Multiscale modeling from kinetic theory and numerical treatment of the nonconservative product for multicomponent plasma in thermal nonequilibrium: Application in solar physics

Quentin WARGNIER, CMAP, Ecole polytechnique

Marc MASSOT, CMAP, Ecole polytechnique

Benjamin GRAILLE, Laboratoire de Mathématique d'Orsay (LMO), Université Paris-Saclay

Sylvain FAURE, Laboratoire de Mathématique d'Orsay (LMO), Université Paris-Saclay

Thierry MAGIN, von Karman Institute for Fluid Dynamics

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This contribution deals with the fluid modeling of fully and partially ionized collisional multicomponent magnetized plasma in thermal and chemical non-equilibrium based on the model developped by Graille et al.[1] for the purpose of simulating and predicting magnetic reconnections in the chromosphere of the sun [2]. We focus on the numerical simulation of a simplified model in order to properly investigate the influence of the presence of a non-conservative product in the electron energy equation for shock solutions [3, 4, 5], derive jump conditions by looking for travelling wave solutions and propose an original numerical treatment in order to avoid non-physical shocks in the numerical solution, even in the coarse resolution regime encountered in applications [6]. The scheme proposed is working well because of the presence of diffusion in the electronic variables according to the scaling used at the first order of the generalized Chapman-Enskog expansion [1].

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Quentin WARGNIER, CMAP, Ecole polytechnique, CNRS, Université Paris-Saclay, Route de Saclay, 91128 Palaiseau Cedex
quentin.wargnier@polytechnique.edu
Marc MASSOT, CMAP, Ecole polytechnique, CNRS, Université Paris-Saclay, Route de Saclay, 91128 Palaiseau Cedex
marc.massot@polytechnique.edu
Benjamin GRAILLE, Laboratoire de Mathématique d'Orsay (LMO), Université Paris-Saclay
benjamin.graille@u-psud.fr
Sylvain FAURE, Laboratoire de Mathématique d'Orsay (LMO), Université Paris-Saclay
sylvain.faure@math.u-psud.fr
Thierry MAGIN, von Karman Institute for Fluid Dynamics, Rhode-Saint-Genese, Belgium
magin@vki.ac.be