Studies of wave phenomena 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 wave phenomena of different origin. We analysed the ULF activity in the Pc 3-4 range and the 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 experiments. During Sura heating experiments 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 ULF waves were found. The interesting feature detected from Sura heating experiment was the dependence of the ULF wave parameters from the effective radiated power of the heating facility. Medium-scale TIDs 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-latitudinal 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.