



Beitrag ID: 36

Typ: Talk

Mathematical modeling and simulation of substrate-flow interaction using generalized gradient flows

Mittwoch, 10. November 2021 11:00 (20 Minuten)

In this talk, I will present a quick overview of the topics that have been considered in this project

- i. GENERIC Lagrangian-Eulerian formulations of fluid flows,
- ii. Gradient flow descriptions of finite strain elasticity with phase fields,
- iii. Thin-film descriptions with dynamic contact angle,

with a focus on topic iii.

i) The thermodynamic structure of fluid flows in Lagrangian and Eulerian coordinates was investigated, in particular formalizing the reduction framework, cf. Morrison, Marsden, Ratiu, in the GENERIC language. As a result, we obtained an operator framework, that is easily able to generate Poisson and Onsager structures that have been considered in the literature. This is joint work with Marita Thomas and Andrea Zafferi.

ii) Combined finite-strain elasticity and phase fields evolution are modeled as gradient flows and their numerical discretization is considered within the class of incremental minimization schemes. This is joint work with Barbara Wagner, Ralf Seemann, Leonie Schmeller and Khalil Remini.

iii) We consider a variational framework for thin-film flows including dynamic contact angles. In this talk, algorithmic details concerning the higher-order in space and time will be provided and different hierarchies of models will be discussed for gravity-driven sliding droplets and unstable ridges. This is joint work with Luca Heltai, Manuel Gnann, and Lorenzo Giacommelli.

References

- * Andrea Zafferi, DP and Marita Thomas (2021) "GENERIC framework for reactive fluid flows" WIAS Preprint (2841). pp. 1-75. ISSN 2198-5855 (Submitted to ZAMM)
- * DP and Luca Heltai (2021) "Model hierarchies and higher-order discretisation of time-dependent thin-film free boundary problems with dynamic contact angle" arXiv preprint arXiv:2110.06862. pp. 1-24.
- * Leonie Schmeller and DP, "Gradient flows for coupling phase fields and mechanics" (in preparation)

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Sitzung Einordnung: Short talks