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Radiotomographic imaging of the artificially disturbed midlatitude ionosphere with the CASSIOPE and Parus satellites.

Abstract:

We present the results of the radiotomographic imaging of the artificial ionospheric disturbances obtained in the recent experiments on the modification of the midlatitude ionosphere by powerful HF radio waves carried out at the SURA heating facility (56.15N; 46.1E, geomagnetic inclination 71 deg). Radio transmissions from PARUS (Russian LEO navigational satellites, coherent transmissions at 150/400MHz) and CASSIOPE (Canadian CAScade, Smallsat and IOnospheric Polar Explorer, ePOP/CER coherent transmissions at 150/400/1066,67MHz) recorded at the specially installed network of three receiving sites were used for the remote sensing of the heated ionosphere. We discuss the possibility to generate AGWs with special regimes of ionospheric heating (with the square wave modulation of the effective radiated power at the frequency lower than or of the order of the Brunt-Vaisala frequency of the neutral atmosphere at ionospheric heights during several hours) and present radiotomographic images of the spatial structure of the disturbed area of the ionosphere corresponding to the directivity pattern of the heater, as well as the spatial structure of the wave-like disturbances, which are possibly heating-induced AGWs, diverging from the heated area of the ionosphere. The spatial period of observed disturbances is 200–250 km and they are easily traced up to a distance of 700–800 km from the heated region.