Cusp dynamics observed by Cluster using multi-point measurements

C. P. Escoubet (1), J. Berchem (2), J. M. Bosqued (3), M. G. G. T. Taylor (1), K. J. Trattner (4), F. Pitout (5), H. Laakso (1), A. Masson (1), M. Dunlop (6), H. Reme (3) and the cusp team

(1) ESA/ESTEC (NL), (2) UCLA/IGPP (USA), (3) CESR (F) , (4) Lockheed Martin ATC (USA), (5) MPE(D), (6) RAL (UK) , (7) MSSL (UK)

The polar cusp has been known to be a highly dynamic region since its first observations in the early 70s. Until recently, however, its motion in space could only be observed directly using statistics over hundreds or thousands of crossings. With Cluster, with four spacecraft closely spaced, we can observe its quasi-instantaneous motion when the cusp is moving through the spacecraft near the exterior cusp or when the spacecraft are crossing successively the cusp at mid-altitude. In this presentation we will use mid-altitude cusp crossings. We will show two events when the IMF is turning from Southward to Northward during the crossings and investigate the changes in the cusp position and in the ion and electron precipitation. In the first case, when the spacecraft were crossing the cusp with about 1 min from each other, the cusp was observed moving poleward, and the ion dispersion contained temporal structures like steps down and steps up or detached steps, and the width of the boundary layer decreased significantly with time. In the second case, the spacecraft were following each other within 2-8 min interval. The first two spacecraft observed the typical IMF-Southward ion dispersion, while the last one observed both an IMF-Southward dispersion and an IMF-Northward dispersion. The cusp was growing in size with the equatorward boundary moving equatorward and the poleward boundary moving poleward. These observations will be discussed in term of double lobe reconnection or simultaneous lobe and dayside reconnection.