

Geosci. Model Dev. Discuss., referee comment RC2
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Comment on gmd-2021-390

Anonymous Referee #2

Referee comment on "A multi-pollutant and multi-sectorial approach to screening the consistency of emission inventories" by Philippe Thunis et al., Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2021-390-RC2>, 2022

TITLE A multi-pollutant and multi-sectorial approach to screen the consistency

of emission inventories

Summary

This paper provides an approach to screen / evaluate emissions inventories, with specific focus on the ability to evaluate multiple pollutants and multiple sectors across two sets of inventories. After describing the methodology, it is applied to evaluate two versions of the CAMS-REG emissions inventories over 150 cities in Europe. Given the key role of emissions inventories in air quality management, specifically as inputs in air quality models, the modeling community is always on the lookout for evaluating emissions inventories, and thus new methods for assessing / evaluating inventories are relevant and of potential interest.

Comments:

It is not clear how this approach differs from previous work by the same lead author published in Thunis et al, 2016. (Thunis, P., Degraeuwe B., Cuvelier C., Guevara M., Tarrason L., Clappier, 2016: A novel approach to screen and compare emission inventories. *Air Qual Atmos Health* 9, 325–333.) The diamond diagram approach has been previously published in that study to screen and evaluate emissions inventories. So,

the statement “we propose and discuss a screening method to compare two emission inventories” in the abstract does not seem to be justified. Further, it would have been helpful to have additional discussion in the Introduction section to see where the previous study stopped and where new improvements are made. There is no mention of this work till Line 236 when a passing reference is made as to how the Diamond diagram differs between this work and the earlier work by the authors. Further the authors state that “the diagram proposed here does not distinguishes between acceptable (within the diamond) and non-acceptable data (outside the diamond) but displays only inconsistencies”. So, this seems like only an incremental tweak, and should have been presented on those lines.

Suggest that the paper be rewritten and if the authors wish so, be resubmitted as a modified version of the previously published approach in Thunis et al, 2016 and present it as an application of this method for evaluating two versions of the CAMS-REG inventories.

While this approach helps compare two inventories, a key limitation is precisely that, i.e., it is only applicable when two versions of an inventory exist. It does not provide any insight into potential biases/uncertainties in a base (or single) inventory. So, potential uncertainties that are present in both will likely be masked.

Additional specifics on the input data used in the case study will be helpful. In lines 90-101, there is reference to gridded inventory and then aggregating to city-scale or country-scale. Since spatial resolution is a key aspect of the emissions inventories, the spatial resolutions of interest and being used are not clear. Are the authors going from grid-scales to city-scales or country-scales? What about potential issues about non-urban areas where some sectors (e.g., agricultural) may be of more importance?

It is not clear as to how the authors chose to present inconsistencies for the 4 examples (3 in the UK and one in Lithuania) discussed in detail. Agreed these are illustrative examples but additional context as to how/these were picked can be helpful. Can the authors also provide additional context as to how important these 4 cities are compared to the 150 cities studied in terms of emissions magnitudes? Also, the ECI metric bins these 4 examples into two approximate bins (two of them with 2 and 2.5, and the other two with 50 and 68). Can the authors explain this ECI pattern, and how this affects the choice of these illustrations?

A key gap in the discussion is how the outputs of this approach in terms of emissions inconsistencies can be used further. Given the detailed discussion of the methods and the illustrative examples, the paper can be strengthened by how this can be put to practical uses. There is some discussion in the Conclusions section (Lines 490-492) that half of the inconsistencies in the studies example is due to differences in country-wise reporting. Given that, wouldn't it be expected that this can be potentially easily addressed by promoting a harmonized approach among EU countries for development of emissions inventories?

Minor Comments:

- An easy to access list of the 150 cities, 4500 screened pollutant sectors, 450 relevant ones, and the 46 that showed inconsistencies would be helpful. Further, some quantitative information on these 46 vs 450 vs 4500 would add even more value to the paper.
- In Figure 4, can you clarify how the 46 points map to a subset of the 150 cities that were studied?
- Lines 65-66: Add "etc." at the end of the sentence
- Figure 6: Can this be made larger, and use darker / bolder font? This figure is mostly difficult to read
- References: Thunis et al, 2013 and Thunis et al, 2016 seem repeated, but with inconsistent years