Proceedings of the 1st WSEAS International Conference on
ENVIRONMENTAL and GEOLOGICAL
SCIENCE and ENGINEERING (EG'08)

ENVIRONMENT and GEOSCIENCE

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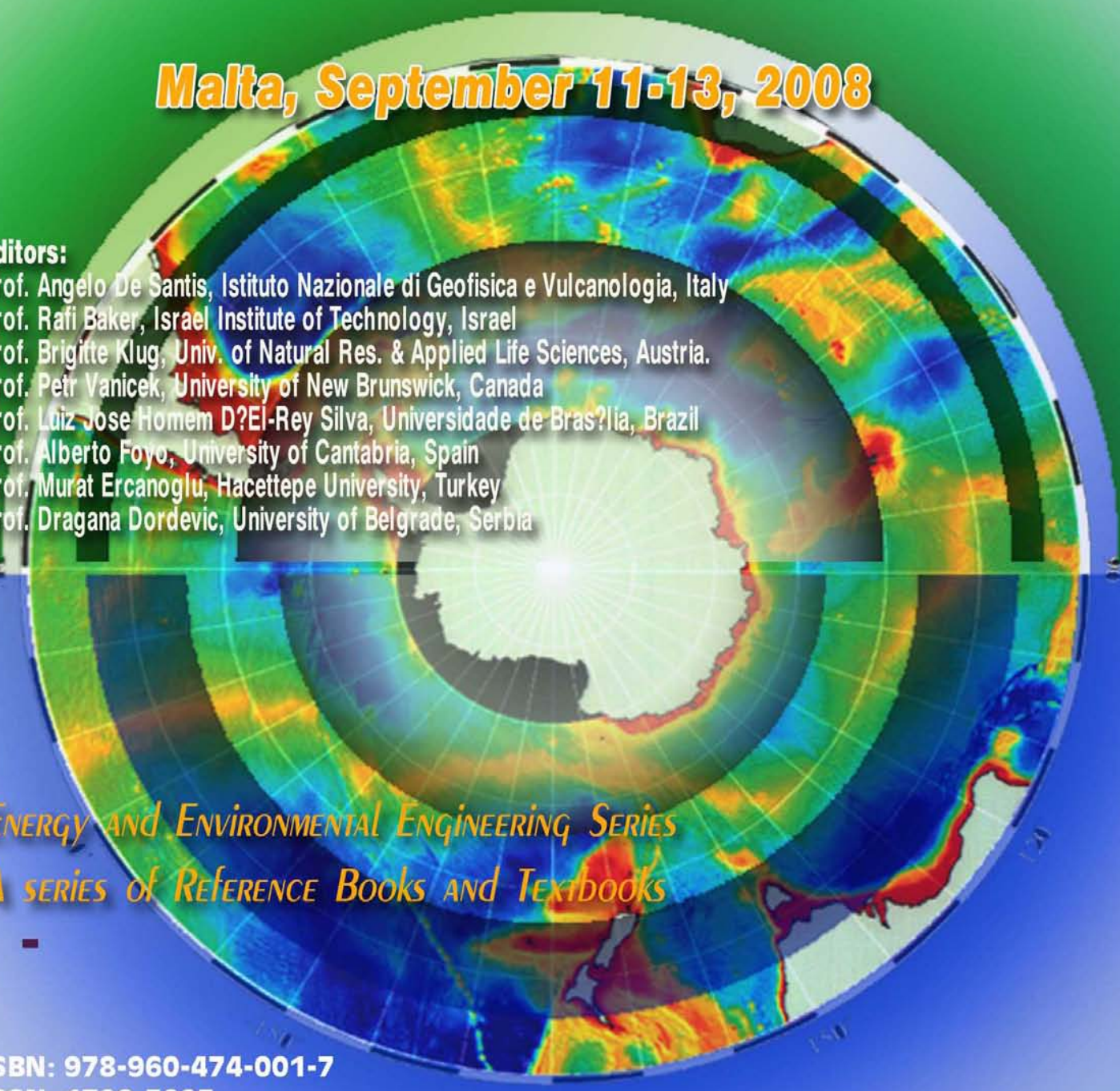
Malta, September 11-13, 2008



Editors:
Prof. Angelo De Santis, Istituto Nazionale di Geofisica e Vulcanologia, Italy
Prof. Rafi Baker, Israel Institute of Technology, Israel
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J. R. Kayal, INDIA
Mihaela Popa, ROMANIA

Preface

This book contains the proceedings of the 1st WSEAS International Conference on ENVIRONMENTAL and GEOLOGICAL SCIENCE and ENGINEERING (EG'08) which was held in Malta, September 11-13, 2008. This conference aims to disseminate the latest research and applications in Renewable Energy, Mineral Resources, Natural Hazards and Risks, Environmental Impact Assessment, Urban and Regional Planning Issues, Remote Sensing and GIS, and other relevant topics and applications.

The friendliness and openness of the WSEAS conferences, adds to their ability to grow by constantly attracting young researchers. The WSEAS Conferences attract a large number of well-established and leading researchers in various areas of Science and Engineering as you can see from **http://www.wseas.org/reports**. Your feedback encourages the society to go ahead as you can see in **http://www.worldses.org/feedback.htm**

The contents of this Book are also published in the CD-ROM Proceedings of the Conference. Both will be sent to the WSEAS collaborating indices after the conference: **www.worldses.org/indexes**

In addition, papers of this book are permanently available to all the scientific community via the WSEAS E-Library.

Expanded and enhanced versions of papers published in this conference proceedings are also going to be considered for possible publication in one of the WSEAS journals that participate in the major International Scientific Indices (Elsevier, Scopus, EI, ACM, Compendex, INSPEC, CSA .... see: www.worldses.org/indexes) these papers must be of high-quality (break-through work) and a new round of a very strict review will follow. (No additional fee will be required for the publication of the extended version in a journal). WSEAS has also collaboration with several other international publishers and all these excellent papers of this volume could be further improved, could be extended and could be enhanced for possible additional evaluation in one of the editions of these international publishers.

Finally, we cordially thank all the people of WSEAS for their efforts to maintain the high scientific level of conferences, proceedings and journals.

