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Comment

Interactive comment on "Climate responses to anthropogenic emissions of short-lived climate pollutants" *by* L. H. Baker et al.

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See attached PDF

Please also note the supplement to this comment:
http://www.atmos-chem-phys-discuss.net/15/C2634/2015/acpd-15-C2634-2015-supplement.pdf

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 3823, 2015.

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Interactive Discussion

Discussion Paper

Thank you to both reviewers for their helpful comments, which we have addressed below.

Response to Reviewer 1

Major comments:

1) Normalized analysis has been shown to provide much more insight into the comparability of forcing-response relationships (Shindell and Faluvegi being a clear example). While it is clear that it is useful to provide the un-normalized numbers, the paper would greatly benefit from adding a description of the normalized results. For example, if ones takes the numbers from HadGEM/ECHAM/NorESM for BC, we see that the response in delta(T) is almost the same as the scale OC response. As it should. A table documenting the radiative forcing associated with each perturbation run should be included.

This work focusses on the climate impacts of perturbing emissions. This is a different focus from e.g. Shindell and Faluvegi who aim to assess the climate responses to regional forcing from aerosols/GHGs rather than the actual emissions.
In order to calculate climate responses for a given RF/ERF, i.e. the normalised responses, it would be necessary to run a different set of experiments (atmosphere-only rather than coupled) in order to find the RF or ERF from the emissions changes, since these cannot be derived from the coupled simulations. We therefore do not have the RF/ERF values that would be necessary to calculate normalised responses.

2) The figures only show stippling where models agree on the sign. That is a pretty low bar to pass (and I guess they still don't pass it). I would however provide estimates of the statistical significance based on the interannual variability. Similarly, zonal mean figures (5-7) are shown even for areas where models do not agree. What is the meaning of those figures in that case!?

We have changed the stippling in Figs 5-8 to denote statistical significance at the 95% confidence level. The distribution is generally very similar to that using previous method.
The zonal mean figures show the zonal means for the individual models as well as the multi-model means. Showing the individual models is useful to see differences (and similarities) between models. The multi-model mean zonal means are useful to compare with the map figures (which show only the multi-model means), and are useful to see when the sign of the response in the different models is in agreement.

3) The control experiment is much too short for the analysis that is being performed here, where the goal is to identify the response to a forcing much smaller than 2xCO2. As one can see for ECHAM, the global surface temperature is still trending at the end of the fifty years. Knowing that, it is necessary to show and discuss the trends in the climate state for the control experiment continued over the 50 years for which the perturbation is calculated. It would not be surprising if part of the "signal" was actually present in the control experiment as well. An approach might be to take into account the model drift over the 50 years.

Fig. 1.