

AVALANCHE SCALING AND CRACK ROUGHNESS IN THE RANDOM FUSE MODEL

P. K. V.V. Nukala, S. Simunovic and S. Zapperi
Computer Science and Mathematics Division, Oak Ridge National Laboratory, USA
INFM, Dipartimento di Fisica, Università "La Sapienza", Roma, Italy

ABSTRACT

We present numerical simulations of the random fuse model, a simple model of fracture in disordered media. As the current flowing in the lattice is increased, fuses fail in avalanches until a final spanning crack is formed. We compute the avalanche distribution as a function of the lattice size and find a power law distribution with exponent $\tau=3$. The cutoff of the power law distribution scales as $s \sim L^D$ with $D=1.14$. This value can be related with the roughness exponent ζ of the cracks as $\zeta=2-D$. Direct inspection of the final crack surface yields a roughness exponent $\zeta=0.83$ which is compatible with this relation.