Title: Impact of COSMIC Radio Occultation Ingestion on GAIM Electron Density Profile Specification

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The University of Southern California and Jet Propulsion Laboratory Global Assimilative Ionospheric Model (GAIM) is a data assimilation system for estimating the time-varying volumetric ion and electron density structure of the ionosphere to monitor space weather and its effects and determine high-quality ionospheric calibrations for tracking NASA’s interplanetary assets. Each estimate is the systematic combination of empirical models of solar radiation, upper atmosphere, and electrodynamics, a first-principles ionospheric physics model, and globally distributed observations, both ground-based and space-borne. Ground observations are provided by the ever increasing (1000+) global network of high-quality GPS receivers that continuously measure the ionospheric total electron content integrated along ground station to GPS satellite links in near real time. However, such measurements have their limitations: receivers are costly to deploy in the ocean and, as a consequence, their locations are concentrated on land and the vertically-oriented observations result in an estimation problem that is under-constrained in the vertical dimension. Space-borne observations include COSMIC radio occultation (RO) measurements. Unlike ground-based GPS observations, RO measurements are not affected by geography (though the spatial coverage at any time instant is sparse) and the link geometry is favorable to constrain vertical ionospheric structure.

In this presentation, we explore the impact of ingesting COSMIC radio occultation (RO) measurements as it pertains to electron density profile specification. We focus on electron density profiles because of their importance for applications such as ionospheric calibration and for scientific investigations. We present validation results comparing GAIM estimated profiles with and without COSMIC ingestion to ionosonde profiles and discuss approaches to retrieving a sufficiently smooth electron density profile from the GAIM voxel lattice.