

Interactive comment on “Ozone database in support of CMIP5 simulations: results and corresponding radiative forcing” by I. Cionni et al.

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We thank the reviewer for the constructive comments. The reviewer has pointed out several suggestions for improving the paper. We have considered carefully each of the comments and have modified the text accordingly. Detailed answers to the reviewer's comments are given below

The paper describes at length the construction and evaluation of a new ozone dataset to be used in support of GCMs, which do not incorporate interactive ozone, taking part in CMIP5. The paper represents an important citable document for modelling groups. With due consideration to my points below, I recommend publication.

Comments: (137-140) I am confused by the latter part of this sentence, "...while the

C9026

NASA-GISS model performed snapshots every 20 years from 1850-1930 and every 10 years there- after, with data taken from the last 6 years of an 8 year simulation". Can you please clarify?

This has been reworded for clarity: 'The simulation from CAM3.5 was a transient simulation from 1850 to 2005 (after a 10-year spin-up at 1850) while the GISS-PUCCINI model performed time-slice experiments every 20 years between 1850 and 1930 and every 10 years thereafter. Each time-slice experiment was run for eight years with two years spin-up, so that the last six years of each simulation are used to calculate the climatological mean for the corresponding decade.'

(151) Remove definition: EESC was defined earlier in the text.

Corrected

(151-152) The historical ozone data does not include a solar cycle poleward of about 50S/N. As the ozone is largely built from a regression model, couldn't one put a representative solar cycle at high latitudes? This has been noticed by a number of modelling groups using the new dataset and has prompted updates to the dataset, from these groups.

The ozone data at polar latitudes originate from ozonesondes at a few stations, to complement the satellite data over 50 S/N. Our experience is that including a solar proxy to the regression fit for the polar ozonesonde data resulted in unrealistic behaviour, in terms of amplitude and vertical structure; this results from the high level of interannual variability inherent to polar regions (accentuated with limited ozonesonde sampling), and the overall short length of the record (25 years) compared to the solar cycle. Rather than include this unrealistic behaviour (and introduce a strong discontinuity with the satellite results), we chose to not include the solar component for the polar regions. This is discussed in further detail in Randel and Wu (2007).

(174) What is meant by CCSM3 commitment here?

C9027

This has been clarified in the text: in the commitment simulation concentrations of all atmospheric constituents were held fixed at year 2000 values.

(176) Replace "nitrogen oxide" with "nitrous oxide".

Changed as suggested

(179) The CO levels vary by 100%, with sizeable differences in NO_x and VOC during 2000-2100. So perhaps the sentence including the words, "somewhat similar" should be reworded.

Reworded.

(190-191) N₂O range appears to be around 345-435 ppm.

Corrected.

(196) Suggest replacing "computational" with "height/pressure". And perhaps "cited literature" -> "references cited"

Corrected

(202-204) It seems odd not to prescribe a representative solar cycle for the future ozone. At a stroke this sets apart the historical database from the future one; precluding a number of DA studies which could be done. It is known to this reviewer that a number of groups have included a solar modification to the new SPARC ozone data, and in fact an update is referred to on the CMIP5 webpages describing the SPARC ozone. Although having now read your conclusion, you do comment on this.

Discussion in summary section has been extended: Since the REF-B2 simulations do not include the solar cycle, unlike in the historical segment of the database (1850-2009) the ozone database in the future does not represent solar cycle variations. The ozone database here is provided without solar cycle in the future, since the climate model groups might want to use the future solar irradiance that is consistent with the one used in the climate model simulations. A regression of the solar signal similar to that in

C9028

the historical part can be applied in case the representation of the solar forcing in the future ozone database should be maintained. Extended datasets with the solar cycle added in the future are available on the PCMDI website.

(209, 211) Suggest writing "linear re-gridding" on line 209 and removing the sentence starting "The interpolation to a common..." on line 211.

Done

(222-225) How much does the vertical interpolation affect total column ozone values? Does the residual vary much with latitude? SH high latitudes?

We calculate the residual for each model. The values are always lower than 3 DU. The residual doesn't vary too much with the latitude, the percentage change (residual/original value) is always around 1%.

(233-236) Is there a known reason (cited reference) why the CCMVal-2 multi-model mean historical trend is so much less than those observed for 35N-60N, 50hPa?

A reference to the Austin et al. (2010) paper and the SPARC CCMVal report has been added.

(304) "...an historical..."

'A historical' kept

(333) Trend similar to 500hPa (figure 3), with the exception of Antarctic trends.

'With the exception of Antarctic trends...' added.

(333-336) Figure 7 includes 10 panels and is described in two sentences. Should this figure really be included here, or should it be included as supplementary material?

We would like to keep the figure in the main paper, since it displays important information.

(342) I would state the relative maximum between South America and Africa is seen,

C9029

but I would refrain from saying it is well reproduced.

We have removed 'well' before 'reproduced'.

(346) Please define "STE".

Done

(348-365) I would move this paragraph to where figure 6 is described; it is out of place as it currently reads. *We have moved this discussion to the section on total column ozone as suggested.*

(368-369) Panel dates are inconsistent compared to figure caption. Possibly caption is correct. (Figure 10) Perhaps label "a" and "b" to be consistent with main text. Also, how reliable are the data >42km, especially in panel a. Presumably, these are insitu measurements taken from balloons, so it is not evident how these measurements could have been made (especially during the SH winter). Please explain.

(a) and (b) has been added to the plot, so that now the main text is consistent with the figure. Over polar regions the trend results are based on ozonesondes up to 27 km; above this altitude the trends are based on extrapolation of the satellite results at 50 S/N. This is explained in more detail in Randel and Wu (2007).

(408) remove "upwards".

Done

(Figure 11) Blue dots are difficult to make out.

Figure has been revised.

(437) typo: "Edwards and Slango"

Corrected

(501) typo: "ozone"

C9030

Corrected

(figure 1 caption) a number of errors appear in the caption with regards labelling and text. Suggest letter labels on panels, correcting letter ordering and removing "in addition" from text. "Additionally, the GHG scenarios are shown for the...". Note that (d-f) does not include SRES A1B and (c) does not include RCP4.5 N2O.

Done

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 10875, 2011.

C9031