

Exploring the real-time prediction of Mercury's magnetosphere

*Manabu Yagi¹, Kanako Seki², Yosuke Matsumoto³, Dominique C. Delcourt⁴, Francois Leblanc⁴

1. RIKEN Center for Computational Science, 2. Graduate School of Science, University of Tokyo, 3. Graduate School of Science, Chiba University, 4. The National Center for Scientific Research

Observations by MESSENGER found that Mercury's magnetosphere is analogous to the Earth's while there are several differences of the two. Big differences from the Earth's magnetosphere are strong IMF-Bx component and dipole offset which could affect to the global configuration of Mercury's magnetosphere. In this study, first we performed many cases of MHD simulation solving an interaction with solar wind plasma and offset dipole of Mercury. Solar wind densities are given between nominal (35cm^{-3}), high (70cm^{-3}), and extreme (140cm^{-3}), with velocities for 400km/s to 800km/s, which are realistic values in the Mercury's orbit. When solar wind density is nominal and no IMF-Bx, the structure of Mercury's magnetosphere is not far from 'miniature' of Earth's magnetosphere, while north-south asymmetry is outstanding because of the offset dipole. In the realistic IMF case, global configurations of magnetosphere drastically change and become more complicated structures which include stronger north-south and dawn-dusk asymmetry. IMF-Bx also affects to the intensity ratio of north and south cusp pressure. IMF-By component "twist" the cusp region to longitudinal direction. The heavy ions' trajectories basically obey the global structure of magnetic field, so that the ions' precipitation concentrate on the 'magnetic cusp' defined from MHD simulations, but the precipitation region is wider and diffusive compared to the MHD cusp. In the presentation, we will discuss more details of heavy ion precipitation pattern. The identification of global structures and ions' precipitation region especially the cusp is important not only on the understanding of magnetospheric physics itself, but also making a proposal to the observational plan of spacecraft such as Bepi-Colombo.

Keywords: Mercury, magnetosphere, MHD