

Interactive comment on “A pre-processor of trace gases and aerosols emission fields for regional and global atmospheric chemistry models” by S. R. Freitas et al.

Anonymous Referee #1

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The authors introduce the tool PREP-CHEM-SRC, which pre-processes data of various emission inventories to make them directly applicable for some atmospheric chemistry models. PREP-CHEM-SRC seems to be helpful for applicants of the models mentioned in the article, but some major questions arise about the universality of the system:

- The authors list the models for which PREP-CHEM-SRC is currently used. It is not quite clear, how much work it would be to use it in other models as well:
 - What is to be changed for a model using a different grid, e.g., the limited-area model of the consortium for small-scale modeling (the COSMO model)

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which works with a rotated gaussian grid.

- What needs to be implemented into an other model for the usage of the system?
- A statement about the data format of the output of the pre-processor is missing. In the “software” subsection it is mentioned that the package requires HDF and NetCDF libraries, so I suppose PREP-CHEM-SRC can produce HDF and NetCDF output. Furthermore it is not clear how many files (and fields) the pre-processor produces in the end. One per species and inventory or one per inventory or only one at all independent of the numbers of emissions chosen?

Apart from the general questions about the usefulness of the tools for users of other than the mentioned models, there is one major concern about this paper: The authors urgently need to improve their article in term of grammar and linguistic style. Sometimes the linguistic flaws are even clouding the meaning of the text (see questions below). Thus I only support final publication after a thorough linguistic revision, copy editing might be a good idea.

In the following more specific questions or remarks are listed:

- abstract: You state that PREP-CHEM-SRC was written to prepare emissions for chemical transport models. The term “transport model” is –after what I understood from your publication– to restrictive. Transport models are driven by externally calculated dynamics. But most of the listed models calculate their own dynamics.
- p856, l. 19: I can imagine more details about the implementation of the emissions into the models. What do I need to use emissions produced with PREP-CHEM-SRC? Most probably a “read-in” facility is required: is this available in a generalised form or is it implemented for each emission individually?

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- Section 2.2.2: It does not become clear, how the MEGAN emissions are treated. You write that they depend on “land cover, weather, and chemical composition”. As these parameters are changing with time, the emissions depend on time too. So how can it be calculated beforehand?
- p. 860, l.8/9: “The hypotheses assumed for the burnt area needed for Eq. (1) are detailed in Longo et al. 2007.”: Please give more details about this in the paper.
- “See AM2001 for a complete list of species available within the PREP-CHEM-SRC system.”; Please give the list in the paper (maybe in form of a table).
- p. 861, l. 5-7; I am not convinced w.r.t. the good consistency of the emissions. GFEDv2 shows much less emissions in Bolivia and Acre and in the middle of the Amazonas region there are simply no emissions. With respect to Paraguay GFEDv2 provides larger emissions at the north-eastern border, whereas 3BEM provides high emissions at the eastern border of the southern part of Paraguay. This is not a “good consistency” in my eyes.
- Sect. 2.4.: Leave out the “umbrella cloud characterization” in the title of the section, as only 1-2 sentences refer to the umbrella cloud. By the way, it is “volcanic emissions” and not “volcanoes emissions”.
- Sect. 2.4.1: It is not quite clear in this section, what is provided to the model. It could be, that the emissions are calculated by the pre-processor, or that the ESPs are provided to the chemistry models. The user first has to read Section 3.2 to know what you are talking about. This might simply be a linguistic problem. I recommend to rephrase this section.
- p. 862, l. 8/9: “Each file contains the number of events for each day over the entire world.” What do you mean, if each file contains each day you do not need more than one file, do you?

