The title (العنوان):

Hybrid phase-field modeling of multi-level concrete gravity dam notched cracks

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Abstract : Phase-field models have become a powerful tool to simulate crack propagation. They regularize the fracture discontinuity and smooth the transition between the intact and the damaged regions. Based on the thermodynamic function and a diffusive field, they regularize the variational approach to fracture that generalizes Griffith's theory for brittle fracture. Phase-field models are capable to simulate complex fracture patterns efficiently and straightforwardly. In this paper, we introduce a hybrid phase-field approach to simulate the crack propagation in laboratory-scale and life-scale structures. First, we apply our methodology to the three-point bending test on notched laboratory beams. Second, we simulate the fracture propagation in a life-size structure: the Koyna gravity dam. We account for the pressure load inside the fracture, and we study the effect of the position and number of initial fractures in the upstream face and the value of the Griffith critical energy release, on the fracture propagation under a flood event. The position of the fracture plays an important role in the final fracture pattern and crest displacements, whereas the value of the Griffith critical energy release alters the onset of the fracture propagation. We conclude that phase-field models are a promising computational tool that may be applied to real engineering problems.

Key words : Concrete, Crack, Dam, Damage, Phase-field model