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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.

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We would like to thank Reviewer 1 for a very thoughtful and detailed review of our manuscript that helped to improve the paper. In the following we address all the points raised in the review.

General comments:

- We tried to improve the wording throughout the paper. In particular we now consistently use 'starting location' for the start point of backtrajectories and 'initialisation location' for the end point of backtrajectories (where trajectories are initialised with ECMWF/HALOE mixing ratios).

- We included two new references (Hoor et al., 2010; Kremser et al., 2009), as they are related to our work.

Specific comments:

L126–128: The smaller differences in ERA-Interim are likely due to the superior 4D–Var scheme used in ERA-Interim – we mention this now in the text (referring to Monge-Sanz, 2007).

L140: For these two flights observations are unlikely to represent background TTL conditions, as explained in the text now.

L153: The choice of 350K is not critical (as stated in the text now) – choosing 340 K for example would yield very similar results. Of course the TST-fraction of trajectories (of a given integration length) decreases for a lower potential temperature value. Slightly increasing the integration length then yields almost exactly the same results. In this sense, our results are not critical to the specific choice 350K.

L174/175: See 'General comments' above.

L227: The wording is improved now.

L243: The tropical mean mixing ratios are defined as between 20°S–20°N degree latitude throughout the paper. Only the HALOE climatology for initialisation (of the sensitivity calculation with respect to different initialisation) is binned according to equivalent latitude. The text is slightly changed now to avoid misunderstandings.

L364: Something went wrong here... there is now a section 3.1 and 3.2 and only one section 4!

L398: Text changed.

L401: See above.

L422ff: There are some changes in the text now, also due to recommendations of Reviewer 2.

L465/66: With 'relatively small differences in transport' we wanted to emphasize that differences in *mean transport* between diabatic and kinematic trajectories are not large enough to be detectable via water vapour analysis. But as Reviewer 1 remarked there are significant differences, like the larger kinematic dispersion. We now just say 'differences in transport' to avoid misunderstandings.

L470: It refers to vertical gradients, which is now properly described.

L492: Corrected.

L515: Corrected.

L550–555: The citation (Mote,1998) here is indeed misleading - and removed now. The paragraph is about the downwelling above the maritime continent as suggested by (Sherwood, 2000).

L565: Corrected.

L589: Sentence changed according to the recommendation.

Fig.2: The plots using the unfitted data are very similar, but slightly more noisy due to limited sampling (trajectories are started only once per month). We decided to show the fitted data to improve readability of the plot without distorting the characteristics of the results.

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