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Advances in Environmental Science and Sustainability

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Preface

This year the 5th WSEAS International Conference on Natural Hazards (NAHA '12), the 5th WSEAS International Conference on Climate Changes, Global Warming, Biological Problems (CGB '12) and the 5th WSEAS International Conference on Urban Rehabilitation and Sustainability (URES '12) were held in Sliema, Malta, September 7-9, 2012. The conferences provided a platform to discuss natural hazards, climate change factors, glacial geology, simulation of climate change, ecosystem, landscape architecture, biodiversity, environment and sustainable development, solar energy systems, land management, water resources management, urban-rural relationships etc with participants from all over the world, both from academia and from industry.

Their success is reflected in the papers received, with participants coming from several countries, allowing a real multinational multicultural exchange of experiences and ideas.

The accepted papers of these conferences are published in this Book that will be sent to international indexes. They will be also available in the E-Library of the WSEAS. Extended versions of the best papers will be promoted to many Journals for further evaluation.

Conferences such as these can only succeed as a team effort, so the Editors want to thank the International Scientific Committee and the Reviewers for their excellent work in reviewing the papers as well as their invaluable input and advice.

The Editors

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Plenary Lecture 1

Mathematical Modeling of Crown Forest Fire Spread

Professor Valeriy Perminov
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Abstract: Mathematical model of forest fires bases on an analysis of known experimental data and using concept and methods from reactive media mechanics. In this paper the assignment and theoretical investigations of the problems of crown forest fires initiation and spread in windy conditions were carried out. In this context, a study - mathematical modeling - of the conditions of forest fire spreading that would make it possible to obtain a detailed picture of the change in the temperature and component concentration fields with time, and determine as well as the limiting condition of fire propagation in forest with fire break. The results of calculations of the initiation and spread of crown forest fires in the horizontal plane, averaged over the forest canopy height of two-dimensional formulation, derived from a general mathematical model of fire are presented. A computer program for calculating the propagation of the front crown forest fire in time for the different meteorological conditions (wind speed, ambient temperature, etc.) and characteristics of forests (moisture and the bulk of forest fuel materials, trees and their height, etc.). The computer program is used for calculation of the contours of the forest fire front, including its interaction with the natural barriers - the forest glades, concentrations of products of pyrolysis and combustion. The effect of their size on the conditions for the propagation of combustion and the effect of wind on the forest fire rate and attenuation of the upland forest fire are investigated.

Brief Biography of the Speaker: Valeriy Perminov graduated with a Master degree in mathematics from Kemerovo University, Russia in 1981. From 1984 to 1987 he is a post-graduate student of mechanics and mathematics department of Tomsk State University. From 1987 to 1995 he worked in the Tomsk University, and graduated in 1995 with a Ph.D. degree in Fluid Mechanics. Since then he has been a faculty member of the Department of Physical Mechanics at the Tomsk University, Russia, serving as an assistant professor from 1987 to 1995, an associate professor from 1995 to 1996. In 2011 he became Doctor of Science in Fluid mechanics Tomsk State University. The theme of thesis: «Mathematical Modeling of Initiation of Crown and Mass Forest Fires». His research interests include mathematical modeling and heat and mass transfer of gas dynamics at the natural and technogenic catastrophes, mathematical prediction of the ecological consequences of the natural and technogenic catastrophes (initiation and spread of the mass forest fires, ignition of forest massifs by radiant energy as a result of nuclear bursts and Tunguska celestial body fall, the recurring radioactive contamination from forest fires). Scientific interests are mainly connected with the application of the numerical methods to solution problems of mechanics of reacting media to the forest fire and environmental pollution. He applies the methods of mechanics of reacting medium to the forest fires and ecological problems of environmental pollution. Mainly, it is a problem of creation of mathematical models for description of forest fires. He has published over 100 papers in different editions. He took part in International conferences and grants. Membership in Council on combustion and explosion of Siberian Department of Russian Academy of Science Member of American Chemical Society.

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Plenary Lecture 2

An Integrated Model of Global Warming and Policy Making

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Abstract: This paper will describe a simple integrated model of global warming due to anthropogenic CO2 emissions that can used by the policy makers when considering various CO2 reduction trajectories for future years in order to meet the desired goals of acceptable increase in global average surface temperature in say years 2030 and 2050. The integrated model consists of three modules: (a) CO2 emission and concentration calculation module, (b) Global average surface temperature calculation module, and (c) CO2 reduction trajectory module. In the mathematical model, it is assumed that the emission and concentration of CO2, as well as the average global surface temperature are functions of time. A mathematical relationship is established among the CO2 emissions, CO2 concentration and global temperature as a function of time. This relationship is then used to determine the scenarios for policy makers under which the emissions (and hence the global warming) can be reduced to meet some targets by 2030 and 2050 as well the consequences of "Business as Usual" scenario. For this purpose, the two scenarios are considered: (a) Forward-step policy making scenario wherein a certain policy could be made based on the projection of CO2 emission growth and examining the consequence of employing certain mitigation approaches using the alternative solutions based on renewable energy, carbon sequestration etc. Then, the corresponding temperature increase in average surface temperature of the earth could be calculated and (b) Backward-step policy making scenario wherein an upper limit on the global average surface temperature increase is set and then various CO2 reduction trajectories over the desired time period are examined to achieve the goal of upper limit on the global surface temperature. The most promising CO2 reduction trajectory can then be used to consider various mitigation approaches which are both technologically and economically viable.

