



entropy

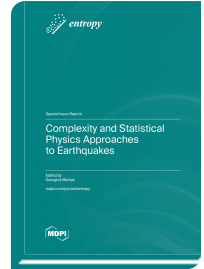


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Complexity and Statistical Physics Approaches to Earthquakes

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Due to the increase in population worldwide, there is an urgent need to estimate natural hazards more efficiently. A crucial aspect of this challenging task is the mitigation of the risk of earthquakes. The occurrence of earthquakes is an inherently complex phenomenon that is manifested in the nonlinear dynamics that form the process of earthquake generation. Earthquakes interact over a wide range of spatial and temporal scales to generate new events; meanwhile, the coupling of stress interactions with other aseismic processes, such as fluid flow, poroelastic effects, and aseismic slip, may further reduce the frictional strength of faults, triggering more earthquakes. As such, earthquakes are considered a critical phenomenon, exhibiting nonlinearity, self-organized criticality, scaling, clustering, fractal/multifractal structures, and long-range interactions. The analysis of earthquake phenomena in the light of complexity theory is thus ubiquitous, and mathematical tools arising from statistical physics offer a consistent theoretical framework with which to better understand the occurrence of earthquakes. With the significant generation of new data in recent years, these modern tools may provide novel and substantial insights into the physics of earthquakes, with the ultimate aim being to mitigate the risk of earthquakes more effectively.



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