Ionospheric Space Weather Probed by GNSS Radio Occultation Soundings

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The FORMOSAT-3 Project is also named Constellation Observing System for Meteorology, Ionosphere and Climate, or FORMOSAT-3/COSMIC (F3/C) for short. The project is targeted to place six micro-satellites into six different orbits with 72-deg inclination at 700~800 kilometer above the earth ground. These satellites orbit around the earth to form a low-earth-orbit constellation that conduct radio occultation (RO) by receiving signals transmitted by the 24 US GPS satellites. The satellite observation covers the entire global atmosphere (temperature and water vapor pressure profiles) and ionosphere, providing over 2,500 global RO sounding data (electron density and S4 scintillation profiles) per day since 15 April 2006. This for the first time allows scientists observing the 3D ionospheric electron density structure and dynamics. Ionospheric weathers response to solar wind, solar eclipse, magnetic storm, earthquake/tsunami, etc. are presented. Following the F3/C, FORMOSAT-7/COSMIC (F7/C2) consists of six small-satellites with 24-deg inclination and about 500 km altitude and six small-satellites with 72-deg inclination and about 800 km altitude will be launched in 2018 and 2020, respectively. Currently, NCU (National Central University) has been collaborating with NCAR (National Center for Atmospheric Research) and NOAA to develop ionospheric weather models by assimilating F3/C data into existing ionospheric models. The developed models with F3/C and F7/C2 data shall be open to the space weather and its related communities in the near future.