

Kinetic Theory, Gaussian Moment Closures, and Fluid Approximations

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Abstract: A hyperbolic-parabolic transition regime model is developed that is a Gaussian moment closure for a classical kinetic equation. The model has an entropy structure. From it we can derive a fluid dynamical system that consists of the compressible Navier-Stokes system plus dispersive corrections terms. This fluid system also has an entropy structure. The dispersive terms change the entropy flux, but not the entropy density or entropy dissipation. From this fluid system we can recover most known fluid approximations, including systems not recoverable from the compressible Navier-Stokes system. Boundary conditions for both the moment and fluid system will be discussed.