

Atmos. Meas. Tech. Discuss., referee comment RC1
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Comment on amt-2022-13

Anonymous Referee #1

Referee comment on "Intercomparison of upper tropospheric and lower stratospheric water vapor measurements over the Asian Summer Monsoon during the StratoClim Campaign" by Clare E. Singer et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2022-13-RC1>, 2022

Review of "Intercomparison of upper tropospheric and lower stratospheric water vapor measurements over the Asian Summer Monsoon during the StratoClim Campaign" by Singer et al.

Summary:

The manuscript by Singer et al. describes the comparison of three hygrometers onboard the Geophysica high altitude research aircraft during the StratoClim field campaign in 2017. Water vapor measurements in the upper troposphere and lower stratosphere are difficult and intercomparisons of different instruments are an essential tool to provide confidence in the observations of each. This study also includes comparisons with balloon borne soundings and space based satellite observations.

The paper is an important contribution for the understanding of the water vapor observations during that campaign. It is overall well written and the analysis is detailed and of high quality. I would recommend publication after some minor modifications.

Major comments:

The study uses v4.3 for the comparison with MLS water vapor measurements. The MLS team has already released v5.0, which addresses some significant biases and drifts that do affect the comparison with the in situ measurements. I would strongly suggest using v5 instead of v4.3 as the results would look slightly differently.

Minor comments:

I would suggest moving Figure S6 from the supplement to the main document. It is quite helpful in understanding the discussion of the cloud determination.

Since the authors refer to Figure S9 twice, it too could possibly be moved to the main text.

Lines 246ff: It would be quite useful to have an overview table, which lists for each flight the total flight hours, total number of data points, total number of measurements in cloud and out of cloud. Without this, the number of data points given here miss perspective.

The comparisons in Figure 8 look quite good. Nevertheless, there may be some sampling biases in this comparison, since the balloon-borne measurements are typically launched only in non-precipitating conditions, and MLS is sensitive to cloud contamination in the UTLS. A short discussion about how this potential sampling bias may influence the comparison could be helpful.

Lines 374: Not unexpected, the comparison was not blind and there have been many interactions between the different teams during the campaign. I have confidence in each team, but it would still be good to know to what extent if any instrument calibrations were adjusted during the campaign based on input from the other teams.

Technical comments:

Line 150: delete the stray comma.

Lines 269f: Better write: "During the stair stepping, there were two moist layers around ..."

In Figure 5: I would suggest making the vertical axes for potential temperature and H₂O

the same between the upper and lower group of panels.