Entropy/energy-stable methods for time evolution problems

Organizers: Aaron Brunk[1], Eduard Feireisl[2], and Mária Lukáčová[3]

[1]Johannes-Gutenberg University, Germany, abrunk@uni-mainz.de
[2]Czech Academy of Science, Czech Republic, feireisl@math.cas.cz
[3]Johannes-Gutenberg University, Germany, lukacova@uni-mainz.de

Short Description

It is well-known that a physically reasonable solution concept for time evolution problems has to reflect thermodynamic properties, such as the energy dissipation and/or entropy production. These properties and the resulting a priori estimates are the starting point to obtain the existence of physically admissible weak solutions. Moreover, they are inevitable to deduce the uniqueness or weak-strong uniqueness results via relative energy/entropy techniques.
In practical applications continuum models are discretised by means of finite difference, finite element and/or finite volume methods in space and time-stepping methods in time. In order to inherit a priori estimates results from energy dissipation or entropy production the resulting numerical methods need to be structure-preserving. In particular, this requires energy- or entropy-stable numerical schemes. Recent results presented in literature indicate that structure-preserving methods together with the relative entropy/energy techniques yield also an elegant, structured approach to the nonlinear error analysis.
The aim of the proposed minisymposium is to discuss recent advances in entropy/ energy- stable models for time evolution problems and corresponding structure-preserving numerical methods. Interesting examples that we want to discussed are the compressible Navier-Stokes equations, phase-field models in phase transition or multiphase models.