Moving meso-scale plasma precipitation in the cusp

Satoshi Taguchi[1]; Shin Suzuki[1]; Keisuke Hosokawa[1]; Yasunobu Ogawa[2]; Akira Sessai Yukimatu[3]; Natsuo Sato[2]; Michael R. Collier[4]; Thomas E. Moore[4]

[1] Univ. of Electro-Communications; [2] NIPR; [3] NIPR (SOKENDAI, Polar Science); [4] NASA GSFC

On 28 March 2001, when the interplanetary magnetic field (IMF) was strongly duskward, the DMSP F12 spacecraft observed an ion precipitation burst near 1200 MLT in the low-altitude cusp. A few minutes before this observation, the Low Energy Neutral Atom (LENA) imager on the IMAGE spacecraft, whose field-of-view (FOV) looks into the high-altitude cusp, detected an enhancement of energetic neutral atom (ENA) signals, which are produced by the ion injection. The LENA data suggest that the ion injection moved out of its FOV about 4 min later. At this time, the ground-based magnetometers of the IMAGE chain, located westward of the LENA's FOV, began to observe perturbations; these perturbations peaked 2 min later. We interpret these observations as a moving meso-scale plasma precipitation (MMPP) or the enhanced westward motion of a plasma precipitation burst having an azimuthal scale of 400-500 km and a latitudinal scale of about 100 km. EISCAT/SuperDARN radar observations support our belief of the existence of such an enhanced flow. The appearance of MMPP is temporal in nature, and its leading and trailing edges are created by the temporal change in the reconnection rate. Since MMPP travels azimuthally with an azimuthally elongated form, the poleward and equatorward edges appear at almost fixed latitudes in the width of 1 hour in MLT. This quasi-stable boundary is recognized as the spatial structure of the cusp despite that the structure is moving. This study provides an explanation on how the temporal and spatial structures of the cusp coexist.