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ANALYSIS OF TOTAL ELECTRON CONTENT IN THE IONOSPHERE DURING HIGH SOLAR ACTIVITY

Abstract

Total electron content, or TEC, is an important variable in satellite communication as well as astronomy. TEC is the total number of electrons present in the path of a transmitter and a receiver, and depending upon its magnitude can negatively affect the accuracy of GPS/GNSS navigation on the scale of tens of meters. TEC is influenced in drastic ways by its location, the time of day, and by space weather events such as the solar cycle, and interaction of magnetosphere with solar winds (aurora borealis). In this study, we monitored the TEC content during a period of high solar activity in Fairbanks, Alaska, over the course of two weeks. Our method of ascertaining our results was by installing a JAVAD Triumph II receiver on the rooftop of the Akasofu International Arctic Research Center at the University of Alaska, Fairbanks and retrieving data from the receiver every 24 hours. Once we returned to the University of Houston the process of analyzing the data began by converting the data to RINEX, calculating TEC ionospheric intercepts, formatting the data for Matlab, plotting latitude versus longitude, and then plotting color points for TEC values. Initial analysis of the data correlates with previous findings collected in prior Alaska and Sweden expeditions by our Undergraduate Student Instrumentation Program at the University of Houston. The TEC content was observed to rise at midday and decrease during the evening. Additional processing and analysis of the results are ongoing for the periods of greatest solar activity. By understanding the effect on TEC due to space weather events we gain the ability to improve accuracy of GPS and radio transmissions through the ionosphere, and potentially safeguard ourselves against unpredictable events.