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Atmospheric Chemistry and Physics Discussions



# *Interactive comment on* "Hydration and dehydration at the tropical tropopause" *by* C. Schiller et al.

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We thank the referee for helpful comments and propose to submit a revised manuscript addressing the suggestions in the following way:

The following statement on ECMWF accuracy can be added in Section 4.1: 'ECMWF temperatures at the tropical tropopause are generally in good agreement with corresponding radiosonde measurements, with standard-level biases of the order of 0.5 °C or less (Simmons et al., 1999; Randel et al., 2004). However a slightly larger warm bias is apparent for the NH winter season for the lowest temperatures.' and to refer to that briefly in the conclusions again: 'The moderate warm bias of the ECMWF analysis compared to radio sonde data may underestimate the drying of air as it enters the stratosphere.'

Simmons, A. J., et al., Stratospheric water vapour and tropical tropopause temperatures in ECMWF analyes and multi-year simulations, Quart. J. Roy. Met. Soc., 125, 353-386, 1999

Randel, W., et al., The SPARC intercomparison of middle-atmosphere climatologies, J. Climate, 17, 986-1003, doi:10.1175/1520-0442(2004)017<0986:TSIOMC>2.0.CO;2, 2004

Contrary to the referee, we think that the initialisation with HALOE climatology of the trajectories provides valuable information and is the clue for the comparison of our data with the H2O reconstruction. Figure 4 and 6 show the necessity of a proper initialisation above the stratosphere, if both quantities are compared directly. We do not think that the low bias of HALOE compared to our data is a disadvantage here. We herby confirm again this discrepancy independently from previous studies (SPARC 2000) and thus provide new evidence for the dry bias of HALOE also in comparison with other instruments. We also felt encouraged by referee 2 who recommend keeping this Section in our manuscript.

We can change RHice to RHtotal (where appropriate) as suggested.

We agree that the figures are small in the printer friendly version and will therefore approach the ACP editorial board to enlarge them in future versions. The ratio of letter size to the figures seems to be appropriate.

We can change to '10 to 50 %'

Tropospheric tracers as CO were measured simultaneously during many flights, as well as ozone. However, there was no clear coincidence of enhanced CO or reduced O3 with the injections observed in water and particles. We therefore do not show such plots, but we propose to add in Section 4.2 the following sentence: Dynamical tracers as CO and O3 measured simultaneously do not show coincidental features in the layers of enhanced H2O and particles (S. Vicciani and F. Ravegnani, personal



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communications). These observations indicate that the fraction of in-mixed air from the troposphere is too small to be detected in these tracers, but is visible in H2O due to the large concentration gradient.

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