

Interhemispheric Comparison of Spectral Width Boundary as Observed by the SuperDARN Radars

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Previous work has shown that the dayside equatorward edge of coherent HF radar backscatter having large Doppler spectral width is coincident with the equatorward edge of the cusp particle precipitation. This enables the boundary between high and low spectral width backscatters in the dayside MLT sector to be used as a proxy for the location of open/closed field line boundary. The work presented here employs magnetic conjugate SuperDARN coherent HF radars to make an interhemispheric comparison of the location and variation of the spectral width boundaries. Agreement between the magnetic latitudes of the boundaries in both hemispheres is remarkable. Correlation coefficients between the latitudes of the boundaries are larger than 0.70 for all conjugate beam pairs employed in this study. The temporal variation of the magnetic latitude of the spectral width boundary follows the same equatorward trend in both hemispheres. This signature is consistent with the accumulation of open flux in the polar cap by magnetopause reconnection, expected when IMF Bz is negative. Boundaries in both hemispheres also exhibit short-lived poleward motions superposed on the general equatorward trend, which follows the the onset of substorm expansion phase and temporal northward excursions of IMF Bz during substorm recovery phase. In addition, there is an interhemispheric difference in response time to the substorm occurrence between two hemispheres such that spectral width boundary in the Southern Hemisphere starts to move poleward 10 minutes earlier than that in the Northern Hemisphere. We discuss this difference in terms of interhemispheric asymmetry of substorm breakup region in longitudinal direction associated with the effect of IMF By component.