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Seismic dynamics in advance and after the World's largest earthquakes, 1985-2017

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A systematic statistical analysis of earthquake series nearby the location of all Mw7.8 or larger earthquakes world-wide, 1985-2017, discloses that seismic activity, in a long-term, resides at rather steady levels, in a mid-term, may switch intermittently from one level to a different one at the times associated with the occurrence of catastrophic main shocks, and, in a short-term, may follow different scenarios. The observed variability of seismic dynamics in advance and after the 71 earthquakes is characterized in terms of several moving averages, including (i) seismic rate, (ii) the Benioff strain release, (iii) inter-event time, τ, (iv) the Utsu estimate of b-value, and (v) the USLE control parameter, η (where USLE stands for Unified Scaling Law for Earthquakes, i.e. a generalization of the Gutenberg-Richter relationship accounting for naturally fractal distribution of earthquake loci, which states that the distribution of inter-event times τ depends only on the value of variable η). Statistically, the achieved results (i) do not support the presence of universality in seismic energy release, (ii) provide fundamental constraints on modeling realistic earthquake sequences by geophysicists, and (iii) can be used to improve local time-Dependent Assessment of Seismic Hazard (t-DASH).
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