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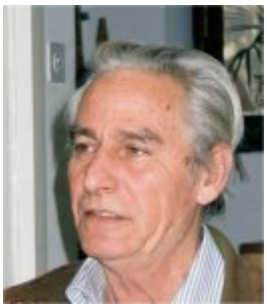
Plenary Lecture I

Critical Review of the Physical Foundations of Unsaturated Soil Mechanics



Professor Rafi Baker
Co-author: Professor S. Frydman
Department of Structural Engineering & Construction Management
Faculty of Civil & Environmental Engineering
Technion - Israel Institute of Technology
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ISRAEL

Abstract: Most constitutive models for unsaturated soils are based on identification of matrix (or metric) potential (energy per unit volume) ψ with it's the capillary component ψcpl = (ua - uw) where {ua, uw} are the pore air pressure and (negative) pore water pressure receptivity. This identification ignores the contribution of adsorption potential ψad to ψ. Identification of a potential with stress (or suction), is questioned, since these quantities have different physical significance despite their common dimensions. Moreover, (ua - uw) is a valid expression for capillary potential only in the simplified and non realistic model of a pore space consisting of a collection of cylindrical capillaries. In reality however the structure of clay soils consists of collection of pods built up of closely spaced parallel plates, and the pods themselves are arranged randomly in space. The water inside these pods is well within the range of adsorption forces, and the adsorption potential should not be ignored. It is noted that unlike the capillary potential, the adsorption potential has no direct interpretation in terms of pressures, and it can not be incorporated directly into mechanical constitutive equations.

Note also that (ua - uw) are not measurable quantities and the only measurable variable is the potential ψ which to a first approximation can be considered as a sum of capillary and adsorption potential, i.e. ψ = ψad + (ua - uw). Therefore, neglecting the adsorption potential results in an over estimation of the capillarity component, for a given measured ψ value.

All techniques for measuring ψ are based on the principle that at equilibrium it is the water potentials rather than water pressures that are equal in the soil and the measuring device. It is impossible to measure water tension greater than approximately 0.8-1.0 atm due to cavitation of the water in the measuring device. In order to overcome this technical difficulty, most potential tests in geotechnical engineering utilize the axis translation technique which applies an external air pressure to the sample. This technique "translates" water pressure to the positive range thus preventing cavitation and making it possible to perform the measurement of uw.

Both thermodynamic considerations and direct measurement of ψ using psychrometeric techniques indicate that at low water content ψ is of the order of 10.000 atm. Moreover under usual field conditions air pressure is atmospheric (i.e. ua = 0). Combining the above considerations yields uw = -10.000 atm. In a heterogeneous and cavitation nuclei rich medium like unsaturated clays, the tension stress in the water can not exceed 0.8-1.0 atm due to cavitation of the soil water. Consequently the extremely large tensile stresses in the water implied by the geotechnical approach, are not realistic, and result from neglecting the adsorption potential which does not have a mechanical interpretation, and from the use of the axis translation technique. Introducing such unrealistic water tensions into mechanical constitutive equations is not justified, resulting with various conceptual problems. It is noted that preventing cavitation by applying an elevated air pressure to an unsaturated soil sample, modifies its behavior. Consequently it is doubtful whether constitutive formulations based on experimental information obtained by the axis translation technique are relevant to actual field behavior.

Capillary potential is shown to account for only a small part of matrix potential, the major contribution resulting from water adsorption inside the soil pods, particularly in soils having large specific surface areas. Consideration of double porosity models as well as the adsorption potential appears essential for proper interpretation of unsaturated soil behavior.

The present talk does not present a complete framework overcoming the above mentioned difficulties. However, reference to the strength of unsaturated clay soils supports the above criticism, resulting also with an alternative and simpler formulation than the conventional geotechnical approach. The main purpose of the present talk is to emphasize the distinction between the terms water potential ψ (energy per unit volume), and the stress variable (ua - uw). The confusion between these two terms in the common geotechnical framework is probably the main element preventing the construction of rational and consistent theory describing the mechanical behavior of unsaturated clay soils.

Brief Biography of the Speaker: Baker completed his first and second degrees in the faculty of Civil Engineering of the Technion I.I.T. The 2nd degree was done in the Geotechnical Engineering Department. He did his PhD in the faculty of Agriculture of McGill University, Montreal Canada, in the Dept. of Soil Physics. The subjects of the speaker's 2nd and 3rd degrees dealt with the interface between soil mechanics and soil physics. As a result, of this history he follows both the geotechnical and soil physics literature. The present talk is a result of this dual interest. He received the G.J. Zeitlen price from the Israeli Association of Engineers and Architects, and twice delivered the Kassiff memorial lecture, which is the most prestigious geotechnical lecture in Israel (some of the previous distinguish lecturers include: G.A. Leonards from Purdue Univ., J. Bear from the Technion, S. Marchetti from L'Aquila Univ., D. Fredlund from Saskatchwan Uni., J.B. Burland from Imperial College, R. Goodman from Berkley, M. Randolh from the Univ. of Western Australia, F.H. Kulhawy from Cornell Univ., and I. Moore from Queen's Univ.).

During 1995-1998 he was a member of the International subcommittee on Slope Stability. During 2000-2002 he served as the head, of the Division. of Geotechnical Engineering at the Technion I.I.T.

During 1980-1981 he was a Visiting Professor at VPI & SU. Virginia, USA. During the summer of 1981 he was a Visiting Scholar, in the Geotechnical Research Center of McGill Univ. Montreal, Canada. During the summer of 1983 he was a Visiting Scholar in the Univ. of Arizona, Tucson, Arizona, USA. During 1985-1986 he was Visiting Professor in Carleton Univ. Ottawa, Canada. During the summer of 1997 he was a Visiting Professor, at Kobe Univ. Kobe. Japan. During 2004 he was a visiting professor in North-Carolina University at Chapel-Hill USA (interrupted due to sickness).

Plenary Lecture II

Natural Hazards Induced by Large Intermediate Vrancea Earthquakes in SE Europe

Professor Andrei Bala
Co-author: Mircea Radulian
National Institute for Earth Physics
P.O. Box MG-2, Bucharest-Magurele, Romania

Abstract: Bucharest, the capital of Romania, with more than 2 million inhabitants, is considered after Istanbul the second-most earthquake-endangered metropolis in Europe. It is identified as a natural disaster hotspot by a recent global study of the World Bank and the Columbia University (Dilley et al., 2005). Four major earthquakes with moment-magnitudes between 6.9 and 7.7 hit Bucharest in the last 65 years. The most recent destructive earthquake of 4. March 1977, with a moment magnitude of 7.4, caused about 1.500 casualties in the capital alone. All disastrous earthquakes are generated within a small epicentral area – the Vrancea region - about 150 km north of Bucharest (Fig. 1). Thick unconsolidated sedimentary layers in the area of Bucharest amplify the arriving seismic shear-waves causing severe destruction. Thus, disaster prevention and mitigation of earthquake effects is an issue of highest priority for Bucharest and its population.

