

## GPS Observations of Tongues of Ionization in the Polar Cap

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During geomagnetic disturbances, intense storm-time electric fields of magnetospheric origin extend across mid-latitudes and the sub-auroral polarization stream is established. Ionospheric plasma is advected across both latitude and local time from a low-latitude source in the dusk sector to the dayside auroral region and the polar cap. Associated with such regions of storm enhanced density (SED), strong increases and sharp spatial gradients in total electron content (TEC) are observed in maps of TEC generated from multiple GPS receivers distributed throughout North and South America. Recent studies (e.g. Foster et al, GRL 2002) have shown the repeatability and global characteristics of these features at mid and auroral latitudes and their relationship to the erosion of the plasmasphere by the disturbance (SAPS) electric field. This analysis extends the GPS observations to high polar latitudes, and is based on data from ~ 180 GPS receivers during the 11 April 2001 storm. We focus on the tongue of ionization that forms across the polar cap as the TEC plume enters the polar region, and show its interconnection with the SED plume of plasmaspheric material observed over the continental US. The tongue of ionization correlates well with observations of discrete regions of strong HF backscatter observed by the SuperDARN radars and with polar cap enhancements of topside ionization observed by the DMSP satellites. Polar tongues of ionization formed in this way constitute a strong source of high-latitude space weather effects and radio scintillation.

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