

Reply on RC2

Nikolai M. Gavrilov et al.

Author comment on "Decay times of atmospheric acoustic-gravity waves after deactivation of wave forcing" by Nikolai M. Gavrilov et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-824-AC1>, 2021

First, we would like to thank the Reviewer 2 for valuable comments helping us to improve the paper. Our replies are given below in bold font.

Minor comments:

(1) We added suggested citations into the revised text, which will be sent to the journal after the public discussion.

(2) In fact, in Fig. 2 the curves of amplitude decay looks like sinusoidal structures superimposed on exponential trends. We think that such quasi-periodical amplitude variations can be caused by long-term biases between upward and downward wave packages reflected from the ground and from the upper atmosphere, which propagate through the middle atmosphere. Increased molecular and turbulent AGW dissipation make periodical amplitude variations less noticeable in panels of Fig. 2 for high altitudes. We added this statement into the discussion section of the revised text.

(3) Intensity and spectra of atmospheric AGWs are very variable. We made modeling of AGW spectral components for broad ranges of wave source amplitudes. The small amplitude of $W_0=0.01$ mm/s corresponds to weak AGWs, and $W_0=0.1$ mm/s is for rather strong AGWs. The latter are subjects for substantial nonlinear effects. Fig. 2 – 4 and tables 1 and 2 show that general AGW behavior after the wave source deactivating does not depend on amplitudes and phase speeds (differences are in some numerical characteristics only). We added this discussion to the revised text.

(4) For strong AGW sources, wave amplitudes can also be strong and wave-induced jets can be produced at high altitudes. Generation of the wave-induced jet streams was studied in more details in our previous papers (Gavrilov et al., doi:10.1016/j.asr.2015.01.033; Gavrilov et al., 2018). In these papers, we also consider experimental evidences of wave-induced jets in the upper atmosphere. We added these references to the revised text.

(5) We use smooth temperature profiles from the NRLMSISE-00 model. Our profiles are published in the paper by Gavrilov et al. (2018). For these climatological profiles AGW reflections inside the troposphere are smaller than

the reflection from the ground caused by lower boundary condition $w'=0$. In special cases of strong vertical gradients of background temperature and mean wind AGW reflections in the troposphere could be stronger, however, we do not consider such cases in the present paper. We added respective statements to the revised text.

Technical comments:

l.26: Corrected in the revised text. l.26/27 The reference for Yigit et al. (2012) is added.

l.29: Corrected. l.36: Corrected. l.40: Corrected. l.43: Corrected.

l.48: Corrected l.54: Corrected l.83: Corrected l.85: Corrected.

l.87: Corrected. l.91: Corrected. l.92: Corrected. l.98: Corrected.

l.99: Corrected. l.102: Corrected. l.104: Corrected. l.112: Corrected.

l.113: Corrected. l.118: Corrected. l.119: Corrected. l.120: Corrected.

l.121: Corrected. l.127: Corrected. l.129: Corrected. l.131: Corrected.

l.133: Corrected. l.135: Corrected. l.136: Corrected. l.142: Corrected.

l.174: Corrected. l.178: Corrected l.191: Corrected. l.192: Corrected.

l.216: Corrected. l.263: Corrected. l.291: XOZ is changed to "atmospheric".

l.304: Corrected. l.310: Corrected. l.420: The page range is added.

l.423: The paper number is added. l.426: The journal title is corrected.

l.448: 47 is the paper number. l.466: Corrected l.460: Corrected

l.475: Corrected l.487: Corrected l.493: Corrected l.494: Corrected