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Is the Evolution towards Global Failure Irreversible after the Appearance of distinguishing Features in the preseismic EM time series?

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Our main observational tool is the monitoring of the microfractures, which occur in the focal area before the final break-up, by recording their kHz-MHz electromagnetic (EM) emissions. Two fundamental questions ought to address are as follows. Is there a way of estimating the time to global failure? Is the evolution towards global failure irreversible after the appearance of distinguishing features in the preseismic EM time series? We attempt to put forward physically powerful arguments with regard to answering these two basic questions. Our approach will be in terms of critical phase transitions in statistical physics and complexity. We obtain two major results. First, the initial part of the preseismic EM emission, which has a rather high complexity and antipersistent behavior, is triggered by microfractures in the highly disordered system that surrounds the essentially homogeneous “backbone asperities” within the focal area and could be described in analogy with a thermal continuous phase transition. Second, the abrupt emergence of strong kHz EM emission in the tail of the precursory radiation, showing significant lower complexity and strong persistent behavior, is thought to be due to the fracture of the high strength “backbones.”

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