**Atmospheric
Measurement
Techniques
Discussions**

Interactive
Comment

Interactive comment on "MIPAS reduced spectral resolution UTLS-1 mode measurements of temperature, O_3, HNO_3, N_2O, H_2O and relative humidity over ice: retrievals and comparison to MLS" *by* S. Chauhan et al.

Anonymous Referee #1

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This paper characterizes results from the reduced spectral resolution MIPAS instrument for atmospheric temperature and trace gas retrievals. Comparisons are made to MLS/Aura, ECMWF (for atmospheric temperature), and AIRS (for water) values to determine biases versus latitude and altitude for November/December, 2005. The paper is well written and easy to follow. Biases are important to characterize, however calculations of the standard deviation of MIPAS vs. the validation data are also needed to validate the MIPAS results. Comparisons should be made between the standard deviation of (MIPAS - MLS/Aura) and the predicted errors for both instruments. Char-

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acterization of both the bias and errors is a necessary step prior to combining results from MIPAS and MLS as mentioned in the conclusion.

Specific comments Abstract: Vertical resolution is given for temperature only. It would be useful to give the vertical resolution for other species.

Abstract: It would be useful to give the validated pressure ranges for atmospheric temperature, ozone, HNO3, and N2O in the abstract.

Abstract: Line 11 states that MIPAS and MLS temperatures agree within +-4 K. This is presumably the bias between MIPAS and MLS? If so, this should be specified as the bias difference, e.g. MIPAS and MLS temperatures are biased within +-4 K over the whole pressure range of 316-0.68 hPa.

Line 18: MIPAS and MLS stratospheric volume mixing ratios (vmr) of H2O agree within +-1 ppmv. State what this is also as a %. Again, is this the mean difference (bias)?

Line 15 : ...present similarly in MIPAS and MLS. Recommend changing wording to ...present in both MIPAS and MLS.

In introduction: ...independence of sunlight, and, in consequence, the coverage of the whole earth within one day. Recommend changing wording to: ...independence of sunlight, allowing the coverage of the whole earth within one day.

In introduction: ...HIRDLS, MLS, SMR and MIPAS are operating continuously. Recommend changing wording to: HIRDLS, MLS, SMR and MIPAS are operating exclusively in limb mode. This is because the instruments may have data gaps for various reasons.

Section 2: As will be shown below, this leads to an improved vertical resolution from 2 to 4 km in the UTLS region of the resulting trace gas profiles compared to the full resolution (FR) nominal mode observations. It is confusing as to which resolution goes with which mode. Is this supposed to read: As will be shown below, this leads to an improved vertical resolution of 2 km in the UTLS region of the resulting trace gas profiles compared to the full resolution (FR) nominal mode vertical resolution of 4 km.

Section 2: If the vertical resolution has improved, has there been any downside to the reduced resolution?

Section 2.1. It would be useful to have a few statements describing the fit procedure. Are different tangent point data retrieved together or each independently? What is the sequence of retrieval?

Section 2.1. Why are zero a priori profiles chosen rather than a more realistic value? It would seem to defeat the purpose of having a priori information included in the retrieval. Additionally, if retrieving in log(VMR) for water as the paper states, a zero value is not possible.

Section 2.1.1, last paragraph: In the case of temperature the total error is dominated by the parameter error. Parameter error is not listed in the list of errors earlier in this paragraph. Parameter error needs to be defined.

Section 4: A coincidence criterion of +-12 h in time and +-300 km in space was used to find closely matched profiles. Comment: Since you have defined the criteria, I would remove the term "closely"; which is subjective.

Section 4: In case of MLS it has been tried to minimize... Recommend changing wording to In the case of MLS, the choice has been to minimize...

Section 4: The standard deviation of the difference between MIPAS and MLS needs to be compared to the predicted errors to see if they are consistent within the reported errors, as discussed previously.

Section 4, ... the agreement between MIPAS and MLS is between +-3 K. Comment: Specify if this is the bias or the standard deviation difference.

Section 4.5 ... agreement between MIPAS and MLS is within 0.5-1 ppbv. Comment: Also give the % difference. Specify this as the bias difference.

Conclusion. ... The agreement between MIPAS and MLS is good with the exceptions

of... Comment: The term good is a value judgment; good needs to be defined. Additionally the term agreement is not defined and should be specified as what is being compared for MIPAS and MLS. A more precise statement would be, e.g. The bias between MIPAS and MLS is less than 10% for VMR values and less than 3K for atmospheric temperatures, with exception of ...Where I have put in the 10% and 3K thresholds which may or may not be the thresholds you use to define "good".

Conclusion: Due to the similar altitude resolution and well characterized biases, the combination of MIPAS and MLS datasets seems possible. Comment: To combine results, both the bias and the standard deviation differences for matched profiles should be characterized. Ideally, since there will be differences in IR and microwave sensitivity, e.g. in the presence of clouds; both instruments should also correctly report their sensitivities for an optimal average.

Table 3. These tables give the total error estimates. How do the actual error, rms of (MIPAS-MLS), compare to this predicted error and MLS predicted error?

Figure 1-5. These figures have numbers at the top of each plot obscuring the title.

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