

Interactive comment on “Precision validation of MIPAS-Envisat products” by C. Piccolo and A. Dudhia

Anonymous Referee #3

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This paper investigates the seasonal, latitude and temperature variation of the precision of MIPAS retrieved profiles and validates it with a self-consistent method that compares the precision itself with the standard deviation between MIPAS retrieved profiles co-located within 300 km in horizontal distance with a time difference less than 6 or 12 h according to the latitude. This study surely helps to better characterise the MIPAS products and provides very useful information for the validation of the MIPAS products with correlative measurements. The paper is well written, but I think that some clarifications and corrections would make the reading easier (see specific comments below).

Specific comments

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Pag. 913, line 2. 'It is capable of measuring ... and complete global coverage is obtained in 24 h'. I would write 'nearly complete global coverage is obtained in 72 h'.

Pag. 914, line 5. 'Assuming that the radiance is proportional to the product of the Planck function and the VMR, then the precision (in ppmv)....., but should be independent of the VMR of the gas.' I would first write that precision varies with the inverse of the signal to noise ratio of the measurement and I would also explain why the dependence on VMR can be disregarded, since it is not evident from the text. Furthermore, the acronym VMR should be defined.

Pag. 914, line 23. Fig.3. In both the text and the caption it is written that Fig. 3 reports the MIPAS retrieved temperature, but it seems that it reports the precision on temperature (see label in the figure and the fact that in Arctic region in December 2003 curves of Fig.3 have a dip, not a peak as expected in case of a stratospheric warming).

Pag. 915, line 6 The sentence 'the NESR is ... also slightly dependent on the atmospheric signal (larger radiance also implies larger NESR)' should be better explained. Is it a general statement for the MIPAS instrument (in this case a reference is needed) or the evidence comes only from Fig. 4? In Fig. 4 the contribution to the noise variation due to changes in the gain (for ice contamination) and to signal variation (for changing atmosphere) are mixed together. Could dependence of NESR on the signal (that does not mean only temperature) be better visible, and independent on the gain variation, comparing the NESR at different tangent altitudes for the same limb sequence?

Pag. 915, line 15 This +/-20 % noise variation is attributed, in this Section, to seasonally signal variation, while it is attributed, in the Conclusions of the paper, to gain variation. Probably a clarification is needed. It is also said that the 'former effect', i.e. the seasonal noise variations, dominates, and 'higher temperatures result in more precise retrievals': I think that 'former' should be replaced by 'latter'.

Pag. 916, line 6. As far as I know, the original criteria adopted for the validation of MIPAS products are 300 km in horizontal distance and 3 hours in time difference. I

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understand that the need of having a sufficient number of samples (whose value could also be of interest for the reader) for a statistically significant validation of precision is a sufficient reason for extending these criteria, but probably this should be written.

Pag. 916, line 9. 'For every tangent point in every pair of profiles, the difference $z=x_1-x_2$...' I would write that x_1 and x_2 represent either temperature or VMR of the target species.

Pag. 916, Eq. (2). Since the VMR is assumed in MIPAS retrieval to vary linearly with altitude, in my opinion it would be better to perform a linear interpolation in $\ln(p)$.

Pag. 918, line 2.'...pT propagation error contributes up to an additional 10% random variability, depending on the species' Is this maximum additional 10% random variability due to pT error propagation coherent with the a-priori estimation or not? This piece of information could help the interpretation of results found in the frame of the validation of MIPAS products with correlative measurements, for which, I think, a-priori estimation of pT error propagation have been generally used.

Pag. 919, line 15. I think that also the effect of non-detected clouds in the line of sight should be included in the list of possible pseudo-random error.

Technical corrections

Pag. 915, line 24. Please define the acronym SD the first time it is used

Pag. 918, line 9. 'Figure 6 shows an example of the comparison ...' Please add that this example refers to 30 July 2003 in Artic summer.

Caption of Fig. 4. I would add 'for Southern and Northern latitudes' after the parenthesis where MIPAS spectral bands are listed.

Caption of Fig. 7. Definition of acronym SD can be deleted here.

Caption of Fig. 8. 'Averging' should be 'averaging'.

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