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- p. 862, l. 13/14 (and p. 861, l.24/25): What do you mean by “collocates each volcano emission within the nearest grid box”. As the grid covers the entire model domain, I would expect the volcano to lay in one grid box. What do you mean by nearest grid box? By the way “collocate” means something like “arrange”, “compose”, most probably you mean something like “place” or “locate”, dont you?
- last part of Sect. 2.4.2.: The processing of the total emissions in one column is not clear: Is there one emission height for all volcanoes in one column? Does this lead to the emissions in one column being placed in one grid box only, which is located at the effective column height of the emissions? Or is it possible to distribute the emissions over a number of levels depending on the heights of the different volcanoes located in the respective column?
- Section 3.1.: What about stacks? Following your description, they are part of the cold/low bouyancy emissions. But often stacks emit hot and wet fumes which are bouyant. How do you handle these?
- Section 3.1.: Please give a unit for E.
- p. 864, l. 7: It is “emission rate”, not emission. Is the unit of the emission rate per dry air or per humid air?
- Eq. 6: Be precise: The emission depends on the time and rho depends on the level.
- Fig. 2: improve the quality of the picture: it is out of focus, and it looks like a slide hastily copied into the paper. Reduce the size of the axis labels “r(t)” and “time”.
- Fig. 3: A sketch might be clearer than a photo.
- p. 865, l. 9-14: The sentence is much too long and not correctly completed, as the relation of “them” is grammatically wrong.

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- p. 865, l. 16: What is lambda?
- Eq. 7: $k > 1$ is missing.
- last paragraph of Sect. 3.2: Please give a reason for the diurnal cycle in biomass burning.
- Sect. 4.1 last paragraph: Does the emission generation depend on the chosen chemical mechanism? In other words do I have to use one of the named mechanisms or do you simply mean, that all species treated by these mechanisms are included in PREP-CHEM-SRC?
- Table 2 is very longish. As no information at all is provided about the individual entries of the namelist/table, I suggest to move the table into an electronic supplement, because it has no added value for the article itself.
- Figure 5: The comparison would be easier if the smaller grid section would be displayed on both panels. As it is, details in the right panel are hard to spot.
- p. 867, l. 18: "In this resolution is more discernible the emission rates within the SPMA": I do not understand this sentence. Please, rephrase it.
- p. 868, l. 8: What is grid resolution G5?

In the end I give a list of some of the language flaws (please be aware that this is –by far– not a complete list):

First, some more general remarks:

- use one spelling only: decide whether to write "pre-processor" or "preprocessor".
- The programming language is spelled Fortran 90 (not FORTRAN 90)

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- $0.5 \times 0.5^\circ$: Both directions are in degree, thus write $0.5^\circ \times 0.5^\circ$. The same holds for other resolutions.
- The abbreviations AM2001, A2010 and M2009 are introduced and used only 2(3) times afterwards. It would be better to fully cite the articles throughout the text.

Second, some specific reformulation suggestions:

- the title: "trace gas and aerosol emission fields". "Trace gases and aerosols" need not to be plural, as they only describe the fields, which are in plural.
- p856, l. 7 (and p. 868, l. 25): plumerise model → plume rise model; I only heard of "plume models" until I read this article.
- p856, l. 19: "The way .. is detailed" ??? Maybe "The inclusion of these emissions is described in detail"?
- p856, l. 14/15: "have became" → "became" or "have become" or here simply "are".
- p.856, l. 17: "upper levels mass fluxes" → "upper level mass fluxes"
- p.857, l. 3/4: "The emissions pre-processor is also under implementation ...": Apart from the fact that emissions should be singular, do you really mean that it is currently being implemented or is it already implemented: "The emission pre-processor is also implemented into the global circulation model of the Brazilian Center ... "
- p. 857, l. 14: what are "selected choices"?
- p. 861, l. 16/17: "Volcanoes eruption" → "Volcanic eruption"
- ...

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- p. 868, I. 9/10: “On the left side, mostly of emission is associated to densely industrial and 10 urbanized areas.” → “Most emissions displayed in the left panel of Fig. 8 are associated to dense industrial and urban areas.”
- p. 868, I. 10: The first part of the sentence does not make sense to me.
- p. 868, II. 17/18: “Emissions fields are interpolated onto the model grid, with several options of map projections available and flexible spatial resolution.” → “To interpolate the emission fields to the model grids, the user can choose between several map projections and determine the spatial resolution in a flexible way.
- “The main interests of this new pre-processor”. I do not believe, that your pre-processor has interests itself. What about “The main accomplishments of this new pre-processor are ...” ?

In summary, PREP-CHEM-SRC seems to be a useful tool for the users of the models in which the interface for the usage of the emissions produced by PREP-CHEM-SRC is already implemented. It would be good to add information about the requirements for the usage of PREP-CHEM-SRC in other models. Finally, the article needs major revisions in terms of the usage of the English language.

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