The studies done after this earthquake had shown the importance of the surface geological structure upon ground motion parameters. New seismic measurements are performed in Bucharest area with the purpose of defining better elastic and dynamic properties of the shallow sedimentary rocks. Down-hole seismic measurements were performed in a number of 10 cased boreholes drilled in the Bucharest City area. Processing and interpretation of the data lead to the conclusion that shallow sedimentary rocks can be considered weak in the area, down to 150 - 200 m depth. Seismic wave velocity values and bulk density values presented in the paper associated with local geology are useful primary data in the seismic microzonation of Bucharest City. They are used as 1D models to derive transfer functions and response spectra for the stack of sedimentary rocks in several parts of Bucharest area, leading to a better knowledge of the local site amplification and associated frequency spectra. The last chapter is dedicated to the data acquired in 20 sites in Bucharest City and to compute the spectral ratio of the noise. The obtained ratios confirm the previous results, showing a dominant resonance in the period range of 1.25 - 1.75 seconds. The average period of these maxima is 1.47 ± 0.20 s, while the average amplitude is 2.5. Our results bring evidence of the applicability of the ambient noise measurements for the risk assessment studies.

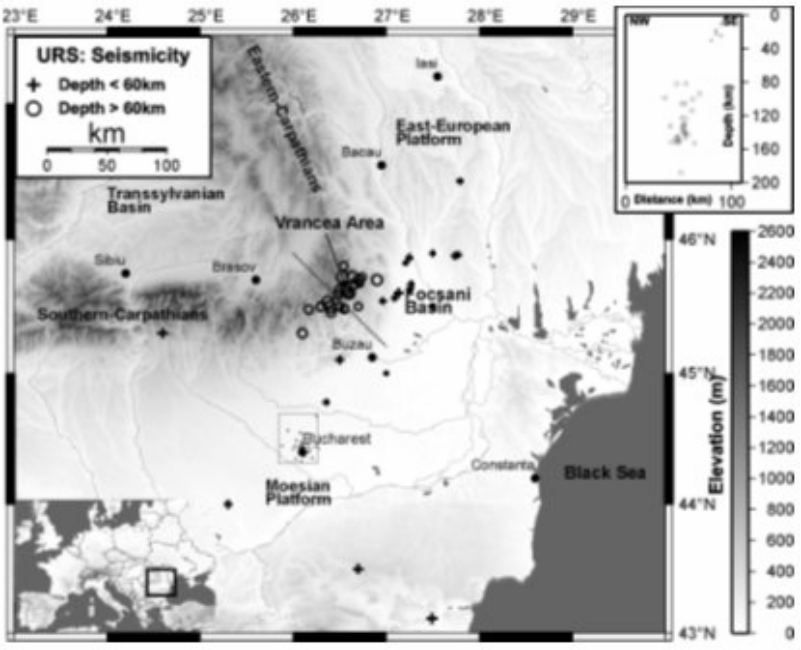

Fig. 1: General map of study region. Strong earthquakes occur at depth below the Vrancea area which corresponds roughly to the southeastern bend of the Carpathian mountains. The seismic waves cause severe damage in Bucharest, about 150 km to the south. The map shows the distribution of epicenters during the URS (URban Seismology) experiment. The cross-section in the upper right corner shows the distribution of hypocenters along a NW-SE cross-section (dotted line in the map).

Plenary Lecture III

The Paleontological History of Wildfire: An Important Tool to Define Fluctuations in the Atmospheric Composition

Professor André Jasper
Botanica, Paleobotanica e Evolucao de Biomas
PPG - Ambiente e Desenvolvimento
Centro de Ciencias Biologicas e da Saude
Museu de Ciencias Naturais
Setor de Botanica e Paleobotanica
Rua Avelino Tallini, 171
Bairro Universitario, Lajeado
Rio Grande do Sul, Brasil
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URL: http://www.univates.br

Abstract: The study of the actual biomes is more and more connected to the environmental processes occurred in its genesis. The actual stability, for the human conditions, is fragile and correlated with an important element: the composition of the atmosphere. In this way, we can observe the recent discussions about the global warming, correlate with the upgrade of the concentration of Carbon in the atmosphere. It is obvious that the human activities have a great influence in the global climatic changes. However, the study of the geological and paleontological registers, can confirm that these changes normally occurred in the Earth's history. One of the most important forms of control of the atmosphere composition is the presence of the "Fire Window", an interval of atmospheric oxygen level (13 to 35%) that permits the occurrence of wildfire. Moreover, if we accept that, over the geologic time, fluctuations in atmospheric gases levels have influenced biological evolution and had an integral role in the feedback mechanisms that governing Earth's biogeochemical cycles, the study of the events is fundamental to establish models for the future. Thus, the evaluation of occurrence, frequency and conditions of palaeowildfires, through study of charcoal (Fig. 1 and 2), a proxy for fire, can contribute for the construction of models that enable a planning of future actions of environmental management.

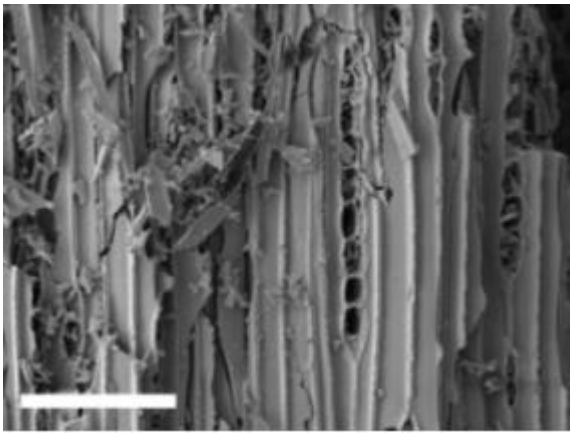

Figure 1: Scanning Electron Micrograph of a charcoal with gimnospermic affinity from the Early Permian of South America (scale bar = 40 μm).

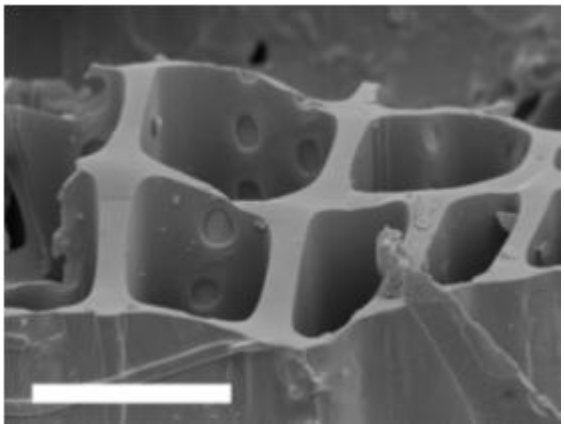

Figure 2: Scanning Electron Micrograph of a charcoal from the Early Permian of South America with the cellular walls indicating a fire of 230 – 340ºC (scale bar = 15 μm).

