



Phenomena observed by HF heating of middle- and high- latitude ionosphere and registered at altitudes of about 700 km with DEMETER instruments

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We present results obtained during experiments carried out at the Sura and EISCAT heating facilities, when features of HF-induced turbulence in the outer ionosphere have been studied by instruments aboard the French micro-satellite DEMETER.

Experimental results discussed here were obtained in two series of experiments carried out under night time conditions: 1) when the satellite was over the Sura facility and CW O-mode pumping of the ionosphere F_2 -region was used, and 2) when it was over the EISCAT heating facility and AM X-mode pumping of the ionosphere E -region was used. In the latter case the amplitude modulation frequency was changed in a frequency range from ~ 200 Hz to ~ 1200 Hz and each frequency radiation lasted during 5 s. Both experiments were carried out during quiet ionospheric conditions. During these measurements, satellite instruments operated in *burst mode* where full data resolution is available.

During these experiments the following features have been observed:

1. formation of ducts with increased plasma density of about 20 – 30 % relatively to a background density, the ducts have a spatial scale of about 40 km across geomagnetic field lines (at middle and high latitudes);

2. variations of plasma density and electron temperature up to 10 – 15 % relatively to their background values (at middle latitudes);
3. generation of VLF electromagnetic waves at AM frequencies (at high latitudes);
4. generation of wide band ELF (from 10 to 1000 Hz) and VLF (from 2 to 20 kHz) electromagnetic fields which are located solely inside ducts (at middle and high latitudes);
5. broadening of a frequency spectrum from a VLF transmitter when the satellite was inside such a duct (at middle latitudes);
6. generation of emissions in a frequency range from 270 to 340 kHz (at high latitudes).

In the paper we discuss the characteristics of the observed phenomena and their connection with various processes such as generation of magnetospheric hiss, quasi-potential low-hybrid noises, auroral kilometric radiation, HF-stimulated precipitation of energetic electrons from the Earth's radiation belts, interaction of waves and particles in the magnetosphere, and influence of small-scale plasma density variations on the results of ELF measurements.