

Assessment of Radio Occultation Observations to Improve Space Weather Nowcasts Using the JPL/USC Global Assimilative Ionosphere Model

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The Jet Propulsion Laboratory (JPL) global assimilative ionospheric model (GAIM) combines first-principles physics with empirical measurements to estimate the time-dependent global electron density structure of the ionosphere. As with other assimilative models of the ionosphere, JPL GAIM faces numerous challenges, including: sparse data coverage, noisy measurements, and incomplete or empirically-specified physics drivers. Validation of the electron density “nowcasts” from GAIM is an ongoing activity to understand and improve global electron density prediction.

We have developed several methods for assessing the quantitative impact of assimilating radio occultation data into GAIM. These include Observation System Simulation Experiments and validation against sparse but detailed independent observations such as incoherent scatter radar. The studies clearly show the positive impact of radio occultation data in many cases. Additional data volume from the planned COSMIC-2/FORMOSAT-7 constellation is likely to lead to substantially improved nowcasts compared to the sparser COSMIC/FORMOSAT-3 data set. However, these studies also show that further progress in assimilation techniques and global modeling are required to use radio occultation data to fullest advantage. We will present the findings of our ongoing research that support these conclusions.