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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Characteristics of intercontinental transport of tropospheric ozone from Africa to Asia" *by* Han Han et al.

Anonymous Referee #2

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This is a relatively straightforward analysis of the interplay of meteorological processes and atmospheric chemistry in venting out ozone and ozone precursors from Africa and reaching Africa. The manuscript is well written, the figures appropriate.

As the authors state- there is relatively little literature discussing Africa-to-Asia transport, so this is a welcome addition, despite it doesn't make use of the recommendation in the HTAP2 exercise to harmonize region definitions to allow comparability of results.

A minor remark is that I don't see terribly much added value of the trajectory analysis in figure 12.

Although some attempt has been made to demonstrate the model's ability to model ozone over Africa, I think this could be done more convincingly- there is meanwhile a

host of other observations (surface, aircraft, satellite tropospheric ozone columns) that could be explored. Are signals from African ozone visible in soundings over India?

The organization and discussion of methods could be somewhat more systematic.

I suggest that the authors explore somewhat further these aspects, and recommend the manuscript to be accepted after taking these major and minor comments below into account.

Minor comments.

l. 11-30 the abstract could be somewhat more explicit in describing the regions and attribution methodology.

l. 16 Replace boreal by NH winter. Or find better way of describing which months are discussed. Are the > and < really meant to express minima and maxima?

l. 30 I miss some statement on the relevance of this analysis. How much of the Asian ozone was produced in Africa or from African precursor emissions- where is it most important (not only vertical but also geographically.

l. 35 give reference time to which this RF estimate pertains.

l. 46 add: as well as a range of papers in the HTAP2 (Galmarini 2016) special issue.

l. 53 The issue is also very connected to legislative issues related to the control of ozone and ozone exceedance in the western states of the USA, e.g. as discussed in Huang et al. (2017; already cited).

l. 54 One reference on LRT transport between South Asia and East Chakraborty et al. Science of the Total Environment, 523, 2015

l. 73 . . . makes a contribution. . . how is contribution defined? Zero out of emissions? This is important because later you present a different method.

l. 117 which resolution is used for GEOS-CHEM; what was the underlying resolution of

the assimilation product. Importantly for this paper, how is convection parameterized, is there any evaluation over Africa of these process. Interhemispheric mixing and similar: refer to any relevant application of the model that demonstrates it is fit-for-purpose for this study. I realize that these are discussed later, but I would have expected these descriptions here.

l. 125- If I understand correctly the authors merge the EDGAR3.2 global inventory with regional ones. Which period? How do these inventories compare with e.g. the HTAP2 inventory for 2008/2010 in this special issue, or EDGAR4.2 products (for time series).

l. 135 What is the global lightning source strenght and specific for Africa. How does this compare to other studies.

l. 137 briefly describe what is the 'standard' tagged ozone method. Pro's and con's-limitations. Comes now later.

l. 138 I expected this description earlier.

l. 140- 143: better include with the GEOSCHEM description.

l. 150- what is the reason for not simply taking the 'african mask'- instead two blocks. I suggest adding a simple figure, showing these masks on top of a map (perhaps along with the HTAP2 definition of Africa).

l. 155 I think most papers that I know keep (anthropogenic) emissions constant- but that is not necessarily the same as keeping the production terms constant. What could be the impact?

l. 175- what about sfc observations, tropospheric residual from satellite. The comparison is fairly superficial

l. 201 Imported ozone=>try to describe more exactly what it is. Region-average abundance of imported ozone (imported ozone could be also the flux through the western border, for instance).

p. 295 /figure 6: I guess if the units are molec/cm2/s this pertains to the integrated amount over a model layer; otherwise it should rather be per cm3?

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