Atmos. Chem. Phys. Discuss.,
doi:10.5194/acp-2016-341-RC1, 2016

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Stratospheric gravity waves at southern hemisphere orographic hotspots: 2003—2014 AIRS/Aqua observations" *by* L. Hoffmann et al.

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Received and published: 7 June 2016

Review of

Stratospheric gravity waves at southern hemisphere orographic hotspots: 2003-2014 AIRS/Aqua observations

by L. Hoffmann, A. W. Grimsdell, and M. J. Alexander

This is a wonderful, I would say perfect paper documenting the stratospheric gravity wave activity (esp. orographic gravity waves) at selected hot spots of the southern hemisphere from 12 years AIRS data. Additionally, the authors also correlate the retrieved stratospheric mountain wave activity with the horizontal wind components taken

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Discussion paper

at 2 km and near the AIRS observational level at 40 km, respectively. The methodology is sound, the presentation is very clear, precise, and comprehensive, the figures illustrate and exemplify the necessary information from the observations and meteorological analyses, and the tables add substantial material from a profound statistical analysis of the data. Therefore, the paper can be published in the present form.

Here, only a few thoughts I got while reading the manuscript:

- the enhanced correlation of the observed stratospheric gravity wave activity with the stratospheric winds was also found recently by the study of Kaifler et al. (2015)

Kaifler, B., N. Kaifler, B. Ehard, A. Dörnbrack, M. Rapp, and D. C. Fritts (2015), Influences of source conditions on mountain wave penetration into the stratosphere and mesosphere, Geophys. Res. Lett., 42, 9488–9494, doi:10.1002/2015GL066465.

Additionally, I found it remarkable that the u_0(2 m) threshold for New Zealand (Table 2) lies almost exactly in the range of tropospheric winds for which Kaifler et al. found the largest gravity wave energies at mesospheric altitudes (Fig. 5a) supporting the findings of the present paper!

- I was wondering about the short vertical propagation times and short horizontal propagation distances. Most of the selected examples in Fig. 3 show a much longer horizontal spread of the waves. I always thought that these wave fronts are essentially due to hydrostatic mountain waves in the rotating regime, i.e. due to inertia-gravity waves (see Gill, 1980, p 260) which would imply longer horizontal wave lengths and longer vertical propagation times. But, you might have another explanation.

- the simple mountain wave prediction model used by the authors (very nice!) reminded me on my own first attempt to quantify stratospheric gravity wave above Scandinavia for one winter month based on quite similar criteria (Dörnbrack, A., M. Leutbecher, J. Reichardt, A. Behrendt, K.-P. Müller, and G. Baumgarten, 2001: Relevance of mountain wave cooling over Scandinavia: Mesoscale dynamics and observations for January

1997. J. Geophys. Res., 106, 1569-1581. However, in the present model the wind turning with height is not considered which is clearly understandable for the southern hemispheric conditions without much planetary wave activity diverting the stratospheric winds from nearly pure westerlies!

AD

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