Geoscientific

Model Development

Discussions

[GMDD]

Interactive

comment

Interactive comment on "HERMESv3, a stand-alone multiscale atmospheric emission modelling framework – Part 1: global and regional module" *by* Marc Guevara et al.

Anonymous Referee #1

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The paper describes the structure of HERMESv3, an open source parallel tool that can be use to create emission input files for various air quality. The strength of HERMESv3 is without a doubt in its ability to process various databases for various air quality models and its flexibility as users can easily choose different parameters and ways to create the emission files. It is therefore certain that HERMESv3 will be widely use by modelers, especially if the list of models and mechanisms compatible increases in the future. The paper is well structured although it is sometimes lacking details. Therefore, the paper should be revised according to the following comments before being published.

Major comments:

One of my concern is that the tool does not take into account some meteorological parameters as it may prevent the code from being used by some air quality models for two reasons. First, some air quality models do not have a constant vertical grid but uses sigma levels. For these models, altitude of the different vertical layers of the model will change with time and space. From what I understand of HERMESv3, the model should not be able to directly distribute the emissions on those vertical grids. Can HERMESv3 somehow treat this specific case or does it mean that the models have to be adapted to read the emissions from HERMESv3? Second, some methods have been developed to temporalize (or even spatialize) the emissions from several sources (for example residential wood burning, agriculture) and such methods are used by some models. I understand it would have been difficult to do in a first approach, but it may be useful to indicate if such methods could be implemented into HERMES.

The figures should be improved. The scale of the maps should be revised (as the maps are almost entirely blue) to improve the readability and increase the number of details. I would recommend using a log scale to avoid showing only high values, and to not color areas without emissions. In figure 2, the order of the columns (ei, sector, ref_year, active, factor_mask, regrid_mask, pollutants) does not correspond to the order in the text (ei, sector, ref_year, pollutants, active, factor_mask, regrid_mask), making the text a bit difficult to follow. Moreover, the examples in figure 2 are difficult to understand without referring to the text. Moreover, I wonder if there could be a mistake in example 1, as the pollutants "nox_no2" and "co" are written in the columns whereas the caption of the figure and the text refer to OC emissions (not CO).

P8 l26: What does the authors means by first-order conservative? The method of Hill et al. (2004) should be better explained. From what I understand, HERMES does not use the landuse and only distribute homogeneously the emissions and therefore could distribute land emissions over seas or distribute agricultural emissions onto cities.

P8 l31-32: the authors use a gridding country mask to allocate emissions to a specific country. How are separated the emissions when there are several countries into a cell? Some inventories (like the EMEP inventory) directly provide the information of the emitting country. In that case, using a country mask is not useful. Is the information of emitting country use when given?

P9 l4-10: several methods are presented to distribute emissions onto vertical layers. A discussion on the comparison of the methods, with the strength and weaknesses of each methods, would be appreciated.

Speciation mapping: This section lacks details and several elements seem weird. In this state, it gives the impression that the speciation is not treated appropriately. For NMVOCs, I don't understand how it is possible to convert from mass to moles before using the speciation. You would need to know the speciation to compute the mean molar masses of NMCOVs. For NOx, I guess that you use the molar mass of NO2 if the NOx emissions are given as NO2 equivalent. Some explanations on Table 2 are needed. I don't understand why: - NO = nox_no2 and NO2=0.18*nox_no - TOL=0.293*voc13 (said to be benzene) +voc14 (said to be toluene) while there is a separate benzene species (and why 0.293). A similar question can be asked for almost species. - POA=3*oc (if it is to convert OC emissions into OM emissions, a factor 3 is very high and very unlikely) - EC=5.9*bc (it seems like that the emissions are artificially increase by a factor 5.9) - PMfine = 3.3*pm25-3*oc-5.9*bc (it seems like the mass of PM is artificially increase by a factor 3.3)

Writing module: as Figure 7 shows the time for writing increase with the number of processors used. As the authors said, the writing function does not scale properly, probably due to the NetCDF 4 library. Did the authors try to write (if possible) the results with only one processor or the use a specific library (like pnetcdf) for parallel writing?

Minor comments:

P2 l4: the authors should add a few words on why the global and regional inventories are too imprecise for urban scale modeling

P9 l11: If you transform a 0.1°x0.1° inventory into 1°x1.4° emissions, it is not technically an interpolation. I would not use the word interpolation in the text and only use the word regridding.

P9 l22: a.g.l is not defined

P12 l5: ":" instead of "Table 2" at the beginning of the line 6

P15 l30: "which are starting to be widely used in global models"

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