Assimilating COSMIC And Ground-Based GPS Measurements To Estimate Ionospheric Parameters Using JPL/USC GAIM

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Abstract

The University of Southern California (USC) and the Jet Propulsion Laboratory (JPL) have jointly developed the Global Assimilative Ionospheric Model (GAIM) to monitor space weather, study storm effects, and provide ionospheric calibration for DoD customers and NASA flight projects. JPL/USC GAIM is a physics-based 3D data assimilation model that uses both 4DVAR and Kalman filter techniques to solve for the ion and electron density state and key drivers such as equatorial electrodynamics, neutral winds, and production terms. GAIM runs can accept as input ground GPS TEC data from 1000+ sites, occultation links from CHAMP, SAC-C, and the COSMIC constellation, UV limb and nadir scans from the TIMED and DMSP satellites, and in situ data from a variety of satellites (DMSP and C/NOFS). Since our forward physics model and the adjoint model were expressly designed for data assimilation and computational efficiency, all of this can be accomplished on a single dual-processor Unix workstation.

In the presentation, we will first quality check our COSMIC-derived products by comparing Abel profiles and JPL-processed results. Secondly, we will discuss GAIM assimilation results using COSMIC occultation data. We will show results for recent ingest of COSMIC and ground-based GPS data using the GAIM Kalman filter. To conclude, we plan to present validation of the GAIM electron density grid by comparisons to Abel-derived and independent electron density profiles using measurements from Incoherent Scatter Radar.