Brief Biography of the Speaker: Jasper is Biologist in its first degree formation and developed it Master and PhD degrees in Paleobotany at the Geosciences Institute of the Federal University of Rio Grande do Sul (UFRGS), Brazil. Made the Postdoctoral stage at the Geosciences Institute of the University of Tübingen, Germany. His main areas of interest are Paleobotany, Evolution of Terrestrial Biomes and Study of Paleowildfires. In addition he compares the Paleoecological data with the actual situation of the environments to be able to determine differences between the planetary events with natural origin and those caused by human action. Actually he works at the Museum of Natural Sciences of the UNIVATES, Brazil, and is Titular Professor for Paleontology in the same University. He is also Guest Professor at the UNICAMP, Brazil, and at the Halmstad University, Sweden.

Plenary Lecture IV

Evaluating and Planning Waste Landfill Top Covers with the Help of Vegetation and Population Ecology

Professor Brigitte Klug1
Co-authors: Johannes Tintner2, Marion Huber-Humer2
1: Department of Integrative Biology and Biodiversity Research
2: Department of Water, Atmosphere, and Environment
University of Natural Resources and Applied Life Sciences (BOKU)
Gregor-Mendel-Stra?e 33, 1180 Vienna
AUSTRIA

Abstract: The accumulation of solid waste has caused remarkable problems for environment and public health, and authorities have to tackle the costly recycling, reduction, and management of solid waste. Nevertheless, the area occupied by landfills is steadily growing. It is an urgent need to avoid toxic impacts such as landfill gas or leachate arising from old landfills, and to find environmentally friendly after-uses for the sites. The co-operation of botany and waste management shows viable practices for the future: Phytosociological releves of the (spontaneous or seeded) vegetation on old landfills can indicate not only the quality of the top cover, but also gaps in the cover where methane or leachate emerges. This information helps companies and authorities to take appropriate steps of sanitation. Well-kept old landfills may be re-integrated into the production of energy plants or fibre plants. Another possible after-use would be a park for recreation. In this case, special care has to be taken for selecting local tree and shrub species with suitable demands and a superficial root system. In regions where rare ecosystems in the vicinity of a landfill are threatened by extinction, one can think of a re-establishment of those ecosystems. By providing a suitable top cover and introducing species of the threatened ecosystem, it is possible to trigger a succession towards this. Nevertheless, steady monitoring of the vegetation development and the soil seed bank is necessary to guarantee success. A new experimental field for botanists and ecological engineers is re-vegetation on combustion slag. To reduce the volume of waist, some municipalities have chosen this method recently instead of mechanical-biological waste treatment. Re-cultivating combustion slag causes many ecological problems, and this is one of the challenges for the future.

Brief Biography of the Speaker:

Date and place of birth: Jan 6,1947, Innsbruck, Tyrol, Austria.
Studies of botany and zoology, University of Innsbruck, 1966-1973.
Additional studies of forestry, University of Applied Life Sciences and Renewable Resources (BOKU), Vienna, 1973-1974.
1974-1980: Researcher, Austrian Academy of Sciences, Vienna: MaB-High Mountain Project Hohe Tauern
1978: Birth of 1st son
1980-1982: Research Assistant, Institute of Game Research, Veterinary University of Vienna.
1982: Birth of 2nd son.
1986-1991: Research assistant, Institute of Botany, BOKU.
1991: Habilitation.
1991-2007: Assistant professor, Institute of Botany, BOKU.

Fields of research:
Ecology of alpine plants, restoration ecology, diaspore ecology, phenology, production ecology

Latest projects:
2001-…:Symphenology of oak-hornbeam forests in the “Wienerwald” (Vienna forest)
2005: Plant ecological research as a basis for a restoration concept at the landfill site Rautenweg (Vienna)
2005: Actual above ground vegetation and diaspore communities on re-vegetated ski runs in the Austrian Alps.
2006-2007: Diaspore communities in successional states of an oak-hornbeam forest in Lower Austria
2006-2007: Above ground vegetation and diaspore communities on an artificially greened solid waste landfill and in the surrounding semi-dry meadows in Lower Austria.
2007: Influence of pasturage on herbaceous and woody successional plants in the Kamp valley 4 years after the flood disaster.

Plenary Lecture V

An Overview on the Landslide Susceptibility Assessment Techniques

Professor Murat Ercanoglu
Hacettepe University Geological Engineering Department
06800 Beytepe, Ankara
TURKEY

Abstract: Natural disasters and their consequences have considerable and destructive effects on human life, properties, infrastructures, and, of course, on environment. One of the most important natural hazards, landslides play a very important role in these effects throughout the world. Therefore, many countries, particularly the developed ones, invest huge amount of money either in mitigation or in prevention of landslides. The first, and probably the most important, stage of mitigation an/or prevention efforts is to assess landslide susceptibility by obtaining data related to landslides, i.e. preparation of landslide inventory and database. If taken into consideration, results of these assessments, i.e. landslide susceptibility maps, will provide useful information and economic benefits for urban planning, development plans, engineering applications, land use potential planning, and so on. When the international scientific literature related to landslide assessments is examined, there has been an increasing interest in landslide susceptibility mapping studies in the last decades, instead of evaluating hazard and/or risk. Particularly, in recent years, depending upon the breakthroughs in computer technology, GIS (Geographic Information System), and RS (Remote Sensing) techniques, very important developments were achieved in these studies. This can be concluded as one of the most promising efforts with respect to combat with natural hazards since they opened wide range of opportunities for analysing, evaluating, and assessing earth processes, notably for landslides. Thus, there are a multitude of studies carried out by different researchers in different parts of the world with the aid of these technological items.

In this study, it was aimed at assessing landslide susceptibility techniques by means of a detailed literature survey based on an overview including twenty years' experiences. The techniques were categorized into two distinct groups such as qualitative and quantitative ones, and examined individually. By doing so, a historical development of the techniques and actual trends in landslide susceptibility assessments were evaluated. It was revealed that some traditional methods seemed to have disappeared, while the new ones, particularly included in the GIS softwares, became very popular. However, at present, there seems to be no agreement on these techniques which is the most effective among the researchers.

Brief Biography of the Speaker: Murat Ercanoglu is a Geological Engineer, PhD. His main areas of interest are Landslides and Engineering Geology. In addition, he has got experience of utilization GIS, Remote Sensing, and Artificial Intelligence techniques such as fuzzy logic and neural networks for his research. He has been studying on landslides more than 10 years, and he has got national and international papers commonly on this subject. He is working at Hacettepe University Geological Engineering Department (Ankara, Turkey) as an Associate Proffessor in Applied Geology Division.

