SÉMINAIRE LAMCOS

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INSA de LYON Amphitéâtre Godet

Computational Failure Mechanics

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Abstract

The lecture starts by a review of cohesive-zone models. Their importance is emphasized, especially for fracture in heterogeneous materials. Different ways are discussed to incorporate them in a numerical setting. Discrete and smeared formats can be distinguished. While smeared formats fit within standard numerical schemes used for the discretization of continua, they suffer from the fact that at a generic stage in the loading process, the governing set of equations becomes ill-posed, thus rendering the solution mesh dependent. Localization limiters have to be introduced in order to restore well-posedness. Various possibilities are discussed, including their advantages and disadvantages. On the other hand, discrete approaches naturally fit the character of cohesive-zone models, but the traditional approach of implementing them, namely via special interface elements, also results in a mesh bias. However, finite elements which exploit the partition-of-unity property of the shape functions, allow for arbitrary directions and locations of crack growth, not influenced by the mesh. Examples will be shown of cohesive crack growth. A recent enhancement, so-called cohesive segments, which are particularly suited for crack nucleation, growth and coalescence in heterogeneous materials is presented as well as a methodology to apply the concept to continuum-discontinuum transition and to fracture in multi-phase media