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Atmospheric Chemistry and Physics Discussions

Interactive comment on "A QBO-signal in mesospheric water vapor measurements at ALOMAR (69.29° N, 16.03° E) and in model calculations by LIMA over a solar cycle" *by* G. R. Sonnemann et al.

Anonymous Referee #2

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The report presents results from 11 years of ground-based water vapour observations at high Northern latitudes (69°N), covering the period from 1996 to 2006 and altitude range from 40 to 80 km. The observations presented as seven-day sliding averages are compared with model simulations employing data assimilated fields, including temperature and winds, to examine signatures of QBO in the upper stratosphere and lower mesosphere. These are obtained employing FFT and correlation analysis. The paper is suitable for publishing in ACP after some revision. Please, see below.

Comments:

Figure 1 shows a very interesting signature: a significant lowering of the H2O stratospheric peak in late 2002 and throughout the first half of 2003, a signature that repeats in late 2003 and the available observations from 2005. However, this has not been commented upon by the authors, while still making a point on H2O enhancement during stratospheric warming events. No major stratospheric warmings were observed during these seasons. This pattern is different from the one observed in the years prior to 2002 and the Reviewer suggests that it deserves consideration particularly in the context of the discussion on QBO effects on the H2O vapour content. It will also be helpful to the reader if the authors describe in greater detail what can be seen in Fig. 1, since it sets the stage for all further considerations in their report, e.g. the choice of the altitudes at which the correlation diagram is presented.

The authors examine the correlation between water vapour measurements at 50 km and 70 km for July/August, thus considering only summer and the average altitude of the H2O peaks in the stratosphere and the mesosphere. Although a correlation between the two regions is established and could be assumed from the presentation in Fig. 1 the correlation coefficients of 0.35 and 0.52 are still not that significant. Figure 6 and the respective discussion on how the plots should be interpreted, is a bit confusing and appears unrelated to the earlier plots and comments. Perhaps a way to improve this is to examine correlations between the peak altitudes for the observations before 2002 and separately for the data after 2002. Such presentation would allow establishing the correlation between the stratosphere and mesosphere the typical H2O pattern at high latitudes and then compare that with the pattern after 2002.

The observations presented contain a lot of information about the altitude variability of the H2O vapour peaks, their magnitude, and the annual maxima. Although the months of July/August have been considered for the correlation analysis, the peak in the annual variability seems closer to fall equinox than mid-summer. Thus, although the authors have presented evidence for the existence of QBO signature in the time series considered, this Reviewer would like to encourage them to refine and elaborate

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more on the presentation of their results and interpretation.

Finally, there are a few minor comments about the text itself. On occasion there is need for rephrasing of some sentences for clarity, e.g. p. 890, line 23 & 24.

Concerning Fig. 6a it is stated: "..... Using the diurnal values IF comparing the water vapour..." (p. 890, line 29). In this case IF is not needed since the authors actually compare the water vapour mixing ration.

Some typos: p. 885, line 8: please remove the first " both" in the sentence. p. 888, line 21: "....small gapes.." please correct to "....small gaps..." p. 890, line 5: "...penal..." please correct to "...panel..."

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 883, 2009.