

Reply to the comments of reviewer #2

Norbert Glatthor et al.

Reviewer comments are in black, while our replies are in blue.

The paper is well written and well suited for AMT. I'd suggest publication after a few minor corrections, listed below.

5 We thank the reviewer for this positive evaluation.

Page 1, lines 4-5: "... with respect to the atmospheric state variables jointly retrieved with the target gases CH₄ and N₂O ..." is awkwardly phrased. Does this mean that CH₄ and N₂O are now retrieved simultaneously and weren't previously?

10 No, MIPAS CH₄ and N₂O have always been retrieved simultaneously at IMK/IAA. For better understanding we will change the passage

"... with respect to the atmospheric state variables jointly retrieved with the target gases CH₄ and N₂O ..." into

15 "...with respect to the atmospheric state variables that are jointly retrieved along with the target gases CH₄ and N₂O ..."

Page 2, line 18: "Submillimeter Wave Radiometer" should be "Sub-Millimetre Radiometer" (note the spelling of sub-millimetre)

The phrase will be changed accordingly.

20

Page 3, line 30: Please specify what the high bias is with respect to

We will change the passage from

"Both MIPAS IMK/IAA CH₄ and N₂O profiles always had a high bias in the troposphere and the lower stratosphere (Laeng et al., 2015; Plieninger et al., 2016)."

25 into

“Both MIPAS IMK/IAA CH₄ and N₂O profiles always had a high bias in the troposphere and the lower stratosphere with respect to ground-based in-situ measurements and remote measurements in other spectral regions (Laeng et al., 2015; Plieninger et al., 2016). For MIPAS V5 data this bias was of the order 0.1–0.2 ppmv for CH₄ and of ~20 ppbv for N₂O.”

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Page 5, lines 14-16: I assume you mean H₂O and HNO₃ are interfering species that are no longer joint-fitted. If so, please clarify in the text. Also, please explain what is meant by “hardly any influence”

We will change the sentence

10 “Contrary to the previous data version, H₂O and HNO₃ were no longer joint-fitted, but their previously retrieved V8 profiles were used instead.”

into

“Contrary to the previous data version, the interfering species H₂O and HNO₃ were no longer fitted jointly with the target species, but their previously retrieved V8 profiles were used instead.”.

15 Section 3.1.2: Please briefly explain the physical justification for how the radiance offset could be altitude-dependent?

As outlined in Kleinert et al. (2018) there is an offset variation with altitude, which “is related to straylight rather than an instrumental offset.” We will change the passage

20 “While the radiance offset correction fitted in previous data versions was allowed to be microwindow dependent, but forced to be altitude-constant, it is now allowed to be altitude-dependent as well. By this means the instrumental characteristic can be reproduced better.”

into

25 “The radiance offset correction fitted in previous data versions was allowed to be microwindow dependent, but forced to be altitude-constant. Now it is allowed to be altitude-dependent as well, because Kleinert et al. (2018) have shown that the offset increases with decreasing altitude, which they attribute to straylight from Earth or clouds.”

Page 8, line 11: If CO₂ is an interfering species, why isnt its VMR listed as an uncertainty in Table 3? CO₂ has been forgotten in Tables 3 and 4 and will be added.

30

Page 17, line 4: for consistency, “methane” should probably be ”CH4”

Ok, will be changed.

Page17, line 8: it seems a bit odd to be using vague phrases like “had been as high as” and “could be
5 reduced to” and then give very specific values. Why not just give the rates for both V5 and V8 (as done in
the next sentence), or say the version that had a non-convergence rate of 8.4%?

Ok, the sentence will be changed into “For FR measurements, the portion of non-converged retrievals
were reduced from 8.4% to 0.3%.

10 Figure 6: In my opinion, there’s more data here than necessary, which makes it difficult to see the region
of interest. Maybe consider only showing the northern latitudes to highlight the oscillations better.

We agree. To highlight the oscillations better we will restrict the lower row of Fig. 6 to the latitudes
75N–90N–45N and to the altitudes 5-50 km.