Geophysical Research Abstracts,
Vol. 10, EGU2008-A-01564, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-01564
EGU General Assembly 2008

Evidence of fractional-Brownian-motion-type asperity model for earthquake generation in candidate pre-seismic electromagnetic emissions

K. Eftaxias (1), Y. Contoyiannis (2), G. Balasis (3), M. Kalimeri (1), J. Kopanas (1), G. Antonopoulos (1), A. Peratzakis (1) and C. Nomicos (4)

(1) Section of Solid State Physics, Department of Physics, University of Athens, Panepistimiopolis, (2) Section of Nuclear and Elementary Particle Physics, Department of Physics, University of Athens, (3) Institute for Space Applications and Remote Sensing, National Observatory of Athens, Metaxa and Vas. Pavlou St., Palea Penteli, 15236, Athens, (4) Department of Electronics, Technological Educational Institute of Athens, Athens, Greece

Many aspects of earthquake generation still escape our full understanding. Observations of electromagnetic emissions preceding significant earthquakes provide one of the few cases of premonitory events that are possibly related to a subsequent earthquake. Understanding the factors that control electromagnetic precursors generation is important for determining how significant earthquakes nucleate. Here we report the results of a comprehensive study of the appearance of individual patterns in candidate electromagnetic precursors possibly indicating the breaking of backbone of large and strong asperities that sustain the activated fault. The search of precursory patterns is mainly based on well documented scaling properties of fault surface topology. More precisely, we argue that the candidate electromagnetic precursors might be originated during the slipping of two rough and rigid fractional-Brownian-motion-type profiles one over the other, with a roughness which is consistent with field and laboratory studies. The results also imply that the activation of a single earthquake (fault) is a reduced self-affine image of the whole regional seismicity and a magnified self-affine image of the laboratory seismicity. Finally, we investigate the open question whether the spatial and temporal complexity of fault structure emerge from geometrical and material built-in heterogeneities or from the chaotic behavior inherent to the nonlinear

equations governing the dynamics of these phenomena.

The project is co-funded by the European Social Fund and National Resources - (EPEAEK II) PYTHAGORAS (70/3/7357)