Author comments

All comments by the anonymous Referee are in black, while the Author's responses are in blue.

Anonymous referee #2

General comments

Introducing more MIPAS data improved the paper a lot. There are still issues with wrong units in figures and not shown data.

Specific comments (line numbers refer to the revised version with tracked changes)

Line 140: Indicate selected time period also here.

The information has now been added, we repeat the boundary conditions of the year 2000.

Line 247/257/262: Timmreck et al. (2018) has the BG(-QBO)-experiment which should be used here, REF refers to a subset of Eyring et al. (2013) in Timmreck et al. (2018). Here the old version was more consistent, please correct, remove at least the reference when you refer to REF defined at the beginning of section 2.1.

The sentence has now been changed as follows: The first GA4-UM-UKCA (hereafter UM-UKCA) simulation submitted for the ISA-MIOP BG_QBO (here called REF) experiment (Timmreck et al., 2018) [...]

Line 381: "tend to overestimate" (?)

Corrected

Figure A1: I wonder why in NAT typical outgassing (degassing) volcanoes in the Andes, Vanuatu, Papua, Hawaii, Japan, Italy etc. are not visible but sources related to forest fires and fossil fuels. The degassing volcanoes are in the references in the main text (section 2.1). Please check if they are not considered in Fig. A1 in contrast to the caption. Maybe a third frame for the volcanoes is necessary.

Although volcanic outgassing was considered in the simulation, these emissions were not included in the previous figure. This has now been corrected. Additionally, we now provide all emissions separately, similar to Dentener et al. (2006)

The units appear to be wrong, isn't it per year as in Fig. A2? Then it differs from the corresponding Fig.4 in Dentener et al. (2006) by about 8 orders of magnitude. Or should it be per second to be consistent with the latter and the integral in section 3.1.1? Please check and correct. Maybe a log-scale is needed, also because in frame b most data are out of scale. Figure A2: Units wrong? A flux is usually per area and time unit.

The units in Figures A1 and A2 have now been corrected. Both were indeed in [s-1] and have now been converted to kg(S)/m2/s to be consistent with the other figures.

Figure A3: A row of panels with the bias between multi-model seasonal means and the seasonal averages of ERA-I (or ERA-5) for the years with the 'background' SAGE data used in Fig.5 would be useful. Here no detrending is needed, just take the averages over the used years as obviously done for the tropopause in Fig. A5. This is important additional information. Add at least some text on this.

We have now changed Figure A3 from a comparison to MMM to ERA-I, since the MMM is biased by outliers, which masks more subtle differences among models.

Technical corrections

Fig.1: The font size is still too small, especially for a lot of numbers.

The figure in question is now turned sideways.

Fig.3: Use superscripts for exponents in caption.

Corrected

Line 912: Letter missing in journal abbreviation

The “Soc.” was added

Line 1006: Is there an abbreviation?

The journal name has been changed to J. Meteor. Soc. Japan.