

*TIDs Observed in the Bottomside Ionospheric F-region Using the
TIDDBIT HF Doppler Sounder*

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The DoD requires accurate real-time knowledge of ionospheric variability in order to reduce one of the biggest error sources inherent in the use of critical systems such as Over the Horizon RADAR (OTHR) and HF communications. OTHR is particularly susceptible to traveling ionospheric disturbances (TID's) which are not well specified by existing methods. The accuracy of the OTHR coordinate registration is currently being limited by TIDs. Measurements are needed that are capable of deriving local TID structures that can be incorporated into ionospheric specifications that drive raytracing results. Such a system will enable characterization of the impact of ionospheric wave structures on coordinate-registration for radar and other applications.

HF Doppler sounders represent a low-cost and low-maintenance solution for monitoring wave activity in the F region ionosphere. HF Doppler sounders together with modern data analysis techniques can provide comprehensive traveling ionospheric disturbance (TID) characteristics, including both horizontal and vertical TID velocities and wavelengths across the entire spectrum from periods of 1 min to over an hour. Atmospheric and Space Technology Research Associates LLC has developed a new HF Doppler system called TIDDBIT, and data will be presented from TIDDBIT systems deployed in Virginia and Peru.

The completeness of the wave information obtained from the TIDDBIT system makes it possible to reconstruct the vertical displacement of isoionic contours over the 200 km horizontal dimension of the sounder array, and movies revealing the detailed shape and motion of isoionic surfaces will be shown. They resemble the surface of the ocean. Such information will be relevant for understanding the seeding of irregularities, as well as for several operational needs involving navigation, communication, and surveillance systems.