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Acoustic-gravity wave instability in nonadiabatic atmosphere

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A continuously stratified model of nonadiabatic atmosphere with taking into account the temperature profile is constructed in order to study a possibility of instability development of acoustic-gravity waves. It is shown that the existence of regions in the atmosphere where the instability conditions are satisfied is due to the cooperation of thermal flow of solar radiation, infrared emission of the atmosphere, water vapor condensation, as well as thermal conductivity. Dispersion surfaces for acoustic-gravity waves are constructed for altitude range of 5 km to 130 km. The instability growth rate for structures of sizes of the order of the atmosphere‘s depth is shown to increase with the altitude, the values of the real and imaginary parts of the frequency becoming comparable with each other at the altitude of 80 km. The results can be useful for study of geophysical effects at different altitudes in the atmosphere. In particular, the results can be used for explanation of an appearance of vortices in the troposphere and the ionosphere. This study was supported by the Division of Earth Sciences, Russian Academy of Sciences (the basic research program “Nanoscale particles in nature and technogenic products: conditions of existence, physical and chemical properties, and mechanisms of formation”) and by the Division of Physical Sciences, the Russian Academy of Sciences (the basic research program “Plasma physics in the solar system”). S.I.P. is also supported by the Dynasty Foundation.