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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Insight from ozone and water vapour on transport in the tropical tropopause layer (TTL)" *by* F. Ploeger et al.

Anonymous Referee #2

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This is an interesting work investigating the reasons for which modelled ozone and water vapour in the lower stratosphere may depend on transport properties. The paper could, however, be improved on a number of aspects.

A general remark is that the manuscript contains a number of repetitions or meanders in the discussion. It would improve significantly by removing these meanders and would be more compact and readable as well.

The fact that ozone, being a quasi-passive tracer in the lower stratosphere, is sensitive to initial conditions is not by itself a great result and I would not even mention it in the conclusions. The truly interesting results are about the explanation of the differences between kinematic and diabatic vertical advection, although the authors could have dwelt deeper in this direction.

More specific comments are listed below. There are all minor except the last one

p.22556, l.1: The reference to Legras et al. 2003 should be replaced by James and Legras (2009).

p.22557: It would be useful to explain what is the frequency of wind fields and heating rates. Numerous authors have reported a dependence of dispersion on the sampling frequency of velocity fields (e.g., Stohl et al., 2005; Bregman et al., 2006; Pawson et al., 2007; Pisso et al., 2010).

p.22558-22559: Although the emphasis is only on the sensitivity to transport, it would be useful to asses the similarities or discrepancies of stratospheric ozone and water vapour in the ERA-Interim with respect to observations.

p.22560, 2.4: HALOE has been mentioned already in section 2.3 and the acronym should be defined there.

p.22563, 3.1:"address the question whether the differences between model prediction can be attributed to any of these subsets" The answer to this question is already provided by the last sentence before 3.1. Please rewrite and reorder so that the conclusion does not appear before the discussion.

P.22566: Figs.6 and 7 convey the same information. Choose one and eliminate the other.

p.22567: "for ERA-Interim kinematic and diabatic trajectories the typical pathways and times to rise into the stratosphere are very similar". Fig.5 does not really suggest that or in a very crude sense. I prefer the explanation mentioned in the last sentence of the same paragraph.

p.22569: I disagree here with the discussion about the mean descent. It is well known that the mean vertical transport is diagnosed by the mean residual velocity and not by the mean vertical motion on pressure surfaces (see Andrews et al., 1987; Randel et al., 2007). These two quantities can even be of opposite sign and it might be the

case here. This section needs to be reworked or cancelled.

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