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Failure of brittle heterogeneous materials: Intermittency or continuum regime JONATHAN BARÉS, Duke University, DANIEL BONAMY, LUC BARBIER, CEA/DSM/IRAMIS/SPCSI/LNOSC — The problem of the solid fracture has occupied scientists and engineers for centuries. This phenomenon is classically addressed within the framework of continuum mechanics. Still, stress enhancement at crack tips makes the failure behavior observed at the continuum-level scale extremely dependent on the presence of microstructure inhomogeneities down to very small scales. This yields statistical aspects which, by essence, cannot be addressed using the conventional engineering continuum approaches. We addressed the problem numerically. The simulations invoke a recent statistical model mapping heterogeneous fracture with the depinning transition of an elastic manifold in a random potential. The numerical exploration of the parameter space allowed us to unravel when (i.e. which loading conditions, microstructure material parameters, material constants...) regular dynamics compatible with continuum approaches are expected to be observed, and when crackling dynamics calling for statistical approaches are observed. In this latter case, we have characterized quantitatively the dynamics statistic and its variations as a function of the input parameters.

Jonathan Barés
Duke University

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