

Interactive comment on “Evanescent acoustic-gravity modes in the isothermal atmosphere: systematization, applications to the earth’s and solar atmospheres” by Oleg K. Cheremnykh et al.

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In the present manuscript, the properties of so-called evanescent acoustic-gravity waves, which propagate only horizontally are investigated. The atmosphere is assumed to be isothermal and stratified by gravity. The possibility of existence of new types of acoustic-gravitational wave modes, not previously studied, is shown. Their pseudo-modes, which satisfy the same dispersion equation, but differ in polarization and height dependence of disturbance amplitudes, were also investigated. The results obtained may be useful for understanding the physics of wave processes in the atmo-

spheres of the planets. They can be used to explain wave observations in the Earth's atmosphere and on the Sun.

At the same time, there are a number of questions to the manuscript that need clarification:

1. The correctness of the transition from equations (1), (2) to equations (5), (6) when considering divergence-free waves ($\text{div}V = 0$) is in doubt. Since in an incompressible medium the speed of sound tends to infinity, the product "infinity to zero" in square brackets of equations (1), (2) becomes uncertain.

2. The realization of the obtained modes was considered in the framework of a simplified model of an infinitely thin discontinuity in the altitude profile of temperature. In the atmospheres of the planets, the situation is most likely realized when the change of the parameters along the vertical occurs on scales of tens of kilometers, or even hundreds, for the Sun. Can the acceptance of the finite thickness of the transition layer significantly affect the conditions of realization of the evanescent wave modes considered in the work?

3. In the atmosphere, different types of gravity disturbances may occur:

(1) freely propagating waves, having a real and non-zero vertical component of the wave vector; (2) evanescent wave modes, propagating only horizontally.

Does it mean that sources of evanescent modes and freely propagating waves are fundamentally different?

4. It is not clear from the manuscript how complete is the list of possible evanescent modes. Are there additional requirements for disturbances that will lead to new solutions?

The following inaccuracies or typographical errors are seen in the manuscript.

1) Based on the content of the manuscript, in the Abstract (lines 10-11 of page 1), the

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phrase “the properties of the medium” should be replaced by “the properties of the disturbances”.

2) The bottom line of Table 2 (line 2, p. 20) uses the abbreviations AMp, AM, which, apparently, should be replaced by AE and AEp.

3) Mistakes are made in the names of subsections 2 and 2.1 (line 1, page 3 and line 19, page 3). Probably should be

2 Evanescent modes in the isothermal atmosphere

2.1 Non-divergent and pseudo-non-divergent modes

As the conclusion I would like to emphasize that conducted in the manuscript research is very important for the relevant science and it may be published in *Annales Geophysicae* after necessary revision taking into account my comments.

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