Ionospheric GNSS Radio Occultation observations of FORMOSAT-3/COSMIC and FORMOSAT-7/COSMIC

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FORMOSAT-3/COSMIC (F3/C) constellation launched on 15 April 2006, which consists of six micro-satellites in the low-earth orbit at 800 km altitude with 72-deg inclination, is capable of uniformly monitoring the ionosphere by using the powerful radio occultation (RO) technique. More than 1500 GPS RO profiles per day provide excellent opportunities to observe new features and study three-dimensional (3D) structures/dynamics of the electron density and S4 scintillation of the globe. This paper reports ionospheric new findings of the plasma cave, plasma depletion bay, and ionospheric disturbances induced by magnetic storm/earthquake/tsunami waves, as well as has better understandings on the middle-latitude electron trough and the Weddell Sea/Yakutsk anomaly by using F3/C GPS RO sounding. Meanwhile, assimilating ground-based GNSS and F3/C RO GNSS total electron contents (TECs) into existing empirical/physical models, monitoring model, nowcast model, forecast model, and S4 scintillation model have been constructed for ionospheric weather monitoring/prediction. Finally, impacts and prospects of F3/C follow-on, FORMOSAT-7/COSMIC-2, which consists of six small-satellites with low inclinations of 24-deg at 550 km altitude and will be launched on 22 June 2019, are briefed.