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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Seasonal changes in gravity wave activity measured by lidars at mid-latitudes" *by* M. Rauthe et al.

Anonymous Referee #2

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This paper presents some analysis of gravity wave perturbations in the lidar temperature measurements obtained by the authors. The long term data set is unique: it covers atmospheric altitudes from 1 to 105 km, and provides a valuable information on the seasonal climatology of gravity waves. The paper is suitable for publication in ACP, however the presentation can be improved by addressing some points listed below. Having seen the assessment of Reviewer 1, I am commenting here only on the issues not raised in his/her review.

p.13745, line 12.
"Only in the troposphere the typical temperature fluctuations are larger than the uncertainties of the measurement". Does this mean that the data above the troposphere can be little trusted due to measurement errors?

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p. 13746, line 11
The density is measured by the lidars. Shouldn't it be used instead of the climatological mean from the reference atmosphere?

p.13749, Fig.5 and the description.
These results are strongly dominated by the tides. Separating gravity waves of other origin from the diurnal (and perhaps semidiurnal) tides might reveal more significant seasonal dependencies.

p.13749, discussion around Eq. (2).
I concur with Reviewer 1 in that the constant intrinsic wave period is a poor assumption for the real atmosphere with strongly varying background wind, and cannot be used for her for the interpretation.

p.13750, discussion of the dominating vertical wavelength.
This wavelength is commonly associated with the "knee" on the "universal" spectrum, and corresponds to the wave that experiences a transition from free propagation to dissipation. It would be important to compare the retrieved dominant wavelength with the empirical model of Fritts and VanZandt (1993, JAS). These authors give the exponential dependence

$$m^* \sim N^{3/4} e^{-z/H^*}$$

for the dominant vertical wavenumber, where H^* varies vertically and seasonally. Are the results become closer to the estimates of F&VZ if the tides are excluded?

p.13752, Fig.9
The information there is hard to grasp. Plotting these results in the manner similar to Fig.8 would make the figure more comprehensible.

p.13756, line 16.
Can the description of how the correlation between the strength of gravity wave activity and the wind was sought be expanded? This correlation is generally not straightforward, because the wave field at a certain level is determined by the filtering and

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8, S6340–S6342, 2008

Interactive Comment

dispersion at all the underlying levels.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 13741, 2008.

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8, S6340–S6342, 2008

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