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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Exploring the uncertainty associated with satellite-based estimates of premature mortality due to exposure to fine particulate matter" *by* B. Ford and C. L. Heald

Anonymous Referee #1

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General comments:

This paper estimates sources of uncertainty in exposure estimates by analyzing differences in model versus satellite-derived PM2.5 and various concentration-response functions. I think that this is an important contribution to the field because it compares the influence of individual assumptions on estimated mortality and compares results to different studies.

Specific comments:

-Pg. 25333, line 14: Did the five-year population estimates indicate that a linear inter-

polation was appropriate in China?

-Pg. 25334, line 4: How would you expect different spatial resolutions of baseline mortality data to influence your results and comparisons with the studies mentioned?

-Pg. 25338, line 18: Specify here that satellite-based estimates are gridded at the same spatial resolution as the unconstrained model instead of (or in addition to) further down in this section.

-Pg. 25339, line 5: Explain why MODIS and MISR were both used (strengths/weakness of each dataset), and why collection 6 for Aqua and 5 for Aqua and Terra. Also, how does this compare with also using SeaWiFS in the more recent van Donkelaar et al. (2014) work?

-Pg. 25341, line 22: This is mentioned briefly later in the manuscript, but do you have any indication of how MODIS and MISR compare with observations at shorter timescales (daily)? Are the satellites overestimating or underestimating peaks and how could this impact exposure estimates?

-Pg. 25342, line 17: Is there a difference in PM2.5 components between China and the U.S. that could influence results?

-Pg. 25344, line 21: Is there a figure or table with these AERONET results?

-Pg. 25344, line 25: Better in the eastern US and eastern China than the western parts of each country? Please clarify.

-Pg. 25348, lines 21-22: What are examples of some of these regional sources?

-Pg. 25352, line 4: Implications of a study that is smaller and using only white participants?

-Pg. 25353, line 3: Can you comment on how the results of Chen et al. (2013) (or another China-specific study) would impact your results?

ACPD
15, C8063–C8066, 2015

-Pg. 25355, line 17: What was the spatial resolution of the Lelieveld et al. (2013) study? As the authors mentioned earlier in the text, spatial resolution might be driving some differences in more populated grid cells.

-Conclusions: I think that the discussion of Figure 9 needs to be expanded, which could also include a brief discussion of how different spatial resolutions (among different models and between model and satellite-based estimates), emissions inventories, region-specific health data, etc. impact these estimates. And, if possible, it might be helpful if the authors could give some sort of general recommendations regarding the "best practices" of the factors that are most important for future authors to consider when estimating exposure at either at a global scale or for China and the U.S. specifically.

-Table 1: Would it make sense to include the updated estimates of Lelieveld et al. (2015)? Also, doesn't Evans et al. (2013) provide estimates with different CRFs?

-Table 1: Does the heading mean that some of the U.S. estimates are for all of North America and China for all of Asia/Western Pacific? Please clarify in the caption because it's unclear if these refer to studies that were specific to the countries or to regions. You mention that the Anenberg study is regional in the text but it's unclear about the others. Also, are all of these studies for similar years?

-Figure 4: Anything available for China? It would be helpful to see a plot based on any available data, maybe AERONET as mentioned in the text?

-Figure 9: Are the previous estimates including only country-based US and China-specific studies, or are some regional? This figure is very helpful and I would appreciate a more in-depth discussion.

Technical corrections:

-Pg. 25330, line 19: "on the order of.."

-Pg. 25344, line 20: Are you referring to Fig. 5a (exposure plot) or to Fig. 6a (AOD

ACPD

15, C8063–C8066, 2015

plot)?

-Pg. 25345, line 2: Missing a period or this is a run-on sentence.

-Pg. 25345, line 10: Fig. 6b?

-Pg. 25346, line 17: “Requires model output,” that is unnecessary as written.

-Pg. 25351, lines 19-23: Much of this is repeated from the introduction and could likely be cut or shortened if the word limit is an issue.

-Table 1: Do you mean that Table 4 provides additional information?

-Table 3: Define threshold abbreviations in caption.

-Figure 2: Can you change the font size of the individual studies? This figure is difficult to read, and the information might make more sense in a table.

-Figure 7: Please clarify that abbreviations are also defined in Table 3.

-Figure 8: Shouldn’t this refer to the last column in Table 4?

References mentioned above:

Chen, Y., Ebenstein, A., Greenstone, M. and Li, H.: Evidence on the impact of sustained exposure to air pollution on life expectancy from China’s Huai River policy, Proc. Natl. Acad. Sci. USA, 110(32), 12936–12941, doi:10.1073/pnas.1300018110, 2013.

Lelieveld, J., Evans, J. S., Fnais, M., Giannadaki, D. and Pozzer, A.: The contribution of outdoor air pollution sources to premature mortality on a global scale, Nature, 525(7569), 367–371, doi:10.1038/nature15371, 2015.

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