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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The effect of future ambient air pollution on human premature mortality to 2100 using output from the ACCMIP model ensemble" *by* Raquel A. Silva et al.

Anonymous Referee #1

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This is a valuable analysis on an important topic that takes advantage of a detailed model ensemble to address air pollution mortalities. However, the work has a few major deficiencies which ought to be addressed in a revision, as well as several minor comments.

1) The paper falls short in putting the work in the context of previous efforts. It cites only two previous papers assessing global health-related impacts of future air pollutants, while there is in fact a larger literature, including both global and regional effects. By not putting their work in the context of the previous work, the authors overstate the novelty of their contribution, and are not able to discuss their work in the context of what is known or unknown in this field.

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Discussion paper

2) The paper does not fully take advantage of the potential utility of using a multi-model ensemble in the analysis. As is, it presents straightforward calculations of resulting mortalities, which (for the most part) are very predictable based on the air quality results presented in previous work. The authors do have some very interesting results about the relative contributions of different assumptions of air pollution concentrations, exposure-response functions, population, etc. While some of these results are noted, in my opinion, they are the most interesting implications of this analysis and could be highlighted. However, the authors fall short in this area by not correctly characterizing the uncertainties and variabilities captured by their use of the RCP scenarios (a significant limitation which could be more thoroughly discussed and caveated) and the ACCMIP effort. These ought to be discussed more carefully.

3) The mortality numbers, while interesting, are not put in proper context such that the reader can understand what they mean. To address this, some comparison with existing literature could be very useful.

In addition to these major comments, there are several areas in which analyses are not fully described, and/or relevant methods-related information is missing. These are noted below.

Minor comments follow:

p3, line 30-31: “few studies have evaluated how the global burden might change in future scenarios” âĂŤ this seems like a small slice of the literature. There are other papers that could be cited here.

p3, line 26-27: “RCPs. . .do not span the range of possible futures published in the literature for short-term species.” This is a key point and it could be highlighted.

p4, line 4-6: but the ACCMIP is coarser. The mortality estimates thus should be justified. Also, line 33-34 on same page: this regridding to a scale finer than that modeled should be better described and justified.

p5, line 19-20: “similar to Silva et al 201. . .except for. . .” Does this mean exactly the same as the Silva et al 2013 paper except for those two differences? The description is unclear, and the language here could be more precise.

p6, line 9-10: using a common projection of population across the RCPs introduces both consistency in this analysis, but inconsistency relative to underlying social drivers. The implications of this choice should be discussed further, with quantifications of the magnitude as well as the direction.

p6, line 27-28: I can guess what the authors are referring to here, but the language could be easily misinterpreted (as the authors do actually look at the influence of climate on air pollutants themselves, just not modifications in ER factors). Rephrase?

p7, line 1-5: are potential correlations between different RRs accounted for in the Monte Carlo sampling? If so, how is that done? If not, the spread could be artificially narrowed. Please discuss.

p7, line 10: for the ACP audience, please describe ‘tornado analysis’ more thoroughly and quantitatively. Also, it is not addressed again, and there is no associated figure that corresponds to a traditional tornado-type plot.

p7. line 7: While the authors do have a certain spread of air pollutant concentrations, this should not be taken as a measure of ‘uncertainty’. It is decidedly not a quantitative uncertainty analysis, as there are many other factors affecting ‘uncertainty’ in air pollutant concentrations that are not captured by the ACCMIP ensemble. This should be noted and discussed, and language carefully examined throughout the paper.

p 7, line 19: “In some cases. . .” This sentence is confusing. Rephrase?

p 9, lines 21-22: I’m not clear what was done here. This should be addressed in detail in methods.

p 10, line 31-32: This difference is noted. However, anyone familiar with the ACCMIP effort could have gleaned this simply from the previous reported results. What is new

here? Why is this particularly significant in terms of mortality?

p 11, line 16+ This could be discussed in more depth, including more quantitatively, as it's a key limitation of the authors' analysis.

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