水星磁気圏におけるナトリウムイオンダイナミクスへの太陽風条件の影響

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Effects of solar wind conditions on the sodium ion dynamics in the Mercury's magnetosphere.

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From the observations by Mariner 10, it has been suggested that the Mercury's magnetosphere might be an analogous to the Earth's magnetosphere. Observation by MESSENGER in Janurary 2008 seems to support this assumption under a quiet solar wind condition. On the other hand, the temporal and spatial scales of the Mercury's magnetosphere are much smaller than those in the Earth's magnetosphere because of its week intrinsic magnetic field and strong dynamic pressure of the solar wind at the Mercury's orbit. The MHD simulation is one of the powerful methods to understand global structure of the magnetosphere. However, in the Mercury's magnetosphere, it should be pointed out that the kinetic effects of plasma might not be negligible because of a large gyro-radius of heavy ions. Statistical trajectory tracing of test particles is the important scheme to investigate the kinetic effects of particles. Recent studies by Delcourt et al. [2003; 2005] used analytical models of electric and magnetic fields that are obtained by rescaling the Earth's magnetosphere and calculated the motion of planetary sodium ions. Although this approach is efficient to see the dynamics of heavy ions, resultant properties largely depend on the field models. Therefore, it is important to examine the particle motion in the self-consistent MHD magnetic field. In the previous study, we developed a new MHD simulation code that automatically satisfies divB=0 condition and applied to the Mercury's magnetosphere successfully. In this presentation, we report on results of statistical trajectory tracings of the heavy ions on the MHD electric and magnetic field.