Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

MTT05-09 Room:203 Time:May 27 12:15-12:30

Development of GNSS tomography for ionospheric electron density and tropospheric water vapor distribution

HATTORI, Katsumi[1*] ; HIROOKA, Shinji[2] ; HIROKI, Akimitsu[1]

[1]Graduate School of Science, Chiba University, [2]National Central University, Taiwan

The GNSS signal contains the information on electron density distribution of water vapor along the line of sight. Therefore, it is possible to develop the electron density tomography and the water vapor tomography to visualize the 3D structures in time and space. For this aim, we use the algorithm of residual minimization learning neural network (RMTNN) without any models (Ma et al., 2006; Hirooka et al., 2011). Tomographic algorithms have a tendency to fall into ill-posed problems. Therefore, in general a regularization is required. In this study, we use the data observed by Ionosonde and AMeDAS to restrict data for electron density and water vapor reconstruction, respectively. We performed the numerical simulation to investigate the ability of the developed RMTNN algorithm and carried out the practical application for actual data. .

The results provide following capacities of the RMTNN algorithm; (1) for the electron density visualization, transient disturbances can be reconstructed successfully without any model assumptions, (2) the reliability of the lower edge of the ionosphere is a little bit weak, and (3) for the water vapor, if adequately restricted data are given, the water vapor disturbance can be reconstructed successfully. These facts show that the developed RMTNN tomography algorithm on GNSS/GPS data for electron density and tropospheric water vapor has the capacity to reconstruct disturbance without any model dependence.

Keywords: GNSS tomography, ionospheric electron density, tropospheric water vapor distribution, RMTNN