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Plasma transport at the dayside magnetopause: observations and large-scale modeling

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Multipoint observations made by the Cluster spacecraft as they cross the polar cusps can provide significant insight into the plasma transport that occurs at the magnetospheric boundary. In particular, the formation of discrete structures in the energy-latitude dispersion of ions observed in the cusp reflects fundamental properties of the entry and acceleration of solar wind ions at the dayside magnetopause. We present the results of a study that uses large-scale numerical simulations to determine the relationship between the structures observed in ion dispersions in the cusp and the injection process at the magnetopause. This study uses the time-dependent electric and magnetic fields predicted by three-dimensional global MHD simulations to compute the trajectories of large samples of ions launched upstream of the bow shock for different solar wind conditions. Particle information collected in the simulations is then used to reconstruct ion dispersions that are compared with Cluster observations in the cusp. Individual particle trajectories are subsequently analyzed to determine the relationship between the structures observed in the cusp and the entry and acceleration process at the dayside magnetopause.