Mathematics and CS Seminar

Sharp Interface Limits for Diffuse Interface Models with Contact Angle

Maximilian Moser
Universität Regensburg

Host: Julian Fischer

In the first part of the talk I will give a general introduction to sharp interface limits for diffuse interface models. Briefly described, these models involve a smooth order parameter that is used to distinguish distinct phases/components of a material/fluid in applications. Moreover, diffuse interface models typically contain a small parameter proportional to the thickness of transition regions (diffuse interfaces) between phases/components. Formally, by sending this parameter to zero, one obtains a sharp interface model, where the interface is described by an evolving hypersurface. Such limits are therefore called “sharp interface limits”. Then I will consider the Allen-Cahn equation as a diffuse interface model. The latter can be used for example to describe antiphase boundaries in iron alloys. These appear when hot metal is cooling and starts to solidify. The sharp interface limit is known to be Mean Curvature Flow. I will give an overview for rigorous results in this direction. For the remainder of the talk I will focus on results from my PhD thesis which are rigorous local in time sharp interface limit results for the Allen-Cahn equation and some variants. The novelty here is the consideration of boundary contact for the diffuse interfaces within the method of de Mottoni and Schatzman for sharp interface limits. This method works as long as a smooth solution to the limit problem exists. Based on the latter, one constructs an approximate solution to the diffuse interace model using asymptotic expansions. Then the difference of the exact and approximate solution is estimated with a Gronwall-type argument using a spectral estimate for the associated linear operator.

Tuesday, January 12, 2021 11:00am - 01:00pm
online via Zoom

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