Acoustically active layers in middle atmosphere

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The analytical theory of amplification of acoustic-gravity waves in atmosphere is developed. It is shown that in some layers, which may be called acoustically active ones, magnitude of acoustical-gravity (as well as internal gravity) waves increases due to gas heating under the influence of sun radiation. The base of the theory is obtained matrix hydrodynamic equation that gives possibility for analytical description of both internal gravity and acoustic-gravity waves in the similar manner. It is shown that proposed equation describes the waves in inhomogeneous atmosphere too. In particular, proposed equation describes an appearance of focal points due to inhomogeneous distribution of temperature. On the base on generalized Fourier-optics [1] we show that large amounts of energy may be concentrated in such points, i.e. real distribution of energy in atmosphere is sufficient inhomogeneous too.

Using this result we show that each region in atmosphere with inhomogeneous distribution of temperature may be considered as a set of "atmospheric lenses" focusing both internal gravity and acoustic gravity waves. The method of description of focusing properties of such atmospheric lenses is developed on the base of generalized Fourier-optics too.

Moreover, disturbances, which generating in this acoustically active layer influence on other atmospheric layers too. This influence becomes most strong when caustic point is appeared. In other words, formation of caustic points of the waves, which are generating in acoustically active layers, is the base for interpretation of interrelations between different atmospheric layers. In the same manner formation of caustic points gives possibility to interpret the influence of space whether on properties of atmosphere, while slight internal influence (which may take place, for example, during magnetic storm) may cause redistribution of temperature in atmosphere. The possibilities of artificial caustic points generation with the help of ground-based instruments is disused too.

1. Suleimenov I.E., Tolmachev Yu.A. // Optics & Spectr., 1995, **79**, 1, 170-172.