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FAKULTÄT FÜR MATHEMATIK
Dekan Univ.-Prof. Dr. Radu Ioan Bot

Einladung zur öffentlichen Defensio

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Thema der Dissertation

Solutions for a two-phase free-boundary problem and for dynamic perfect elasto-plasticity

Abstract: In this dissertation talk I address two problems with applications to materials science: a free boundary static problem in the theory of small deformations and an evolution problem in perfect plasticity.

Regarding the static problem, original variational models for describing the morphology of two-phase and multiphase continua in the framework of the theory of Stress Driven Rearrangement Instabilities will be introduced. Such models are characterized by the competition between elastic and surface effects, and appear to be the first allowing for both coherent and incoherent portions on the interfaces between phases. By working both in the wetting and in the dewetting regimes the existence of energy minimizers is established in the plane by means of the direct method of the calculus of variations under a constraint on the number of boundary connected components and by prescribing a generalized graph assumption for the underlying phases.

Concerning the evolution problem, the well-posedness of a dynamical model of perfect plasticity with mixed boundary conditions for general closed and convex elasticity sets is discussed. The main issues include the extension of both the measure theoretic duality pairing between stresses and plastic strains, and of a convexity inequality to situations where deviatoric stresses may not be bounded. Complete answers are provided for pure Dirichlet and pure Neumann cases, and partial answers with additional geometric hypotheses are given for general mixed boundary conditions

The presented investigations and results are contained in the following papers:
- J.-F. Babadjian and R. Llerena, Mixed boundary conditions as limits of dissipative boundary conditions in dynamic perfect plasticity, Journal of Convex Analysis 30, no. 1 (2023) 081-110.- R. Llerena and P. Piovano, Existence of minimizers for a two-phase free boundary problem with coherent and incoherent interfaces, submitted (2023).- R. Llerena and P. Piovano, Solutions for a free-boundary problem modeling film multilayers with coherent and incoherent interfaces, submitted (2024).

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Zeit und Ort

Thesis defense R. Llerena
Time: Feb 29, 2024 15:00 Vienna

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