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The formation of the low latitude boundary layer in Mercurys magnetosphere: a 3D hybrid simulation study

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Abstract

Mercurys magnetosphere is a poor known system which couples directly to the surface but is hardly affected by the tenuous ionosphere. We performed a 3D hybrid model to simulate the Hermean system without injecting any planetary ions. The results showed that the solar wind ions could penetrate into the magnetosphere, accumulate at low latitudes, and form an ion boundary layer. The low latitude boundary layer (LLBL) shows strong dawn-dusk asymmetry and constitutes a large proportion of the magnetosphere inside the magnetopause. The LLBL exhibits similar features in accordance with the MESSENGERs first flyby data. We discussed the formation process of the LLBL in detail and attempted to compare with the earth case with respect to the size and the existence of an ionosphere.