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Test-kinetic simulation of velocity distribution functions in a tangential discontinuity

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In this paper we investigate the velocity distribution functions at the interface of two separate plasma regions of a one-dimensional tangential discontinuity. The test-kinetic approach is used to compute the spatial variation of the velocity distribution function inside the simulation domain. The electric and magnetic fields are steady-state and one-dimensional and are provided by a self-consistent kinetic model of a tangential discontinuity. The plasma parameters (density, temperature, bulk velocity) and fields (magnetic and electric fields) vary only in the direction perpendicular to the surface of discontinuity. Test-particles (electrons, protons and Oxygen ions) are injected from sources placed in the xOy plane with initial velocities distributed according to a displaced Maxwellian. We integrate numerically the trajectories of all test-particles (electrons, protons and Oxygen ions) and use the Liouville theorem to propagate along these trajectories the velocity distribution function of the ensemble of particles. The numerical results obtained are compared with analytical solutions obtained from the Vlasov equilibrium model as well as with in-situ experimental data from Cluster satellites at the interface of the PSBL with the lobe, at the magnetospheric dusk flank.