Some Features of Magnetotail Ion Dynamics at Earth and Mercury: A Comparative Analysis

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The early measurements of Mariner-10 in 1974-75 revealed that Mercury possesses a weak intrinsic magnetic field that leads to the formation of a miniature magnetosphere with spatial and temporal scales much smaller than those at Earth. The recent observations of MESSENGER during Mercury flybys in 2008-2009 confirm this outcome. We will review some features of plasma transport in planetary magnetotails with emphasis on the nonlinear dynamics of ions at Earth and that expected at Mercury. We will concentrate on convection of solar wind and planetary material from high latitudes into the plasma sheet, including nonadiabatic interaction with the magnetotail neutral sheet and subsequent filling of the inner magnetospheric region. We will discuss also the response of magnetospheric ions to short-lived dynamical reconfigurations of the magnetotail and the prominent nonadiabatic heating that may follow under the effect of the induced electric field.