Impact of (almost forgotten?) infrasound from below on the upper atmosphere and ionosphere

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Acoustic waves have a remarkable ability to transfer energy from the ground quasi-vertically up to the uppermost layers of the atmosphere. On the ground, there are many permanent sources of infrasound, and also pulse and/or sporadic sources. The infrasonic waves carry the major part of their energy upwards to the upper atmosphere. The propagation of sinusoidal signals of different (among others meteorological) origin is simulated with a new model that takes into account the inhomogeneity of the atmosphere, non-linear effects, absorption, divergence of wave front due to the long-range acoustic wave propagation, etc. The calculations show that nonlinear processes destroy sinusoidal signal during its upward propagation; it transforms into two, initial and final, impulses. The location of the “transformation region”, where most of wave energy is deposited into the atmosphere, depends on frequency; its height increases with decreasing frequency. Thus the acoustic waves can in principle selectively heat the upper atmosphere. An ionospheric method for infrasound sensing of aboveground and underground explosions has been developed. Its main advantage is the remote observation of an explosion in near-field zone by means of short radio waves, i.e., the radio sounding of the ionosphere directly above explosion location. The only possibility to monitor propagation of an infrasonic wave at high altitudes is to watch for its influence on ionospheric plasma using Doppler method of radio sounding of the ionosphere. Since January 2004 the Doppler sounding system has been in operation to perform common volume measurement with the digisonde DPS-4 at Pruhonice (50^oN, 15^oE). We will present examples of two strange phenomena, short time S-shaped traces in the spectrograms, and patterns having quasi-linear shape in the time-frequency space with Doppler shift corresponding to the objects moving with velocities up to several hundreds m/s.