

# ***Interactive comment on “HTAP2 multi-model estimates of premature human mortality due to intercontinental transport of air pollution” by Ciao-Kai Liang et al.***

## **Anonymous Referee #1**

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### General Comments

This manuscript uses the HTAP2 models to quantify source-receptor relationships for surface ozone and fine particulate matter for emission reductions occurring in six world regions and globally, as well as within three emission sectors. These source-receptor relationships are then combined with concentration-response functions to estimate premature mortality due to intercontinental, within-region, and global emissions (which includes for three separate sectors). This manuscript builds on an existing body of literature coming out of HTAP1, and so, while not particularly novel in terms of methodology, it provides an important benchmark for comparison with earlier and future work.

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A serious weakness in the paper is the absence of model comparison to observations. At the very least the paper should include a summary of any evaluation of the HTAP2 models that may be appearing in other articles in this special issue, preferably ones that are already published. A stronger paper would evaluate the specific exposure metrics used to calculate health impacts. For example, observational estimates could be added to Table 1 for regions with ground-level networks. This seems especially relevant in light of the large discrepancies across the HTAP2 models. If some models could be discarded as unrealistic, it is possible that the uncertainty in the estimated numbers of premature mortalities due to the inter-model range may decrease.

In the abstract, some context could be provided as to whether the numbers here are in line with earlier work.

### Specific Comments

Lines 63-68. Does this mean outside of any of the six regions?

Many prior studies are mentioned in the introduction. Are there any robust findings across this prior body of work?

Lines 246-248. Is the actual value of  $\beta$  given somewhere?

Line 261. Make sure all terms in equation 3 are defined.

Line 267-268. Elaborate on Zcf: does it vary from 5.8 to 8.8  $\mu\text{g m}^{-3}$  in space and time?

Figures S8 and S9 are referred to several times in the text but are impossible to read. I suggest splitting them each into 4 figures, with half the models on each, one for the regional perturbations and one for the sectoral perturbations. The full range of the colorbar isn't used, so consider using a different color bar that allows for one to read the values off the figure more easily.

Lines 318-320. Is this intended to be a quantitative comparison? If so, are the metrics reported here and in the Lin et al. studies the same?

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Lines 449-459. This seems like methodology and could be included in the earlier section.

Lines 545-547. Could the use of a different year make a difference here?

Lines 559-560. This seems like an important point and suggest including in abstract and conclusions.

Lines 609-610. Given the large ranges, is it really meaningful to report averages?

Table 4. What is an “empirical mean”?

Table S1. Why not calculate PM<sub>2.5</sub> consistently across models from the individual components?

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2017-1221>, 2018.

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