Weak-Strong Uniqueness and Relaxation Limit for a Parabolic Relaxation of the Navier-Stokes-Korteweg System

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Abstract

In this talk, we consider a parabolic relaxation formulation for the compressible Navier–Stokes–Korteweg system. This relaxation model depends on two positive relaxation parameters $\alpha, \beta > 0$ and approximates formally the compressible Navier–Stokes–Korteweg system in the relaxation limit $\alpha \to \infty$ and $\beta \to 0$. In the first part of this talk, we introduce the class of finite energy weak solutions to the initial-boundary value problem of the relaxation system and derive a corresponding relative energy inequality. In the second part of this talk, we use the relative energy inequality as a tool to prove two new analytical results for the relaxation model. First, we prove for fixed relaxation parameters that the relaxation model satisfies the weak-strong uniqueness property in the class of finite energy weak solutions. Second, we show that a sequence of finite energy weak solutions converges in the relaxation limit to a classical solution of the compressible Navier–Stokes–Korteweg system in strong norms, provided such a solution exists. As a byproduct we identify a convergence rate for the corresponding norms. This is joint work with Nilasis Chaudhuri (University of Warsaw, Warsaw, Poland) and Christian Rohde (University of Stuttgart, Stuttgart, Germany).