

Interactive comment on “Advancements, measurement uncertainties, and recent comparisons of the NOAA frostpoint hygrometer” by Emrys G. Hall et al.

Anonymous Referee #3

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General:

I agree with the assessment of the two reviewers which already appeared in the open discussion: this is a very thorough study describing the functional principle, history, accuracy and reliability of the NOAA frostpoint hygrometer FPH, that recorded the important 30-year stratospheric water vapor series at Boulder, USA. The paper is well organized and fluently to read. I recommend it for publication in AMT and have only some minor remarks which are listed below in the specific comments.

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Specific comments:

1. Page 1, line 17: '*... decreasing the uncertainty in the thermistor calibration fit to less than 0.01 °C over the full range of frostpoint temperatures (-93 °C to +20 °C) ...*'

For $T > 0\text{ °C}$ the temperature of phase change is the dewpoint, so maybe better say '*... over the full range of frost- or dewpoint temperatures ...*'.

2. Page 1, line 19: '*... water vapor intercomparisons are presented, including the excellent agreement during AquaVIT-2 chamber experiments ...*'

Excellent agreement of what is presented ?

3. Page 1, lines 24 - 26: To my feeling these statements need references.

4. Page 2, 2nd paragraph: Here you might want to include a new reference pointing to the importance of long term stratospheric water vapor monitoring by balloon sounding:

Müller, R., A. Kunz , D. Hurst , C. Rolf , M. Krämer , M. Riese (2016): The need for accurate long-term measurements of water vapor in the upper troposphere and lower stratosphere with global coverage, *Earth's Future*, 4, doi:10.1002/2015EF000321.

5. Page 2, lines 17 - 22: Another recent publication where core hygrometers are compared (also showing results from the AquqVit-1 and 2, MACPEX, etc.) is:

J. Meyer, C. Rolf, C. Schiller, S. Rohs, N. Spelten, A. Afchine, M. Zöger, N. Sitnikov, T. D. Thornberry, A. W. Rollins, Z. Bozóki, D. Tátrai, V. Ebert, B. Kühnreich, P. Mackrodt, O. Möhler, H. Saathoff, K. H. Rosenlof, and M. Krämer (2015): Two decades of water vapor measurements with the FISH fluorescence hygrometer:

a review, Atmos. Chem. Phys., 15, 8521-8538, doi:10.5194/acp-15-8521-2015, 2015.

In this study it is stated that the agreement of hygrometers has improved from overall up to 30 % or more to about 5–20 % at < 10 ppmv and to 0–15 % at > 10 ppmv.

6. Page 8, section 3.1 ff: It would be nice to convert errors and uncertainties of the frostpoint measurement in H₂O mixing ratios.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2016-160, 2016.

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