Kinetic Vlasov simulations of contact discontinuities

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The stability of contact discontinuities formed by the relaxation of two Maxwellian plasmas with different number densities but the same plasma thermal pressure is studied by means of a one-dimensional electrostatic full-Vlasov simulation. Our simulation runs with various combinations of ion-to-electron ratios of the high-density and low-density regions showed that transition layers of density and temperature without jump in the plasma thermal pressure are obtained when the electron temperatures in the high-density and low-density regions are almost equal to each other. However, the stable structure of the contact discontinuity with a sharp transition layer on the Debye scale is not maintained. It is suggested that non-Maxwellian velocity distributions are necessary for the stable structure of contact discontinuities. A direct comparison between full- and hybrid-Vlasov simulations is also made.