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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Geophysical validation of MIPAS-ENVISAT operational ozone data" *by* U. Cortesi et al.

U. Cortesi et al.

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General comments

I have only a major remark concerning the relation between this paper and the paper entitled: "Bias determination and precision validation of ozone profiles from MIPAS Envisat retrieved with the IMK-IAA processor" also published in ACPD the 30/03/2007. Here a similar work has been done on MIPAS ozone products derived by a different level 2 processor; some common experiments are used for the comparisons in the two papers. This situation may confuse the MIPAS data users so that it would be desirable for the two studies to cross-compare their results and provide a synthesis of the outcomes. This task should not be tricky considering that four of the authors are common to the two papers.

ANSWER: The main focus of the ACP Special issue "MIPAS (Michelson Interferometer

for Passive Atmospheric Sounding): potential of the experiment, data processing and validation of results" is on the official products provided by the ESA operational processor, even though contributions describing the outcome of different level 2 processors might also be included.
We believe that by adding a synthesis of the outcomes from the comparison between MIPAS operational products and IMK-IAA data to the revised version of our paper would make it less coherent, without properly addressing the issue raised by the referee. To this purpose, a dedicated article or technical note, describing the differences between the ESA processor and other scientific codes for MIPAS level 2 data analysis, would be more effective and better serve the MIPAS data users. This comparison has already been done in the frame of the AMIL2DA project (see von Clarmann et al., J. Geophys. Res., 108, D23, 4746-4, 2003) using simulated spectra and should be repeated using real measurements.

Specific comments

Section 2: I understand that the authors have chosen to provide in this section a description of MIPAS limited to aspects that are functional to the understanding of their comparisons and of the paper text. If this is the case I feel the necessity to integrate this section by:

- shortly indicating the algorithm used for the data analysis (since the algorithm is often reported for the comparative measurements),
ANSWER: an indication of the algorithm adopted for MIPAS level-2 data analysis has been included at P. 5813, L. 14: "The data obtained during the instrument full spectral resolution mission, from 6 July 2002 to 26 March 2004, have been processed by using v4.61 and v4.62 of ESA level-1b and level-2 (based on an unconstrained non linear-least-square fit procedure) operational algorithms, as described in details in

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Kleinert et al. (2007) and in Raspollini et al. (2006) respectively, ..."

- defining the meaning of 'near real-time', 'off-line', v4.61, and v4.62,
ANSWER: we have defined the meaning of near real-time and off-line data, by writing at P. 5811 L. 22: "A first attempt was made there to achieve a quantitative evaluation of the quality of MIPAS near real-time (produced within three hours from the measurement time) and off-line (produced with a less stringent constraint for the processing time and using an extended retrieval range) O_3 data products". In section 2, we already described v4.61 and v4.62 as "two versions of ESA operational processor", clarifying that they are substantially equivalent for the purposes of MIPAS ozone validation (P. 5813 L. 19 and ff.).

- explaining the subdivision of MIPAS spectra in bands (A, AB, etc., that are reported in the text)
ANSWER: The sub-division of MIPAS spectra in bands is mentioned at the beginning of section 2 (P. 5812, L. 19) where we refer to (Fischer et al., 2007) for more details on the definition of the boundaries of each spectral bands. Following the suggestion of referee #2, we added the definition of band A and band AB, in parenthesis, at P.5813, L. 25 - "... in MIPAS band AB (1020-1170 cm^{-1})" - and P.5813, L.. 27- "... in MIPAS band A (685-970 cm^{-1})".

P. 5814, L. 1: "the root-mean-square of the diagonal elements of the error variance covariance matrix". Do the authors mean 'the square root of the diagonal elements of the variance-covariance matrix of the profile'? If not they should better explain this sentence.
ANSWER: Yes, corrected "root-mean-square" to "square root" .

P. 5814, L. 3: "climatological estimates". A reference would be wise for these data.
ANSWER: Added reference to (Dudhia et al., 2002).

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P. 5815, L. 10: "Profiles measured at much higher vertical resolution than that of MIPAS were convolved with the averaging kernels and a priori profiles associated with the MIPAS retrievals". I agree with the convolution with the AK but the authors should clarify what they mean for "convolution with the a priori profiles".
ANSWER: we modified the sentence by writing: "With the objective to reduce systematic and random comparison errors associated with the MIPAS vertical smoothing error, correlative profiles measured at much higher vertical resolution than that of MIPAS were transformed using the method described in sub-section 4.1.1, which uses both the averaging kernels and the a priori profiles associated with the MIPAS retrievals".

P. 5823 L. 20: "At Antarctic stations results can be separated between ozone hole (21 August to 15 October) and normal ozone periods (16 October to 20 August)". It is known that the ozone hole phenomenon starts in coincidence with the spring equinox, the 21 September, and extends up to about mid November. Why do the authors anticipate by one month? Which dates have been actually considered for this comparison?
ANSWER: The time periods have been empirically determined from the ozone comparison time series, at the considered stations and for 2003 only. However, we agree that the sentence cited by referee #2 could be misleading and replaced it by "At Antarctic stations results can be separated between *ozone hole* (that is, for 2003, 21 August to 15 October) and *normal ozone* periods (that is, for 2003, 16 October to 20 August)".

