

Results of Ionospheric Wave Studies from First Deployments of the Transportable Dynasonde System

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The Transportable Dynasonde System represents the latest step in development of the Dynasonde technique. It provides a unique set of capabilities in studies of dynamic ionospheric processes utilizing modern principles of HF radio sounding and capitalizing on sensitivity, accuracy and rich information content of phase-based measurements. Products of autonomous Dynasonde data analysis (profiles of the electron density and of the horizontal gradients, complemented with profiles of the Doppler speed), carry comprehensive quantitative information about Atmospheric Gravity Waves, a ubiquitous feature of the space weather that has become an important objective of atmospheric research [1]. Being combined into a time series, and without additional processing, the profiles allow visualization of the time fronts of the Traveling Ionospheric Disturbances (TIDs). They also provide high-resolution input data for calculating the complete set of parameters (both vertical and horizontal) of TID activity in the upper atmosphere between the base of the E layer and the maximum of the F layer. We report here results of extending the Dynasonde technique to a transportable version capable of both mono- and bistatic sounding modes. Development of the Transportable Dynasonde System was accomplished at the University of Colorado Boulder Center for Environmental Technology based on the second generation VIPIR HF radar and on several innovations in antenna building techniques. The system uses a delta transmitting antenna supported by 33-m high telescopic tower and a spaced array of 5-m high dipole receiving antennas. The radar electronics is sheltered in a specialized trailer. The first deployment of the Transportable Dynasonde System took place in October 2020 at the Platteville Atmospheric Observatory (PAO) in Colorado. PAO is the historic site of the first-ever experiments on ionospheric heating and also the site of installation of the first prototype Dynasonde (in 1970). The second deployment of the system took place in November 2020 in Socorro, New Mexico. Pictures below illustrate extraordinary mobility of the system and also show a general panorama of the installation site in Socorro.

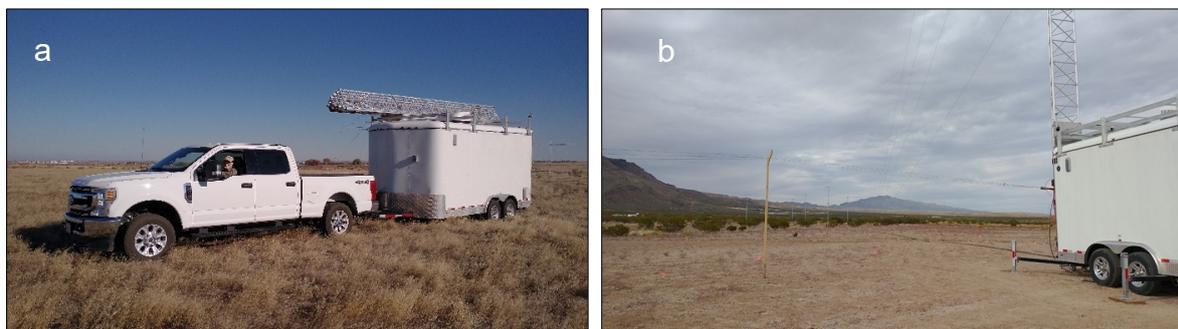


Figure 1. a) TDS in stowed state, leaving the Platteville site on October 30, 2020. b) TDS fully prepared for operation at the Socorro site on November 6, 2020 (recommended zoom level 500%).

Reference

- [1] N. Zabotin, O. A. Godin, C. Negrea, T. Bullett, L. Zabolina, “Studies of wave activity in the thermosphere-ionosphere system using Dynasonde techniques,” *XXXIInd General Assembly and Scientific Symposium of the International Union of Radio Science (URSI GASS)*, Montreal, QC, 2017, *IEEE Xplore*, pp. 1-4, doi:10.23919/URSIGASS.2017.8105216.