

Atmos. Meas. Tech. Discuss., referee comment RC2  
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## Comment on amt-2022-68

Anonymous Referee #3

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Referee comment on "A comparison of carbon monoxide retrievals between the MOPITT satellite and Canadian high-Arctic ground-based NDACC and TCCON FTIR measurements" by Ali Jalali et al., Atmos. Meas. Tech. Discuss.,  
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Review of "A comparison of carbon monoxide retrievals between the MOPITT satellite and Canadian High-Arctic ground-based NDACC and TCCON FTIR measurements" by A. Jalali et al.

### General Comments

In this new study, Jalali et al. discuss the validation of MOPITT v8 satellite measurements of carbon monoxide with high latitude ground-based FTIR measurements in the Canadian Arctic. Following a concise introduction and description of the MOPITT and FTIR ground-based measurements, the vertical sensitivity of the measurements of the different instruments in terms of averaging kernels and degrees of freedom for signal are discussed. The methodology section clearly outlines the comparison approach and properly introduces the Taylor diagram as a tool to summarize the intercomparisons of the various MOPITT data subsets with the NDACC and TCCON measurements. For the actual comparisons with the reference data, the focus is given to multiple aspects, including MOPITT pixel-to-pixel bias, noise, and drifts. Results are compared to earlier validation studies using MOPITT v6 and v7 data, illustrating the benefits of the improved retrieval method of the v8 data. Major results are nicely summarized in the conclusions.

Overall, I got the impression that this is a carefully conducted study with sound results, applying state-of-the-art methodologies (e.g., consideration of the averaging kernels in the comparisons and the Taylor diagrams). The study properly considers the results of earlier work on MOPITT CO retrieval validation. The authors clearly spent time and effort to prepare and submit such a well-written, clear, and concise manuscript. Overall, I have only a short list of clarifications and suggestions and would like to recommend the paper for publication in AMT.

## Specific Comments

p1, l9: Suggest replacing "within a 1° radius" with "within 110 km radius" (as stated later in the manuscript).

p2, l12: At the end of the abstract, perhaps add a sentence about any broader implications and/or an outlook of the study?

p2, l13-33: In the introduction, it could be elaborated and referenced that the MOPITT CO measurements are of interest for chemistry-transport and climate model validation as well as studies of tropospheric tracer transport, I think. Model validation and transport studies will benefit from proper error characterization and improved accuracy of the new MOPITT v8 data, as described here.

p3, l16-27: Did the earlier studies provide any reasons for biases between the NDACC and TCCON measurements?

p4, l24: What are the actual pressure levels of the MOPITT retrievals (or maybe, what is the vertical range with meaningful retrieval results)?

p33, l10-13: At the end of the conclusions, perhaps add 1-2 sentences on the broader implications of the study and future work (similar to the abstract).

## Technical Corrections

p2, l23: remove "140pp"?

p4, l6-7: Would like to suggest not using "Buchholz2017" and "Hedelius2019" and simply keep the references in their original formatting. It does not look like this makes the paper any shorter.

p4, l9: NASA'\_s\_

p4, l12: 22 x 22 km\_^2\_

p5, l18: \_the\_ water vapor (?)

p9, Table 1: use Copernicus table layout