

## ***Interactive comment on “Evidence of horizontal and vertical transport of water in the Southern Hemisphere Tropical Tropopause Layer (TTL) from high-resolution balloon observations” by Sergey M. Khaykin et al.***

**Anonymous Referee #3**

Received and published: 19 August 2016

Review of “Evidence of horizontal and vertical transport of water in the Southern Hemisphere Tropical Tropopause Layer (TTL) from high-resolution balloon observations” by Khaykin et al.

This paper presents high vertical resolution in situ measurements of trace species to examine the origins of water vapor in the TTL. This paper is well written, well thought out, and is relevant to ACP. I recommend publication after some minor revisions to address a few comments I have about the manuscript.

Comments:

C1

L51: I don't think the TTL extends down to 12 km. The base of the TTL is typically defined as being 14 km (see Fueglistaler et al 2009).

L169: What is the Livesey reference? I don't see it in the references section.

L186: GDAS acronym needs to be defined

L252: I assume you mean 17 March, not 17 August?

L287-288: There are different ways to define overshooting, and I'm not sure if LRT is the most appropriate boundary for talking about WV. Wouldn't the cold point tropopause be most appropriate? Some further discussion here to justify the choice of LRT seems appropriate.

L353: Remove comma after “locations”

Paragraph starting on L369: This paragraph confused me. Overall, I just don't see what the point is that is trying to be made here. Also, what does negative 13 m/s mean in this context?

Sentence starting line 379: The ‘cooling signature’ is not very obvious to me in Fig. 4. Perhaps it would be more obvious if an ‘unperturbed’ temperature profile were available. I'm not sure if there is one (perhaps from a nearby radiosonde), but if so it would help. As is, this is not very convincing.

Sentence starting on line 381: You say that the ice has sublimated, but it also could have precipitated.

Line 389: You mention a dip in ozone in the data from Africa. Were ozone data available from these flights? If so, that would seem to be an important piece of information to include.

Sentence starting L458: So in-mixing and overshooting signatures are similar, at least in terms of WV/aerosol. But what about ozone? It seems as though ozone would allow one to ‘fingerprint’ these two processes, since extratropical overworld ozone would

C2

have a high value, whereas overshooting would bring up ozone poor air.

---

Interactive comment on *Atmos. Chem. Phys. Discuss.*, doi:10.5194/acp-2016-588, 2016.

C3