

Review of: "The AquaVIT-4 intercomparison of atmospheric hygrometers" by Brunamonti et al.

Overall impression and rating

The authors describe the laboratory comparison of four hygrometers in the Aida chamber in an excellent manner. The manuscript is of a very high standard, well structured, and easy to read. The figures are all clear and of excellent quality. The relevance to the community is also given because accurate water vapor measurements in UTLS are still very important for monitoring and process studies. I therefore recommend the manuscript for publication in AMT after a very few minor questions on my part have been answered.

Specific comments/questions:

- Page 2, lines 11-16: I think it should also be mentioned that negative trends have been found in stratospheric water (Hegglin et al. 2014), depending on the reference period used. This is clearly shown in Toa et al. 2023. I think it would be good to mention this as well, even though the paper is not about trends.
- Page, line 18: In the upper troposphere and even in the LMS higher mixing ratios above 10ppmv are observed. I would rather change the sentence to: "In the UTLS and in particular above the tropopause mixing typical mixing ratios of < 10ppmv are found."
- Page 3, lines 2-4: There are already alternatives for cooling frost point mirrors, such as dry ice or liquid nitrogen. The CFH for LN2 cooling can already be ordered from the manufacturer. I would therefore tone down the statement that there are already alternatives that still need to prove themselves in the future.
- Page 22, lines 6-8: Why should the temperature directly influence the water vapor mixing ratio ? Because of adsorption effects of the water vapor molecules on the tube wall ? You should add a short explanation here.
- Page 26, lines 5-7: How did you know the sampling efficiency of ice particles by the sampling line. Can you insure isokinetic sampling ? Otherwise you need to correct or it to determine the ice water content. Maybe it is worth mentioning this also in the text.
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Technical comments/suggestions:

- Figure 3/4: I would suggest to include the saturation mixing ratio as additional line. This would help the reader identify which points in the time series are supersaturated or subsaturated.

References

- Hegglin, M., Plummer, D., Shepherd, T. et al. Vertical structure of stratospheric water vapour trends derived from merged satellite data. *Nature Geosci* 7, 768–776 (2014). <https://doi.org/10.1038/ngeo2236>
- Tao, M., Konopka, P., Wright, J.S. et al. Multi-decadal variability controls short-term stratospheric water vapor trends. *Commun Earth Environ* 4, 441 (2023). <https://doi.org/10.1038/s43247-023-01094-9>