**Atmospheric
Chemistry
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Discussions

Interactive comment on "Reassessment of MIPAS age of air trends and variability" *by* F. J. Haenel et al.

Anonymous Referee #3

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The paper presents an improved data set of SF6 retrieved from MIPAS measurements, and the derived AoA data set. The results are well presented and the paper is well written. I only have a few minor comments and can recommend the paper for publication.

General comment:

My only significant objection concerns the presentation of AoA trends: I strongly advise the authors to only show the "model-error corrected" trend, as presented in Sec. 5.4. I don't see a reason to first show the uncorrected version of the trend, and I would fear that as it is now, it will mostly be referred to Fig. 9, where the significance is strongly overestimated. If there is a good reason for showing the "uncorrected" version as well, please state so, but also in this case I would advise to first show the corrected version

and later the uncorrected one.

Another general comment is the question, whether the "overaging" by the SF6 sink in the mesosphere could influence trends, in particular the strong positive trends in the SH polar region. A very valuable addition to the paper (that answers this question) would be to show, next to the trend in KASIMA AoA derived from SF6, the trend in an idealized AoA tracer (i.e. no sinks, perfect linear increase). This would allow to better evaluate how strongly and in which region the SF6 sink (and possible artefacts due to the non-linearity) influence the trends.

Specific comments:

- page 14687, line ~8: the BDC is not only the residual circulation, but is the mean transport circulation through the middle atmosphere. (I.e. it also includes mixing effects, diffusion, as you state later).

- page 14690, line 12: Why is the new ESA version of the data they superior? Include a reference?

- Section 3.5 / Figure 2: Is Fig.2 a good example of how the residual was reduced? I.e. is it typical for other heights / regions / times? Is the RMS given in line 1, page 14696 the one for this example or for all data? If the former is true, it could be worth mentioning the improvement for all data, and possibly the improvement as function of region (height, latitudes) ?

- page 14696, line 25; This information would be appropriate already in Sec. 3. What does "4-6 in 20 km" refer to?

- page 14699, line 26: "maybe"? -> "only slightly... " (if it's true, otherwise delete).

- Section 5: Is there a reason you do not allow for seasonal variation in the regression coefficients for QBO and the trend (via a Fourier Expansion of those coefficients, as you include for the mean annual cycle (c_n and d_n)) ? Please comment.

- page 14702 top / Fig. 8: I would move the discussion of Fig. 8 to page 14701, line 20 (i.e. before Sec. 5.1), as it is relevant for the whole regression fit rather than a specific topic for the trend.

- page 14709, line 15: the region of the "negative tongues" in KASIMA AoA are not significant in MIPAS trends (and only in the SH in KASIMA) - So there is no actual disagreement, is there?

- page 14711, line 14: Another important conclusion is that the ERA-Interim data, used to nudge KASIMA, apparently are able to reproduce the observed transport trend, which validates their usage for studies of (even trends in) the BDC.

Technical/ Language suggestions:

- page 14695, line 2: "improve retrievals..." (remove first "other")

- page 14698, line 10: change sentence to: "Stiller et al. (2012) estimated the global effect of overaging to about .... for the Northern Hemisphere."

- page 14699, line 22: (their Fig. 4) (Add "their" to avoid confusion).

- Fig.1: labels are too small, and colors of individual lines are hard to distinguish.

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