

Space Studies of the Upper Atmospheres of the Earth and Planets including Reference Atmospheres (C)

Advances in Remote Sensing of the Middle and Upper Atmospheres and Ionosphere from the Ground and from Space, including Sounding Rockets, Novel Radar, and Multi-Instrument Studies (C0.2)

Consider for oral presentation.

HIGH FREQUENCY BASED DETECTION OF TIDS IN THE NET-TIDE PROJECT: CHALLENGES AND OPPORTUNITIES FOR LONG HF PATHS

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Net-TIDE project

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Travelling Ionospheric Disturbances (TIDs) are the ionospheric signatures of atmospheric gravity waves. TIDs carry along information about their sources of excitations which may be either natural (energy input from the auroral region, earthquakes/tsunamis, hurricanes, solar terminator, and others) or artificial (ionospheric modification experiments, nuclear explosions, and other powerful blasts like industrial accidents). TIDs contribute to the energy and momentum exchange between different regions of the ionosphere, especially during geomagnetic storms. Their tracking is important because the TIDs affect all services that rely on predictable ionospheric radio wave propagation. Although a number of methods have been proposed to measure TID characteristics, none is able to operate in real time for monitoring purposes. In the framework of a new NATO Science for Peace and Security multi-year project (2014–2017) we are exploiting for the first time the European network of high precision ionospheric DPS4D sounders and the related software to directly identify TIDs over Europe and specify in real-time the gravity wave parameters based on measuring the variations of the angles-of-arrival and Doppler frequencies of ionospherically reflected HF radio signals. The project will run until 2017 and is expected to result in a pilot network of DPS4D ionospheric sounders in Europe, enhanced with a system to process the TID observations for real-time diagnostics and issue warnings for TIDs and the potential disturbance over the area. Based on these warnings the end-users can put in action specific mitigation techniques to protect their systems. The technical challenges of operating long distance ionospheric HF radio links for the detection of TIDs will be discussed.