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On a vector-BGK approximation of fluid-dynamics equations

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Abstract

A singular semilinear hyperbolic approximation to the Euler and the incompressible Navier-Stokes equations in 2D, inspired by the kinetic theory, is considered. We show the convergence of the vector-BGK model to the Euler equations under the hyperbolic scaling, and to the incompressible Navier-Stokes equations in the diffusive scaling. The latter result deeply relies on the dissipative properties of the system and on the use of an energy which is provided by a symmetrizer whose entries are weighted in a suitable way with respect to the diffusive parameter. This convergence is valid for smooth solutions and it is local in time. Some possible strategy to obtain the global in time convergence will be illustrated on a toy model.