Atmospheric Measurement Techniques Discussions

Interactive comment on "Position error in profiles retrieved from MIPAS observations with a 1-D algorithm" *by* M. Carlotti et al.

Anonymous Referee #2

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This paper provides a useful discussion of what the authors term 'position errors' when using 1D retrievals from limb-sounding instruments such as MIPAS, and the impact of temperature position errors on the trace gas retrievals. However, I found it a little confusing in places, and would recommend some changes before publication.

The concept of 'position error' itself (section 3), has been discussed previously e.g. in von Clarman, 2009, and although this paper applies a different technique it does follow many of the same processes. This is acknowledged and addressed somewhat in Section 5.3; however it would be clearer if this discussion were to be included within Section 3 itself. As the most novel results of this paper concern the impact of the temperature position error on trace gas retrievals I would suggest changing the title of

the paper to reflect this.

Additionally, in sections 4 and 5, the effect of temperature position errors in an inhomogeneous atmosphere was discussed and compared to a 'total' error due to horizontal inhomogeneity. However, it was confusing, and somewhat contradictory at times as to what this 'total' error included; is it the effect of horizontal inhomogeneity in both temperature and trace gases, or is it solely inhomogeneity in temperature that is considered (i.e. position error compared to other sources of error such as the spread of information). For example, while the last sentence in section 4.1 talks about 'the total error expected as a consequence of not modelling the horizontal variability of T in 1-D retrievals', in Section 4.2 the description states that it is horizontal inhomogeneity in both T and VMR's.

As this difference would affect the whole meaning of the paper it needs to be made clearer. In particular, it is concluded that the 1-D retrieval determines an "effective" temperature profile that simulates the effect induced by horizontal variability on the observed spectra. If only temperature inhomogeneities are being considered, and significant errors still remain, can this conclusion be supported? However, if both temperature and vmr inhomogeneities have been considered, it would be instructive to also show how much of the remaining error in figures 8 and 9 are due to other errors due to temperature and how much due to vmr inhomogeneity errors.

Scientific comments:

- In both the abstract and conclusions it is stated that the authors have shown that the information load analysis provides a tool for the selection of observations that minimize the position error of the retrieved profile. This did not seem to be discussed anywhere in the actual text though. These claims should either be removed, or actually proved in the main paper.

- The first part of the paper defines position error to be compared to the average position of the tangent points of all the scans in a set of measurements. However, in

the latter portion of the paper, the tangent point of each scan separately is the more relevant quantity. Why is this not considered instead in the definition of position error?

- The position error is defined with respect to the median of the IL analysis. However, as is acknowledged, this definition breaks down at some altitudes. It would be useful to have indications on the plots or in the texts as to which altitude ranges we can use 'position error' as a sensible concept.

- The simulations and conclusions have only been drawn on the basis of the operational MIPAS microwindows. However, I believe that these microwindows have already been selected to minimise the impact of horizontal gradients? If other spectral regions were to be used would the conclusions drawn in the paper be affected?

- In Section 5.3, it is stated that the advantage of the IL analysis over 2D averaging kernels is that it is a property of the observations rather than the retrieval. However, given the variability of position error around the orbit and the dependence on the temperature gradient, is there a practical way of using the IL analysis without first retrieving the temperature distribution?

- Figures 1, 3 and 11 are somewhat confusing, particularly the fact that the atmosphere is plotted upside down with the surface at the top. It would be clearer plotted the other way up, but at the very least there should be clearer labelling of altitudes on the plots. They would also benefit from having the position of the satellite indicated.

- section2: Since ENVISAT is no longer operating, this paragraph could be updated slightly

- p6537, line 25-26. 'e.g. the cross-section of the analysed transitions' – this is not mentioned in the text only in the conclusion. It would be helpful to add this part to section 5.2

Technical comments:

- p.6521, References in lines 12 + 13. As there are lots of different retrieval techniques

/ papers it would be better to have these as examples

- The English in the paper would benefit from further checking. While generally ok and always understandable, there are a lot of minor errors.

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 6519, 2012.