Martin Kružík

Nonlinear and linearized models in thermoviscoelasticity

We consider a quasistatic nonlinear model in thermoviscoelasticity at a finite-strain setting in the Kelvin-Voigt rheology where both the elastic and viscous stress tensors comply with the principle of frame indifference under rotations. The force balance is formulated in the reference configuration by resorting to the concept of nonsimple materials whereas the heat transfer equation is governed the Fourier law in the deformed configurations. Weak solutions are obtained by means of a staggered in-time discretization where the deformation and the temperature are updated alternatingly. Afterwards, we focus on the case of deformations near the identity and small temperatures, and we show by a rigorous linearization procedure that weak solutions of the nonlinear system converge in a suitable sense to solutions of a system in linearized thermoviscoelasticity. The same property holds for time-discrete approximations and we provide a corresponding commutativity result.
This is a joint work with R. Badal and M. Friedrich (both Erlangen).