Dominic
Fuller-Rowell
NOAA Space Weather Prediction Center
Rodney Vierick, NOAA, Space Weather Prediction Center
Mihail Codrescu, NOAA, Space Weather Prediction Center
Tim Fuller-Rowell, NOAA, Space Weather Prediction Center and University of Colorado Boulder, CIRES
Oral
In an effort to improve the ionospheric products at NOAA, the Space Weather Prediction Center (SWPC) are working to replace regional products like North America Total Electron Content (NATEC) with a GLObal Total Electron Content (GloTEC) product. GloTEC is a novel global-scale three-dimensional electron density data assimilation scheme that makes use of a Kalman Filter (KF) (Yue et al., 2011). The code uses modern programming languages, practices, and data ingest systems to facilitate real-time, as well as retrospective, electron density assimilation, TEC product generation, and dissemination. The primary data source will be provided by the COSMIC-II low latitude constellation from Global Navigation Satellite Systems (GNSS) remote-sensing (RS) radio-occultation (RO) sampling. The satellite-based COSMIC data will be augmented by ground-based GNSS observations from hundreds of dual frequency receivers streamed in Networked Transport of RTCM via Internet Protocol (NTRIP) by real-time providers around the world. These measurements are used at SWPC in coordination with State Space Representation (SSR) observation biases to approximate absolute Slant Total Electron Content (STEC) for each Rx (receiver) Tx (transceiver) pair. SWPC collect and ingest all of these STEC observations in GloTEC to obtain a best estimate of current and historical global ionospheric electron density from 80 to 2000 km. COSMIC RO observations are particularly valuable because they reveal vertical structure in ionospheric electron densities due to their orthogonality to ground-based observations. Upward looking COSMIC GNSS data are also useful because they help to resolve structure in the ionosphere above the F2 peak. The COSMIC-II mission will greatly increase the quality and quantity of data collected from space and thus improve the model accuracy and resolution. The assimilation system has been tested and validated by simulating historical quiet and storm-time conditions with COSMIC-I data, and the GloTEC results agree with various other unique independent model and data sources. Using GNSS data and GloTEC as a baseline, we are working to expand the data sources to include RS ground-based ionosonde and in-situ electron density measurements as input to the KF. We are also exploring the possibility of replacing the International Reference Ionosphere (IRI-16) as the background model with a global, time-dependent, physics-based model.
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