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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Influence of air quality model resolution on uncertainty associated with health impacts" *by* T. M. Thompson and N. E. Selin

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Thank you very much for you feedback. We agree that it is not appropriate to extend these results to areas/pollutants/met conditions outside of this particular study, and as noted in the comment to Reviewer #2, we present a case study and application of a method that can be used to carry out this investigation. We have edited the manuscript to make this clear throughout.

We have copied and responded to all minor comments below:

Minor comments. - p14528/l25: I don't understand this sentence as written.

We have edited this introductory sentence as follows to clarify our point.

"With respect to uncertainties related to air quality modeling results, the US EPA argued that uncertainties in ozone benefits using a 12-km grid are likely minor, but primarily because the health benefits due to reductions in ozone are far outweighed by health benefits due to reductions in particulate matter (PM); they did not quantitatively compare results obtained from varying model resolution."

-p14529/l11: I understand what the authors are trying to say here but the sentence is rather technically written and detailed. The meaning of "full meteorological files" is not clear. Perhaps a more conceptual explanation would work better?

We have edited/added the following sentences in our introduction as follows to clarify our point.

"Another common procedure is to use downscaling to model the regional air quality impacts of global change (Bell et al., 2007; Chen et al., 2009; Knowlton et al., 2004; Lam et al., 2011; Tagaris et al., 2009). Downscaling takes the output from global scale models and converts it to input for regional models. These input files can be gridded meteorological files covering the entire domain (instructing the regional model on meteorological conditions such as wind direction/speed and temperature), and/or initial and boundary conditions (instructing the regional model on initial concentrations of pollutions and concentrations of pollution that might move into the modeling domain from outside the boundary)."

-p14529/l16: I assume the study by Bell and others mentioned below this line used downscaling. Please clarify and relate to the discussion on downscaling.

All papers that were cited in the description of downscaling use it in one form or another. We have added the following sentence to the end of this introductory paragraph and we hope this will pull the paragraph together and make clear the point we were trying to make.

"Because of the increasing use of human health impact analyses from both global scale

ACPD
12, C6712–C6715, 2012

modeling and downscaling, it is important to evaluate how model resolution impacts the uncertainty associated with human health impacts of air pollution and to move towards identifying a resolution target for human health impact analyses."

-p14531/l9: What is the resolution of the meteorological inputs? It is not clear what the authors mean by "consistent in both scenarios". Consistent with what? Is the same meteorology used for both future and present scenarios. Please clarify.

We have edited the sentence, found in Methods section 2.1 as follows to clarify our point.

"Meteorological inputs are the same in both scenarios and were developed using the fifth generation Penn State/NCAR mesoscale model MM5 (Grell et al., 1994) to represent conditions as they occurred on 13 August–15 September 2006. MM5 was used to create meteorological input files for the 36, 12 and 4 km modeling domains; for the 2 km domain, meteorological data is interpolated by CAMx from 4 km."

-p14539/l19: "there does exist the possibility for uncertainty analyses". Could the authors state more explicitly what type of uncertainty analyses they have in mind?

We have added an example of the types of analyses we are referring to in the following sentence (found in the conclusions):

"However, because the median values of all health impacts evaluated that were calculated using coarse modeling do fall within the health impact uncertainty range of fine resolution results, there does exist the possibility for uncertainty analyses (for example: Monte Carlo analysis) on 36 km resolution air quality modeling results, which are on average 300 times more computationally efficient than running the same episode and same domain with 2 km resolution"

-In the conclusions the authors claim: "we conclude that population weighted ozone concentrations obtained using regional photochemical models at 36 km resolution are likely to over- estimate the benefits associated with human health impacts relative to

ACPD

12, C6712–C6715, 2012

values obtained using fine (12 km or finer) resolution modeling". This seems like a strong claim from one study. Is there additional evidence to back this up? If not they should modify restrict this claim to the Houston area.

We agree that the wording in this sentence is too strong and we have adjusted our claim by editing that sentence as follows:

"Given the uncertainty associated with human health impacts and therefore the results reported in Table 1, we conclude that population weighted ozone concentrations obtained using regional photochemical models at 36 km resolution have the potential to over-estimate the benefits associated with human health impacts relative to values obtained using fine (12 km or finer) resolution modeling."

-In the abstract the authors suggest that this study may be appropriate for analysis with similar chemistry. I would add similar meteorology and population density also.

We have added meteorology and population density as qualifiers in the following sentence located in the abstract:

"We suggest that 12 km resolution may be appropriate for uncertainty analyses with respect to health impacts due to ozone control scenarios, in areas with similar chemistry, meteorology and population density, but that resolution requirements should be assessed on a case-by-case basis and revised as confidence intervals for concentration-response functions are updated."

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 14525, 2012.