

Hybrid particle simulation on Mercury's dayside magnetopause

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The purpose of the present study is to investigate the ion dynamics at the dayside magnetopause of Mercury's magnetosphere and the magnetopause location's dependence on the solar wind dynamic pressure by performing hybrid particle simulations. In the simulation model, a small planetary body that has an intrinsic dipole magnetic field is placed at the center, and the solar wind with the Southward or Northward IMF is injected from the simulation boundary. A magnetosphere is created in the simulation due to the interaction between the solar wind and planetary magnetic dipole field. Bow shock, magnetosheath, magnetopause, and cusp are formed in the magnetosphere. In this study, we focus on the ions' trajectories at the dayside magnetopause in the Southward IMF case and analyze the meandering motion and ExB drift motion of the ions at the magnetopause. We also performed simulations to study the magnetopause location in the extreme case of the solar wind condition. When the solar wind dynamics pressure is very high, the previous observations suggest that the possibility that the dayside magnetopause disappears and the solar wind bombard directly to Mercury's surface, called Disappearing Dayside Magnetopause (DDM). We simulate DDM and investigate the structure of the magnetosphere in terms of density and current profiles and the solar wind flux to the surface.

Keywords: Mercury, magnetosphere, hybrid particle simulation