

Behavior of Saturn's magnetosphere on various solar wind conditions

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The configuration and dynamics of the Earth's magnetosphere are largely controlled by the solar wind while Jupiter's magnetosphere is dominated by its massive rotating equatorial current sheet and plasma source at Io. Saturn has a rapid rotation equivalent to Jupiter and has the comparable strength of the magnetic field with Earth. Thus Saturn is often called that the planet has the intermediate character of Jupiter and Earth. In recent our simulation study, we show that the Kronian magnetosphere always has vortices and turbulent convection which are the result from the interaction of the solar wind and corotation or the solar wind and magnetospheric convection for no IMF, southward and northward IMF by the global magnetohydrodynamics (MHD) simulation. This suggested that the Kronian magnetosphere can be quite different from both Jovian and Earth's magnetospheres.

To understand the behavior of the magnetosphere to the other solar wind conditions which are variations of the dynamic pressure and IMF By component, we have carried out the simulations under such conditions. When we changed the dynamic pressure double and half, the convection of Kronian magnetosphere dynamically changed. Periodic plasma ejections became more turbulent and the wavy configuration appeared along the magnetopause. Then we ran the simulations including IMF By component. As the results, the vortices and turbulent convection in the magnetosphere appeared as same as the previous our study which included the only IMF Bz. From these simulation results, it suggests that the Kronian magnetosphere basically has the turbulent convection under any solar wind conditions. However those convections have the each character.