R008-17 会場: D 時間: 11月24日 16:30-16:45

接触不連続における全圧を維持する電子温度の条件: 運動論シミュレーション

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The condition of electron temperatures to maintain total pressure in contact discontinuities: kinetic simulations

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Contact discontinuities in Magnetohydrodynamic regimes are boundary layers where, at constant pressure, the particle number density and temperature rapidly change, without a corresponding change in the normal plasma flow and magnetic field. Hybrid and particle-in-cell simulations of contact discontinuities have previously been performed, and its stability has been discussed [Wu *et al*., GRL, 1994, Lapenta & Brackbill, GRL, 1996]. When the total pressure is almost constant on the electron time scale in the absence of an electron heat flux, then the initial pressure and temperature profiles satisfy a pressure relation $(p_{e2}\text{-}p_{e1})(p_{i2}\text{-}p_{i1}) <0$ and a temperature relation $(T_{e2}\text{-}T_{e1})(T_{i2}\text{-}T_{i1}) <0$ [Tsai *et al*., JGR, 2009]. Here the subscript i indicates an ion, e indicates an electron, and 1 and 2 indicate the regions of low and high particle number densities, respectively.

In this study, we analytically reconsidered the derivation of both pressure and temperature relations. We then performed Vlasov simulations with initial parameters based on observational data [Hsieh *et al*., GRL, 2014], using a 4th-order conservative and non-oscillatory scheme [Umeda *et al*., CPC, 2012]. We investigated the physics of contact discontinuity structure by varying the ratio of ion and electron temperatures between a low and high particle number density region. As a result, we found that the constant total pressure on the electron time scale is not maintained with the initial pressure and temperature relations but is maintained with T_{e1} ~T_{e2}. We also observed that the ion number density structure diffuses even though the total pressure is maintained in all cases. These results show that the condition of total pressure on the electron time scale cannot stabilize the contact discontinuity.