



## **Studies of medium-scale traveling ionospheric disturbances using HF-induced scatter target**

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Experimental results from Tromso and Sura heating experiments at high and mid-latitudes are examined. It was shown that the combination of HF-induced target and bi-static HF Doppler radio scatter observations is a profitable method for the identification and studies of medium-scale traveling ionospheric disturbances (TIDs) at high and mid-latitudes. Bi-static HF Doppler radio scatter observations were carried out on the London-Tromso-St. Petersburg path in the course of Tromso heating experiment on 16 November 2004 when the pump wave was reflected from auroral Es layer. During Sura heating experiments on 19 and 20 August 2004, when the HF pump wave was reflected from F2 ionospheric layer, multi-position bi-static HF Doppler radio scatter observations were simultaneously performed at three reception points including St. Petersburg, Kharkov, and Rostov-on-Don. Ray tracing and Doppler shift simulations were made for all experiments. Parameters of medium-scale TIDs were found. In all events they were observed in the evening and pre-midnight hours. TIDs in the auroral E region with periods of 20-25 min were traveling southward at speeds from 190-250 m/s. TIDs in the mid-latitude F region with periods from 15 to 45 min were at speeds between 40 and 120 m/s. During quiet magnetic conditions the waves were traveling in the north-east direction. In disturbed conditions the waves were moving in the south-west direction with higher speeds as compared with quiet conditions. Possible mechanisms for the AGW generation at middle and high latitudes are discussed.