Karlsruhe Institute of Technology

Seminar of the Work Group
Nonlinear Partial Differential Equations
WS 23/24

February 13th, 2024, 11:30 - 12:30
Seminar room: SR 3.061

Partially Dissipative Hyperbolic Systems: Hypocoercivity and Hyperbolic Approximations

Timothée Crin-Barat, FAU

Abstract

In this talk, we review recent results on so-called partially dissipative hyperbolic systems. Such systems model physical phenomena with degenerate dissipative terms and appear in many applications. For example, in gas dynamics where the mass is conserved during the evolution, but the momentum balance includes a diffusion (viscosity) or a damping (relaxation) term.

First, using tools from the hypocoercivity theory and precise frequency decompositions, we derive sharp stability estimates for linear systems satisfying the Kalman rank condition. This linear analysis allows us to establish new global-in-time existence and large-time behaviour results in a critical regularity framework for nonlinear systems.

Then, we interpret partially dissipative systems as hyperbolic approximations of parabolic systems, in the context of the paradox of infinite speed of propagation. In particular, we focus on a hyperbolic approximation of the multi-dimensional compressible Navier-Stokes-Fourier system and establish its hyperbolic-parabolic strong relaxation limit.