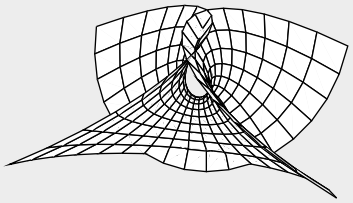

Einladung zum Oberseminar Mathematik in den Naturwissenschaften

Julius-Maximilians-Universität Würzburg
Lehrstuhl für Mathematik in den Naturwissenschaften

Petr Pelech

WIAS Berlin, Germany

Balanced-Viscosity solutions for a Penrose-Fife model with rate-independent friction

We study a non-autonomous system of two evolutionary PDEs, an enhanced version of the Penrose-Fife model introduce in 1990, which first in the history coupled the Allen-Cahn phase-field equation with thermal effects in a thermodynamically consistent way. In our work we consider an activated phase transformation which makes the phase-field equation non-linear in time derivative; it contains an additional term, analogical to the Coulomb dry friction and appearing also in rate-independent models of plasticity or damage.

Apart from proving the existence of solutions of the system, we investigate its effective behavior for the so-called slow-loading regimes. There the internal time-scale introduced by phase-field viscosity and thermal conductivity is much smaller than the time-scale of the loading, an external force acting on the system. Hence the system stays almost in its equilibrium described by the static solution. However, the limit of solutions (as the ratio of the time scales tends to zero) may not be characterized by the corresponding fully rate-independent model, where the viscous-like terms has been dropped. The reason is that the phase transformation is driven by a non-convex thermodynamic potential and hence the solutions may develop jumps in the limit. In order to resolve the jump's detailed trajectory, along which the viscous effects play a crucial role, we use the so-called Balanced-Viscosity (BV) solutions introduced by Efendiev and Mielke in 2006.

Penrose O., Fife P. C. - Thermodynamically Consistent Models of Phase-Field Type for the Kinetics of Phase Transitions (1990) Sprekels J., Zheng S. M. - Global smooth solutions to a thermodynamically consistent model of phase-field type in higher space dimensions (1993)

Efendiev M., Mielke A. - On the rate-independent limit of systems with dry friction and small viscosity (2006)

Mielke A., Roubicek T. - Rate-independent Systems Theory and Application (2015)

Ort: Mathmatik Ost, 40.03.003/Zoom Zeit: Donnerstag, 08.12.2022 um 14:00 Uhr

You are cordially invited to this lecture. Request the Zoom link from anja.schloemerkemper@mathematik.uni-wuerzburg.de

gez. Anja Schlömerkemper