

Numerical Simulation of Jovian and Kronian Magnetospheric Configuration

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It has long been recognized that the rapidly rotating magnetospheres of Jupiter and Saturn differ greatly from that of the Earth where rotational effects are largely confined to the plasmasphere. In addition to rapid rotation Jupiter and Saturn both have sources of plasma within the magnetosphere: the volcanos on Io and the ice geysers on Enceladus while the main sources of plasma at the Earth are the solar wind and ionosphere. The magnetic moments of the two rotating gas giants are much larger than that at Earth although the surface field at Saturn is about the same as the Earth's because of its larger radius. At the Earth magnetospheric dynamics are largely controlled by the interplanetary magnetic field and reconnection while at Jupiter and Saturn the solar wind dynamic pressure is more important. Internal processes are also more important at Jupiter and Saturn than at the Earth. For many years simulators have been able to test their codes at Earth by direct comparison with observations. Now with the large Galileo and Cassini data bases from Jupiter and Saturn we can do the same thing at the outer planets.

From the results of our global magnetohydrodynamic (MHD) simulations of Jovian magnetosphere we found that the Jovian magnetosphere is affected by the solar wind (dynamic pressure and IMF) then the configuration and dynamics are dynamically changed (location of bow shock, magnetopause, magnetic reconnection and plasmoid ejection). Recently we can perform the high resolution simulation of Jupiter then will connect the results of MHD simulation with electron hybrid simulation of Jupiter.

In our simulation of Kronian magnetosphere, we have reported that the Kronian magnetosphere had the turbulent convection and vortices which were also found by Cassini spacecraft for the constant solar wind conditions. Then we have run the simulation with the observed solar wind data by Cassini and have obtained the layered configuration of convection which affected to the configuration of field aligned currents. Thanks to the recent development of computer we are getting to perform the high resolution Kronian simulation then we found clear vortex in the magnetosphere again.