

COSMIC/FORMOSAT-3 Observations of Ionospheric Structure and Variability

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We provide an overview of some of the ionospheric science being studied at the Naval Research Laboratory using the COSMIC/FORMOSAT-3 (CF3) satellite constellation. The Tiny Ionospheric Photometer (TIP), GPS Occultation Experiment (GOX), and Tri-band Beacon (TBB) constitute a powerful measurement suite for studying ionospheric structure on a wide range of size scales. We have used the CF3 constellation to study ionospheric structure on the global scale (1000's of kilometers) in the Equatorial Ionization Anomaly (EIA), on a regional scale (100's of km) in latitudinal cuts through the EIA, and on a local scale (<10 km) in local ionospheric tomography studies. Highlights of these studies include: Characterization of the longitudinal modulation of the equatorial ionization anomaly showing that the tidally driven structure is more complex than the 4-cell pattern reported in other studies. Observation and characterization of nighttime enhancements of the global E-region ionosphere by gamma-ray bursts originating from a soft gamma repeater thought to be caused by a star quake in a neutron star. Tomographic observations of the latitudinal-altitude structure of the EIA in regions where ionospheric bubbles associated with spread-F were seen. The first observation of a medium-scale traveling ionospheric disturbance from space using TIP and GOX measurements in conjunction with VHF interferometry by the Very Large Array (VLA) radiotelescope in Socorro, New Mexico, USA. The FC3 measurements have made a large impact on ionospheric science.