Sodium ion dynamics in the magnetospheric flanks of Mercury

*Sae Aizawa[1,2], Dominique Delcourt[3], Naoki Terada[1]

1. Graduate School of Science,Tohoku University, 2. Laboratoire de Physique des Plasmas, Ecole polytechnique-CNRS-UPMC, 3. Laboratoire de Physique et Chimie de l'Environnement et de l'Espace, Universite d'Orleans - CNRS

We investigate the transport of planetary ions in the magnetospheric flanks of Mercury. In situ measurements from the MESSENGER spacecraft show evidences of Kelvin-Helmholtz instability development in this region of space, due to the velocity shear between the downtail streaming flow of solar wind originating protons in the magnetosheath and the magnetospheric populations. Ions that originate from the planet exosphere and that gain access to this region of space may be transported across the magnetopause along meandering orbits. We examine this transport using single particle trajectory calculations in model MHD simulations of the Kelvin-Helmholtz instability. We show that heavy ions of planetary origin such as Na^+ may experience prominent nonadiabatic energization as they ***E*x*B*** drift across large-scale rolled up vortices. This energization is controlled by the characteristics of the electric field burst encountered along the particle path, the net energy change realized corresponding to the maximum ***E*x*B*** drift energy. This nonadiabatic energization also is responsible for prominent scattering of the particles toward the direction perpendicular to the magnetic field.

Keywords: Mercury's mangetosphere, Kelvin-Helmholtz instability, nonadiabatic motion