

The impact of air pollution on human health and the associated external costs is an interesting topic. The study utilized a multi-model ensemble of regional models to calculate the impacts. The results encourage the use of optimal-reduced multi-model ensembles compared to traditional all model-mean ensembles. The topic is certainly suitable for ACP, the method is appropriate, and the analysis and the results are generally reasonable. This paper can be considered for publication after addressing the following issues.

General comments:

The Abstract is a bit too long. I encourage the authors to shorten their abstract to make it concise and informative. In addition, the authors should be more careful about the units. Many units in the tables and figures are missing or unclear and should be added.

Although the description of the methods is comprehensive, additional description is needed. As the ensemble-contributing members as well as the gridded population density data have different spatial resolutions (see Table 1), the combining methods for those data should be added. Also, what is the spatial resolution of the multi-model ensemble mean (MM_m) and the optimal reduced ensemble mean (MM_{opt}) (Fig. 4)?

Specific comments:

Line 72: “North American emissions foreign emissions” - delete “foreign emissions”.

Line 224-225: “a number of emission perturbation scenarios have been simulated (Table 1)” – there is no EAS emission perturbation scenario for the European domain, and no EUR emission perturbation scenario for the North American domain. Please explain the design of the perturbation scenarios.

Line 351: Some text discussions should be added for the median values as they are part of Tables 3-5, Figures 2-3.

Line 342: “As DE1 and US3 use the same SMOKE emissions and CTM” - but they appear to use different CTMs (i.e., COSMO-CLM/CMAQ for DE1, WRF/CAMx for US3)?

Table 2: There are four exposure-response coefficients for RAD in the table. How were they used in this study?

Table 4: Definition of “PD” is missing. Units should be added, as they differ across different health impacts. The same applies to Tables S2-S4. Also, please check the units for BUC and BUA in Table 2.

Figure 1: Units should be added.

Figure 2: “Days” should be replaced by “Months”. “O₃”, “SO₂”, “PM_{2.5}” – please use lower case for the number.

Figure 4: Units should be added in Figures 4A and 4B. It is not clear what was shown in Figures 4C and 4D. This needs to be explained in the figure caption.