Ionospheric responses on the 21 August 2017 solar eclipse by using three-dimensional GNSS tomography

*Chia-Hung Chen¹, Charles Lin¹, Akinori Saito², Mamoru Yamamoto³, Susumu Saito⁴

1. Department of Earth Sciences, National Cheng Kung University, 2. Department of Geophysics, Graduate School of Science, Kyoto University, 3. Research Institute for Sustainable Humanosphere, Kyoto University, 4. Electronic Navigation Research Institute, National Institute of Maritime, Port, and Aviation Technology

In this study, we study the ionospheric responses on the August 2017 solar eclipse event by using a three-dimensional tomography algorithm with the ground-based GNSS (global navigation satellite system) total electron content observations around the Northern America. This three-dimensional ionospheric electron density structure from the tomography can provide us more information regarding to how the density variations and propagations are. Results show that the ionospheric electron density depletion triggered by the solar eclipse is distributed to all the altitudes. The most electron density depletion is around 40% compared with the previous day of solar eclipse. We further conduct a procedure of Fourier analyses to derive the vertical phase and group velocities of the electron density propagations. Results show that the opposite directions of the vertical phase and group velocities around 300 km altitude imply the energy source by the solar eclipse.

Keywords: ionospheric GNSS tomography, August 2017 solar eclipse