Geosci. Model Dev. Discuss.,
https://doi.org/10.5194/gmd-2017-76-AC2, 2017

Geoscientific Model Development Discussions

Interactive comment on "Correct boundary conditions for DNS models of nonlinear acoustic-gravity waves forced by atmospheric pressure variations" *by* Yuliya Kurdyaeva et al.

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Received and published: 16 June 2017

Dear Prof. Igor Đąhunchuzov,

thank you for your very useful comments. Our answers are as follows.

1. Âń.. But the effects of nonlinearity of the equations (1)-(4) and dissipation of acoustic-gravity waves sustantially affect the wind velocity and temperature fields in the upper atmosphere (altitudes more than 70 km). Unfortunately, such effects are not modeled in the examples considered in the paper.Âż

We feared that the inclusion of such simulations (the influence of waves from the lower

atmosphere on the parameters of the upper atmosphere) in this paper can distract a reader from the analysis of the presented computer mathematical model. The problem of waves generated by pressure variations at the boundary is non-standard, not studied mathematics. We are forced to fill this white space in the theory; it has not been done before. Only after that, one can study the influence of waves produced by atmospheric pressure variations on velocity wind and on temperature in the upper atmosphere. Such a way is more careful. Some other author's publications are devoted to the propagation of waves from the lower atmosphere to the upper atmosphere and to the influence of waves on velocity wind and temperature. They performed with some other wave sources, but they are sufficient to demonstrate the capabilities of the program. One can look, for example, 1. Gavrilov N. M., Kshevetskii S. P. Three-dimensional numerical simulation of nonlinear acoustic-gravity wave propagation from the troposphere to the thermosphere // Earth, planets and space. 2014. Vol. 66, No. 88. 2. Gavrilov, N. M. and Kshevetskii, S. P.: Dynamical and thermal effects of nonsteady nonlinear acoustic-gravity waves propagating from tropospheric sources to the upper atmosphere, Adv. Space Res., 55, doi:10.1016/j.asr.2015.01.033, 2015. 3. Karpov, I. V. and Kshevetskii, S. P.: Formation of large-scale disturbances in the upper atmosphere caused by acoustic gravity wave sources on the Earth's surface, Geomagn. Aeronomy, 54, 553–562, 2014.

2. ÂńDoes the artifical limiting of the horizontal region and observational time period for the pressure variations (22) affect the calculated wave field in Fig. 4 obove the ground?Âż

Of course, the constraint (22) affects the calculated wave field. However, the wave source (22) is enough to demonstrate the program's efficiency. The program allows one to simulate waves produced by any variable pressure field at the lower boundary. The preparation of input data is always based on experimental observations, and it is other task. The program is only a tool for simulations. We intend to prepare the input data over a wide region on the basis of measurements with net of microbarographs

and meteoradars. We will include the appropriate commentary in the paper.

3-4. Thank you for pointed our mistakes in formula (20) and Line 19. We will fix them.

The authors.

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