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Two-fluid 2.5D code for simulations of small scale magnetic fields in the lower solar atmosphere

Isabell Piantschitsch, Ute V. Amerstorfer, Julia K. Thalmann, Arnold Hanslmeier, and Birgit Lemmerer
Institute of Physics, IGAM, University of Graz, Austria

Our aim is to investigate magnetic reconnection as an implication of the time evolution of magnetic flux tubes in the lower solar atmosphere. We implemented a new numerical two-fluid code which will perform a 2.5D simulation of the dynamics from the upper convection zone up to the transition region. Due to the two-fluid approach the effects of ion-neutral collisions, ionisation/recombination, thermal/resistive diffusivity and collisional/resistive heating are incorporated in the code. As initial conditions we make use of analytically constructed vertically open magnetic flux tubes within a realistic stratified atmosphere. The single-fluid approach is applied to the initial conditions as well, in order to compare the results with those obtained under two-fluid description. The code is based on the Total Variation Diminishing Lax-Friedrichs scheme and applies an alternating-direction implicit method. Parallelisation is done by using MPI and OpenMP directives. First magnetohydrodynamic (MHD) tests have shown good agreement with known results of numerical MHD test problems like e.g. Orszag-Tang vortex test and Current Sheet test.