Atmospheric
Chemistry
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Discussions

ACPD

Interactive
comment

Interactive comment on "Quantifying uncertainty from aerosol and atmospheric parameters and their impact on climate sensitivity" *by* Christopher G. Fletcher et al.

Anonymous Referee #2

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The study by Fletcher et al. provides an assessment of the role of compensation between uncertainties in aerosol forcing and atmospheric parameters, and their impact on climate sensitivity. From their analyses they conclude that structural uncertainties have a higher contribution to uncertainty in climate sensitivity than parametric uncertainties. This is a really interesting study. However, since the result presented are quite complex I have among others some suggestions on the presentation of the results that should be considered before publication in ACP.

General comments:
(1) I can follow your reasoning why you perform your analyses with such a coarse

resolution. However, I am not so convinced that it does not have any influence on your results. If you use a coarse resolution gases as well as aerosols will probably not as accurately simulated than using a higher resolution and thus I would expect an effect on radiative forcing. Can't you do a simple test? For example you could use the combination of the input parameters where you found in your analyses the highest uncertainty and repeat the analyses to check if the results are still the same when you apply model simulations with a higher resolution.

(2) The matrix plots are quite difficult to read. Wouldn't it be possible to use colours or frames to emphasize the correlations that are significant or have a high correlation coefficient? Further, the figures would be better readable if the labelling of input and output would be at the x and y-axis. I also would suggest to use different colours to separate between input and output.

Specific comments:
P1, L12: Shouldn't it be plural? Thus "uncertainties"?

P2, L2: There are also uncertainties concerning the emissions of trace gases. This should be mentioned here as well.

P4, L4: The abbreviation AGCMs has not been used yet.

P5, L3: Large scale transport is generally poorly simulated when model resolution is low. Of course, resolution does not solve all problems with the circulation problem, but it has been shown that it definitely looks better when a higher resolution is used.

P5, L1: $O[10^5]$? What is the O standing for?

P5, L1: If anyway an emulation is used, why is it then not possible to use a higher model resolution? How would a higher resolution change the computing time needed for the emulation?

P7, L30: I cannot see the correlation between x3 and AOD. Is these really correct? Is it not possible to improve the presentation of the results in the figures? See my specific comments on the figures below and above.

P8, L13: What is "Cess"? What do you mean with "Cess climate sensitivity"?

P9, Figure 1: The figure(s) are quite difficult to read. In the caption some guidance how to read this matrix plot should be given.

P10, L9: 10th percentile → 90% percentile (?)

P10, L14: Either use parenthesis around the reference Kay et al. (2014) or write "as in Kay et al. (2014)".

P10, L30: The abbreviation RMSE has not been introduced yet.

P11, Figure 2: There should be more space added between each row of figure panels. Wouldn't it possible to add a figure legend with the variable names or add them in the caption? Alternatively, this information could be given in a table. Additionally, the units at the axis should be given.

P12, Figure 3 caption: I would suggest to move the last sentence up, so that it is the second sentence in the caption.

P14, Figure 4 caption: by the → by

P14, Figure 4 caption: Comma after "parameter" redundant?

P15, Figure 5: Also here I would suggest to add x und y-axis label for better readability or to give some guidance on how to read the figure in the figure caption. The read lines are not really helpful. Is there another way of presentation? Also here units should be given. Further, I would suggest to somehow mark (emphasize) in the figure the examples mentioned in the text.

P15, L1: Comma after "than" redundant?

P15, Figure 6: Similar comments on this figure. Add x and y axis labelling and chose another presentation than the red lines. These are rather confusing than helpful.

P19, Figure 7: Add colourbar so that the highest and lowest values (range of values) are easier to differentiate. Also here, the red lines are rather confusing than helpful.

P20, Figure 8: Same comments as for the previous figures.

P21, L26: Could you give here a number? How many percent?