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Worldwide seismicity in view of non-extensive statistical physics

Kaliopi Chochlaki (1,2), Filippos Vallianatos (2,3), and George Michas (3)

(1) University of Crete, Department of Physics, Heraklion, Crete, Greece, (2) Technological Educational Institute of Crete, Laboratory of Geophysics and Seismology, Crete, Greece (fvallian@chania.teicrete.gr) , (3) Institute for Risk and Disaster Reduction, University College London, Gower Street, London, WC1E 6BT, UK

In the present work we study the distribution of worldwide shallow seismic events occurred from 1981 to 2011 extracted from the CMT catalog, with magnitude equal or greater than Mw 5.0. Our analysis based on the subdivision of the Earth surface into seismic zones that are homogeneous with regards to seismic activity and orientation of the predominant stress field. To this direction we use the Flinn-Engdahl regionalization (Flinn and Engdahl, 1965), which consists of 50 seismic zones as modified by Lombardi and Marzocchi (2007), where grouped the 50 FE zones into larger tectonically homogeneous ones, utilizing the cumulative moment tensor method. As a result Lombardi and Marzocchi (2007), limit the initial 50 regions to 39 ones, in which we apply the non- extensive statistical physics approach. The non-extensive statistical physics seems to be the most adequate and promising methodological tool for analyzing complex systems, such as the Earth's interior. In this frame, we introduce the q-exponential formulation as the expression of probability distribution function that maximizes the Sq entropy as defined by Tsallis, (1988). In the present work we analyze the interevent time distribution between successive earthquakes by a q-exponential function in each of the seismic zones defined by Lombardi and Marzocchi (2007).confirming the importance of long-range interactions and the existence of a power–law approximation in the distribution of the interevent times. Our findings supports the ideas of universality within the Tsallis approach to describe Earth's seismicity and present strong evidence on temporal clustering of seismic activity in each of the tectonic zones analyzed. Our analysis as applied in worldwide seismicity with magnitude equal or greater than Mw 5.5 and 6.) is presented and the dependence of our result on the cut-off magnitude is discussed.

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