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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Global carbonyl sulfide (OCS) measured by MIPAS/Envisat during 2002–2012" *by* Norbert Glatthor et al.

Anonymous Referee #1

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1 General Comments

The subject of the paper is validation and interpretation of a satellite data set of OCS useful for several applications in the fields covered by ACP. There are already several short papers around where this dataset was introduced, but nevertheless, the actual manuscript gives new views and is worth to be published. A very interesting aspect for users are the details on the consequences of averaging kernels used for retrieval. For example it is possible to reproduce "observed" negative mixing ratios with models if the model results are convolved with the averaging kernels.

Please give less focus to the uncertain uppermost levels.

2 Specific Comments

In the abstract a sentence on the model simulations is missing.

In the introduction on page 3, line 10 also the recent data by NOAA available on the internet should be mentioned since they are obviously used in Figure 7.

Near the end of section 2.2 it should be explicitly said that the averaging kernels cause a significant high bias in the layers above about 30km.

It might be dangerous to interprete the sparse data in the upper troposphere in the tropics in detail because of possible biases due to longitudinal features like for example more clouds above the West Pacific warmpool (sections 4.1 and 4.2.2., first paragraphs). Please add more information here.

The Montzka data cited at the beginning of section 4.2.1 do not represent a zonal mean in Northern midlatitudes, but are low biased because most stations are located near the Eastcoast, where the influence of the uptake by vegetation and soil is strongest because of the prevailing winds.

Please cite the comparison of the OCS data with EMAC in a different setup in Brühl et al (2015, J. Geophys. Res. Atmos. 120, 2103) in section 4.2.2 (third paragraph). Does the version in the manuscript contain a flux boundary condition for OCS? Please reformulate paragraph 4 of section 4.2.2: There is no stronger upwelling in the MIPAS data compared to the model, this is just an artifact introduced by the averaging kernels as demonstrated by the third column of Figure 8. Here it is nice to see that the convolution with the model results even reproduces the negatives. This figure is a very valuable contribution for modelers using satellite data.

For comparison with MIPAS is would be more useful to keep the mountain stations and give the 3 Eastcoast stations a lower weight by just using their average. These numbers should be given in addition in the text of section 4.2.3.

The seasonal cycle of OCS observed by MIPAS in Figure 9 (section 4.2.4) in high and midlatitudes is influenced by the polar vortices which should be mentioned. In the Southern hemisphere this effect might by reduced by a sampling artifact in MIPAS data because vortex airmasses have PSCs and therefore data gaps. It would be useful to add two frames in Figure 9 with corresponding model results to disentangle dynamical and surface effects.

Section 4.3.2 should be shortened. It is not necessary to use 2 figures and a table to demonstrate that there is no correlation, at least Figure 11 is superfluous in the main text (skip and replace by a sentence or move to a supplement).

Please improve text at the beginning of section 4.3.3. Isn't that tongue due to the Northern part of the AMA circulation?

The discontinuity at the time of the switch between the data versions should be addressed in the text of section 4.4 or the caption of Figure 13. A continuous line would be not in contradiction to the Montzka data and better fit the Jungfraujoch data. Does the analysis in Figure 14 also include the jump in 2004? Figure 14 points to a kind of redistribution or an oscillation of circulation patterns. Please skip the sentences on the insignificant and uncertain upper layers.

3 Technical Corrections

The ticks on the time axis in Figure 5 should be thicker and longer.

Include "i.e. on mountains" in caption of Figure 7.

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