Review of the manuscript

High resolution mapping of combustion processes and implications for CO_2 emissions

by

Wang, Tao, Ciais, Shen, Huang, Chen, Shen, Wang, Li, Zhang, Lu, Zhu, Chen, Liu, Wang, Wang, Li and Piao

Submitted to ACP

Recommendation

I recommend rejecting the manuscript in the present from. It potentially might become publishable after substantial revision, which cannot be achieved in few weeks.

General

The manuscript describes of global spatially highly-resolved inventories of fuel burn and CO_2 emissions, which can eventually become a highly valuable source of information for climate-chemistry modelling, satellite date evaluation and policy making. However, the present approach pretends a spatial accuracy, which mostly appears to be an artefact of the applied downscaling method (see also below), lacking a sound evaluation. Without clear caveats about the methods, this may lead to false interpretation of the results and potentially to wrong political decisions.

Mayor comments

1. l 82-84: The aviation data used as input are probably from EDGAR. I.e. they are based of lower resolution data originating either from great circle routes or from few days of actual flights. In the light of the variability of flight routes due to weather and heavy traffic is far beyond the resolution of EDGAR. Therefore downscaling these data to 0.1°x.01° is only a mathematical exercise. The result pretends accuracy, which only is an artefact of the method without any reliability. Furthermore the present manuscript appears to ignore the large uncertainty with respect to different aviation emission inventories. (The cases of aviation and cement production only serve as examples of the weakness of the manuscript.)
2. 133-136: CO_2 emissions from cement production were disaggregated using industrial coal consumption. To my knowledge cement production is much more localised than industrial coal consumption, i.e. here the method makes wrong distributions. (The cases of aviation and cement production only serve as examples of the weakness of the manuscript.)
3. Provide important information such as the sectorial emissions in line 186-188, l 191 ff in Table. That will increase the readability of the manuscript.
4. 301 ff: PKU-CO_2 only helps to reduce uncertainty in atmospheric modelling, if PKU-CO_2 itself has a high reliability, which the manuscript lacks to prove.
5. Provide a caveat section, which clearly shows the limitations of your method.
6. Transfer important table from the supplementary material to the main text.

7. Figs 2 and 4 show a weakness of the method. I cannot belief that, for instance, the emissions pattern significantly change at the border between the USA and Canada, or between the European and Asian parts of Russia. These pattern can only be artefacts of the methods applied.
8. It would be helpful, if the authors provide a web address where potential users can download the data, once the (substantially improved) manuscript is published.
9. How do the present results compare with the UNFCCC data?

Minor comments

1. Provide a list of abbreviations.
2. l 20: The SI unit for year is "a" not "yr".
3. 56: Do not use "EC-36" for the European countries. "EC" normally means "European Commission".
4. 57: Use "USA" or "U.S.A" as abbreviation for the United States of America. There are many United States in the world. (US is slang used in the USA from their view point of the world.)
5. 80-96: Provide the name behind the Groups, e.g., "Group 1 (wildfire). The reader is not as familiar with your nomenclature as the authors are.
6. l 83 and many later places: I guess it should read "CO_2 emissions".
7. 139: What does the "(4)" at the end of the line mean?
8. References: Sort the reference with the names used for citing in the text, e.g., "JRC".
9. Fig 1b. Explain the high values of per capita CO2 emissions in the Western USA or Finland.
10. Table S2: I do not think Poland considers itself being a developing country.