

## Comparative Study of the Magnetospheres of Jupiter, Saturn and Earth

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In the Solar system, structure and dynamics of planetary magnetospheres are affected by interaction with the solar wind accompanying interplanetary magnetic field (IMF). Moreover, the individualities of planetary magnetospheres are determined by the mass, intrinsic magnetic field, co-rotation period and plasma sources. Thus three important parameters for planetary magnetospheres can be presented as the magnetopause distance, Alfvén radius, where rotational speed equals the local Alfvén speed, and distribution and species of plasma sources. Therefore, we have studied structure and dynamics of the planetary magnetospheres with intrinsic magnetic field, in particular for Jupiter and Saturn by 3-dimensional global MHD simulation of interaction between the solar wind and their magnetospheres and compared them with the earth's magnetosphere.

Since Jupiter has the largest mass and large intrinsic magnetic field, shortest co-rotation period and a large amount of plasma source from moon, Io, the largest magnetosphere with magnetic disc is formed among planets of the solar system. Saturn is the second largest planet with short co-rotation period. However, the Saturn's magnetosphere may resemble the earth's one because the effect of intrinsic magnetic field is comparable with earth. Then since the IMF By component is generally strong by the Parker spiral, it was considered that auroras could be affected by the dynamic pressure of solar wind but less by the IMF. However, it has been pointed out that the magnitude and orientation of IMF can also have an important role on the aurora activity in Saturn as well as Jupiter. We will demonstrate the structure and dynamics of planetary magnetospheres of Saturn and Jupiter and compare them with those of earth in base of global MHD simulation results. We found clear formation of large vortices in the space between the corotation region and the magnetopause of the Saturn's magnetosphere, which comes from velocity shear of the solar wind and co-rotational plasma. It is not remarkable to excite such large scale of vortices in the magnetospheres of Jupiter and earth. On the other hand, the periodic ejection of plasmoids occurred in the Jovian magnetosphere during the period of northward IMF, which comes from combined effects of magnetic reconnection in the tail and successive corotation of ejected plasma.