

Interactive comment on “Validation and data characteristics of methane and nitrous oxide profiles observed by MIPAS and processed with Version 4.61 algorithm” by S. Payan et al.

Anonymous Referee #2

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Review of manuscript acpd-7-18043-2007,

"Validation and data characterisation of methane and nitrous oxide profiles observed by MIPAS and processed with version 4.61 algorithm"

by S. Payan et al. .

The authors present a large number of comparisons mainly of vertical volume mixing ratio profiles of methane and nitrous oxide retrieved from MIPAS/Envisat measurements with independent observations in order to assess the quality of the MIPAS-E version 4.61 level-2 data product. This paper is of course needed in a special issue on

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MIPAS/Envisat data products and therefore adequate for publication in ACP, possibly marked as "technical note" in the title (technical paper).

Whilst the amount of data presented by the authors to achieve their goal is quite impressive, I still feel that the discussion paper has several major short-comings which need to be addressed before it could be considered for publication in ACP.

Specific comments:

My first three comments are related to the scientific quality and give recommendations on how to improve the balance between the different parts of the paper. The last comment addresses the presentation quality.

1) In particular, only little effort was made to quantitatively summarise the results obtained in the individual comparisons, for example by providing overview plots and tables in the conclusion section. This would be very useful for potential users of the data. Examples can be found in other validation studies which have been cited in the manuscript (e.g. Strong et al., ACPD 2007, Lambert et al. JGR 2007, Urban et al., JGR 2005, for N₂O validation and De Mazière et al., ACPD-2007 for CH₄).

2) The introduction section also lacks a summary of elsewhere published intercomparison results for the species N₂O and CH₄ and MIPAS version 4.61. This manuscript should be regarded as an extension of earlier work by adding additional material (notably from balloon-borne campaigns) with special focus on MIPAS validation.

3) The section on comparisons to other satellite data sets is far from being complete and only two examples are presented. Moreover, the Odin N₂O data version used in this study is obviously not up to date, if compared to the more recent version used in the work of other authors (Strong et al., ACPD 2007, Lambert et al. JGR 2007). Since it makes no sense to validate MIPAS with an obviously old data version, this section needs to be improved. On the other hand, comparisons to satellite data sets are maybe not required in this paper, if previous work of other authors is appropriately

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summarised in the introduction. In this case, one should however remove the term "validation" from the title and replace it with something more appropriate (e.g. assessment, intercomparison with).

4) My last general criticism concerns the technical form on how the material is presented (see also my detailed remarks). I indeed wonder how the manuscript passed the technical review before being published in ACPD, the applied criteria were obviously not very stringent:

a) Many of the 27 figures are too small and hard or impossible to read, both in the electronic and printer-friendly pdf version. This needs to be improved. Examples for acceptable figure and font sizes are figures 1, 7, 13, 21-27, whilst other figures are not readable at all (multi-panel figures 3, 9, 10, 14, 15, 16, 17) or the chosen font sizes of axis labels and legends are simply too small (figures 2, 4, 5, 6, 8, 11, 12, 18, 19, 20).

b) The basic information provided for each of the individual validation instruments (sections 4 and 5) should (at least) include: measurement method, appropriate reference(s), typical values for precision, systematic uncertainties (and/or accuracy), vertical resolution and range, horizontal resolution and range (or coverage). The level of detail could be better balanced for the different validation instruments.

c) The results of the individual comparisons (Sections 4 and 5) are unfortunately not always appropriately described in the main text. As a basic rule, if a figure is presented, the major findings should also be quantitatively discussed in the manuscript text, otherwise the figure can simply be omitted. The information should be provided in a consistent way, for example by preferring pressure as vertical coordinate (figure 1 to be modified) and by providing preferably absolute differences (in ppbv or ppmv) in all individual comparison figures and in the main text, otherwise it is impossible to compare validation results obtained in the different parts of the manuscript.

