

Variational discretization of the Navier-Stokes-Fourier system

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In this talk I will present an ongoing work with François Gay-Balmaz on the variational discretization of the compressible Navier-Stokes-Fourier system, in which the viscosity term and the heat conduction term are handled within the variational approach to nonequilibrium thermodynamics developed by Gay-Balmaz and Yoshimura. In order to spatially discretize the system we extend the geometric approach developed by Pavlov and al., which is particularly well-adapted for the discretization of Euler-Poincaré systems whose configuration space is the infinite-dimensional Lie group of diffeomorphisms. A careful treatment of the phenomenological constraint is necessary. After this spatial discretization, we obtain a nonholonomic, variational principle on a finite-dimensional Lie group. Finally we discretize in time the resulting system using a nonholonomic variational integrator whose associated discrete evolution equations are proved to respect the balance of energy of the system.