Rate-dependent elastoplasticity at finite strain: existence and approximation results

Alexander Mielke[(1)], **Riccarda Rossi**[(2)], **and Giuseppe Savaré**[(3)]

(1) Weierstrass Institute and Humboldt University, Berlin, Germany
(2) University of Brescia, Italy
(3) University of Pavia, Italy

We consider a model for elastoplasticity consisting of the elastic equilibrium equation for the elastic deformation field, coupled with the flow rule for the plastic tensor in accord with the theory of generalized standard solids. The plastic law balances dissipation forces with restoring forces. It has in fact the form of a gradient system, driven by a highly nonconvex energy functional due to the geometric nonlinearities arising from the multiplicative decomposition of the strain.

In the case of a 1-positively homogeneous dissipation potential, the system is rate-independent. Existence and approximation results have been obtained in [1] in the framework of *energetic solutions*.

In [3] we address the *rate-dependent* case, featuring a dissipation potential with superlinear growth at infinity. Existence results are proved passing to the limit in a time-incremental minimization scheme via variational convergence techniques, developed in [2] for gradient systems driven by nonconvex and nonsmooth energy functionals.

References

[1] A. Mainik and A. Mielke, Global existence for rate-independent gradient plasticity at finite strain, *J. Nonlinear Sci.* **19** (2009), 221–248.

[2] A. Mielke, R. Rossi, and G. Savaré, Nonsmooth analysis of doubly nonlinear evolution equations, *Calc. Var.* **46** (2013), 253–310.

[3] A. Mielke, R. Rossi, and G. Savaré, Existence results for viscoplasticity at finite strain, in preparation.