



## **GPS TEC signatures of polar rain patches over Antarctica**

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High electron concentrations at F region altitudes in the polar ionosphere are known as polar patches and are often seen when IMF Bz turns southward. It is generally accepted that large-scale polar patches result from solar produced plasma that is transported poleward from lower latitudes. Little work has been done to ascertain the possible contribution of particle precipitation within the polar cap to patch formation. Here we present some experimental evidence indicating that patches in the cap ionosphere are produced locally by soft particle precipitation.

Based on using various types of measurements from ground GPS receivers, vertical sounding, DMSP spacecrafts and LEO satellites, the low energy (keV) electron precipitation and its association with patches in the cap ionosphere are studied over Antarctica during several ionospheric events. An advanced 4D tomographic method is also employed for the first time to image the Antarctic ionosphere. The focus is to reveal the polar rain over the polar cap and its signatures on GPS TEC tomographic maps. These studies can lead us to a better understanding of the interaction between the solar-wind and the geomagnetic field and also the coupling between the magnetosphere and the ionosphere.