

Preface

This book is a comprehensive summary of the 15th annual conference of the International Association for Mathematical Geosciences (IAMG Madrid 2013) held in Madrid (Spain). The IAMG Madrid 2013 has been an international forum of scientific debate on the research progress made worldwide on theoretical developments and practical applications of geomathematics. The theme of the conference, “Frontiers of Mathematical Geosciences: New Approaches to Understand the Natural World,” makes emphasis on the need for new paradigms, methodologies, and detailed earth models at multiple scales in order to solve important technological problems that the humankind is facing in relation to sustainable water, energy, minerals, and multiple environmental resources considering climate and natural hazards concerns.

Planet Earth is a complex system where the lithosphere, atmosphere, hydrosphere, cryosphere, and biosphere interact among them to build products from complex processes. Furthermore, the increase of human population is associated to new issues in relation to fast lessening of earth resources and habitats; e.g., depletion of nonrenewable resources, contamination of water, soils and air pollution, environmental impact, deforestation, endangered species, climate change, and geological hazards (e.g., earthquakes, tsunamis, volcanic eruptions, flooding, potential loss of glaciers and ice caps, etc.). Some of these problems may be also associated to the increase of urban settlements around the world. In consequence, governmental agencies, the industry, and society in general are demanding the scientific community to increase the quantitative understanding of how the complex earth system works. Computers, satellite imagery, and new geophysical techniques have been deployed to gather and process large amounts of new data, expecting to facilitate the planetary monitoring and modeling. Nevertheless, the scientific basis for interpreting such data is well established in the young discipline of geomathematics, some of the challenges in relation to earth processes are very complex, and their solution will require the best of human ability and creativity, through numerical models and associated methods. Therefore, geomathematics has been raised as the essential science to model processes and resources in geosciences for solving fundamental resource and planetary

sustainability problems at multiple scales. Moreover, the application and use of mathematics in geological research and technology is not only focused on dealing with specific issues of our planet. Study findings on mathematical geosciences are also extremely important for the planetary geology research.

The main duty of IAMG 2013 has been to discuss and disseminate the latest trends in research about leading problems. This proceeding book contains 184 contributions grouped adequately in 27 sessions.

Mathematics of Planet Earth

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