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Interactive comment on "Intercomparison of in situ water vapor balloon-borne measurements from Pico-SDLA H$_2$O and FLASH-B in the tropical UTLS" *by* M. Ghysels et al.

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The authors wish to thank the anonymous referee #1 for his helpful comments. Below are the responses to the referee #1 comments.

Specific comments :

p 13695, l 14-15 : Yes, it is only considering balloon borne measurements. I suggest to modify this sentence this way : "This level of agreement for balloon-borne measured stratospheric water mixing ratio constitute one of the best agreement reported in the literature" .

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p 13695, l 22: Thank you, we will add this reference to the list.

p 13699, l 12-14 : The authors suggest this modification to make the description more clear : "For measurements from the ground to around 200 hPa pressure level, we used the 413 ← 414 $H_2^{16}O$ line at 3802.96561 cm-1 . Above 200 hPa pressure level, we use the 202 ← 101 $H_2^{16}O$ line at 3801.41863 cm-1. During in-flight measurements, the switch from one line to the other is automatically driven ". This replace the previous sentence.

p13701, l 12-14 : Yes, all sources of error that we can determine are included. We have summed the error due to baseline interpolation (obtained from tests on synthetic spectra), the HITRAN line strength uncertainty and the experimental errors. Then, it is really hard to precisely determine all uncertainties. We can modify the sentence to clarify this point as : "By taking into account all sources of error that we can estimate (i.e spectroscopic and experimental errors, as well as error due to spectra processing), the combined relative standard uncertainty ranges from 7.5 % to 3.5 % in the TTL and the lower stratosphere, depending on the local conditions."

p 13701, l 20 : The referee is right, we forgot to add the time of flight. Both Pico-SDLA and the RS-92 have flown under the same balloon. We add the time of flight by adding a sentence line 20 as : "On January 18, Pico-SDLA has been launched at 22 : 11 UTC under a 1500 m3 balloon."

p 13708, l 18-21 : Yes, it is quite hard to answer since the flights of Pico-SDLA and Flash have been realized 3 hrs apart and that their trajectories were spaced by several tens of kilometers (like seen on Fig. 3 and 5). Of course, the CPT altitude and the temperature profile differences can partially be due to some natural temporal and spatial temperature changes. The temperature profiles from Pico-SDLA and Flash are quite different. Then, the temperature uncertainties for Pico-SDLA and Flash are 0.3 and 0.5 °C respectively. We notice that for these flights, in the TTL, the temperature profile is relatively constant and the CPT not well pronounced. The temperature varies usually

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by less than 0.5 °C in this area which is within the uncertainty range. The CPT altitude is determined by finding the minimum temperature altitude. This is strongly affected by the small structures in the profile which have an amplitude lower than the uncertainty of both sensors. This complicates the CPT altitude determination.

We add in the text on page 13709, l 2 a paragraph : " The altitude difference between the CPT altitudes from Pico-SDLA and FLASH can be attributed to three different factors : a natural temporal and spatial temperature variability in the TTL, the measurements uncertainties and the temperature profile behavior in the TTL which complicates the determination of the CPT : for this flight and the March 13, 2012 flight, the temperature profile in the TTL is quite constant with temperature variations of less than 0.3 °C, within the sensors uncertainties. Then the CPT altitude is determined using small structures in the profile."

p 13710, l 19-24 : We did not have this problem on 10-11 February that is why I did organize the text this way.

p 13711, l 14-15 : We suggest this modification : " The local maximum at 18.1 km (Fig. 6) stands out with a mixing ratio of 4.09 ppmv in both Pico-SDLA and FLASH measurements"

p 13712, Sec. 5 : For the two flights the float altitude is different. In the case of March 13, 2012 the maximum altitude we could consider was around 21 km. Since the two enhancements structures at 18.1 and 18.7 km are large, if we remove this part of the profile, the sample altitude range for the intercomparison is too small ($\sim$ 2 km) to obtain reliable and representative results. That is why we did not expose the result from the correlation without the spatial structures.

Technical comments/suggestions : We have taken into account all suggestions of the referee.

Please also note the supplement to this comment:

http://www.atmos-meas-tech-discuss.net/8/C4877/2016/amtd-8-C4877-2016-supplement.pdf

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