

## ***Interactive comment on “Foreign influences on tropospheric ozone over East Asia through global atmospheric transport” by Han Han et al.***

### **Anonymous Referee #1**

Received and published: 15 May 2019

#### General Comment

This paper examined the tropospheric ozone in East Asia in terms of the influence of various source regions, particularly focused on the regions outside East Asia, they called them as “foreign ozone”. The topic of the paper is well within the scope of the journal. The model used and the methods to deduce the influence of each different source region are adequate and have been applied so far in various studies for similar purpose. The results shown in the paper are generally consistent with the facts published in the previous literatures. This gives a certain reliability to the analysis done in this paper, but at the same time, the novelty of this paper over those previous studies is not clearly shown in the manuscript. For example, the authors reviewed the roles of East Asian Monsoon on the foreign ozone in East Asia in “Introduction”, but the find-

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ings of this paper written in “Abstract” is quite similar to what was reviewed there. The author argued that this paper provided a comprehensive assessment of the influence of foreign ozone on the East Asian tropospheric ozone, but if they just want a comprehensive assessment, writing a review paper is more suitable, and actually the review given in this paper is quite comprehensive. I suggest the authors should state more clearly what they achieved on top of the previous studies to be published in the journal. This is my general concern.

#### Major Comment:

Almost all analysis was done for the average over East Asia. As previous studies have shown that the relative contributions of various source regions can vary considerably depending on the location within East Asia. So, I cannot fully understand the meaning of such “East Asian averaged” contributions of various source regions. Actually, the latitudinal dependence in each foreign and native contributions were analyzed, but I guess the longitudinal dependence should be also large enough to be analyzed.

#### Specific Comments:

- L45: The terms “native” and “foreign” are used before their definition is given in Table 2.
- L83-85: Is the “transport” itself associated with thing other than meteorology such as emission and/or chemistry?
- L124-125: How did you treat CH<sub>4</sub> chemistry in the model? Is it fully represented?
- L132-136: I don’t think these detailed definition of regions are necessary, since Figure 1 shows them visually and they can be found in its caption.
- L146 (formula (1)): How is the consistency between CTRL-EAnth-GLO and the sum in the denominator of the first term? How are they close to each other? Should be explained somewhere in the text.

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- L159-160: The production and loss of ozone can vary considerably with in a day, so I imagine using daily production and loss data should have bad consequences on the simulated tagged ozone concentration. Did you check the validity for using the daily values for them?
- Table 2: I don't think Table 2 could effectively explain the different definition of the terminology used in the manuscript. For me, the caption of Table 2 is easier to understand what you want to explain than Table2 itself and the descriptions in the main text (L194-210).
- L233-234: You can not compare the contribution of foreign ozone on whole East Asia and that on China
- L248: How did you calculate the chemical lifetime? Explain it in the text.
- L251-252: Only the dry deposition could be the cause of the difference? Are there any other causes which should be mentioned here?
- L267-269: This part should be more specific. Where is the East Asian trough? Which region of downdraft you are referring?
- L284-287: This sentence is quite hard to understand logically. The difference between foreign and foreign anthropogenic O<sub>3</sub> is not mentioned in the previous sentences. I cannot understand what you want to mean here.
- L342: Why the contribution from Africa in winter can be so large? Why it can be larger than that from SAS SEAS where much closer to EAS.
- L442 (formula(8)): What is U'850?
- L484-487: Where should I look at in Figure 3 and 7 to find these values? Is it annual evaluation or seasonal? This is a quite blur sentence.

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2019-132>,

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