

Adjustment of the ionospheric height for TEC derivation of GRBR network

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To derive Total Electron Content (TEC) of GNU Radio Beacon Receiver (GRBR) network in low latitude region, the ionospheric height was adjusted to reduce a TEC estimation error. GRBR is a simple digital receiver developed to measure the ionospheric total electron content (TEC) from Low-Earth-Orbit (LEO) satellites. GRBR network is used to capture the small-scale structure of the ionosphere. It is known that fixed altitude of the ionosphere leads to large error of TEC in low latitude sector. In order to reveal a low latitude meridional TEC distribution, we thus developed the method with adjustable ionospheric height to derive GRBR-TEC.

This method employs data from 5 GRBRs, 3 ionosondes and 17 GPS receivers in March 2012. The GRBR receivers are located at Kototabang (0.20S, 100.32E), Phuket (7.89N, 98.38E), Chumphon (10.72N, 99.37E), Bangkok (13.73N, 100.77E), and Chiang Mai (18.76N, 98.93E). The ionosondes are located at Kototabang (0.20S, 100.32E), Chumphon (10.72N, 99.37E) and Chiang Mai (18.76N, 98.93E). The GPS stations distribute from 25N to 10S and 98E to 108E in the geographic coordinate. Assuming that mean ionospheric height variation is a function of latitude, the ionospheric height at each position was adjusted based on an ionosonde-hmF2. Consequently, GPS-TEC was employed as a zero-guess to estimate the bias for the GRBR-TEC calculation. As a result, meridional TEC of the low-latitude ionosphere over equatorial region was obtained with high accuracy for both cases with and without plasma bubble occurrence. In addition, an asymmetry of EIA enhancement was captured as well, which will be discussed in the presentation. The proposed method with adjustable ionospheric height was successful to derived multi-station GRBR-TEC from polar orbit satellite.

Keywords: GRBR-TEC, Ionospheric height, Equatorial region, EIA, Ionosonde, GPS