

# ***Interactive comment on “Air quality and acid deposition impacts of local emissions and transboundary air pollution in Japan and South Korea” by Steve Hung Lam Yim et al.***

## **Anonymous Referee #1**

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This paper presents the a study of local versus transported pollution in South Korea and Japan with emphasis on the impact of pollutant deposition to the ecosystem. This is an interesting perspective on a topic that has been studied extensively, but I feel there are significant changes required to this paper before it could be published.

This work uses the regional air quality model CMAQ to perform numerous model experiments, turning off emissions from various regions to quantify the impact of different source regions to aerosol distributions and deposition over Korea and Japan. The model configuration and design of the sensitivity experiments seems sound.

However, I feel far more model evaluation should be performed (and illustrated) before

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using the model to attribute source contributions. A more complete description of how the model bias statistics (e.g., Table 2) were determined is needed. For example, how was the ratio determined - is it the mean over the model divided by observation at each time of observations, or just the model mean divided by the observation mean? What is Index of Agreement - correlation coefficient? Also, it would be valuable to see time series of the model-observation comparisons: are there larger model differences in some seasons than others? As you show later, there is significant difference among seasons in the transport from China to Korea and Japan.

Another issue with the model evaluation is that the satellite-derived PM<sub>2.5</sub> is for 2014, while your model simulation is for 2010. Is the satellite product not available for 2010? If not, you need to explain how much error is introduced in not matching the years. At I.218 you discuss the discrepancy between model grid size and the observations, but I thought you were talking about comparison to the satellite product here, and you should be able to average the satellite grid to the model grid (or vice versa, if the model grid is smaller), so that you are comparing the same area. In Figure 2, what do each of the points represent (daily or hourly, each model grid)?

It would be valuable to evaluate the model results to observed deposition rates. Aren't there some measurements available in Korea and Japan for this evaluation?

It is not clear what is being shown in Figure 3 and discussed in Section 3.2 and onward. I guess this is only model results. Since there were significant biases in the comparison to observations, how well can we trust the source contributions based purely on model results that are presented.

In section 3.4 (I.291), you write "implying that ... emissions ... remain relatively constant all year long." This conclusion is determined by the emissions inventory that you use to drive the model, but the way the sentence is written it suggests it is a finding from your analysis based on observations, but my impression is that you are just presenting model results here.

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There are a number of typos or grammatical errors, for example:

I.25: perhaps you mean to say 'one of the most polluted regions of the world.'

I.110: 'with describe' needs to be rewritten.

I.149: 'Other two' should be 'Two other'.

I.367: use 'prevalent' instead of 'popular'.

I.393: 'enhance increase' (remove one word).

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2019-175>, 2019.

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