Atmos. Chem. Phys. Discuss., 14, C9714–C9716, 2014
www.atmos-chem-phys-discuss.net/14/C9714/2014/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Radiative forcing and climate metrics for ozone precursor emissions: the impact of multi-model averaging" *by* C. R. MacIntosh et al.

Anonymous Referee #1

Received and published: 29 November 2014

The authors examine how multi-model ensemble averaging impacts the calculation of radiative forcing, GWP, and GTP from changes in ozone and its precursors, and the related uncertainties. They conclude that using the multi-model mean as input to the radiative forcing code makes no significant difference relative to using averaged results from individual ensemble members. However there are significant differences in the estimated uncertainties between the two approaches; this should be taken into account when assessing the uncertainties associated with simply using the ensemble means as input, and the uncertainties are larger than the true uncertainties from calculating the radiative forcing from individual models. This is a valid topic worth publishing. However,

I feel that the presentation can be improved, and the paper should be carefully revised to make it more readable and to focus on what the authors really want to deliver. In the present form, there is too much technical jargon and too many details that obscure the main points. There are many places in the text that need to be clarified.

Section 2 ("Methods") should be re-organized to more clearly describe what methods you use, and should give brief descriptions also of the established methodologies, e.g. Fry et al. At present, these messages are very obscure and are everywhere; this makes the text difficult to follow. This section could also be condensed to just present the essential message.

A clear message on why using ensemble means result in larger uncertainties would be useful.

Sections 4 and 5 should be condensed to deliver the main points/messages more clearly. Presently it is very difficult to follow all these details.

Specific comments:

1) The authors should state specifically what causes the discrepancies w.r.t. estimating the uncertainties using the alternative approach (i.e. the ensemble means) in the abstract and/or in the conclusion.

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2) Line 7-8: Do you mean methane concentration or just methane lifetime as the input to the RF code? The radiation code does not directly accept "lifetimes" as input.

3) Line 15-16: Please quantify how significant these numbers are in the overall estimation of the RF, GWP, and GTP (e.g. give absolute values).

4) Line 19: Spell out "SD" here.

5) Line 23-24: "We find that the effect is generally most marked for the case of NOx emissions": What is the cause of this effect? Page 27197

6) Line 27: Please explain “primary mode” here, supported by a reference.

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7) Line 15: Please define “$\pm\sigma$” here.

8) Line 25-28: This should be more specific. Please state clearly and in context what you are going to address in the following sections.

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9) Line 13: “This approach differs . . .” – Can you summarise more clearly what your approach is and what exactly is the difference w.r.t. Fry et al. What is the simple formula from Ramaswamy et al. (2001)? Please explain/define “back-calculation”.

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10) Line 18: “Confidence in the chemistry of each species can be inferred”: I cannot understand how exactly such confidence can be inferred from the following statements. Figures

11) Plots in Figures 1&2 are too small. Units are missing on left axis on Figures 5&6.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 27195, 2014.