Plenary Lecture VI

The Method of Sequence Stratigraphy

Professor Octavian Catuneanu
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1-26 Earth Sciences Building
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CANADA

Abstract: Sequence stratigraphy is a modern method of stratigraphic analysis, whereby stratal stacking patterns and facies relationships of sedimentary rocks are studied within a time framework. Sequence stratigraphy is now routinely employed in both academic and industry research, to understand local to global changes in the geological record, to improve the predictability of petroleum, coal and mineral resources exploration, and to optimize the development of petroleum-producing reservoirs.

In spite of its popularity, the sequence stratigraphic method tends to be confusing and hence difficult to apply because of the proliferation of an unnecessarily complicated terminology, with several synonymous terms for the same concept, or similar terms for different concepts. In addition to this, the existence of several different approaches to sequence stratigraphy complicates further its applicability. This paper takes a balanced approach to explaining what is the relationship between all existing approaches, what are the reasons for having this diversity of opinions, and what is the logical way that would help one select the optimum approach for each case study. Ultimately, all current approaches are correct in the context under which they were proposed. The proponents of each model have often used case studies from different sedimentary basins to support their methodology, which explains the difference of opinions that is observed today. The applicability of the sequence stratigraphic model varies with the data set that is available for analysis (e.g., seismic data versus well logs or outcrop), tectonic setting, depositional setting, and the scale of observation. Taking the right decision regarding the method that provides the optimum approach under specific circumstances requires an emphasis on depositional processes rather than terminology or other model-dependent assumptions. This promotes flexibility in the application of sequence stratigraphy, and guides the practitioner through a process-based, model-independent approach.

The lack of formal inclusion of sequence stratigraphy in the current international stratigraphic codes may be attributed largely to trivial differences in terminology and the style of conceptual packaging of the rock record into sequences and systems tracts. The choice of how we name the packages of strata between specific sequence stratigraphic surfaces varies with the model, which is why the systems tract nomenclature becomes less important than the correct identification of the stratal stacking pattern which defines that particular package of strata. Even the selection of what surface (or set of surfaces) should serve as the 'sequence boundary' becomes subjective and trivial to some extent, as the correct interpretation of all sequence stratigraphic surfaces and of the origin of strata that separate them is far more important for the success of the sequence stratigraphic method. Irrespective of the model of choice, the 'pulse' of sequence stratigraphy is fundamentally represented by shoreline shifts, whose type and timing control the formation of all genetic packages of strata (systems tracts) and bounding surfaces. Beyond nomenclatural preferences, each stage of shoreline shift (normal regression, forced regression, transgression) corresponds to the formation of a systems tract with unique characteristics in terms of stratal architecture, sediment dispersal patters and distribution of depositional elements across a sedimentary basin. These fundamental principles are common among all models, and allow for a unified sequence stratigraphic approach. Finding the common ground between the various 'schools' is the key for making real progress towards standardizing the concepts of sequence stratigraphy (Catuneanu, 2006).

Reference:

Catuneanu, O. (2006) Principles of Sequence Stratigraphy. First Edition, Elsevier, Amsterdam, 375 pp.

Brief Biography of the Speaker: Octavian Catuneanu is Professor in the Department of Earth and Atmospheric Sciences at the University of Alberta, with Ph.D. degrees from the University of Toronto (1996) and the University of Bucharest (1992). He is the recipient of several distinctions in the field of Geology, including best paper awards from the Geological Society of America (2002) and the Romanian Academy (1994). Octavian Catuneanu has served as the Chair of the North American Commission on Stratigraphic Nomenclature (2005-2006), the Chair of the Canadian Sedimentology Research Group (a division of the Geological Association of Canada; 2004-2007), and he is the current Chair of the International Working Group on Sequence Stratigraphy (working towards the standardization of sequence stratigraphy in the International Stratigraphic Guide and in the North American Stratigraphic Code). He is the Editor-in-Chief of the Journal of Marine and Petroleum Geology, and also serves on the editorial board of the Journal of African Earth Sciences and as an Associate Editor of the Bulletin of Canadian Petroleum Geology. He is the author of Elsevier's textbook titled "Principles of Sequence Stratigraphy" (Elsevier's best seller in Earth Sciences, and recipient of a CHOICE Award for one of the best reference titles), co-editor or senior editor of several books and special issues, and author of numerous publications in the fields of sedimentology, stratigraphy and basin analysis. He is currently involved in several international research programs and as an instructor of sequence stratigraphy and basin analysis workshops for conferences and companies worldwide.

Plenary Lecture VII

Climate Change (in Sweden)- Geotechnical and Contaminated Land Consequences

Professor Yvonne Andersson-Skold
Co-authors: Carina Hulten, Louise Simonsson-Forsberg, Sofie Storbjork
Swedish Geotechnical Institute (SGI)
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Abstract: According to climate scenarios the global mean temperature will increase the nearest 50 to 100 year. Based on regional climate models the annual precipitation and heavy rain events in most parts of Sweden will consequently increase. The risks for flooding will increase. Also the risks of erosion and landslide are expected to increase as well changed behaviour and increased mobility of soil contaminants. The summer season in general is expected to become drier. There consequently is expected to be larger fluctuations of groundwater levels further enhancing risks of erosion, land slides and mobility of soil contaminants. One of the areas expected to be among the most affected in Sweden is the Lake Vanern and the Gota alv river system.
The Swedish geotechnical institute has, together with other agencies and universities in Sweden, contributed in the national climate and vulnerability inquiry (SOU 2007:60, Sverige infor klimatforandringarna - hot och mojligheter). The individual contributions are presented in separate appendixes. Here the results from the following reports will be presented:

Impact of Flooding on soil pollutants, Andersson-Skold, Nyberg, Goransson, 2007, Varia 576 & Varia 577, SGI, Statens geotekniska institut 2006. (In Swedish)

Hulten C, Edstam T, Arvidsson O, Nilsson G. 2006. Increased tapping from lake Vanern and related geotechnical conditions in the Gota alv valley. (Geotekniska forutsattningar for okad tappning fran Vanern till Gota alv. Underlag till klimat och sarbarhetsutredningen.) SGI, Statens geotekniska institut 2006. (In Swedish)

Fallsvik, J, Hageryd, A-C, Lind, B, Alexandersson, H, Edsgard, S, Lofling, P, Nordlander, H, 2007, Assessment of erosion and landslides in a changing climate (Oversiktlig bedomning av jordrorelser vid forandrat klimat, preliminar version Dnr 1-0611-0652) (In Swedish)

Based on the results from the national climate and vulnerability inquiry research projects have been initiated. One project focuses on the vulnerability and adaption capacity among municipalities along the Gota alv river system. The project includes eco social, environmental and geotechnical aspects and is done in co-operation by Linkoping University and Swedish Geotechnical Institute. The aim is to present some preliminary results from this project.

