Propagation of regularity and uniqueness for a Kelvin-Voigt model in viscoelasticity

We consider nonlinear viscoelastic materials of Kelvin-Voigt type with stored energies satisfying an Andrews-Ball condition, allowing for non-convexity in a compact set, and a linear viscous stress. We show the existence of weak solutions with deformation gradients in H^1 for energies of any superquadratic growth. In two space dimensions, and in a striking analogy to the incompressible Euler equations with bounded vorticity, weak solutions turn out to be unique in this class. Conservation of energy for these solutions in two and three dimensions, as well as global regularity for smooth initial data in two dimensions are also established under additional restrictions on the growth of the stored energy. This is joint work with C. Lattanzio, S. Spirito, and A.E. Tzavaras.