatial analyze and multi-criteria decision making methods is essential to select the correct location. Howsoever, Geospatial system is as an efficient way to employ and manage various data that they can be utilized in location more appropriate places for the suitable site to decrease Industrial Pollution. The implementation methodology utilize Geospatial technology for the management and visualization of spatial data that fuzzy logic sets is used to identify the best location for industrial site.

Key words: Risk Reduction, Geospatial Models, Fuzzy Logic Sets, W L C, Industrial Pollution.

THE ANTHROPOGENIC AND COSMOGENIC FACTORS OF NATURAL DISASTERS

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There were considered the anthropogenic and cosmogenic factors of Natural Disasters. The anthropogenic factors include population growth, man-made human intervention in the environment; the cosmogenic factors are solar-terrestrial and lunar-solar connection, rotational-gravitational regime of the Earth, its position in the circumsolar and galactic orbits, and also naturally-random events as asteroid strikes and comets.

Key words: natural disasters, anthropogenic, cosmogenic, rotational-gravitational regime, pulsation, earthquake, volcanism, tsunami.

NEW CONCEPT OF FOREST FIRE DANGER FORECAST IN RUSSIAN FEDERATION

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Forest fires destroy state wood fund, pollute an atmosphere and kill people and damage of settlements in various regions of the world annually. It is necessary, to carry out the forecast of forest fire danger with purpose of minimization of ecological, economic damage, number of victims, and also rational use of means for protection of woods from fires. Indexes and systems for estimation of fire danger in woods (for example, in Canada, USA, Europe) worldwide are developed for the decision of the specified problems. Nesterov's criterion is applied as state standard in Russia. However, it physically is not substantial and does not take into account anthropogenous loading and storm activity. Purpose of present work is creation of the conceptual project of the Russian Forest Fire Danger Forecast System on base of deterministic-probabilistic approach. Predesign research of the Canadian, American, European systems of forest fire danger estimation is lead. The basic requirements with which the modern system of forest fire danger forecast to boreal forests should satisfy are formulated. Conceptual base for creation of such system for territory of the Russian Federation is considered. Association of subsystems of gathering, storage and processing of the information in uniform hardware-software complex is offered. It is offered to use supercomputers with parallel data processing in role of the calculator. Program realizations of deterministic-probabilistic techniques of forest fire danger forecast are offered as software. Questions of creation of new state standard based on deterministic-probabilistic technique of forest fire danger forecast are discussed.

MATHEMATICAL MODELING AS A TOOL TO PREDICTION OF FOREST FIRE DANGER

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It is necessary to note imperfection of existing systems and methods of forest fire danger forecast both in Russia, and in other countries of the world. Basic lack of all systems is an ignoring real physical and chemical processes at occurrence of fire. In the scientific literature broad attention is given to research of processes of forest fuel drying, distributions of surface and crown fires in view of physical and chemical processes. However, deciding stage of forest fire occurrence is an ignition of forest fuel by source of the raised temperature. Such sources can be a natural and anthropogenous origin. Purpose of research is creation of complex of mathematical models for studying processes of ignition of forest fuel by sources of raised temperature. Till now forest fires from thunder-storms create intense conditions, for example, in taiga. In present work various mathematical models of deciduous and coniferous trees ignition by cloud-to-ground discharge are considered. Questions of creation of mathematical model of forest fuel ignition by electric spark are discussed. Principal cause of forest fire occurrence is human activity now. In work the mathematical model of forest fuel ignition by particle heated up to high temperatures is considered. Such particles can be formed as result of inflating outstanding fires and welding /cutting of metals. Generalized mechanisms of forest fire occurrence from storm activity and anthropogenous loading are discussed in summary.

ENVIRONMENTAL PROTECTION FROM EXPOSURE ELECTROMAGNETIC RADIATION

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Researches of characteristics of reflection of electromagnetic radiation on the thickness of the layer of material deposited on a metallic or dielectric substrate. Established that in the wave dispersion of the substance covering a range of election of its layer thickness values and the frequency of the incident radiation, in which reflected waves are absent. Equations were obtained between these values election, the dielectric properties of the coating and substrate materials and the minimum number depending on the thickness of the reflected signal. Their authenticity was confirmed by experimental studies of reflection characteristics of binary solutions of polar liquids. The possibility of practical application of the phenomenon found in the environment and the accumulation of solar energy by creating a non-reflective and antireflective coatings, as well as to increase the sensitivity of detectors and development of various microwave methods of quantitative and qualitative analysis of the properties of matter, including its methods of analysis through remote sensing.

HUMAN, NATURAL ENVIRONMENT AND ARCHITECTURE

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From the time immemorial, human beings have been accompanied with the nature and natural organisms. These interactions sometimes lead to different and contradictory paradigms but the natural organisms have always been the inspiring sources for humans. Like other human beings, architects enjoyed such an inspirations and criteria as well (Lang, 2002:40). However, they necessarily not always successful as degree of their success depended upon their perception and understanding of the nature of organisms. Later, some biological comparisons were introduced focusing on formal and structural aspects to have wider perspective about the nature of the organisms and new rules and regulations. These gave rise to critical faults and disadvantages.

Like human beings themselves, their architectures possess integral, united and harmonic system that is demonstrated in the best possible form in the natural organisms. But, these organisms lack divine or spiritual aspects, to distinguish humans from the other organisms, As such, inspiration and modeling from the ongoing rules and regulations within the structure of the organisms, are a kind of physical recreation of human architecture and therefore, fulfillment of the divine and spiritual needs and attaining an appropriate space in this regard would be possible only through knowing the nature of the organisms and spiritual dimensions. The present work attempts to introduce some of the principles, rules and regulations related to the natural organism and then describes how to apply those organisms in architecture. Finally, it realizes the ways of going beyond the motional principles in order to attain a multidimensional humanistic architecture.

