

Interactive comment on “Assessment and economic valuation of air pollution impacts on human health over Europe and the United States as calculated by a multi-model ensemble in the frame work of AQMEI13” by Ulas Im et al.

Anonymous Referee #5

Received and published: 7 December 2017

This study addresses the impacts of air pollution on health and their economic evaluation in Europe and the US. The study has been done within the AQMEI13 action. There are several aspects: a CTM ensemble, health impact assessment and economic evaluation. Numerous research teams in Europe and the US have coauthored the manuscript.

The study contains new and important results and definitely deserves to be published. However, in my view the presentation of methods and results in the manuscript should be improved, as detailed below.

C1

General comments

First, the description of the health impact assessments and the economic impacts should be more detailed, and include especially all the assumptions and choices made in making the computations and assessments. There are numerous alternative choices that you will need to make for e.g. economic evaluations; some of these have been properly described and discussed, whereas some have not been described. Reviewer number 1 has already detailed this issue.

Second, there are also gaps in the description of the individual CTM's and, the constructed ensemble and the evaluation of the models and the ensemble. In particular, there is very little discussion on how the non-anthropogenic emission sources have been included; as these constitute a substantial part of the total PM mass, these should also be described. There should be also discussion on the main limitations of the CTM's and the emission inventories used, what are their main uncertainties and the most poorly known parts of modelling. Details on this issue are in 'detailed comments'.

Regarding model evaluation, the manuscript should specify which networks of stations were used, how many stations were considered within each domain, and what were their site classifications. Large PM deficits were found for some models. The manuscript should therefore discuss the most probably reasons for these under-predictions: were these caused by deficiencies of the used CTM's, missing emissions or both, or/and some other reason.

Regarding the presentation of the results, there are a lot of large tables, but in my view too little synthesis and graphical illustration of the main results and findings. I would recommend to move some of the large tables an annex or to supplementary materials for better readability, and some summary figures could be added instead, to highlight the main insights, findings and conclusions. Regarding the section 'materials and methods', I recommend to use the traditional sections for a better readability, e.g.,

C2

first Evaluation of emissions, then Atmospheric dispersion modelling, the construction of ensembles, Health impact assessment and finally economic parts. The current subtitles list one project and one model.

Detailed comments

Abstract.

Lines 52-53. This is one of the main results of the study, so it should be presented clearly. This study addresses models for (i) emissions, (ii) dispersion, (iii) health assessment and (iv) economic evaluation. The term 'model' should therefore be used carefully and specified as necessary, throughout the manuscript. This sentence probably refers to CTM's but not health models (or emission models). It is therefore variation due to the differences of CTM's. However, the computed health impacts can also vary a lot depending on which health assessment model would be used, and which health assessment assumptions would be selected. In this study, the authors have addressed the variability due to CTM's but not that of the health assessment modelling, although the latter uncertainty is commonly much larger. Please clarify and write more clearly and accurately what is meant.

Lines 54-55. These results could be also presented per capita; this would better illustrate better the differences of the two selected domains. The PM concentration levels and the distributions of population of the two domains could also be quantitatively compared. 'In agreement', specify quantitatively, e.g., within what percentage.

Line 68. Write the acronym in full.

Line 71. 'global anthropogenic emissions' – specified for which pollutant species ?

Line 72. 'emissions foreign emission' – correct sentence

Lines 75-77. 'foreign sources make a minor contributing ...'. This is too general. Whether the sources in a specified domain contribute more or less to health within that domain depends on a lot of factors, such as e.g., population densities in the considered

C3

areas, how large the considered two areas are, which pollutants are considered, etc. This statement is therefore correct for some cases, and not correct for some others. Please rewrite the statement more accurately.

Introduction

Lines 107-109, and lines 114-117. Same comment as above. Whether these statements are true, depends on various factors – the relevant factors therefore need to be specified.

Lines 134-136. When presenting cost values, it is proper to state also for which year this has been evaluated.

Line 168. '... seen ...' - correct the English language.

Lines 200-202. Using a so-called optimal ensemble is fine, but as far as I know, it does not guarantee that there is e.g. no redundancy or recursiveness of models. Practically in all cases, a collection of CTM's will have some very similar treatments; using an 'optimal' ensemble will probably reduce their effect, and that is OK, but it does not altogether remove these effects.

Materials and methods

Line 218. Should read 'emission information'. There are also several other input datasets, obviously. Report also the modelling of sea salt, desert dust, biogenic emissions, wild-land fires, etc. Add some discussion on what were the main limitations, uncertainties and gaps of modelling of the CTM's used.

Results

What were the networks of stations used in Europe and the US; these should be described. How many stations were considered ? What were the classifications of stations – were all of these classified as regional or global background ?

Conclusions

C4

Line 562. This statement may be true, but it should be supported by quantitative evidence: were there model runs to quantify this effect, and how large was it in e.g. per cents of predicted concentrations ? Alternatively, if not confirmed, this statement could be removed.

Lines 533-538. The underestimation of PM mass is a key uncertainty. There should therefore be some accurate assessment on the reasons resulting to this uncertainty. For instance, 'natural emissions' are mentioned, but it is not stated in the text which of these were included, which were neglected, and which possible omission or under-estimation could probably have the largest effect. Please add some discussion of the most probable causes of the under-prediction.

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2017-751>, 2017.