

# VARIATIONAL PHASE-FIELD MODELING OF FRACTURE: TOWARDS SECOND-GENERATION MODELS

F. Vicentini, J. Heinzmann, A. Fajardo-Lacave, F. Welschinger, P. Carrara, L. De Lorenzis

Variational phase-field modeling of fracture, first proposed in 2000 for brittle fracture of homogeneous and isotropic materials in predominant mode I, has since been further developed in several directions, encompassing the extension to multiaxial stress states, to heterogeneous and anisotropic materials, to ductile, dynamic and rate-dependent fracture. While the first model was based on the regularization of a variational reformulation of Griffith's fracture criterion, for many of the subsequent extensions the structural rigidity of the variational framework led to the proliferation of non-variational models, which give up the theoretical and practical advantages of the variational framework in exchange for a greater flexibility to reproduce experimental results.

In this presentation, we discuss some ideas by which variational phase-field models can be endowed with sufficient flexibility to overcome the limitations of existing models, possibly leading to a second generation of variational phase-field fracture models. We show some first results in this direction concerning fracture under multiaxial stress states, fracture of anisotropic materials, and dynamic fracture.