Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2017-939-SC1, 2018

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Key drivers of ozone change and its radiative forcing over the 21st century" *by* Fernando Iglesias-Suarez et al.

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Received and published: 25 January 2018

On behalf of myself and Dr A. C. Maycock - We thank the authors of this study for providing additional process-based estimates of future ozone stratosphere-adjusted radiative forcing (RF) using simulations from the WACCM model. This well complements our own study with a different model (Banerjee et al., 2017). While comparing our two studies, we noted some pertinent issues that should be addressed in this manuscript:

-We ask the authors to clarify the tropopause height used throughout the manuscript. Has the chemical tropopause (150 ppbv O3) been used to separate stratospheric and tropospheric ozone (as suggested by the caption of Figure 2)? Has the radiative kernel been computed using the 200 hPa level as a tropopause (as in Rap et al. (2015))? If

so, the authors should consider maintaining a consistent definition of the tropopause across all their calculations, or at the very least testing the sensitivity of the results to this choice.

-A main assumption in utilizing the radiative kernel is that the RF scales linearly with the perturbation. This assumption of linearity has been shown to hold for tropospheric ozone perturbations (Rap et al., 2015). However, the same might not necessarily be true for stratospheric ozone perturbations, for which the stratospheric temperature adjustment is an important component of the RF and one that might introduce non-linearities. A simple test of linearity would be to compare the results obtained using the radiative kernel to an RF calculation using the full O3 perturbation (e.g. for CLIMATE-CNTRL).

-During the review process, we performed further calculations that show only a small sensitivity of the total RF, and separate stratospheric and tropospheric ozone RFs, under climate change at RCP4.5 and 8.5 to climate-driven changes in tropopause height; i.e. using the control versus scenario-consistent tropopause height, with the latter being higher under a warmer climate. If possible, we ask the authors to also test and report this sensitivity.

-Highlighting and understanding inter-model differences/similarities is important in constraining the future ozone RF. A key difference between our two studies is mentioned on P20L16. However, we would also like the authors to highlight a key similarity, and hence the robust result, that the stratospheric ozone changes under future ODS reductions ultimately drive almost 100% of the tropospheric ozone RF.

References

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Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2017-939, 2017.