

Atmos. Meas. Tech. Discuss., referee comment RC2
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Comment on amt-2021-53

Anonymous Referee #1

Referee comment on "Improvement of Odin/SMR water vapour and temperature measurements and validation of the obtained data sets" by Francesco Grieco et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2021-53-RC2>, 2021

This manuscript discusses newly developed version 3.0 Odin/SMR water vapor and temperature level-2 products. Algorithms used include empirically derived adjustment of the receivers' sideband rejection that improves agreement with correlative measurements. This is subject matter that is appropriate for AMT and that should be entered into the scientific record.

However, the manuscript requires significant revision. Many suggestions have been included in an attached, marked-up pdf.

Correlative datasets from MIPAS, ACE-FTS and MLS should be concisely introduced with appropriate references in a single data section early in the manuscript. Then early discussion in the manuscript to the perceived need to adjust the sideband rejection could be made less vague. Figures similar to the summary Figures 12 and 13, early in the paper, could make clear the biases in v2.1 that are being addressed with v3.0.

Figures 12 and 13 effectively summarize the content of the "Difference [%]" panels of Figures 8-11 for H₂O and A20, A23, A26, and A29 for Temperature in a way that makes comparisons much easier. Similar summary figures could more-concisely convey the content of the correlative-dataset-specific figures, making them unnecessary.

The standard deviation of the median (equation 10) assumes that errors are Gaussian and can be infinitesimally beaten down with more data, making error bars unrealistically small. It would be better to convey some idea of the range of the differences from correlative measurements and some idea of what wiggles in the data are significant. Use of a "bootstrap" method could be useful. For example, are the differences among the three MIPAS datasets significant?

There are several paragraphs associated with individual comparative datasets that describe details of the biases throughout their profiles but that do not provide much insight. These could be reduced/combined in association with plots that combine different correlative data sets.

SABER would be a useful additional source of correlative data.

There should be discussion of how/why FM13 and FM19 differ. It seems that they put the same H₂O spectral line into a spectrometer. Are the spectrometers different? Is this an indication of poorly understood systematics?

MLS does not have 1.5 - 3 km vertical resolution; this is rather the resolution of the vertical grid on which data is reported. In the mesosphere, MLS H₂O has 3-6 km resolution and temperature has 7-12 km vertical resolution. "Schoeberl et al., 2006" is not the appropriate reference. Cite instead the MLS Data Quality document.

Discussion (P6, L11-15) of how new values of r_0 were chosen to minimize differences with correlative measurements should be expanded. This section suffers because the correlative datasets have not yet been introduced. It should include figures showing the problem and the improvement.

Statements in the conclusions are not all supported by the figures:

P20L3-4: You say MLS and ACE-FTS agree with SMR to -5% -- 0% from 45-80 km, but MLS is -22% at 80 km. ACE-FTS is -10% at 80 km. Please check these numbers in the conclusion and abstract.

Please also note the supplement to this comment:

<https://amt.copernicus.org/preprints/amt-2021-53/amt-2021-53-RC2-supplement.pdf>