Global Assimilative Ionospheric Modeling and the Tiny Ionospheric Photometer on the COSMIC Constellation

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The Constellation Observing System for Meteorology, Ionosphere, and Climate (COSMIC) uses the Tiny Ionospheric Photometer (TIP) to characterize the nighttime ionosphere. TIP is a compact, nadir directed, narrow-band, ultraviolet photometer operating at the 135.6 nm wavelength. This emission is produced by recombination of O+ ions and electrons, which is the natural decay process for the ionosphere. At night, the strength of the emission is proportional to the square of the peak electron density. TIP measures the horizontal structure of the ionosphere with 15-30 km resolution and high sensitivity, providing remarkable detail even during solar minimum conditions. With six sensors on COSMIC providing global coverage, TIP is a valuable resource for evaluating ionospheric models. We present a comparison of TIP data with models which employ global assimilation of ionospheric measurements. Ground-based GPS observations are routinely ingested and serve as the primary data source for assimilative models. With the launch of the COSMIC constellation in 2006, research has begun on assimilating GPS radio occultations. These space-based observations provide global coverage and promise to improve ionospheric specification in both a vertical and horizontal sense. Comparison with TIP reveals the horizontal performance of these models and demonstrates the improvement obtained from ingesting radio occultation data.