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Atmospheric Chemistry and Physics Discussions



# *Interactive comment on* "Interannual variability and long term changes in planetary wave activity in the middle atmosphere observed by lidar" *by* A. Hauchecorne et al.

**A. Hauchecorne et al.**

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Referee comment: The main problem is that, given the method with which the data are obtained, only transient PW can be studied. This is mentioned at some places, but the discussion mostly is about PW energy in general and may lead to confusion. This must be rectified. The strongest dynamic effects in the stratosphere are from stationary waves, transient waves modulate these, sometimes counteracting the effects of stationary waves. To use an appropriate picture here, the data provided can describe the ripples, but not the waves. It would be very useful to include data from ERA40 for stationary wave EP flux since only then the net forcing of stratospheric circulation may be discussed. I would expect interesting information on the distribution of PW energy into stationary and transient in different years.

Author answer: We agree with the referee: with a fixed lidar it is only possible to sample the travelling component of planetary waves (PWs) and global data are needed to study stationary component. However we consider that lidar data can provide a unique source of information concerning the characteristics of travelling PWs in an altitude range (30 to 70 km) not well covered by other methods, especially for the mesosphere. Satellite profiles are in general limited to the stratosphere and have a poor vertical resolution. Meteorological reanalyses like ERA40 are also limited in altitude range and vertical resolution. Furthermore, the study of both PW components using ERA40 would be a totally different topic outside of the goal of this paper. We intend to refocus the paper on the characteristics on travelling waves, including the link with QBO and the relation between PW characteristics in the stratosphere and in the mesosphere which is not enough described in the first version.

Referee comment: Further problems: - Figure 2: This does not fit with the text at p 11304, are the Figures swapped?

Author answer: We apologize but the plots for QBO East and QBO West have been inverted in Figure 2.

Referee comment: - Figure 4: The statistical analysis is weak. First of all it is not mentioned which statistical test is used. I would wish a non-parametric since the variance of transient PW energy is extremely decreasing with time. A linear correlation is highly questionable. - Figure 5 shows that there is much more variability at QBO East, possibly the extreme years determine the correlation. This weakens the PW-QBO conclusions very much. I suggest combining with stationary PW and discussion of the potential reasons for the decrease in interannual variability.

Author answer: We thank the referee for its good remark concerning the statistical analysis. Our results should be more interpreted in terms of variability of travelling PWs which is enhanced during QBO East rather than in terms of a linear relation between PW energy and equatorial wind. The paper will be rewritten in this direction.



ACPD

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Referee comment: - P 11306, L 10 Eˇ : With so few data this remains pure speculation. What are the other years of type 2? What is the contribution of stationary waves?

Author answer: The 3 years with more energy in the 12 day-wave are in QBO East. Other years with intermediate energy level are 90, 97, 95 and 88. Two of them are with a weak westerly wind and the two others with a strong easterly wind. It is then difficult to conclude. For the contribution of stationary PWs, see the answer to the first comment above.

Referee comment : - P 11306 , L 15 ˇE This discussion does not distinguish between stationary and transient planetary wave flux. This is misleading in the context of only transient waves being measured by the OHP lidar.

Author answer: For the discussion concerning of stationary wave, see the answer to the first comment above.

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Interactive comment on Atmos. Chem. Phys. Discuss., 6, 11299, 2006.