Special
PHYSICAL MATHEMATICS SEMINAR

SPONTANEOUS SHEAR LOCALIZATION IN A MODEL BRITTLE SOLID

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ABSTRACT:

Recent attempts to model brittle materials via particle based methods (molecular dynamics simulations or "Discrete Element Method" granular simulations) and models from statistical physics (random fuse model, random spring model, etc.) have largely been focused on geometries such as uniaxial tension or anti-plane strain. They are not appropriate for modeling the formation of fault systems in shear.

I will discuss a novel approach which introduces damage directly into particle based simulations to allow for brittle behavior in shear. When loaded, the model exhibits a period of bursts of spatially correlated damage accumulation followed by a period of catastrophic weakening during which a geometrically complex through-going fault network forms. The fault network will be shown to be composed of tensile fissures connected via compressive jogs with striking similarities to features found both in the laboratory and at the field scale. The pre-catastrophic damage patterns are strongly anisotropic and a quantitative comparison with the angular correlations expected from a classical Mohr-Coulomb analysis can be made. I will also discuss the scale-dependent roughness of the fully developed primary fault structure.

MONDAY, NOVEMBER 13, 2006
2:00 PM
Building 4, Room 270

Joint reception with the Applied Mathematics Colloquium at 4:00 PM in Building 4, Room 174 (Math Majors Lounge)

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