Brief Biography of the Speaker: Professor Ramesh Agarwal is the William Palm Professor of Engineering and the director of Aerospace Engineering Program and Aerospace Research and Education Center at Washington University in St. Louis. From 1994 to 2001, he was the Sam Bloomfield Distinguished Professor and Executive Director of the National Institute for Aviation Research at Wichita State University in Kansas. From 1978 to 1994, he worked in various scientific and managerial positions at McDonnell Douglas Research Laboratories in St. Louis. He became the Program Director and McDonnell Douglas Fellow in 1990. Dr. Agarwal received Ph.D in Aeronautical Sciences from Stanford University in 1975, M.S. in Aeronautical Engineering from the University of Minnesota in 1969 and B.S. in Mechanical Engineering from Indian Institute of Technology, Kharagpur, India in 1968. Over a period of 35 years, Professor Agarwal has worked in Computational Fluid Dynamics (CFD), nanotechnology and renewable energy systems. He is the author and coauthor of over 300 publications and serves on the editorial board of fifteen journals. He has given many plenary, keynote and invited lectures at various national and international conferences worldwide. Professor Agarwal continues to serve on many professional, government, and industrial advisory committees. Dr. Agarwal is a Fellow of fifteen societies - American Association for Advancement of Science (AAAS), American Institute of Aeronautics and Astronautics (AIAA), American Physical Society (APS), American Society of Mechanical Engineers (ASME), Royal Aeronautical Society (RAeS), Society of Manufacturing Engineers (SME), Society of Automotive Engineers (SAE), Institute of Electrical and Electronics Engineers (IEEE), American Society of Engineering Education (ASEE), American Academy of Mechanics (AAM), Institute of Physics, Energy Institute, Institute of Engineering and Technology, Academy of Science of St. Louis, and World Innovation Foundation (WIF). He has served as a distinguished lecturer of AIAA (1996-1999), ASME (1994-1997), IEEE (1994-2011), and ACM (2011). He has received many honors and awards for his research contributions including the ASME Fluids Engineering Award (2001), ASME Charles Russ Richards Memorial Award (2006), Royal Aeronautical Society Gold Award (2007), AIAA Aerodynamics Award (2008), AIAA/SAE William Littlewood Lecture Award (2009), James B. Eads Award of the Academy of Science of St. Louis (2009), SAE Clarence Kelly Johnson Award (2010), SAE Franklin W. Kolk Progress in Air Transportation Award (2010), ASME Edwin Church Medal (2011), AIAA Thermophysics Award (2011) and SAE John Connors Environmental Award.

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Plenary Lecture 3

Leading »Greenovate« Change

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Abstract: The growing importance of the environmental question has led many executives to modify their business policies. Sustainability is integrated into business strategy. It is not a separate discipline. The integration of “green” issues in the enterprise system thinking and in the process of strategy formation has significant environmental, social, financial, managerial and organizational implications for the corporate system, thus requiring firms to re-design their business philosophy and culture, value chain activities and processes. Integrated system approach integrates the requirements of sustainable green development and environmental excellence with all other business requirements. “Green” innovation in management and technologies and how they are applied are key to enabling corporate to create new business values while also benefiting stakeholders, people and the planet as whole. In recent years, enterprises have been upgrading their efforts towards sustainable acting from environmental prevention to integrated approaches that take into account product lifecycles and wider impacts.”Greenovate” helps to enable this evolution through a combination of “soft” non-technological (culture, habits, management and leadership approach) and “hard” technological changes that can yield substantial environmental improvements. The current economic crisis and climate change negotiations should be taken as a great opportunity to move towards leading “greenovate” change. The environmental challenge must be seen as a major source of managerial change.

Brief Biography of the Speaker: Dr. Davorin Kralj completed his undergraduate studies at the University of Maribor, Faculty of Chemistry and Chemical Engineering (1987) and post-graduate study at the University of Maribor- Faculty of Organizational Sciences, in the area of Integral Quality Management (1991) and also post-graduate master’ study program Management and Organization - MBA at Faculty for Economics and Business in Maribor (2008). In 2009 he holds a Ph.D. in the field of Chemistry and Chemical Engineering. In 2006 he started his second doctoral study program at the Faculty of Economics in Ljubljana. His main teaching and research areas include organizational sciences, environmental management and sustainable development. He has authored or co-authored various scientific papers and environmental patents. He has been awarded numerous certificates and awards. In 2008, have been distinguished with the silver award during the China Association of Inventions and IFIA International Federation of Inventors' Associations, the silver award during the International Jury of IENA 2008 and award of the Best Eco Inventor during the WIPO World Intellectual Property Organization.

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