

Interactive comment on “Multi-model Impacts of Climate Change on Pollution Transport from Global Emission Source Regions” by Ruth M. Doherty et al.

Anonymous Referee #2

Received and published: 12 July 2017

The paper makes use of a global CO tracer to track changes in advection patterns between present and future climate. The tracer has a fixed decay of 50 days. In this way the total CO mass is the same in both present and future climate, and any changes in CO can be attributed to changes in advection.

This is an innovative use of tracers that can single out effects from pure advection processes as opposed to the combined effects of advection and chemistry etc in chemical tracer models. A major portion of the CO tracer is from biomass burning emitted in the tropics. Similar studies using purely anthropogenic tracers emitted at mid. latitudes are referred to in manuscript. In this way this study complements previous studies.

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Major comments/suggestions:

I wonder if the zonally averaged figures (Figure 2-3, 6-7) would have been easier to interpret if the distance between the latitudes and the vertical axis had been scaled by mass?

Reading the paper the reader really has to keep the tongue straight in the mouth in order to follow all the effects of seasonal sources, convection etc. Maybe this is how it has to be, but could some sort of illustration/table help? Just a suggestion to be considered: Maybe a table or bar figure in section 2, "Data sets and methods" (page 4 - 5) with seasonal emissions split by region and natural vs anthropogenic emissions would help in the interpretation? The table/figure could in some way also be supplied with for example arrows of varying length, indicating the convective strength as this is a key feature in the interpretation of the data?

On page 12 the authors state that this study presents a clear and robust picture of the effect of climate change on the transport of pollution from major emission source regions. This is not quite true, as the major sources in this study are located in the tropics. This is partially true for CO, but not necessarily true for other air pollutants.

The authors should also state more clearly what knowledge has been gained, and in what way this study may improved out understanding of future air quality (and short lived climate forcers). Could there for instance be any potential feedback mechanisms to climate?

Minor corrections

Starting with the introduction (page 2) I see that for several citation the reference year in the text and the reference list don't match. Starting from page 2 (Introduction): TF-HTAP 2011 (2010), Kang et al. 2014 (2013), Cooper et al. 2002 (2004), Langford et al. 2014 (2015) Hwan Seo et al. 2014 - should it be Seo et al. 2014? Year in text and year in reference list in brackets. Please double check, and use the correct year both

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places. NB! I have only checked the first page, and leave it to the authors to check the rest of the manuscript.

Page 3, line 10 Bengsson or Bengtssen (as in reference)?

Page 4, Confusing use of "one model" (line 18) and models in lines 19 - 23.

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