

Two sources of magnetosheath ions observed by Cluster in the mid-altitude polar cusp

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Double cusps have been observed on a few occasions by polar orbiting spacecraft and ground-based observatories. On 7 Aug. 2004, Cluster 4 was moving poleward through the Northern cusp, followed by Cluster 1, Cluster 2, and finally Cluster 3. The Wind spacecraft detected a Southward turning of the Interplanetary Magnetic Field (IMF) at the beginning of the cusp crossings and IMF-Bz stayed negative throughout. Cluster 4 observed a high energy step in the ion dispersion around 1 keV on the equatorward side of the cusp. Cluster 1, entering the cusp around 1 minute later, did not observe the high energy step anymore but a partial dispersion with a low energy cut-off reaching 100 eV. About 9 minutes later, Cluster 3 entered the cusp and observed a full ion dispersion from a few keV down to around 50 eV. The flow deduced from the ion distributions was directed poleward and Eastward in the step/dispersion, whereas in the centre of the cusp, the ion and electron fluxes were higher and the flow was directed mainly westward. This event could be explained by the onset of dayside reconnection when the IMF turned southward. The step would be the first signature of component reconnection, and the injection in the centre of the cusp be produced by anti-parallel reconnection in the northern dusk flank. A three-dimensional magnetohydrodynamic (MHD) simulation will be used to help us to locate the sources of the ions and the topology of the magnetic field during the event.