Key words: Architecture, Organism, Nature, System, and Modeling.

ADDRESSING THE ENVIRONMENTAL SAFETY IN EMERGENCY SITUATIONS

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Modern humanity is faced with the fact more and more natural disasters occur, with great destructive power, resulting in the death of the living forces, causing tremendous damage. Natural disasters trigger man-made disasters that could put mankind on the brink of survival. Security issues and human society requires in order to avoid catastrophe, develop and implement stringent measures to prevent and survive in conditions of disasters, beyond manifestation of hazards during response and recovery operations. Providing real-life safety of humanity in violation of the natural balance of nature is possible in developing the program serial for Action and the preventive measures at the stage of the forecast of the situation and minimize damage from natural disasters. It is known that natural disasters are taking place in Azerbaijan, causing serious damage to the economy and population. Despite the on going work in the Republic of grandiose, reveals some natural volatility and the new high-risk areas. As part of the rehabilitation of affected natural disaster areas for their further development, it is important to create an information of data bank. This will enable the optimum way to disaster relief, recovery and accordingly

its required financial costs. In determining the plan and program of action during disasters, the localization of the affected areas and damage in the shortest possible period, to minimize the damage, you need a full analysis of the environment, which should be reflected in the information and maps. Comprehensive analysis of the situation and the available database is needed for decision-making at all levels. In the region there are lagging behind in research and work to develop a database for high-risk areas, including the prediction and the estimated mapping. The problem of the comparability of diverse information about the objects can be overcome by the possibility of spatial referencing based on geographic information systems (GIS). For Azerbaijan, its separate areas to accommodate the natural features, its vulnerable areas - high-risk areas for the population and the economy as a whole, will require a comprehensive environmental studies and preparation of large-scale maps. Conducted research and collected information in a single country, as well as in different countries, agencies, companies and organizations in different directions, require the creation of a unified information system. This requires the development of GIS expertise to save lives. With the changing of the geodynamic situation, increase the level of preparedness of the population in potentially dangerous areas to natural emergencies, man-made and man-made, it is particularly important.

ANALYSIS AND INTERPRETATION OF HEAVY METALS ATMOSPHERE CONCENTRATION OBTAINED BY NUCLEAR TECHNIQUES IN ALGIERS URBAN SITE

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The low part of the atmosphere, troposphere, is characterized by a strong human activity accompanied by a serious deterioration of the quality of air in this layer due to the rejection of pollutants.

Among these pollutants one finds heavy metals (Fe, Mg, Pb, Zn, Sc…) contained in the suspended matters. The nuclear techniques such as, the XRF (X-rays fluorescence) and the NAA (Neutron Analysis Activation) constitute effective tools to identify and quantify heavy metals in air. X-ray fluorescence (XRF) analysis is a fast, non-destructive and environmentally friendly analysis method with very high accuracy and reproducibility. All elements of the periodic table from beryllium to californium can be measured qualitatively and quantitatively by study of X rays response emitted by samples after irradiation. In the NAA process, a nucleus absorbs a neutron. The nucleus becomes excited, and immediately releases a gamma ray and decays to a lower energy level, although it still is in an excited state. Then after a period of time (dependent on the nucleus) the excited nucleus emits and a gamma ray. Analysis of the spectrum of gamma rays emitted allows determination of the elemental composition of the air samples collected in high KASBAH. Analysis of matrix correlation put in an obvious existing relation between different elements, and meteorological parameters.

Key words: Heavy metals, X-rays fluorescence, Neutron activation, orrelation.

FUZZY RULE BASED FIRE RISK ANALYSIS OF ISTANBUL'S STREETS AND AVENUES

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The mega city Istanbul is one of the oldest and most populous cities on earth. This historical city is under a constant threat of fires. In Istanbul, which has many different types of housing units, streets and avenues, the Fire Brigade both responds to the fires and takes measures to prevent fires. In this context, residential areas need to be kept under constant monitoring, and extra measures need to be taken in areas where fire and fire response risks are high. It is crucial that these activities are carried out within the framework of a sustainable and systematic risk management approach.

This study, in cooperation with the Fire Brigade of Istanbul, develops a fuzzy rule based fire risk model. With this purpose, inputs to be used in identifying risk levels were defined, and these inputs were graded for each avenue and street in the pilot area. Then, risk levels of these streets and avenues were calculated using a fuzzy rule based model. Once the streets and avenues were classified in terms of fire risks, measures to be taken to manage and systematically minimize the risks were examined.

Keywords: Risk Analysis, Fuzzy Logic, Fire, Istanbul.

OFFSHORE PIPELINES PROJECTION AND ECOLOGY PROBLEMS

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At now offshore pipelines are active constructed (Nord Stream, Blue Stream and others) and one of important tasks is ecological safety guarantee. Accident environmental damage is evidence, but everyday functioning is also could influence on environment. One way mitigate environmental damage – choose an optimal everyday functioning regime. Offshore pipeline functioning computer modeling is a power instrument of ecological safety guarantee in time of pipeline projecting and working.

The report is a part of authors' research on a creation of an offshore pipeline gas flow mathematical model. Stationary non-isothermal gas mixture flow into offshore pipeline mathematical model is good worked for scientific research of gas transportation from the Shtokman gas and condensate field in Baltic Sea to the Teriberka and for the Nord Stream project.

At the report non-stationary non-isothermal natural gas flow into offshore pipeline mathematical model is presented (for a shock-free flow only). The other mathematical models are analyzed with. For the mathematical model numerical algorithm is suggested and model task is solved.

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