

3D hybrid simulation of the mini-magnetosphere

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Interaction between the solar wind and the mini-magnetosphere of dipolar magnetized objects is investigated by a new three-dimensional hybrid simulation, which treats the ions as kinetic super particles via particle-in-cell method and the electrons as a massless fluid and additionally includes a fluid ion component to approximate the cold background plasma component. The hybrid simulation is suitable for the study of the mini-magnetosphere which scale is the order of the ion Larmor radius of the solar wind ions at the magnetopause, because the ion kinetic effects are important for the structure of the mini-magnetosphere. In the northward interplanetary magnetic field (IMF) solar wind case, the shape of the mini-magnetosphere more or less resembles the down-sized geomagnetosphere. On the other hand, in the southward IMF solar wind case, the dayside magnetopause boundary layer became unclear and the density is enhanced in the cusp region. We will discuss the structures of the mini-magnetosphere in the various solar wind conditions.