

Formosat-3/COSMIC Space Weather Data Analysis

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Abstract: The Formosat-3/Constellation Observing System for Meteorology Ionosphere and Climate (COSMIC) is a joint US-Taiwan mission. COSMIC consists of six low-Earth orbiting (LEO) satellites at 72 degree inclination in circular orbits, presently ranging from 500 – 800 km in height. Ultimately all satellites will be deployed at 800 km with their orbit planes separated 30 degrees to provide continuous global observations of atmospheric and ionospheric properties at all local times. COSMIC uses GPS radio occultation to measure profiles of refractivity, pressure, temperature and humidity with high vertical resolution (0.1 -1 km) from the surface to ~40 km altitude. In the ionosphere COSMIC observes total electron content (TEC) along the lines of sight to all GPS satellites in view (up to 16 satellites at one epoch) at rates of 1 Hz or 50 Hz. Between 80 and 800 km COSMIC TEC observations are used to retrieve electron density profiles. Over 500,000 such profiles and a larger number of TEC arcs have already been published by the COSMIC data analysis centers in the US and Taiwan. Since recently a new observable is generated by COSMIC – S4 scintillation index along all LEO-GPS lines of sight. First results of the new COSMIC scintillation observations will be presented. Each COSMIC satellite also carries a Tiny Ionospheric Photometer (TIP) and a Tri-Band Beacon (TBB). The TIP measures the nadir intensity of the 1356 Angstrom radiation from which the night-side electron density gradients in the F-region can be inferred. The TBB transmits on two or three frequencies to ground based receivers for high-resolution tomographic reconstruction of electron density and scintillation studies. This presentation will discuss the availability and quality of the GPS-derived COSMIC products for space weather monitoring and science.