Plenary Lecture VIII

The Role of Engineering Geology in the Identification and Evaluation of Geological Risk and their Application in Prehistoric Cave Areas. Three Case Histories

Professor Alberto Foyo
Civil Engineering School
University of Cantabria
SPAIN
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Abstract: By means of the traditional geologic approaches as they are the characterization of geologic estratigraphical and structural discontinuities, the petrographic and geomorphological characteristic, the conditions of stability and the elaboration of geological maps, it is possible to define such parameters of geological risk as Natural Risk Index (NRI) and the Safety Factor (SF), and through them, to establish the corresponding protection areas and their characteristics about the different human uses, be already industrial, urbanistic or touristic, to prevent and avoid the geological deterioration of the cavities and, in consequence, of the samples of prehistoric art that content.
The experience and research works in the Altamira Cave and El Castillo Cave Areas in Cantabria, and in the Tito Bustillo Cave Area in Asturias, North of Spain, carried out by the Engineering Geology Group, will be presented.

Brief Biography of the Speaker: Was born on 1949 in Lugo, Galicia, North of Spain. Graduate in Geology (1976) and Doctorate in Geology (1980) in the University of Oviedo, Asturias.

Since 1977, as a member of the Applied Geology Group of the University of Cantabria, participate in many civil engineering projects, mainly in motorways, large dams foundations, geological risk in hydraulic works and, finally, since 1999, in the geological risk research around the main prehistoric caves in the North of Spain. Since 1983, Professor of Engineering Geology in the Civil Engineering School of the University of Cantabria, and since 1993 Prof. of Dam Geology in the Master of Engineering Geology, Geological Faculty of the University of Madrid. Member of the Cantabria International Institute for Prehistoric Research. Actually, Director of the Ground Engineering and Material Sciences Department of the Cantabria University.

Plenary Lecture IX

Are we going towards a Global Planetary Magnetic Change? Possible Scientific Perspectives and Consequences to our Everyday Life

Professor Angelo De Santis
Director of Research
Istituto Nazionale di Geofisica e Vulcanologia, Roma, Italy
and
Professor of Geophysics at
University G. D'Annunzio, Chieti,
ITALY

Abstract: The dipolar part of the geomagnetic field has been decaying rapidly during the last few hundreds of years. In addition to this classical argument, from Information theory applied to geomagnetism, there are some evidences that the recent Earth magnetic field is showing characteristics typical of a reversal in progress. If this is true, many scientific and environmental questions will arise. For instance, it will be of particular interest to monitor the time-space dynamics the South Atlantic Anomaly, where the magnetic field is strongly reduced (a sort of "planetary magnetic hole"). Here we find one of the most favourite places where Low Earth Orbiting (LEO) satellites are lost or present some damages, due to the vicinity of "clouds" of electric particles (Van Allen belts) to the Earth's surface. The decay of the field will also decrease the screening effect to the solar wind and cosmic charges, so enhancing the cosmic radiation illuminating our planet: possible negative consequences are expected in terms of increase of skin cancers. Also important will be the study of the possible evolution of the core dynamics that will be generating this specific condition of the geomagnetic field.

Brief Biography of the Speaker: I have been working since 1977 in the National Institute of Geophysics and Vulcanology of Italy (INGV). I took my Doctor Degree in Physics (1984) at University of Rome (Italy). My main interests are in: a) Models in Earth sciences, with particular attention to geomagnetism; b) Search for nonlinearities in Geophysics; c) Geomagnetic Deep Sounding; d) Potential Field Theory; e) Magnetometry and Riometry. My present position at INGV is as Director of Research (since 1999). I have been Head of Geomagnetism Group for 5 years (from 2000 to 2005). I received a Royal Society 5-month Grant visiting the British Geological Survey (1987). Former Member of INGV Scientific Committee 1999-2005 and former Member of ESA Swarm satellite Mission Advisory Group Phase A. I am presently formal member of INGV and INFN (National Institute of Nuclear Physics of Italy) Committee. Professor of Solid Earth Physics and then Geophysics at Chieti University (from 1998 to present). I have been member of 5 Italian expeditions in Antarctica and I coordinated all scientific activities during the XI Antarctic expedition. I have been responsible of many National and International Projects: Riometry, ARM I, II, REM within the “ItaliAntartide” Program, 1993-2006; bilateral Cooperation Italy-Spain 1994-1996; bilateral Cooperations: Italy-Czech Rep. 1996-1999, Italy-Albania 2002-2004; NATO 1999-2001. Vice-Responsible of Space Weather Project within the “ItaliAntartide” Program, 1996-1999. I coordinate some programmes of research in the framework of Oersted and Champ satellite missions 2001- present. I cooperate with many Italian Universities following graduates and PhD for theses. I also teach some PhD Courses in Geophysics (2000- present). I count around 140 scientific publications (70% are International) and 150 scientific communications at national and international conferences.

Plenary Lecture X

Source Identification using CMB Models and Effects of Emission Control on Reducing Ambient Air Pollution in Industrial City

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Abstract: Harmful substances in the ambient air can be reduced only on condition that their emitters are kept under control. For that purpose it is necessarily to know key points in technological processes that are emitting specific pollutants, the nature of emitters, the link between the emission fluxes on the emitters, meteorological base of the region and the concentration of pollutants at the receptors of ambient air. Atmospheric surface temperature inversions play a significant role in the problem of ambient air pollution since their upper edge acts as a natural barrier to the vertical dispersion of pollutants. In many cases of pollution, there are no prior knowledge of the emission sources, hence Chemical Mass Balance models (CMB) are applied to extract information concerning the sources using minute by minute continuous measurements data of ambient air pollution at the receptors. The results of calculated fingerprints of possibly sources are connecting to real emission sources. Model of investigation was highly industrial city in Serbia (Pančevo), with over 80.000 habitants, where among the rest industries are located oil refinery, petrochemistry and fertilizer factory. The investigated region is characterized by maximum number of surface temperature inversions of atmosphere during the night times and their furlough during the day times in August. Analysis of daily variations contents of pollutants in ambient air show that concentrations of the pollutants from the low altitude emission sources were higher two times and more during the night than daytimes vice verse for pollutants from the high altitude sources. The daily variations of their concentrations show the minimums in the afternoons when is boundary layer at the top point. NH3 in this case origin from high altitude source in fertilizer factory, which is only one in the region, therefore was chosen as a tracer of industrial area influence. CMB models showed the highest associations of pollutants that are constituents of volatile organic compounds from low altitude sources in industrial area. The measures of control of identified emission sources, such as extinguishing key sources, planning of emiters' activities in harmony with meteorological conditions, and at a low rate and simple reconstruction one part of sources in both the refinery and petrochemistry had as the result the reduction of VOCs concentrations in the receptor's part of ambient air for more than twice. The benzene concentrations at the receptors which are under high influence of industrial sources reached in the years 2004 and 2005 the values acceptable with regard to the limit value of the Directive 2000/69/EC.

