
Reviewer 2

- Reviewer Point P 2.1** — The authors do not explain how they take into account the distinction between land and sea. No discussion is provided on that point. Lines 11-12, p. 6 suggest that the emission for any, possibly coarse, cell of the input inventory will be assumed to be evenly distributed within this cell, and thereafter evenly redistributed between all the intersecting model cells according to the intersection area. In the common case when model cell is smaller than inventory cell, this would lead to emissions of a clearly continental nature (e.g. traffic, residential heating) ending up in part in purely oceanic model cells, and shipping emissions ending up in part in purely continental cells. The authors should either explain how they avoid this problem, or acknowledge this point as a serious limitation of their tool that needs to be addressed in its future versions.
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- 10 **Reply:** Thank you for this important comment. Our current version does not use additional information (land/sea mask, landuse etc.) to redistribute low-resolution inventory data onto the high-resolution COSMO-grid. We have modified the section and now mention this limitation:

15 [Our tool does not redistribute the low-resolution inventory data onto the high-resolution COSMO-grid using additional information, such as land-sea masks and country boundaries, which can be used for improving the spatial allocation of area sources. This feature could be implemented in a future version similar to the implementation in CHIMERE-2017 model \(Mailler et al., 2017\).](#)

- Reviewer Point P 2.2** — Similar to point 1 (but less hindering), accounting for landuse differences to have a meaningful distribution of emissions among model cells is also possible (e.g. the emiSURF emission preprocessing tool described in Mailler et al., 2017, "CHIMERE-2017 : from urban to hemispheric chemistry-transport modeling").
- 20 From a computational point of view this would be the same as accounting for land/ocean difference, but less critical. If the inventory is, e.g., 10x10km, one inventory cell could very well contain one area with forest and one city, and taking this information into account when generating emissions at the, say, 1x1km resolution of the model is clearly useful. Same as for point 1., if this is done the authors should explain how, and if not they should acknowledge this point as a limitation compared to other tools.
- 25 **Reply:** See our previous response.

- Reviewer Point P 2.3** — I can take the word of the authors that it does not generate major errors, but the areas in square degrees are not really convincing. An "area" in squared degrees is not an area, and is not even proportional to the geometric area (that would depend on the orientation of the considered area, zonally or meridionally elongated). It would probably not be more difficult to work with real geometric areas on a sphere. The meaning of an area in squared degrees is really unclear to me, in particular if either the inventory or the model grid is not a regular lat-lon grid. What is a square degree close to the pole for example ? I feel uncomfortable with this point which more or less prevents a clear and physical writing of the equations for horizontal redistribution of the emissions, which are the key points of the tool they propose. In my opinion, the code should be slightly modified to deal with real geometric areas in squared meters.
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- 35 **Reply:** We addressed this issue already in our reply to Reviewer Point P 1.4. We have modified the code to compute the intersection in an equal-area projection, solving this issue.

Reviewer Point P 2.4 — The country-dependance of time profiles is mentioned in the text but not in the equations. As a consequence, the management of cells that are at the border of two or more countries is not really

made clear : does teh CTM have, for these cells, yearly amount of pollutant per snap sector *and per country* ?
This problem is not major, but the authors should make clear how they deal with this issue

Reply: We addressed this issue already in our reply to Reviewer Point P 1.5.

References

- Mailler, S., Menut, L., Khvorostyanov, D., Valari, M., Couvidat, F., Siour, G., Turquety, S., Briant, R., Tuccella, P., Bessagnet, B., Colette, A., Létinois, L., Markakis, K., and Meleux, F.: CHIMERE-2017: from urban to hemispheric chemistry-transport modeling, *Geoscientific Model Development*, 10, 2397–2423, <https://doi.org/10.5194/gmd-10-2397-2017>, <https://www.geosci-model-dev.net/10/2397/2017/>, 2017.
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