

Interactive comment on “Impacts of H₂O variability on accuracy of CH₄ observations from MIPAS satellite over tropics” by Temesgen Yirdaw Berhe et al.

Anonymous Referee #3

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General Comments

This manuscript presents an investigation of the large uncertainty of MIPAS V5R_CH4_220 methane retrievals in the tropical upper troposphere and lower stratosphere and attributes it to interference from atmospheric water vapour. Including water vapour when fitting methane reduces the uncertainties in the new data version MIPAS V5R_CH4_224.

The work is a useful contribution to the field and appropriate for AMT, but the manuscript needs major revisions and another round of reviews.

I have read the reviews of the other two referees. My assessment of the manuscript is

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similar to theirs, so I will not repeat their specific and technical comments.

In general, the manuscript should be improved in the following ways:

- Change the title. MIPAS is not a satellite. e.g., "The impact of H₂O variability on the accuracy of MIPAS CH₄ measurements [or retrievals] over the tropics:"
- Rewrite the abstract for clarity, conciseness, and grammar. The explanation of the results is wordy and unclear.
- The manuscript needs much clearer explanations of methods and results throughout, and more detail on how results were obtained.
- Figures need to better describe what is shown and ALL plots and captions need revisions. e.g., Figure 1 shows (X - Y)/Z differences but doesn't say what X, Y, and Z are. Figure 4 needs a better colour scale, panel labels, y-axis label, larger fonts, etc. Figure 8 should plot CH₄ vs. H₂O, not H₂O vs. CH₄. Take a careful look at quality of all the figures.
- Is it correct to extrapolate the results from three specific sites as representative of the tropics, mid-latitudes, and polar regions? Justify this assumption.
- Correlation seems to be equated with cause, e.g., p16, para1.
- Add a table stating sites/latitude bands used and time periods.
- Use consistent terminology when referring to the MIPAS versions, e.g., both V5R_CH4_220 and MIPAS CH₄ 220 are used. Use the former throughout, and similarly for V5R_CH4_224.
- Section 4.3 should be rewritten for clarity.
- Data providers who are co-authors don't need to be thanked in the Acknowledgements.
- The References should be revised to ensure that they are correct and have consistent

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formatting. Some have incomplete information and several are old AMTD references (e.g., Laeng et al., 2015; Sepulveda et al., 2012). AMTD references are to manuscripts under review. These should be updated to the published AMT references.

- The manuscript needs line-by-line copy editing to correct the many typographical, grammatical, and technical errors.

- Overall, the manuscript is poorly written. It needs a complete rewrite for scientific clarity. I encourage all of the authors to review the next version carefully prior to resubmission.

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