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Assimilative Modeling of Ionospheric Dynamics for Now-casting of HF Propagation Channels in the Presence of TIDs

Abstract:

The ionospheric data assimilation algorithm called GPS Ionospheric Inversion (GPSII; pronounced “gypsy”) [Fridman et al., 2006, 2012; McNamara et al., 2013] has been extended and employed to model the dynamic ionosphere, including medium-scale traveling ionospheric disturbances (MS-TIDs). GPSII can assimilate many forms of ionospheric-related data, including ionogram data and GPS L1/L2 beacon data. For this effort, GPSII was extended to assimilate delay, Doppler, and angle-of-arrival (AoA) measurements of HF transmissions from known reference points (KRPs). A companion paper [Fridman, et al., IES 2015] documents the development of the assimilation capability for KRPs. In this paper we show test results of the model’s performance in reproducing measured AoA variations in the presence of MS-TIDs using Near Vertical Incidence Skywave data collected at White Sands Missile Range by the IARPA HFGeo Program Government team. We find, using three KRPs within approximately 50 km of non-assimilated transmitters, we can reproduce the measured AoAs of the non-assimilated transmitters to within 1.3 degrees with 90% confidence even in the presence of highly dynamic MS-TIDs.

References:

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