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# *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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In this paper the authors consider and test their high-resolution numerical model that simulates the propagation of acoustic-gravity waves (AGWs) in the atmosphere caused by pressure variations near ground surface. For the system of nonlinear hydrodynamic equations derived relative to the perturbations of the atmospheric parameters (pressure, velocity, density and temperature) the boundary and initial conditions have been formulated. They allow one to obtain a unique solution of the equations. The conditions under which such unique solutions exist are formulated as theorems.

Since the numerical model takes into account both the nonlinearity of hydrodynamic



equations and wave dissipation at high altitudes it can be used for studying various effects that AGWs from tropospheric sources cause in the upper atmosphere. I think that this paper deserves to be published in the journal Geosci. Model Dev.

However, there are several my remarks (below):

1. The testing of simple examples of boundary conditions for pressure variations (periodic plane wave (21) and measured pressure variations (22) localized in space) does not show a potential of numerical model. This is because these examples are considered for small amplitudes (to compare them with the analytic linear solutions) and not very high altitudes to neglect the nonlinear effects and dissipation of acoustic and internal gravity waves. But the effects of nonlinearity of the equations (1)-(4) and dissipation of acoustic-gravity waves substantially 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.

2. The measured pressure variations near ground are taken as boundary condition (22) and are considered as a source of acoustic-gravity waves localized within some region of the half-width d. But in real atmosphere there are many other sources of AGWs (meteofronts, wind shears, orography and others) that propagate along ground surface, therefore the pressure variations are not localized both in space and time. Does the artificial limiting of the horizontal region and observational time period for the pressure variations (22) affect the calculated wave field in Fig.4 above ground?

3. The second term under the square root of formula (20) is not of the same dimension with 1 (the first term).

4.Line 19 : The power of alpha should be -1, not -2, i.e. $\alpha$ = (2H0 )-1

After answering my remarks and questions listed above this paper may be published.

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