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Ionospheric Storm Effects in GPS Total Electron Content

Abstract:
Total electron content (TEC) is a commonly-used parameter for characterizing the Earth's ionosphere. It is defined as the total number of electrons within a cross-sectional volume along a path between two points and given in units of 1×10^{16} electrons/m^2, or 1 TECU. Ionospheric TEC measurements can be obtained from the pseudorange and carrier-phase data contained in the L1 (1575.42 MHz) and L2 (1227.60 MHz) signals broadcast by Global Positioning System (GPS) spacecraft and recorded by a ground-based receiver. By collecting data from the thousands of stationary GPS receiver sites around the world, globally-gridded maps of GPS TEC allow for imaging of large-scale ionospheric electron density structures at high spatial and temporal resolution. Strong gradients associated with the edges of these density structures have been related to outages of aircraft navigation services and disruption of satellite communication links. We present an analysis of ionospheric GPS TEC variations driven by geomagnetic storms during the current solar cycle (2008 – present) with the aim of improving existing space weather modeling and forecasting capabilities.