

Time-asymptotic self-similarity of the damped Euler equations in parabolic scaling variables

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In this talk, we study the long-time behavior of solutions to the compressible Euler equations with frictional damping on the whole space, assuming nonzero direction-dependent values for the density at spatial infinity. By introducing parabolic scaling variables, we reformulate the system and derive a relative entropy inequality. This framework allows us to show that the density converges to a self-similar solution of the porous medium equation, while the limiting momentum is governed by Darcy's law. We also obtain convergence rates that explicitly depend on the flatness of the limiting profile. The main part of the analysis focuses on weak solutions in the one-dimensional case, and we further extend the results to energy-variational solutions in the multidimensional setting.

This research is joint work with Thomas Eiter (WIAS).