Brief Biography of the Speaker:
Graduation: 1990, Faculty of Physical Chemistry, University of Belgrade
M.Sc. Thesis: 1996, Faculty of Physical Chemistry, University of Belgrade
Ph.D. Thesis: 2004, Faculty of Chemistry, University of Belgrade

Professional background: Between 1990 and 1991 part-time worked in Institute of General and Physical Chemistry in Belgrade as a Research Assistant. From 1992 to 1999 worked in Institute of Workers Safety, Fire and Environmental Protection, Belgrade as a research associate. Since 1999 has been working in Centre of Chemistry of Institute for chemistry, technology and metallurgy. Present position is scientific research and head of the Environment department of the Laboratory of IHTM-Centre of chemistry. She is familiar with GC, FAS and GF-AAS laboratory techniques. The scientific research evolves investigation in environment; air pollution and their physicochemical transformations, emission sources and atmospheric transport as well as interactions between aquatic systems and soils. The whole scientific research of Dr. Dragana Đorđević published in 20 scientific articles, 7 contributions to books and over 60 published contributions to academic conferences.

Plenary Lecture XI

How a Horizontal Surface is Traced

Professor Petr Vanicek
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Abstract: What is a horizontal surface and who needs it? Whoever is determining or using heights uses it, implicitly or explicitly: one particular horizontal surface, the geoid, is the reference surface for heights, the "heights above the sea level". These heights are used exclusively in engineering practice as well as in other applications. A horizontal surface is realized, more or less, by a surface of a water body, but how about dry land; what is needed for tracing a horizontal surface on land? What is needed, are gravity data observed on the surface of the earth, earth topography, some idea about topo-density, some idea about long-wavelength features of gravity field (derived from satellite tracking), and a conventional reference system with respect to which the tracing and the display should be done. The tracing is done through solving a non-linear boundary value problem for gravity potential with the boundary (the geoid) being itself a function of the potential. The solution is obtained by finite element or finite difference techniques, after transforming the boundary value problem into Green's form. The solution uses a vast amount of data irregularly distributed on the surface of the earth.

Brief Biography of the Speaker: Petr Vanícek, P.Eng., Ph.D., Dr.Sc, is Professor Emeritus of geodesy in the Department of Geodesy and Geomatics Engineering at UNB. He retired in 1999, after 28 years of teaching and is now involved only in post-graduate student supervision and in research. His research interests cover the whole spectrum of geodesy, geophysics and applied mathematics. He is a fellow of AGU, IAG, Senior Distinguished Scientist Humboldt awardee (1989), and recipient of CGU 1996 Tuzo J. Wilson medal. He is also author and co-author of about 450 publications including the comprehensive textbook "Geodesy: the concepts" used world-wide.

Plenary Lecture XII

Heterogeneous Photo-Fenton Process for Effective Removal of Organic Pollutants Contaminated in Wastewater

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Abstract: Civilization and industrialization have resulted in serious problems with water supply. Industrial water effluents contain a variety of highly toxic organics such as dye pollutants. Numerous processes have been investigated for treating such pollutants. Among them, photo-Fenton's reaction is effective for the organics mineralization with the hydroxyl radical generated from the Fenton's reagents (Fe2+ and H2O2). However, there are two major problems with the application of photo-Fenton process. One is that a separation system is required to recover the homogeneous ferrous ion in the treated wastewater and the other is that the oxidation performance deteriorates quickly as the solution pH goes up above 4. The working pH range can be broadened by replacing Fe with Cu and the secondly pollutant (metal ions in the treated water) can be eliminated by immobilizing active metal onto the surface of porous solids. In this study, a heterogeneous Cu catalyst supported on bentenite clay was synthesized using a chemical vapor deposition (CVD) technique. To resolve the copper leaching problem during the catalyst's application in aqueous reaction, a critical pretreatment step, acid activation by H2SO4, was applied to the original bentonite clay. Such manufactured Cu/clay catalyst was characterized and evaluated in the photo-Fenton-like degradation of an azo organic dye, Acid Black 1 (AB1). It was found that the acid activation process of clay could significantly reduce the leaching problem by almost 72% and improve the catalytic activity. These improvements came from the active site and the addition of sulfonate functional group on the clay surface. Moreover, in order to provide a best catalyst over a broad pH range, the pH insensitive Cu was integrated together with the typically affirmed Fenton (Fe) reagent to form a bimetallic catalyst. The metals (Cu and Fe) were deposited onto the acid-activated bentonite clay by CVD to form a heterogeneous bi-functional catalyst. The developed bimetallic catalyst is able to sustain the activity in catalysing the total organic carbon (TOC) removal of organic dye in a wide range of pH, viz acidic and alkaline condition. To further minimize metal leaching, another highly porous solid, MCM-41, was used as the catalyst support. An in-situ oxidation technique was developed to stabilize the metals on the support. The bimetallic MCM-41 supported catalyst, FeCu/MCM-41, was found to achieve an extremely low leaching level (~0.3 ppm) and have an excellent degradation power of organics over a wide pH range, achieving TOC removals of 93%, 83%, and 78% at pHs of 3, 5.5, and 7, respectively. Furthermore, this catalyst can maintain its high catalytic activity after 10 consecutive runs. .

Brief Biography of the Speaker: Xijun Hu is Associate Professor of Chemical Engineering at the Hong Kong University of Science and Technology. He received his B.S. in chemical engineering from South China University of Technology (1982) and his Ph.D. from the University of Queensland, Australia (1993). After two years postdoctoral work at the University of Queensland, he joined the faculty of the Hong Kong University of Science and Technology in 1994.

Professor Hu is associate editor of two journals, has edited 1 book, published over 90 technical articles and presented more than 50 conference papers. He also has 3 patents.

Professor Hu has been active in international conferences. For example, He was the secretariat of 17th International Symposium on Chemical Reaction Engineering (ISCRE17, 2002), technical chairman of 3rd Asia Pacific Conference on Sustainable Energy and Environmental Technologies (2000).

