Atmospheric
Chemistry
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Discussions

Interactive comment on "TNO-MACC_II emission inventory: a multi-year (2003–2009) consistent high-resolution European emission inventory for air quality modelling" *by* J. J. P. Kuenen et al.

Anonymous Referee #3

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I have read the paper "TNO-MACC_II emission inventory: a multi-year (2003–2009) consistent high-resolution European emission inventory for air quality modelling" by Kuenen, et al. This paper reports on the construction of an inventory of anthropogenic emissions for the European region. The work is of high quality and will be of substantial value to the modeling and emissions community.

The work described to correct for inconsistent emissions across sectors is particularly valuable and, as mentioned below, providing more detail in this area would enhance the contribution of this work. This methodology not only likely produces a higher quality inventory (although issues of possible double counting should be discussed) with better

consistency over time, but is also a methodological advance in this area. More detail about these procedures and their results should be provided, as discussed below, so that this work will be even more useful to the broader community.

I recommend publication after consideration of the following specific comments.

The supplement supplies total emissions by country and year. It would make the dataset much more useful if the supplement could also provide emissions at a higher level of sectoral detail. It would seem feasible to provide these at the 2 digit SNAP level by country and species. This would appear to be about a 2000 line file if in a format similar to the current file "Resulting_emissions_by_country_and_year_clean.xlsx".

Comparison, at the major country grouping level, of this emissions estimate with other estimates (specifically: EDGAR, GAINS, and original country inventory data) should be given and discussed. This is important context for these data.

PM2.5 is missing from the supplemental file "Resulting_emissions_by_country_and_year_clean.xlsx".

EC and OC emissions should be added to the supplemental tables given the substantial interest in these emissions.

It would be useful to see more quantitative detail about the issues raised in section 2.1.1, regarding differences between inventory estimates and values used by TNO. (some of this might best be in a text supplement). In general it would be very useful to report on the quantitative impact of each of these changes so that readers can have a sense of how important each of these issues were. Hopefully this will lead to improvements in the country inventories.

Including: On agricultural waste burning, were country inventory values generally less than GAINS, or were some higher and some lower? How much aggregate difference did this substitution make? Inland & coastal shipping. When the text says "very inconsistent be- tween countries," was this mostly a matter of split (no concern for dupli-

cation) or were there inconsistent estimates (e.g., countries with known high levels of shipping activity reporting low emissions). There is a potential issue of double counting here (e.g., perhaps shipping or port fuel use might have been included in another category.) Again, how much difference did this substitution make in the inventory? "For particulate matter, numerous cases were found where reported PM2.5 exceeded reported PM10." How large a correction overall did this make in the final emissions? Were there particular sectors where this was the case?

The issue of possible double counting of emissions should be discussed. This should always be a concern when additional data is added to an inventory. In inventories where there are discontinuities in the data, it is possible that those emissions might have been included in another category instead? Could this be, at least partially, excluded as a possibility in the cases where the corrections/additions increased emissions significantly (e.g., as in the cases shown in Figure 2).

The text just generically refers to the supplement, while the supplement currently consists of 4 excel files. A text file should be added to the supplement that provides the file names for each file and briefly describes their contents. Giving each file a letter or number prefix (A., B., or S1., S2.) would also be helpful so that they can be appropriately referred to from the text.

pg 5845, Line 10 "was made both for the coarse and the fine mode."

clarify if separate splits were used for coarse & fine mode, or if the same split was used for both.

pg 5845, Line 25

1) The sentence "When particle mass is calculated based on the SO2 emissions, it is found that SO4 fractions in PM range from 0.1% for gasoline and diesel combustion in road trans- port to 10–20 % for coal and residual fuel oil combustion in energy and manufacturing industries and in shipping."

is a bit confusing. If this is referring to the fraction of S that is emitted as particles, it would be clearer just to use the wording of the previous sentence, as follows.

"... the fraction of sulphur emitted in the form of particles ranges from 0.1% for gasoline and diesel combustion in road trans- port to 10–20 % for coal and residual fuel oil combustion in energy and manufacturing industries and in shipping."

2) In this same sentence, "It was found", does this still refer to the LOTOS-EUROS model? Clarify. The "It was found" wording might be misleading. Generally the SO4/SO2 emissions factions are input into such models, they are not outputs of those models. (Unless a detailed plume chemistry model is included.)

Section 3.1 This is one of the most important technical contributions of the paper. The "mosaic" type approach of combining emissions from different sources, giving precedence to officially reported data, is rather widely used. The authors show the importance of making sure consistent emissions datasets over time are provided. They construct a consistent dataset by considering emissions at a moderately fine sub-sectoral level, and correcting for missing or in-consistent data. Given the importance of this contribution, it would be very useful to provide a supplemental table with detail by at least country, year, and sector (if not also fuel if this differs) of data type. Something similar to the table Resulting_emissions_by_country_and_year_clean.xlsx, but with a list of sectors for each country (e.g. Power plants, Refineries, Residential combustion,etc.) coded with the source for the data (R="Reported", L="Linearly Extrapolated", G="Gains", etc.) by year. This would be extremely valuable for the community in general, and would enhance the contribution of this work. It is important that, for any particular country and sector, that the source of the data used be clear.

Section 3.2 The discussion noting that sectoral EC/OC ratios vary by country is interesting, but a more complete presentation of the data would be helpful. A table in the supplement that gives EC/OC by sector and country would be very helpful, particularly given the interest in black carbon reductions.

The conclusion says "To further improve allocation to point sources, OMI satellite data were used to check the SO2 source strengths of point sources" but this is not discussed in the text. This sounds potentially quite useful and interesting. Material discussing this procedure and its results should be added. How much did the original point data have to be modified to match the OMI observations?

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