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Role of interactions and damage in a cohesive fracture model JOSESPH GRAN, JOHN RUNDLE, DONALD TURCOTTE, University of California, Davis, WILLIAM KLEIN, Boston Univeristy — We study the influences of local and long range interactions in a numerical model of tensile fracture. Our model simulates fracture events on a 2D square lattice plane with a Metropolis algorithm. We chose a Hamiltonian that is written as a function of the crack separation (offset field) and includes contributions from an external field, interactions, as well as a cohesive energy across the crack surfaces. Included in our study is both a ferromagnetic-type (attractive) and antiferromagnetic-type (repulsive) interactions. We test both of these interactions individually as well as a hybrid interaction in which over a short range the interaction is antiferromagnetic and in the long range the interaction becomes ferromagnetic. This dual interaction approximates a Lennard-Jones potential. We also propose a characterization of damage and investigate the increase of damage in time for fractures occurring by a static-load as well as a time-dependent load. Damaged sites do not interact with neighboring sites and cannot hold any load. We compare our damage model to previous studies of fiber-bundle models.

Josesph Gran
University of California, Davis

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