

## ***Interactive comment on “Intercomparison of in situ water vapor balloon-borne measurements from Pico-SDLA H<sub>2</sub>O and FLASH-B in the tropical UTLS” by M. Ghysels et al.***

### **Anonymous Referee #2**

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This manuscript describes an intercomparison of TTL and lower stratospheric H<sub>2</sub>O measurements made by two different balloon-borne hygrometers, Pico-SDLA and FLASH-B. The balloon flights were made as part of the TRO-Pico campaign Brazil in 2012 and 2013, and in each case, the two measurements were made on separate sondes launched from the same location approximately 3 hours apart. The measurement comparison segments are primarily on the sonde descents following balloon burst and are separated by  $\sim 1.75$  and 3 hours and  $< 0.2^\circ$  latitude or longitude. The authors present fairly comprehensive descriptions of the operation of the two instruments, their measurement uncertainties and artifacts (outgassing), and balloon launch operations. The two measurements are compared using vertical profiles and a discussion of small

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"enhancement" features in the profiles is included.

The manuscript is overall well written and the topic is wholly appropriate for publication in AMT. Prior to publication, I would encourage the authors to consider the few comments and questions posed below.

General: The order in which the two comparisons are discussed seems a little awkward. Chronologically, March 2012 comes before February 2013, which would make some sense. If the authors feel there is reason for the order, it would be good to keep the same order whenever the two comparisons are mentioned in the text—they are occasionally reversed.

P13698, L22: The wavelength/frequency tuning accomplished by ramping the laser current is actually due to the small induced temperature change, so the laser temperature is not truly “fixed”, but I understand you are distinguishing between current tuning and TEC temperature tuning.

P13700, L23: Model of the Honeywell pressure sensor should be included since this is an important consideration.

P13708, L10: Perhaps “Since the smaller balloon reduces the amount of water vapor outgassing, we are able to also consider”

P13708, L14: Perhaps “plot”/“display”/“present” instead of “compare”. Also, if the Pico-SDLA data is known to be contaminated above 23 km (as described in section 2.1.2), shouldn't it be omitted from the plot (as the FLASH-B ascent data above 18 km is) or distinguished in some way.

P13708, L25: Eliminate “especially for water vapor”, or “The water vapor” from the beginning of the sentence. Overall, the qualitative discussion of the role of the tropopause in dehydration seems unnecessary since it does not factor significantly into the subsequent analysis.

P13709, L8: What is the difference in terms of pressure altitude? And overall, how did

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the pressure vs altitude measurements between the sondes compare? Does this do anything for the CPT altitude differences?

P13709, L11: “at the same altitude and shifted up by 50 m” seems self contradictory. Perhaps leave out “at the same altitude and” – I think it would read fine. Change “up” to “upward”.

P13709, L12: To what does “this” in “The descent profile of FLASH-B does not show structure at this altitude” refer? It appears to be the 17.2 km feature discussed in the previous sentence, but that clearly does not make sense?

P13710, L12: The lack of outgassing water vapor in the FLASH-B profile up to 21.3 km (45 hPa) contradicts the description in section 2.2 which states that it becomes an issue at  $\sim 70$  hPa. Perhaps a better description of the method for determining the affect, or lack thereof, of outgassing is needed.

P13712, L1: A personal communication can not really “show” something to the reader.

P13712, L11: It would be good to include the equations of the linear fits as well as the correlation coefficients since correlation alone does not describe how good an agreement is.

P13713, L23: Inclusion of the absolute values of the differences as well as the relative difference would be useful to the reader, especially since the enhancements are subsequently described in absolute terms (P13714, L1).

Figure 3/5: A marker (x, etc) indicating the location of the burst of the FLASH-B balloon would be nice. Why not use 15 km as the bottom since that would correspond to the lowest altitude plotted in Figs 4/6. Or perhaps just plot the segments of the flights that appear in the corresponding vertical profiles.

Figure 4: One of the significant features of the vertical profiles is the apparent extensive dry layer between 16 and 19 km. This is not discussed at all, only the “features” embedded within it.

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Figure 4/6: It is interesting how much the temperature varied between the two profiles without any significant difference in water vapor. Is this fully attributable to T measurement issues?—solar heating would not have been an issue.

Figure 7: Bolder lines showing the fits would be helpful. Greater contrast between the two flights—outline one in black? As mentioned above, equations for the fits would be useful for the reader.

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Interactive comment on Atmos. Meas. Tech. Discuss., 8, 13693, 2015.

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