



## **Polar cap dynamics during geomagnetic storms: large-scale ionospheric response**

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Geomagnetic storms driven by coronal mass ejections (CME) and/or high speed solar wind streams (HSS) can produce large-scale ionospheric anomalies extending from mid-latitudes into the polar cap known as the tongue of ionization. Polar cap anomalies induced by both CME- and HSS-driven storms are analyzed using 4D tomographic reconstructions of the ionospheric plasma density based on the measurements of total electron content along ray paths of GPS signals. Results of the GPS tomography are supported by ground-based observations of F region plasma density using digital ionosondes deployed in the polar cap region of Canadian Arctic as well as by plasma observations on-board LEO spacecraft. It is shown that the formation of large-scale polar cap anomalies is largely controlled by the orientation of interplanetary magnetic field (IMF) with the tongue of ionization forming exclusively during the periods of extended southward IMF under storm-time conditions of high solar wind velocity.