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Hybrid simulations of driven reconnection with variable inflow conditions

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We present a series of reconnection simulations with the HYB hybrid simulation model developed at the Finnish Meteorological Institute. The simulations are set up in a box with controllable inflow and free outflow conditions. Reconnection is driven by imposing a constant plasma inflow speed, and merging is initiated with localized resistivity; there is no initial condition on the magnetic field geometry. We show that after initialization the simulated system attains a steady state where the outflow speed outside the diffusion region is of the order of the Alfvén speed in the inflow region, consistent with theoretical expectations. The inflow parameters (density, temperature and magnetic field strength) are then varied periodically to model plasma fluctuations that are present in inflow regions of solar-terrestrial reconnection sites, e.g. in the magnetosheath. The inflow variations are found to be transmitted through the reconnection process in the simulations: they cause variations of the same period in the outflow speed and other outflow parameters.