PHENOMENA INITIATED BY THE HF IONOSPERIC MODIFICATION AT DIFFERENT LATITUDES

N. F. Blagoveshchenskaya[1], T. D. Borisova[1], V. A. Kornienko[1], T. R. Robinson[2], T. K. Yeoman[2], M T. Rietveld[3]

[1]Arctic and Antarctic Research Institution, St. Petersburg, Russia

[2]University of Leicester, Leicester, UK

[3]EISCAT, Ramfjordmoen, Norway

Experimental results concerning the artificial field-aligned irregularities (AFAIs), stimulated electromagnetic emission (SEE), and artificial ULF wave activity from SPEAR (78.15ºN, 16.05ºE, magnetic dip angle *I*=82º), EISCAT/Heating (69.6ºN, 19.25ºE, *I*=82º) and Sura (56.13ºN, 41.6ºE) Results obtained in the course of HF heating experiments carried out in 2006-2007 are summarized. HF diagnostic bi-static radio scatter techniques in the vicinity of St. Petersburg was used for diagnostics of the HF heater-induced phenomena in the combination with the CUTLASS HF coherent radars, EISCAT UHF (931 MHz) incoherent scatter radar, and ionosondes at SPEAR and EISCAT/Heating sites. The properties and behaviors of AFAIs are studied in detail. Results from Tromso and SPEAR heating experiments have shown that AFAIs were excited in the F-region as well as in the auroral E-region even with the pump frequency exceeded the maximum plasma frequency. Strong signals scattered from AFAIs were observed when the pump frequency was up to 0.5 MHz larger than the critical frequency. The analysis of the EISCAT UHF radar data has shown that in this case very strong electron temperature enhancements (in 2-3 times) closely related to the heater-on periods took place. Note that SEE observations carried out at Barentsburg (Spitzbergen) also demonstrate that the SEE can be excited in the polar ionosphere with the pump frequency exceeded the maximum plasma frequency. It was found that the amplitude-modulated heating by using the HF transmission scheme of 30s on, 30 s off gave rise to the wave variations of Doppler frequency shift, fd, and spectral power of diagnostic signals scattered from AFAIs. These waves with period of 1 min were observed from Tromso as well as from SURA experiments. The correlation between magnetic and Doppler data was found. It is interesting that in the course of SURA heating experiments the period of amplitude modulated heating was close to the eigenperiod for the SURA magnetic flux tube. Here more pronounced fd wave variations as compared with the Tromso case were observed especially in the evening hours.

The work is supported by INTAS, grant 03-51-5583 and by the Russian Foundation for Basic Researches, grants 07-05-00167 and 07-05-13516. SPEAR is supported by PPARC grant PP/E002544/1.