Abstract Submitted
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Inferring earthquake statistics from soft-glass dynamics below yield stress[1] PINAKI KUMAR, FEDERICO TOSCHI, Eindhoven University of Technology, ROBERTO BENZI, University of Rome Tor Vergata, JEANNOT TRAMPERT, Utrecht University — The current practice to generate synthetic earthquake catalogs employs purely statistical models, mechanical methods based on ad-hoc constitutive friction laws or a combination of the above. We adopt a new numerical approach based on the multi-component Lattice Boltzmann method to simulate yield stress materials. Below yield stress, under shear forcing, we find that the highly intermittent in time, irreversible T1 topological changes in the soft-glass (termed plastic events) bear a statistical resemblance to seismic events, radiating elastic perturbations through the system. Statistical analysis reveals scaling laws for magnitude similar to the Gutenberg-Richter law for quakes, a recurrence time scale with similar slope, a well-defined clustering of events into causal-aftershock sequences and Poisson events leading to the Omori law. Additionally space intermittency reveals a complex multi-fractal structure, like real quakes, and a characterization of the stick-slip behavior in terms of avalanche size and time distribution agrees with the de-pinning transition. The model system once properly tuned using real earthquake data, may help highlighting the origin of scaling in phenomenological seismic power laws.

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