Advances in Geophysical Processes – Models and Methods

PREFACE TO THE TOPICAL ISSUE

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Modeling is at the core of geophysical research. Scientists have been developing and applying modeling tools in various disciplines of geophysics. Geophysical models have different origins and can take a number of forms. There are purely theoretical models and data-driven models but several methods combine *a priori* information with geophysical data to produce models that are more consistent with the constraints.

Geophysics is a quite specific yet interdisciplinary branch of science in which scientists of very different fields are active: physicists (both theoretical and experimental), mathematicians, chemists, engineers, geologists, and geographers. They apply successfully their knowledge and methods to geophysical problems.

The purpose of the Topical Issue is to assemble methods and achievements obtained in various fields of geophysics on chosen subjects including model building, model testing and parameter optimization. The term “model” may mean different objects in various studies. It can be represented by: a system of physical equations, some rules in cellular automaton, distribution functions in stochastic investigation, geometric structure of medium *etc.* A vast diversity of models is constructed by specific sophisticated methods of data analysis on the basis of recorded time series.

This Topical Issue “Advances in Geophysical Processes – Models and Methods” of *Acta Geophysica* integrates original papers, review papers, and tutorials on diverse types of models – deterministic and stochastic, static and dynamic, microscopic and macroscopic – as well as papers presenting recent results of data analysis obtained with wide range of modern methods.

There are many issues presented in this volume: cellular automata in seismic processes, goodness-of-fit test of power-law distributions, tomographic imaging of rock-mass velocity heterogeneities, controlled-source seismology in models of the Earth crust, performance assessment of the ionospheric model, calibration and validation of rainfall-runoff modeling, implementing of persistency in time series model, dynamics of monthly rainfall series, prediction of hourly tidal level variations, dissolution dynamics in rocks, locating the aquifers and assessing the hydro-geological conditions, seismicity induced by the water injection, seismic clustering relating to magma intrusion, fractals in geographical topographies, dynamics of fluctuations of seismic noise, inverse problem in an earthquake model, theoretical description of viscoelastic behaviour of rocks, and stress field of fault modeled by dislocation in an asymmetric continuum.

The reader interested in application of statistical methods and models to various aspects of seismicity can find a number of recent papers in another Topical Issue of *Acta Geophysica* “Statistical Mechanics in Earth Physics and Natural Hazards” edited by Filippos Vallianatos and Luciano Telesca (2012).

We believe that the presented scientific contributions will help to provide a common language of modeling geophysical complexity.

References

- Vallianatos, F., and L. Telesca (eds.) (2012), Statistical Mechanics in Earth Physics and Natural Hazards, *Acta Geophys.* **60**, 3, 499-984.