

The model study of ionospheric variations during the solar eclipse event by assimilating the GNSS TEC observations

*Chia-Hung Chen¹, Charles Lin¹, Tomoko Matsuo²

1. Department of Earth Sciences, National Cheng Kung University, 2. Department of Aerospace Engineering Sciences, University of Colorado at Boulder, CO

Using the physics-based thermosphere-ionosphere model (NCAR-TIEGCM) with an ensemble Kalman filter, this study reports the first data assimilative analysis of the ionosphere responses to the solar eclipse on 21 August 2017. The system, using a 2-minute assimilation cycle of data from ground-based GNSS observations, show dynamic variations of the equatorial ionization anomaly (EIA) due to the electrodynamic effects of the solar eclipse. Two major ionospheric responses are captured: (1) an early appearance of EIA at the westward boundary of moon shadow and (2) an enhanced EIA at lower latitudes and suppressed EIA at the higher latitudes. These eclipse-induced conjugate EIA variations are produced by an eastward electric field perturbation around magnetic equator and a westward electric field perturbation at the higher latitudes.

Keywords: Ionospheric data assimilation, solar eclipse, electric field perturbation