Paul
Straus
The Aerospace Corporation
Oral
The Constellation Observing System for Meteorology, Ionosphere and Climate (COSMIC-2) mission is a collaboration between the United States of America (NOAA and the USAF) and Taiwan. Each COSMIC-2 satellite includes three space weather sensors: the primary Tri-GNSS Radio occultation Sensor (TGRS), developed by the Jet Propulsion Laboratory (JPL), which also has terrestrial weather sensing capabilities, the Ion Velocity Meter (IVM), designed by the University of Texas at Dallas (UTD), and the Radio Frequency (RF) Beacon, designed by SRI. Following the successful completion of the TGRS neutral atmospheric Cal/Val effort, the COSMIC-2 program has been engaged in Calibration/Validation activities for space weather products. The TGRS sensor measures ionospheric Total Electron Content (TEC) in both the radio occultation (RO) limb-viewing and overhead geometries, exploiting signals for both the GPS and GLONASS navigation satellites to make these observations. GPS-based TEC validation was completed in June 2020, while GLONASS TEC validation is ongoing. The COSMIC-2 program is striving to meet 3 and 0.3 TECu absolute and relative accuracy requirements, respectively. TGRS also performs routine on-board calculations of ionospheric scintillation parameters and sends the underlying high rate observations to the ground for selected events. Validation activities for TGRS scintillation include assessments of the accuracy of geolocation algorithms for the irregularity structures associated with scintillation, evaluation of an “All Clear” product that specifies regions that are irregularity free, and inference of scintillation strength in a ground-to-space geometry based on the TGRS limb observations. The IVM sensors measure both in-situ ion density, temperature, composition and plasma drifts from which electric fields, the most important physical driver for equatorial ionospheric structure, can be inferred. The U-, L- and S-band signals transmitted by the RF Beacon are observed by special purpose ground receivers, directly measuring scintillation effects on trans-ionospheric signal propagation across a broad frequency spectrum. These three COSMIC-2 instruments on the six COSMIC-2 satellites are providing a wealth of data needed to address topics associated with specification and forecast of ionospheric densities, as well as the instabilities and irregularities that cause ionospheric scintillation. This presentation will provide an overview ongoing validation activities together with a high level review of latest validation results.
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