Detailed technical remarks or suggestions:

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Shorter title? e.g. "Validation of version-4.61 methane and nitrous oxide profiles observed by MIPAS/Envisat", "Intercomparison of ... with ..."

Please use consistently either MIPAS-E or MIPAS, throughout the manuscript.

Table 1: remove ACE

Table 2: please indicate latitude-longitude range of flights

Table 3,4:

reformulate "the statistics for coincidences ... is added"

Period: "Whole"? Also indicate years (not only months)

Figures:

Check font sizes of labels and legends (see major remarks for a list).

Multi-panel figures (9, 10, 14-17) are in this form not adequate for publication and need to be improved in one way or another (e.g. showing only averages with standard deviation), or omitted.

Figure 1: pressure-scale?

Figures 15 and following: provide absolute differences rather than relative differences, for consistency with figures 1-14.

Figure captions:

"Validation ... of ..." -> "Comparison of ... with ..."

Explain all lines and symbols shown in a plot in the caption, in particular since all the plots in this manuscript are different. Confusing!

Fig.1: "... with twice the weight given to results from the polar winter case" cannot be understood. Please explain further.

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Fig.5: "...trajectory transported profiles for a larger statistics." ?

Fig.11: "validated" -> "compared"

Fig.13: What is the shaded area?

Fig.15: Describe error bars. "one"?

Fig.26: "red"?

Abstract

Suggest to start with "The present paper ..." and remove the first two sentences.

I8: MIPAS/Envisat

Acronyms need to be explained (e.g. "MIPAS")

Provide quantitative summary of results, not only for the lower stratosphere. Abstract should be self-standing (summarise most important information for data users).

Introduction:

18046

I14: "higher statistics"? Check this throughout the manuscript.

I18: "averaging kernels have to be used". Please explain in detail how this is done in this study!

I22: which "specific constraints"?

I24: "optimising the coincidence ... possibilities"? (rephrase)

I25: why "smaller vertical coverage"?

I29: "for some ... dataset" (to be corrected)

18047

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I19: "by Nett et al."

I25: the reader needs also to know what happened after October 2003, which data are available as version 4.61 and which data are validated in this paper. I would assume that a validation paper submitted in 2007 deals with the whole Envisat period (2002-2007).

18048

I5-9: explain "decontamination events"

I11 : "in the" -> "on the"

I16: "then" -> "before"

I18: temperature and pressure errors will typically lead to systematic errors and not only to random errors. Please correct or explain further.

I20: -> "is given in the covariance matrices" -> "can be found ..."

18049

I1: "using"

I3: define "SD" (or write standard deviation)

I12 "so" -> "and"

I14 explain further "... with twice the weight given to results from the polar winter case".

I21: when did the campaign take place?

I24: pressure preferred: check Fig.1. Describe rather what has been done in this paper, "preferred" doesn't seem to be the appropriate verb.

18050

I2: please explain in more detail how averaging kernels have been used in this paper,

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this is not so trivial and a typical source or error in intercomparison studies.

I5-6: please reformulate ("precision are given when smoothing is applied"?)

I7-8: expand on how trajectory calculations were used exactly (suggest to introduce short paragraph).

18051

I9: suggest to remove "a situation which ... (... below).".

I16: insert "from" before "Kiruna"

I19: "yields" -> "leads to"

I24-25: "A Tikhonov-Philips regularisation approach constrained with respect to the shape of an apriori profile was adapted". Needs to be explained or removed.

18052

I1: define "MIPAS-B proven micro-window" or reformulate

I3-6: check, rephrase?

I7-9: "Rec"?

I17-21: Besides that a quantitative description of the comparison results is missing, why isn't it possible that MIPAS-B is wrong at levels below 100hPa?

