



复旦大学数学科学学院 数学综合报告会

报告题目: Higher Order Convergence for the Sharp Interface Limit of 3D Navier-Stokes/Allen-Cahn Systems

报告人: Prof. Dr. Helmut Abels (University of Regensburg)

报告时间: 2026 年 8 月 10 日星期一, 14: 00—15: 00

报告地点: 光华楼东主楼 1801 室

报告摘要: We show convergence of solutions to a Navier-Stokes/Allen-Cahn system as the interfacial thickness $\varepsilon > 0$ tends to zero for well-prepared initial data as long as the limit system possesses a sufficiently smooth solution. The limit system consists of a two-phase Navier-Stokes system separated by a sharp interface in the presence of surface tension coupled to a convective mean curvature flow equation. In comparison to previous results we obtain improved convergence estimates for higher-order norms. These enable us to prove convergence in the case of three space dimensions and non-constant viscosity, which was unknown before. The convergence result relies crucially on uniform higher-order estimates for the associated linearized Navier-Stokes/Allen-Cahn system in suitably weighted L^2 -Sobolev spaces. Here a novel problem-adapted weight proportional to the sum of ε and the distance to the sharp interface of the limit, which gives improved and sharp estimates, is an important new ingredient. This is a joint-work with Mingwen Fei, Yadong Liu, and Maximilian Moser.

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