Atmos. Chem. Phys. Discuss., 13, C7176–C7178, 2013
www.atmos-chem-phys-discuss.net/13/C7176/2013/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Gravity wave influence on NLC: experimental results from ALOMAR, 69° N" *by* H. Wilms et al.

Anonymous Referee #2

Received and published: 20 September 2013

GENERAL COMMENTS

This paper evaluates the influence of locally observed (i.e. in the mesosphere) gravity wave activity on concurrent observations of noctilucent clouds (NLC). Model studies suggest that gravity waves with periods less than approximately 6.5 hours should be anti-correlated with NLC, while longer period waves should enhance NLC occurrence frequency and brightness. However, experimental studies that examine stratospheric gravity wave activity (and assume a direct correlation to mesospheric behavior) give conflicting results. The present study uses common volume mesospheric NLC and wind measurements from Norway to provide coordinated observations in the same vertical and horizontal [3-D] region, which greatly improves the confidence in causal relationships determined from these data.

This paper was a pleasure to review. It is very well-written, all of the key points are clearly identified in the text, and their relationship to the figures is easy to understand. I have only a few comments and suggestions for the authors.

SPECIFIC COMMENTS

p. 20053, lines 18-25: It is good that the potential impact of the improved NLC detection capability is identified and explicitly treated, since one can imagine additional faint clouds being formed in the negative temperature fluctuations of waves.

p. 20055, lines 2-4: The authors might clarify here that the 2-hour band width can be applied over any desired central period value (as shown later in Figure 1).

p. 20055, lines 22-24: I suggest stating clearly that the X-axis for Figure 1(a) is logarithmic, whereas the X-axis for Figure 1(b) is linear and covers a smaller overall range. The initial visual impression from this figure is that the maximum energy [top] and maximum variance [bottom] do not have the same period, although closer examination shows that they do.

p. 20057, lines 1-7: This is a good discussion of the reasons for larger fluctuations in NLC occurrence rate at higher energy density levels, and the rationale for discarding such data. Why does the range of accepted energy density extend to higher values for progressively longer periods in Figure 3?

p. 20057, lines 22-23: Equation (3) and Figure 4, in conjunction with the following two paragraphs, provide a very clear explanation of how to evaluate gravity wave influence on NLC occurrence in a quantitative way.

p. 20059, lines 22-26: It is interesting that the increase in normalized kinetic energy at periods of 8-9 hours shown in Figure 7 appears as a "precursor" approximately 12 hours before the bright NLC event. Does this correspondence happen for other bright (e.g. beta_max > 30e-10) NLC? Figure 6 does seem to show such strong NLC for a range of gravity wave periods.

p. 20060, lines 25-28: Has a similar analysis been performed using only the “strong” clouds (beta_max > 13e-10) as defined by Fiedler et al [2011]? These NLC are more likely to be detected by satellite instruments, which typically have lower sensitivity than lidar measurements.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 20049, 2013.