

## ***Interactive comment on “Errors induced by different approximations in handling horizontal atmospheric inhomogeneities in MIPAS/ENVISAT retrievals thinsp;” by Elisa Castelli et al.***

### **Anonymous Referee #3**

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Review of “Errors induced by different approximations in handling atmospheric inhomogeneities in MIPAS/ENVISAT retrievals” by Castelli et al.

This paper provides simulated results that describe the need for a two-dimensional retrieval approach to infer vertical information from MIPAS limb emission measurements. The authors simulate measurements and perform a variety of different retrievals in an attempt to quantify the errors induced by an assumption of horizontal homogeneity within the retrieval scheme. The simulations are by no means comprehensive but the reader is left with the impression that any retrieval scheme that uses two-dimensional information is less likely to produce artefacts related to atmospheric structure along the satellite track. This is of course by no means a surprising result. Although this paper

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provides no real information it is another work that supports the hypotheses that in order to accurately retrieve atmospheric composition information from limb measurements, a set of dense observations and a multi-dimensional retrieval are required.

#### Major Comments:

I found the paper to be well written and the information that was presented was done so in an organized and easily understood manner.

It is very unclear to me what I am supposed to have learned from reading this paper. The limited number of simulations performed do not allow me to quantify the typical error associated with MIPAS retrieved results. They may give me a feel for the seasonal dependence of certain errors and where in the vertical profiles these errors may occur, but I struggle to believe the errors have been “quantified” in any meaningful way.

I think the main take home message of the paper is that to accurately retrieve information from the vertical profiles of limb emissions a two-dimensional scheme is required. This is well known. The paper is a report of some work but it’s use for the interpretation of MIPAS data is not clear. I would really like the authors to improve their discussion related to how their results guide the reader to better interpret artefacts within the standard MIPAS data products.

#### Comments and concerns

(page 2-line 7) it is stated that the MIPAS observations are exploited. This work is entirely simulation so I don’t see any exploitation of the MIPAS data.

(page 2-line 29) I think the authors should spend some more time justifying the statement that a 1.4 degree model is highly resolved. How does this resolution relate to MIPAS sampling resolution? The paper should do a better job of demonstrating the forward model of the radiance measurements is sufficient to accurately simulate realistic MIPAS measurements. I think the paper is trying to tell me that MIPAS 1-D retrievals have errors so the forward model must be justified as an accurate representation of MI-

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PAS measurements in order for me to interpret the two-dimensional results.

(page 3-line20) Is a four day and only eight orbit set of observations sufficient to quantify the errors in the one-dimensional approach? I believe that some specific errors have been quantified but I need more information to know that “the errors” have been quantified. Once again for this paper to be useful it must tell a complete MIPAS related story.

### Summary

I found the paper to be well written but without much value in its current state. The results presented need to be linked more to the MIPAS measurements in order for them to be of value. It is very well known that two-dimensional retrievals do a better job of retrieving two-dimensional structure and without a more comprehensive link to the MIPAS data set this paper simply reiterates this well known fact. If the authors attempt to link their simulated results to the existing MIPAS data sets in a more realistic fashion I will be happy to look at the paper again.

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