

Interactive comment on “An update on the uncertainties of water vapor measurements using Cryogenic Frostpoint Hygrometers” by H. Vömel et al.

Anonymous Referee #3

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This is an excellent paper on the CFH measurement uncertainties. CFH is a reliable, light weight instrument, which provides accurate measurements of water vapor in the upper troposphere and lower stratosphere. The instrument is widely used to study UTLS processes, to provide reference observations for satellite and lidar measurement validation and also for comparisons with radiosonde measurements. The paper describes a method to estimate uncertainty of the CFH water vapor profiles. Regarding some older versions of the CFH, the authors have studied a small bias found in the lower troposphere. They also provide a method to correct the bias. Since such biases may occur in the future, the authors recommend the use of an additional ground check prior to the launch. The authors find that the ground check introduced in 2014 confirms

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that the systematic error of the instrument is less than 0.1 K and no drift can be seen during the recent time period.

General comments: In the paper the CFH is characterized as a disposable instrument. It would be interesting to learn if recovered instruments could be flown to reduce the cost of such measurements. Vertical range of the measurements by the CFH instrument depends on the possible contamination due to outgassing from the balloon, the parachute, the load line or the intake tube of the instrument. The contamination affected data are flagged during the data post-processing. It would be useful to include some more detailed discussion on how to perform the flagging. It is possible that in some cases it would be difficult to separate real variability from a suspected contamination.

Specific comments and suggestions: Page 2, line 15. Add references for papers published after 2010, which have made use of the CFH measurements.

Page 8, line 14. Add locations, where these 1022 soundings were made.

Page 9, line 22. Figure numbered 9 should probably be before Figure 10 in the text.

Page 11, from line 14. Missing commas in several sentences.

Page 11, line 14- 15. " For tropospheric and stratospheric observations the CFH is a fast-responding instrument and lag issues are not suspected". Does this mean that time lag is not impacting the measurements during balloon ascent?

Page 12, line 13. From the figure it looks like the dots are within 0.2 K?

Page 12, line 20. "section 0", replace with "2.4"?

Page 24, the figure 8 caption. Should it read for example "Distribution of the correction as a function of altitude for all soundings, where a bias is suspected"?