I27: "a larger statistics is achieved" (rephrase)

18053

I1-4: provide quantitative results as well

I9-10: -> "at mid-latitudes", "at high-latitudes"

I15: -> "the vertical resolution of"

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I17: and following: quantitative description of comparison results is missing

I26: "the tropics region", "the polar region"

18054

I1: "The origin of air masses ... is ... depending on latitude" remove "Then"

I18: remove "between"

I22: -> "in Fig. 7"

I25: discuss quantitative bias

18055

I13: indicate altitude of "float". Which altitudes were measured by "LPMA"?

18056

I10-13: describe results of comparison (quantitatively)

I14: remove "simultaneous" from section title

I15- : suggest to move this to the introduction and summarise main findings of previous intercomparison studies. See my general remark 2).

18057

I1, I23-29: the MLS N₂O validation paper of Lambert et al. has been published in 2007 in JGR, not in ACPD

18058

I9: The statement that retrieving vmr on tangent-altitudes makes regularisation unnecessary is certainly not generally correct, and the observed "zigzagging" suggests the opposite. Suggest to review and rephrase.

I18: again, no quantitative discussion of the results in this section

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I26: "the high degree of coincidence" ?

18059

I2: again, no quantitative discussion of the results in this section

I24: "The MIPAS off line ... considered." can be omitted

18060

I4: "in terms of" -> "for"

I14: agreement doesn't look good at mid-latitudes (?)

18061

I27: define or explain "the degrees of freedom for the signal"

18063

I6: describe applied smoothing procedure

I8: -> "column"

I12: "will be" -> "are"

I18: explain "random error covariance matrix of the differences MIPAS -FTIR"

18064

I1: "gives"

I11 and following: Figure 14 unreadable (too small). Are standard deviations shown?

I20-25: move to figure caption

18065

I6-8: Speculation! What about atmospheric variability, instrument noise, artefacts of smoothing procedure?

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I10: "same ones"

I28: "relaxed criteria"? Reduced time period?

18066

I5-8: I speculate that the nice agreement is obtained through the applied smoothing, whilst at Ny Alesund something else went wrong. Please check your algorithms.

18067

I2: "once another one"?

I8: "full stratospheric range"?

I9: suggest to remove this, not important for this paper, except that you used HALOE version 19 data for the comparisons

I13: "are" -> "is"

I13: for which HALOE data version are these accuracy and precision values?

18068

I4: Something is missing here? Results should be given quantitatively (also in ppmv, not only in %, for consistency).

I6: explain acronym

I13: Version 1.2 is obviously old! Other studies use version 2.1. This will probably change the results of this section, since work of Lambert et al. and Strong et al. indicate a better agreement compared to what was found in this manuscript.

I25-27: please explain in more detail how the systematic errors were treated, or rephrase

18069

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I8: "MRD"?

I13-15: on apriori contamination: speculation?

I20-23: on spectroscopy: speculation. Can this be verified?

18070:

I12: "Spacelab"? ATMOS was also flying on three ATLAS missions (instrument platform in the Space shuttle cargo bay). Please verify, the dates seem to confirm this.

I21: "Arctic"

I29: Might this be due to a problem in the applied trend correction or a bias in the ATMOS data?

18071:

I4: reformulate "providing a new consistency test" I4-18: suggest to check, rephrase this paragraph.

18072:

Generally I suggest strongly to summarise results in terms of both absolute and relative differences.

I3: "self consistency check of CH₄/N₂O correlation"? Rephrase

I7-11: indicate versions of satellite data

I18: "...demonstrate the impact of remaining oscillations." What do you mean with this statement?

I20: -> "balloon"

I23: -> "The general ..."

I20-25: Are results of this assessment consistent with the systematic error estimates

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(published elsewhere)?

18074:

A summary plot for the results obtained in the different sections of the paper is clearly missing. This would also simplify to summarize the results. Potential MIPAS data users would benefit a lot. Other general recommendations for MIPAS data users could be summarised here as well, for example considering the artefacts discussed in this section (and how to avoid them).

Acknowledgements: confusion between ACE team and Odin team?

Please check use of English language and style carefully (before submission).

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 18043, 2007.

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