

## ***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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Received and published: 22 December 2010

We would like to thank Reviewer 2 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 included two new references (Hoor et al., 2010; Kremser et al., 2009), as they are related to our work.

### **Specific comments:**

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**p22556/L1:** The reference James and Legras (2009) is added.

**p22557:** Wind field frequency is 6h - explicitly stated in the text now.

**p22558–22559:** A detailed comparison of ERA-Interim ozone and water vapour with observations would be interesting but is not the scope of this paper. We just state main differences between ERA-Interim and HALOE like the higher ozone mixing ratios of ERA-Interim. The important point for this paper is that the results (in terms of differences between kinematic and diabatic transport) are not sensitive to the chosen initialisation.

**p22560/2.4:** The acronym HALOE is now defined at the first place where it appears - however we write the full name 'Halogen ...' also in the 'Observations' section.

**p22563/3.1:** The corresponding text is changed now.

**p22566:** Indeed, Fig. 6 and Fig. 7 contain very similar information. Nevertheless, we want to keep them both, as Fig. 6 easily explains the way how Fig. 7 was obtained, helping the reader to understand Fig. 7, and Fig. 7 contains the full information for the full year (Fig. 6 is only a snapshot for one month). Besides, Fig. 6 highlights that the Northern Australia/maritime continent region is a region of maximum transport differences (at least during November/December 2005) and therefore explains the large difference between diabatic and kinematic ozone reconstructions for the SCOUT-O3 campaign.

**p22567:** We refer to (Ploeger, 2010, JGR) here, where transport timescales are given - this is explicitly stated now.

**p22569:** We added a new figure to this reply (Fig. 1) to be more specific about the (ERA-Interim) kinematic net downwelling above the maritime continent (Thanks to Reviewer 2 to pointing out to us that our discussion of this topic could have easily lead to misunderstandings!). The additional figure shows horizontal maps

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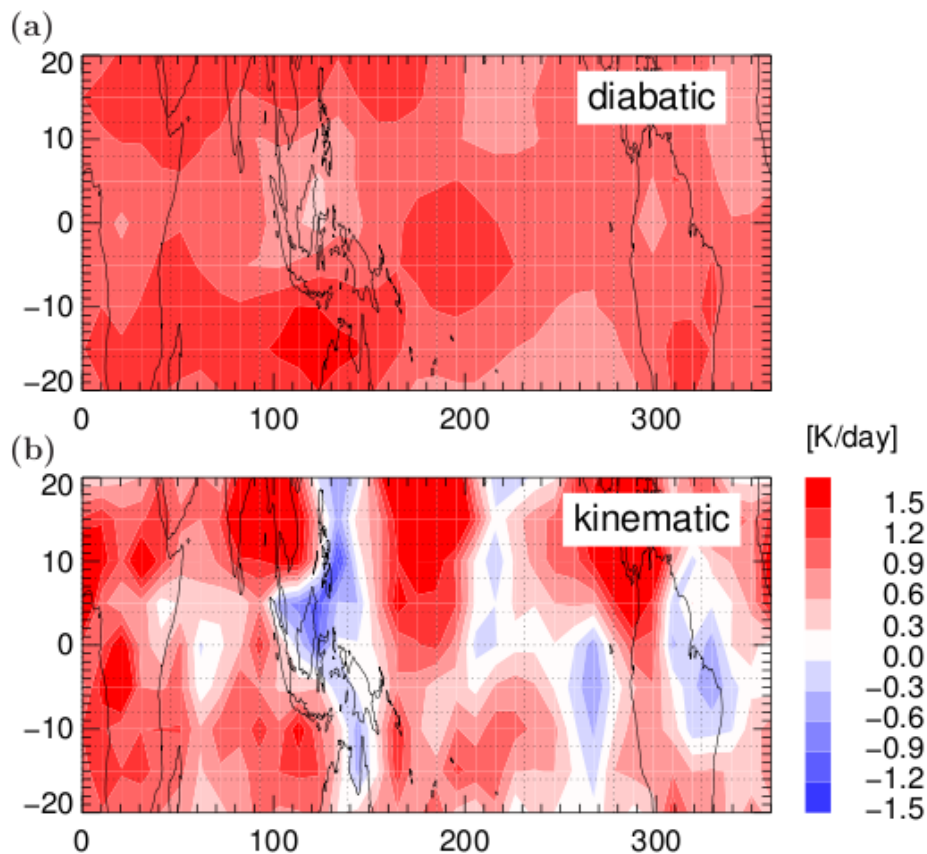
of mean cross-isentropic trajectory motion in the upper TTL between 390–410 K for both diabatic and kinematic 3-month backtrajectories, started on 20 November 2005 on a  $1^\circ \times 1^\circ$  latitude-longitude grid along the five isentropic levels 380, 390, 400, 410, 420 K (due to the particular choice of the trajectory starting date, the figure shows cross-isentropic motion prior to the SCOUT-O3 campaign; but note that our findings below result similarly for other time periods). These diabatic velocity fields were determined by interpolating potential temperature to both types of trajectories (diabatic and kinematic) and calculating cross-isentropic motion along the trajectories. Before plotting, cross-isentropic velocity fields were binned into  $5^\circ \times 10^\circ$  latitude-longitude bins. In particular, the maritime continent and Northern Australia turn out as regions where cross-isentropic motion for diabatic trajectories is directed upward, for kinematic trajectories downward - and this subsidence is not an artefact of averaging the  $\omega$ -wind. A similar figure was already shown by (Ploeger, 2010, Fig. 6), only for a different period (winter 2002). Therefore, we don't want to include such a figure in this paper, but we now refer directly to (Ploeger, 2010, Fig. 6) in Sect. 4 and Sect. 5.3.

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Interactive comment on Atmos. Chem. Phys. Discuss., 10, 22553, 2010.

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**Fig. 1.** Horizontal maps of mean cross-isentropic trajectory motion in the upper TTL (390–410K) for diabatic (a) and kinematic (b) backtrajectories during the tropical SCOUT-O3 campaign.

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