

Profiling of ionospheric electron density based on the FORMOSAT-3/COSMIC data: results from the intense observation period experiment

L.-C. Tsai^{1,2}, C. H. Liu², and C. I. Cheng¹

¹ Center for Space and Remote Sensing Research,
² Institute of Space Science,
National Central University, Chung-Li, Taiwan, R.O.C.

Abstract

The FORMOSAT-3 (FS3) / COSMIC program used the radio occultation technique to receive multi-channel GPS carrier phase signals from six low Earth orbiting satellites and approach active limb sounding of the Earth's atmosphere and the ionosphere. In this study, we have considered the effect of large-scale horizontal gradient and/or inhomogeneous ionospheric electron density and approached a compensation procedure for measured total electron content (TEC) values through several close-up occultation observations. Using the Abel inversion through the "compensated" TEC values, we have collected more than one-hundred and fifty thousand vertical profiles of the ionospheric electron density during the intense observation period from days of year 171 – 270, 2006. In order to assess the accuracy of the observations to the ionosonde data from forty nine world-wise stations have been examined. From several thousand matches within the intense observation period, the *rms foF2* differences between the ionosonde measurements and the FS3/COSMIC retrievals are improved from 1.82 MHz to 1.02 MHz. The results also show successful improvement of overestimates (underestimates) on low (high) retrieved *foF2*s and more reliable *hmF2*s compared with the ionosonde data.

Key words: Radio occultation, FS3/COSMIC, ionospheric profiling, Abel inversion, total electron content (TEC)