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Comment

Interactive comment on “Net influence of an internally-generated QBO on modelled stratospheric climate and chemistry” by M. M. Hurwitz et al.

M. M. Hurwitz et al.

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We thank Reviewer #2 for his/her comments. We have revised the manuscript accordingly. Our responses directly follow each comment.

M. M. Hurwitz and co-authors August 2013

> 1. p13500 l20. It might be worth noting the differences in the annual frequency at 30hPa and below between MERRA and Q.

We have added the following sentence: “The annual frequency is weaker than observed in the lower stratosphere.”

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> 2. p13504 l21. Could the authors note the correlations between equatorial winds and 60 N/S. It is useful to put the model in the context of what is known from the re-analysis (given that there is some uncertainty in the relationship with the limited observational record).

Yes. Figure 9 shows correlations between equatorial and extra-tropical zonal winds at 50 hPa, in both MERRA and the Q simulation. This figure shows that there are positive correlations around 60° latitude in some months, indicating a strong Holton–Tan relation. Note the difference in seasonality and magnitude between MERRA and the Q simulation.

> 3. p13505. Linked to the above, given the small number of QBO-W and QBO-E phases which makes any differences subject to quite a bit of sampling uncertainty is it worth doing these comparisons for this particular experiment?

We agree that the QBO-W and QBO-E composite differences are sensitive to the composite size and method. Regardless, Figures 10 and 12 in the revised manuscript make the point that the Q – N differences are qualitatively similar (and of the same order of magnitude) as the QBO–W – QBO–E differences, at polar latitudes and in certain months. That is, the polar stratospheric net impact of the QBO reflects the relative westerly shift in tropical zonal winds.

> 4. Fig. 2. I'm not sure that the t-test is the right statistical framework for the variance comparison. Wouldn't an f-test be more appropriate?

We did f-tests to check the significance of changes in the variance. The Q / N changes in variance for all fields are shown in the revised Figure 4. In the figure caption, we mention that the black Xs “indicate changes significant at the 95% level in an f-test”.

> 5. Fig. 3. I didn't understand the sign convention for v^* . Is this poleward positive for both hemispheres? If so, might be worth noting.

In Section 3.2, we state “In Figures 3g–i, positive v^* (residual meridional velocity) val-

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ues indicate poleward motion in both hemispheres.” We have added the following to the revised Figure 5 caption, to clarify the sign convention: “Note that values of v^* in the Southern Hemisphere are multiplied by -1 , such that positive v^* values indicate poleward motion in both hemispheres.”

> 6. Fig. 5. I couldn't find a reference to this in the document, is it needed

Figure 5 (Figure 7 in the revised manuscript) is discussed in the third paragraph of Section 3.2.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 13495, 2013.

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