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Geoscientific Model Development Discussions

Interactive comment on "HEMCO v1.0: A versatile, ESMF-compliant component for calculating emissions in atmospheric models" *by* C. A. Keller et al.

Anonymous Referee #2

Received and published: 4 April 2014

This paper describes the Harvard-NASA Emission Component v1 (HEMCO). HEMCO is a Fortran 90 program that allows to mash different emission inventories to create emission input data for CTMs. Such a program is of high value for global and hemispheric modellers as it allows to use the best available regional emission inventories where such data is available and to use global (less accurate) inventories where such data is not available.

In general, the paper is very well written and good to understand. As it is mainly a technical development the work seems to be ideal for publication in GMD. However, before I can support the publication of this paper the authors need to address a few issues:

Minor comments:

1.1) Table 1 lists all emission inventories readily available in HEMCO. Here species from different inventories are mixed. e.g. CO,NOx,SO2 from EDGAR, VOCs from RETRO, NH3 from GEIA. Using different species which originate from similar sources from different inventories with different methodologies could lead to inconsistencies. While I think that it is reasonable to do so this issue needs to be discussed and the choices made need to be explained.

1.2) Furthermore, it seems that the model is lacking a large fraction of PM2.5 (e.g. primary sulphate particles, primary nitrate particles, unspeciated primary particles). Is there a reason for this?

1.3) It is not clear which particle fraction (PM2.5, PM10, or PMC) is covered by the inventory "Mineral dust aerosols" Zender et al., 2003 Please specify this.

1.4) Please add the grid resolution of each dataset into the table

2) In section 2.5 you write that the regridding method can only process datasets on a lat/lon grid. Yet, in table 1 you indicate that also EPA SMOKE data can be used as HEMCO input. As the SMOKE data is usually on a Lambert Conformal Conical Projection, how did you do the interpolation. Has this to be done externally (e.g. with the MAPL (Modeling Analysis and Prediction Program Layer) software toolkit)? If so you should indicate which projections can be interpolated by this software.

3) Please adhere to the guidelines of GMD From the GMD homepage under "Manuscript Types" for Model Description papers: "All papers must include a section at the end of the paper entitled "Code availability". In this section, either instructions for obtaining the code (e.g. from a supplement or from a website) should be included, or a contact point should be given where the code can be obtained on request; or the reasons why the code is not available should be clearly stated."

The webpage is given in the last sentence of the Conclusion. I would suggest to add

a "Code availibility" section just before the Acknowledgements and put that sentence there.

4) As the HEMCO code is not available on the given webpage yet, I was unable to assess the source code. As I expect the paper to be published after revisions I would encourage the authors to give access to the model source code as suggested in the paper.

Major comments:

5) My major criticism of this paper is the lack of a use case. I might expect too much of a model development paper. But I think that there should be an exemplary CTM run to show the benefits of HEMCO for global modellers. E.g. a comparison of a CTM run with emissions from a single global inventory like EDGAR compared to a CTM run using the described HEMCO setup. It is common knowledge that more information does not neccessarily lead to better results. However, when putting so much effort in improving the emission dataset there needs to be a kind of "proof of concept" to illustrate the benefits and also possible shortcomings of the applied method.

Here another excerpt from the GMD guidelines: "The publication should consist of three parts: the main paper, a manual, and the source code, ideally supported by some summary outputs from test case simulations."

6) I agree with the first reviewer that the paper is a bit too compact at times. Especially the HEMCO extensions explained in section 2.6 and the data library in section 2.2 (see also comments 1.1 to 1.3). Also the interpolation capabilities need to be described in more detail (see comment 2).

7) I would ask the authors to give an example for all configuration files. This could be given as a supplematary similar to Fig. 2. This could then be considered the "manual" part of the publication.

Once more: "The publication should consist of three parts: the main paper, a man-

ual, and the source code, ideally supported by some summary outputs from test case simulations."

Interactive comment on Geosci. Model Dev. Discuss., 7, 1115, 2014.