A derivation of Griffith functionals from discrete finite-difference models

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We analyse a finite difference approximation of an Ambrosio-Tortorelli-like functional in brittle fracture, in the discrete-to-continuum limit. In a suitable regime between the competing scales, namely if the discretization step is smaller than the ellipticity parameter, we show the Γ-convergence of the model to the Griffith functional. The limit analysis combines a blow-up procedure with suitable adaptions to the discrete setting of recent compactness and lower semicontinuity results in spaces of generalised functions of bounded deformation. In particular, we do not need to add any artificial L^p fidelity term, which would be unnatural in fracture mechanics.