

INITIAL VALIDATION STEPS FOR THE USTEC IONSOPHERIC NOWCAST SYSTEM

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Initial validation for the United States Total Electron Content (USTEC) nowcast system has been underway. USTEC provides 4-dimensional total electron content maps over the continental United States. MAGIC the analysis version of USTEC is evaluated in using two different methods. The first examines forecast error growth with time through differential validation. In this method, error growth, obtained from the difference between the actual and expected observation, asymptotes to a final value with time, indicating a type of upper bound on the error of the system. The upper bound for this method indicates an error within 2 to 3 TECU over the United States. The second method uses ionosphere imaging data assimilation software with total electron content data from the Fast Onboard Recording of Transient Events (FORTE) satellite to evaluate the combined error level of the MAGIC and FORTE systems. The MAGIC/USTEC software uses ground-based GPS observations to model the 4-dimensional variations in the electron density of the ionosphere. The FORTE satellite detects the arrival time vs. frequency for a broadband (pulse) VHF signal from a transmitter at Los Alamos. The resulting group-delay measurements can be used to estimate the TEC along the raypath. Because of the relatively low frequencies involved, raypath bending effects are significant and have been corrected using a numerical integration raytrace algorithm. The RMS errors between the FORTE and MAGIC solutions is about 2.872 TECU using all the FORTE observations and 60 GPS stations in MAGIC. This value can be reduced to 1.659 TECU if FORTE observations with high (≥ 55 degrees) elevation angles and low (≤ 60 TECU) TEC values are chosen to mitigate numerical errors from the raypath bending calculation. Increasing the number of GPS stations in the MAGIC solution to 133 reduces these numbers to 2.705 TECU and 1.148 TECU respectively.

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1. (a)

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2. G - Ionospheric Radio and Propagation

3. (a) G2: Ionospheric modeling and data assimilation

4. C - Contributed Paper

5. No special instructions