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To b or not to b ?? A nonextensive view of b-value in the Gutenberg–Richter law.

Filippos Vallianatos
Technological Educational Institute of Crete, Geophysics and Seismology, CHANIA, Greece (fvallian@chania.teicrete.gr)

The Gutenberg-Richter (GR) (Gutenberg and Richter, 1944) law one of the cornerstones of modern seismology has been considered as a paradigm of manifestation of self-organized criticality since the dependence of the cumulative number of earthquakes with energy, i.e. the number of earthquakes with energy greater than E, behaves as a power law with the b value related to the critical exponent. A great number of seismic hazard studies have been originated as a result of this law. The Gutenberg–Richter (GR) law is an empirical relationship, which recent efforts relate it with general physical principles (Kagan and Knopoff, 1981; Wesnousky, 1999; Sarlis et al., 2010; Telesca, 2012; Vallianatos and Sammonds, 2013).
Nonextensive statistical mechanics pioneered by Tsallis (Tsallis, 2009) provides a consistent theoretical framework for the studies of complex systems in their nonequilibrium stationary states, systems with multi fractal and self-similar structures, long-range interacting systems, etc. Earth is such system. In the present work we analyze the different pathways (originated in Sotolongo-Costa, A. Posadas , 2004; Silva et al., 2006) to extract the generalization of the G-R law as obtained in the frame of non extensive statistical physics. We estimate the b-value and we discuss its underline physics.

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