Professor Hu's research covers the development of novel heterogeneous catalysts by chemical vapour deposition (CVD) and their applications in air pollution control and wastewater treatment; Continuous wastewater treatment by catalytic wet oxidation using a trickle bed reactor; Modified nanoporous materials for efficient storage and rapid release of hydrogen; Multicomponent adsorption equilibrium and kinetics in heterogeneous porous media; Characterization of microporous solids; fabrication of Meso-Structured Crystals for Electrical and Optical Applications.

Professor Hu is the first person to introduce the concept of micropore size distribution (MPSD) to describe the surface heterogeneity of adsorbents for the study of multicomponent adsorption equilibrium and kinetics, which has now been widely adopted by other researchers. The synthesis of a high performance heterogeneous bimetallic (Fe+Cu) catalyst by his group is one of the most important contributions in the Fenton process, which successfully solved the problems of stability (metal leaching in acidic solution) and narrow working pH range of Fenton catalyst, which have puzzled the scientists for a long time.

Plenary Lecture XIII

Collision Mountain Belts as Crustal-Scale Pop-Up Structures due to Underthrusting: The case of the Brasília Belt, Central Brazil

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Abstract: Because collision-related mountain chains form above sites of mantle down welling (= mantle convection), contractional deformation in general must be governed by the mechanism of underthrusting, mainly, and the inner parts of mountains should correspond to crustal-scale pop-up structures. In fact, convective cells and underthrusting are the basis for a new understanding (termed Suction Tectonics) on lithosphere deformation. The Brasília Belt (BB) is the most complex of the three fold-and-thrust belts that constitute the Tocantins Province of central Brazil, a Neoproterozoic orogen situated between the Amazonian and São Francisco cratons. The Araguaia and Paraguay Belts are the other two. The Araguaia-Brasilia Belt records the evolution of a Meso-Neoproterozoic ocean and the collision between the Amazonian and São Francisco paleo-continents, during the ~750-590 Ma Brasiliano orogeny. The Paraguay Belt records the 620-510 Ma evolution of a rift-oceanic basin opened within the Amazonian paleo-continent, adjacent to the southern half of the BB. The results of a research carried out in the last 15 years and focused on the operation of the underthrusting mechanism in the BB are summarized, and a brief review of the up-to-date literature supporting the new understanding on lithosphere deformation is presented. Due to underthrusting, the inner part of the BB evolved such as a crustal-scale pop-up structure, and the evidence presented herein must be found in other collision-related mountain chains on Earth.

Brief Biography of the Speaker: PhD geologist, educator, born in Itabuna-BA, Brazil, 1947, son of José Silva and Mary Alice H. D'el-Rey, married Irene Ordine Lopes H. D'el-Rey, three children: Manuela, Alexandre, and Henrique O.L.H. D'el-Rey. Diploma in Geology, University of Brasília (Brazil), 1971; MSc in Geology, Federal University of Bahia (Brazil), 1984; PhD in geology, Royal Holloway University London (UK), 1992; Post-doctor in geology, Geological Survey of Finland (Finland), 2001. Biography included in Marquis Who´s Who in Science and Engineering (2005, 2006, 2007-2008), and Who´s Who in the World (2007).

Associate Professor of structural geology and tectonics in the Institute of Geosciences of the University of Brasília, since 1993, where has been developing a research program focused on the controls exerted by age- and scale-independent convection cells on the deformation of the lithosphere and formation of tectonic features such as mountain belts, basins, plateaus, with special attention on the tectonic evolution of the Neoproterozoic fold belts that surround the São Francisco Craton, Brazil. Scientific publications include 64 pieces or work, being 34 full papers (25 in indexed periodicals, 9 in congresses). Large working experience in mine geology and on the structural controls of ore deposits, with special achievements in the detailed study of highly deformed ore deposits of copper, gold, emerald, and base sulfides, in Brazil and in Canada.

Plenary Lecture XIV

Monitoring Land Degradation by the Integration of in Situ and Remote Sensed Data: Badlands in Basilicata Region

Professor Maria Francesca Macchiato
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Complesso Universitario di Monte Sant'Angelo, I-80126, Napoli,
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Abstract: The complexity of land degradation phenomena leads to a large number of definitions and to the use of terminologies often having distinct disciplinary-oriented meanings. Although land degradation is under a debate on terminology and is still difficult to grasp in its totality, some individual processes of degradation such as soil erosion, wind erosion, salinization and desert expansion are properly described and defined. Human activities enter in this framework through the uncontrolled and irrational exploitation of natural resources. Overgrazing of rangeland, over-cultivation of cropland, waterlogging and salinization of irrigated land, deforestation and pollution, intensive change of land use are some of unsustainable human practices that in recent years undermined the environmental balance, causing accelerated forms of land degradation. These processes act on lands at different spatial and temporal scales, making the understanding and the characterization of land degradation processes quite arduous. In this talk we present a multidisciplinary research work carried out through the integration of different monitoring techniques carried out in an area of Basilicata region in Southern Italy where badland landforms ("calanchi") are found in fine-grained clastic sedimentary bedrock. Badlands consist of deeply-dissected, non vegetated or poorly-vegetated landforms of high relative relief and high drainage density; they are conventionally considered areas of extreme soil erosion. In this work, we focus on the development of a suitable approach for remote identification of areas interested by "calanchi" formations by means of the analysis of Landsat ETM images for mapping badlands area. Contemporaneously we selected some chemical physical parameters (soil magnetic susceptibility, electrical conductivity, and pH) suitable for the characterization of erosive processes that took place in the "calanchi" formations.

Brief Biography of the Speaker: Maria Macchiato Biography. Maria Macchiato, is full professor of Physics at the University "Federico II" of Naples. She is responsible of research activities related to environmental modelling at DSF (Department of Physical Sciences) of the University "Federico II". She is also responsible of research activities related to the development of integrated technologies in situ and in remote sensing for the study of land degradation and of research activities related to energetic-environmental planning at IMAA/CNR (Institute of Methodologies for Environmental Analysis). Her main areas of interest are in the field of land degradation with a particular attention to those scientific issues that are related to climate change and sustainable development. The research lines can be summarized as in the following: study of vegetation cover dynamics observed from satellite for desertification and climate studies; soil and air monitoring by means of integrated chemical and geophysical techniques for pollution studies; development of integrated methodologies and multicriteria models for environmental planning. In recent years, she has been responsible of many National and International projects. At now she is Project Manager of the project INTERREG III B ARCHIMED "Methodology integration of EO techniques as operative tool for land degradation management and planning in Mediterranean areas" and she is responsible of the Integrated Project "New Energy Externalities Developments for Sustainability - NEEDS". She counts around 150 scientific international publications and 140 scientific communications at national and international conferences.

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