AURORAL POLEWARD BOUNDARY INTENSIFICATIONS AND MODES OF ENERGY TRANSPORT IN THE PLASMA SHEET

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Auroral poleward boundary intensifications (PBIs) have an auroral signature in ground meridional scanning photometer (MSP) data that appears as an increase in intensity at or near the magnetic separatrix. This increase is often seen to extend equatorward through the ionospheric mapping of the plasma sheet. PBIs are also associated with fast flows in the tail plasma sheet and are thus an important disturbance of the auroral zone and plasma sheet. We have recently used simultaneous auroral observations from the CANOPUS MSPs and either the Freja UV imager or the CANOPUS Gillam all-sky imager (ASI) to investigate the two-dimensional structure of auroral intensifications near the poleward boundary of the oval. We found that equatorward extending PBIs are either north-south (NS) aligned structures or east-west (EW) arcs that mostly propagate equatorward, but we have not been able to determine without doubt which type is the most prevalent. The different two-dimensional orientations for equatorward extending PBIs suggests that they may be the auroral footprint of two major modes of energy transfer in the plasma sheet: multiple, narrow, earthward fast-flow channels (associated with the NS structures) and sequences of azimuthally broad and primarily earthward propagating phase fronts initiating near the separatrix (associated with the EW arcs). We test this hypothesis by combining data from the CANOPUS MSPs, the all-sky imagers of the newly installed NORSTAR array in northern Canada which cover the poleward boundary of the auroral oval, auroral images from the IMAGE spacecraft, and magnetic field and plasma data from the Geotail spacecraft. We discuss, in particular, two events. First, an event from Jan 3, 2001 when multiple PBIs occurred during the long recovery phase of a substorm. We find that PBIs correlate well with plasma sheet fast flows that occur within the local time sector of PBIs. Most of the PBIs are EW arcs that initiate near the poleward boundary and then propagate equatorward. They often tilt and become approximately NS structures as they propagate equatorward. Second, an event from Jan 13, 2001 that occurs during very quiet (northward IMF) conditions and is not associated with a substorm. The PBIs are EW arcs and the ionospheric footprint of a triple flow burst in the plasma sheet. These two events suggest that, contrary to our previous suggestion, the same dynamics likely produce both EW and NS structures and that similar plasma sheet dynamics may occur both during the recovery phase of a substorm under southward IMF and during a

quiet, non-substorm, northward IMF time period.