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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Envisat MIPAS measurements of CFC-11: retrieval, validation, and climatology" *by* L. Hoffmann et al.

Anonymous Referee #2

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General comments

The paper reports the assessment of CFC-11 abundancies in the stratosphere obtained using MIPAS observations in the first two years of operation. The retrieval of CFC-11 abundancies from the measured radiances is obtained using an approximated and fast forward model. Even if yet limited to the two year for which consolidated MIPAS data are available, the analysis provides detailed information on the climatology of this constituent as well as on its time and space variability. This new climatology, that is particularly valuable because of the role that this constituent can have for both ozone recovery and the green house effect, is made available to the scientific community as an electronic supplement to the paper. The paper is clearly written and, apart the few specific issues discussed below, contains exhaustive information about the measure-

ments and the performed analysis. The approximations of the forward model have been validated through comparison with line-by-line calculations and independent retrieval codes. In situ measurements have been used for the validation Also considering the scientific interest of the results I recommend the paper for publication in ACP with minor modifications.

Specific comments

Pag. 4566, lines 7-22. This discussion of the spectral signatures of CFC-11 is what I expect for a radiometric measurement. It is instead made after the description of the spectroscopic measurement made by MIPAS and before the discussion of the retrieval approach. It is, therefore, difficult to understand the meaning of the quoted interferences. Please consider moving this discussion after Fig.2, as a comment made in the light of the fact that the retrieval uses the approach adopted for radiometric measurements (see next comment).

In Sect. 3.2 it is stated that “JURASSIC computes the radiative transfer based on the band transmittance approximation”. For further details a few references are given. However, it would help the reader if a clarification is made here on whether the mean values calculated by the forward model are those of the spectral elements measured by MIPAS or those of the spectral interval used for the retrieval. The latter seams to be the case, but several points are affected by this uncertainty.

In Fig. 2 the quantity “radiance (844.275 to 850.575 cm-1)” could more precisely be qualified as “average radiance of band 844.275-850.575 cm-1”.

Pag. 4573. Discussion about the chi-square-test. I do not agree with this discussion. It is stated that the chi-square-test should provide values around one, however in fig. 6 values that are much smaller than one are shown without a comment. The normalisation is usually made dividing the chi-square by m-n (the measurements minus the unknowns). For a radiometric retrieval where, most probably, n=m this operation is

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impossible. Some clarification must be provided in order to understand this unusual chi-square-test.

Sect 4.2. I am surprised by the very small differences between the “radiometric” retrieval and the “spectroscopic” retrievals. This suggests that the two retrieval approaches not only obtain consistent results, but, most probably, also have the same retrieval error. This is not in agreement with my understanding that the spectral resolution of MIPAS was motivated by the need of reducing the retrieval errors. Could the authors comment on this? Has this something to do with the statement at pag 4575, line 10: “common retrieval approaches” which probably should read “common systematic errors” ?

Technical corrections

pag. 4564, line 14: “the the” pag 4566 last sentence. I expect larger signals, and therefore larger S/N at low altitudes. In Fig.s 3 and 4 the EGA method is not defined.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 4561, 2008.