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Atmospheric Measurement Techniques Discussions

# *Interactive comment on* "Methane and nitrous oxide retrievals from MIPAS-ENVISAT" *by* J. Plieninger et al.

**Anonymous Referee #2**

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The paper describes an update and improvement to the CH4 and N2O data retrieved using MIPAS measurements. The new retrieval set up is clear and the effects of the new settings are discussed extensively, al least for the longer part of MIPAS mission.

However I suggest to revise the paper before publishing it in AMT, addressing the following comments:

1) The MIPAS mission identified as 'reduced resolution' by the authors has been called by ESA 'optimised resolution mission'. The name 'optimised' comes from the fact that, despite the spectral resolution of the instrument has been reduced due to instrumental problems, the spatial resolution of the measurements has been improved as a result of the lower time used by MIPAS to acquire an interferogram. Therefore I strongly



recommend the authors to adopt the conventional name.

2)The spectral resolution of MIPAS is given before and after apodization. Which kind of apodization do the authors refer to?

3)Page 7808 – line 15-16 'The data sets of these versions are disjoint in a sense that one observation is either 224 or 225.' What does this sentence mean?

4) page 7809 line 1-2 Are the tangent altitudes used in the CH4-N2O retrievals coming from previous retrieval steps as well?

5) page 7809 line 17 – The a-priori profile is zero, as stated at line 12 of the same page, therefore the diagonal element of the regularization matrix artificially pulls the profiles toward zero.

6) Section 3 – page 7810 – Why the retrieval setup has been tested for the Optimised Resolution on 110 orbits in summer (north emisphere) and for the full resolution on 16 orbits only and in winter (North emisphere)? A part from the highly reduced statistics that you have for the Full Resolution mission, the use of data from one season only may not represent completely the real behaviour of your retrieval setup.

7) page 7811 lines 12-15 Which spectroscopic parameters have been changed? Line strengths, broadening coefficients, line positions or all of them? Are the changes for both N2O and CH4 or the differences are due to CH4 only?

8)Page 7812 lines 9-10 What does it mean that the degrees of freedom 'increase slightly'? please quantify

9) Page 7812 lines 12-16 Actually in the tropics the CH4 VMR difference oscillates from negative to positive to negative and then positive, similar behaviour shown for N2O. For both gases the differences are in phase, that means that continuum accounts for part of CH4 and N2O signal. Do you regularize the continuum to zero value as well? I don't understand why the retrieval of continumm above 30 km lowers the VMR below 20 km and enhance the DOF of the VMR profiles. Is it because before the offset was

altitude dependent and therefore you had correlations between offset and continuum in the altitude range where you retrieved both?

10) Page 7813 lines 6-14 From what I read here, it looks like the authors have applied changes to the retrieval setup only if they produce results that are lower below 20 km. Isn't it a little like to force the results to be in agreement with other data?

11) Page 7813 lines 20-24 Can you explain which criterion have been used to select the new MWs? Were they selected because of the presence of water lines or because the lines of CH4 and N2O did not saturate? From Figure 6 it looks like the number of spectral points used below 20 km has been reduced drastically. What about the retrieval error of the altitudes below 20 km? To me both error and vertical resolution should deteriorate in the new retrieval

12) Page 7815 line 4 – Since the vertical steps of MIPAS measurements ranges from 1.5 to 3 km I would not consider a vertical resolution of 7 km a good resolution

13) Page 7815 line 12-15 – Figure 10 and 11 report not all the AK but a subset of them, since, if I understood correctly, your retrieval was performed at 1 km vertical steps

14) Page 7816 . You cannot extrapolate the errors obtained for just one scan to the full mission. I suggest to evaluate them for few orbits considering all seasons. From figure 12 it looks like that the noise error is larger than the systematic error al low altitudes. Is this caused by the small number of spectral points used in this altitude range?

14) Page 7817 lines 12-24 – Very few details are given for the Full Resolution retrieval setup. Which MWs have been used? Are they the same as for the Optimised Resolution? Are you using the same regularization matrix? Do you retrieve offset and continuum as for OR?

Minor corrections

Page 7808 line 20 – Level 1b versions are labelled IPF-5.02 and IPF 5.07



Page 7809 line 1 – improve -> reduce?

Page 7809 line 24 – spectra -> retrieval

Page 7811 line 5 – where new -> where the new

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