

## Boundary layer plasma flows from high-latitude reconnection in the summer hemisphere for northward IMF: THEMIS observations

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We report observations by the THEMIS spacecraft on 11 July 2008 (near solstice) when, under extended northward IMF, southward flows of magnetosheath plasma from reconnection poleward of the northern cusp were detected simultaneously at longitudinally as well as radially separated points earthward of the dayside low-latitude magnetopause. The flows were cold and dense ( $T < 1$  keV and  $N > 1$  /cc), and had southward velocity  $\sim 100$  km/s and longitudinal extent  $> 3$  Re. These features are all consistent with a global magnetohydrodynamic (MHD) simulation of the magnetosphere for similar conditions [Li et al., 2009] in which under large geomagnetic dipole tilt, a low-latitude boundary layer (LLBL) forms via poleward-of-the-cusp reconnection first in the summer hemisphere and later in the other. Contrary to the simulation, however, the observed LLBL was mostly on closed field lines, characterized by balanced field-aligned and anti-field-aligned fluxes of high-energy electrons. This suggests that the reconnection rate was roughly equal in both hemispheres. Moreover, the cold-dense part of the LLBL was less thick ( $< 0.5$  Re) than in the simulation, suggesting that the actual reconnection rate was lower and/or that the plasma transport toward the magnetotail was faster. The discrepancy between the observations and the global simulation could be explained in terms of the formation of a plasma depletion layer immediately outside the dayside magnetopause [Phan et al., 1994] and of momentum transport that can be enhanced by the Kelvin-Helmholtz instability in the LLBL [Miura, 1984].

Li, W., J. Raeder, M. Oieroset, and T. D. Phan (2009), Cold dense magnetopause boundary layer under northward IMF: Results from THEMIS and MHD simulations, *J. Geophys. Res.*, 114, A00C15, doi:10.1029/2008JA013497.

Miura, A. (1984), Anomalous transport by magnetohydrodynamic Kelvin-Helmholtz instabilities in the solar wind-magnetosphere interaction, *J. Geophys. Res.*, 89, 801-818.

Phan, T.-D., et al. (1994), The magnetosheath region adjacent to the dayside magnetopause: AMPTE/IRM observations, *J. Geophys. Res.*, 99, 121-141.