

Ionospheric variation induced by 21 August 2017 total solar eclipse detected by Global Ionospheric Specification

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On 21 August 2017, a total solar eclipse passed through the continental United States (CONUS) from the west to the east coast. Total Electron Content (TEC) measurements from thousands ground-based GNSS (Global Navigation Satellite System) receiving stations over CONUS observe the ionospheric horizontal variation induced by the moon shadow. Meanwhile, Global Ionospheric Specification (GIS) is an ionospheric data assimilation product based on Gauss-Markov Kalman filter, to assimilate slant TEC observed from ground-based GPS receivers and space-based RO instrumentations into background model International Reference Ionosphere (IRI-2016) to provide the continuity ionospheric three-dimensional (3D) electron density distribution. In this study, GIS assimilates about 1000 ground-based GNSS receiving stations data over the CONUS to reconstruct 3D electron density distribution during the obscuration period. Comparison of integrated TEC, $N_m F_2$, and $h_m F_2$ for the eclipse day and the day before the eclipse day, the assimilation analysis results demonstrate that not only electron density is depleted and also the peak height is uplifted during the solar eclipse. These results also indicate that the GIS electron density can study ionospheric 3D structural variation.

Keywords: Data Assimilation, Ionosphere, Solar Eclipse