



## **Is the statistical analysis of regional seismicity a macroscopic reflection of the physical processes in the earthquake source?**

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The present study adopts a non-extensive Tsallis statistical approach to examine the seismicity of Greece. In particular, we explore whether the statistics of regional seismicity can be merely a macroscopic reflection of the physical processes in the earthquake source with relevance to pre-seismic kHz electromagnetic emissions.

The non-extensive Gutenberg Richter type formula which describes the earthquake dynamics includes two parameters: the entropic index  $q$  that refers to the deviation of Tsallis entropy from the standard Boltzmann-Gibbs entropy, and the physical quantity  $a$ , which characterizes the energy density.

Concerning the seismicity, we used data from the Greek seismic catalogue as provided on the website of the National Observatory of Athens (NOA) for the years 1990-2009 inclusive. We attempt an examination in terms of:

- a) Different thresholds of magnitudes, in order to study the variation of non-extensive parameter  $q$  and  $a$ , as the magnitude cut-off ( $M_c$ ) increases.
- b) The possible variation of parameters  $q$  and  $a$ , using specific span time windows, which include strong and weak seismic events respectively.
- c) The variation of parameters  $q$  and  $a$  between regions characterized by low and high seismicity respectively.

Comparing our results from this type of analysis on seismicity with those of recent studies in different regions, we focus on the universal behavior of earthquake dynamics. As concerns pre-seismic electromagnetic kHz emissions, we concentrate on the examination of 'anomalies', which have been well justified in the literature as seismogenic ones, by means of the non-extensive Tsallis statistical approach.

The whole analysis supports the hypothesis that the statistics of regional seismicity is a macroscopic reflection of the physical processes in the earthquake source as it has also been suggested by Huang and Turcotte.