

***Interactive comment on “Variability in upwelling across the tropical tropopause and correlations with tracers in the lower stratosphere” by M. Abalos et al.***

**Anonymous Referee #1**

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Overall:

I think this is a useful and nicely written paper. It shows the consistency among various estimates of upwelling in the lower tropical stratosphere, and also demonstrates the reality of these estimates on subseasonal timescales via coherence with chemical tracer variability. I recommend publication with minor revisions.

In addition to the above results, the paper also argues a relatively large additional positive term in the ozone budget is required to balance the ozone budget in the tropical lower stratosphere. This ozone source is attributed to inward eddy transport from mid-latitudes. In a way, it is unfortunate that the 3d models (Konopka, 2010) showing the

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existence of this transport pathway did not publish an effective tropical mean production rate from this mechanism that could be compared with the more observationally constrained method of this paper.

Minor Comments

I would like the authors to speculate on the reasons why ozone appears to require a meridional eddy mixing source, but CO does not. Presumably, if it exists for one, it would exist for the other, unless there is something about the meridional gradients of the two species that makes the transports substantially different. Ploeger (2012) has some discussion of this.

page 18829, line lines 7-10: The authors state: "The presence of a significant residual in these calculations is consistent with the importance of eddy transport into the tropics (in-mixing) for the ozone budget, as suggested previously by Avallone and Prather (1996) using a one-dimensional 10 model, ..". In my reading of the Avallone paper, they did not require an additional ozone source to explain the mean vertical profile (of ozone). E.g. a sentence in the discussions says: "Thus we conclude like Kinne et al. [1992], that primary production of O<sub>3</sub>, through reaction (1) alone, can explain the observed vertical distribution over this scale height." They did need mixing for other gases, but not for ozone.

Figure 8: explain the reasons for the jumps in the power spectra around 120 days and 180 days.

page 18828, line 10: should also mention longwave forcing of ozone near the tropical tropopause (not just CO<sub>2</sub>).

Technical Comments

They are various places where the authors use "associated to" rather than "associated with", which would be more appropriate.

page 18834, line 19: "accuracy" would be better than "reality"

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