Viscous and rate-independent damage models in non-smooth domains

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In this talk, both a rate-independent system for damage, and its rate-dependent, or viscous, regularization are addressed. The models consist of a system of elliptic PDEs coupled to a doubly nonlinear evolution equation of either rate-independent or parabolic type with velocity constraints. The analysis of the latter PDE system presents remarkable difficulties, due to its highly nonlinear character. We tackle it by combining a variational approach to a class of abstract doubly nonlinear evolution equations, with careful regularity estimates tailored to this specific system, relying on a q-Laplacian type gradient regularization of the damage variable. Hence for the viscous problem we conclude the existence of weak solutions, satisfying a suitable energy-dissipation inequality that is the starting point for the vanishing viscosity analysis. Then for the latter we obtain the global-in-time existence of weak solutions, exploiting refined regularity techniques which do not require a smooth domain. This talk is based on a joint collaboration with Dorothee Knees (University of Kassel) and Riccarda Rossi (University of Brescia).