P. 5836, L. 6: Table 4 has no columns reporting the quantity SIGMAbj,tot.
ANSWER: Corrected by modifying the text, that is now consistent with the contents of Table 4.

P. 5853, L. 11: "and to the climatological estimate of systematic errors". There are systematic error sources that do not depend from climatology (e.g. calibrations,

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instrument function?). Are they considered?
ANSWER: Yes, they are considered. We replaced "climatological" with "a priori" throughout the text, to be more comprehensive and indicate all the uncertainties of the forward model (estimated a priori by University of Oxford and including uncertainties associated to instrument characterization, to input parameters of the radiative transfer, as well as to approximations in the forward model itself).

P. 5858, L. 16: "The retrieval algorithm is based on the Optimal Estimation Method using statistical a priori knowledge of the retrieved parameters for regularisation". Optimal estimation and regularization are two different exploitations of the a priori information. The authors should clarify what actually is the case.
ANSWER: The statement is, in fact, misleading. ODIN-SMR uses Optimal Estimation. We corrected the statement, by simply writing: "The retrieval algorithm is based on the Optimal Estimation Method".

P. 5858, L. 28: "Only good quality ODIN-SMR profiles have been selected and a measurement response larger than 0.75 has been used". The authors should better define the "measurement response"; Is it a measure of the information content of the observations in the results provided by optimal estimation?
ANSWER: definition of measurement response added: "... and a measurement response (defined by Urban et al. (2005) as the sum of the averaging kernel functions at a given altitude and providing an estimate of the relative contribution to the information coming from the measurements and from the a priori) larger than 0.75 ... ".

P. 5863, L. 3: "convolution id". The authors should specify what is this flag.
ANSWER: This is a typo error. We changed "(a) convolution id and retrieval success flags are equal to 0.0;" to "(a) Only profiles corresponding to successful retrieval flags were selected".

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Technical corrections

P. 5808, L.2 and throughout the text "collocated measurements". I suggest to use "colocated measurements".
ANSWER: The use of "collocate" seems to be more appropriate for the meaning of "to occur in conjunction with something" (see, for instance, Merriam-Webster on-line).

P. 5810, L. 2: I suggest to move the reference "Fischer and Oelhaf, 1996" on the previous line after MIPAS otherwise it seems to be referred to ENVISAT.
ANSWER: corrected.

P. 5810, L. 4: "Fischer et al., 1990" is not present in the references section.
ANSWER: corrected by changing (Fischer et al., 1990) to (Fischer et al., 2000).

P. 5810, L. 18: "Upper Troposphere and Lower Stratosphere" should have capital initials in analogy with the acronyms expanded in other parts of the text.
ANSWER: corrected by adding the acronym at the first occurrence in the text.

P. 5810, L. 26: "Non Local Thermal Equilibrium" idem.
ANSWER: corrected, as above.

P. 5811, L. 17 and below: "Commissioning Phase", "Main Validation Phase", "Long-term Validation Programme"; there is no reason for using capital initials.
ANSWER: corrected.

P. 5812, L. 20: "about 800 km" instead of "800 km".
ANSWER: corrected.

P. 5813, L. 11: "Interferometric Drive Unit"; there is no reason for using capital initials.
ANSWER: corrected to "interferometric drive unit".

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P. 5816, L. 13: "depends on" instead of "depends of".
ANSWER: corrected.

P. 5817, L. 22: different fonts are used to represent matrices AK and W in this equation.
ANSWER: corrected.

P. 5827, L. 12: a blanc should be inserted between "guidelines." and "In".
ANSWER: corrected.

P. 5833, L. 4: delete "." after "(2007)".
ANSWER: deleted.

P. 5849, L. 6: "lower than MIPAS" instead of "lower MIPAS".
ANSWER: corrected.

P. 5860, L. 26: I suggest to delete "variability".
ANSWER: deleted.

P. 5861, L. 2: "squares" instead of "square".
ANSWER: corrected.

P. 5863, L. 27: "Table 8" instead of "Table 9".
ANSWER: corrected.

P. 5865, L. 15: "Borchi (Borchi and Pommereau, 2006)" instead of "Borchi Borchi and Pommereau (2006)".
ANSWER: corrected.

P. 5867, L. 10: delete "." after "profile".
ANSWER: deleted.

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P. 5867, L. 25: "Eq. (19)" instead of "Eq. (12)".
ANSWER: corrected.

P. 5867, L. 27: "SIGMAsys" should be "Ssys".
ANSWER: corrected.

P. 5878. L. 18: "with ground" instead of "withground".
ANSWER: corrected.

P. 5924. Fig. 19 caption: "mean relative" instead of "meanrelative".
ANSWER: corrected.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 5805, 2007.

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