

Geosci. Model Dev. Discuss., referee comment RC2  
<https://doi.org/10.5194/gmd-2021-96-RC2>, 2021  
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## Comment on gmd-2021-96

Anonymous Referee #2

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Referee comment on "The CHIMERE v2020r1 online chemistry-transport model" by  
Laurent Menut et al., Geosci. Model Dev. Discuss.,  
<https://doi.org/10.5194/gmd-2021-96-RC2>, 2021

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The paper described an important and valuable updates developed for CHIMERE model, which are particularly relevant for the CHIMERE modelers community and also to enlarge this community.

However, there are large parts where this paper seems more a manual of the model, than a scientific paper. Besides that, there is too much updates included which do not allow to enter in detail in each one of them, in particular to perform an adequate model evaluation for the different developments. I would suggest that this paper could be divided into 2 parts (A and B), where the different type of model developments could be analysed in more detailed, and evaluated with test cases not so general (the domain is too coarse and the model validation is presented only in terms of average over the all domain! This is not sufficient to understand the benefits and advantages of the mode updates.

Taking into account these comments (and others following) I would recommend major changes before accept it to publications. Please consider the following additional major and minor changes:

Line 7: "The NO<sub>x</sub> emissions from lightning are added"

Figure 1: Map of CHIMERE users in 2021

Line 27: "biomass burning" should be specified that is related to forest fires (there is also biomass burning in residential combustion sector, which was already included in previous version

Tables caption: should the legend of the table be placed below the table? (usually is on the top)

Line 144: please correct this sentence

Line 150: besides the quantification of the coupling changes, it would be important to show how the model perform better with this update

Section 3.2: a large coarse domain was selected but since there is only available air quality observations for Europe, why is this domain considered? Maybe the best would be to focus on Europe (and North Africa eventually to model dust) and perform a more detail and interesting validation exercise

Line 178: why do not used the Delta-Tool developed for model assessment pruposed within the FAIRMODE community?

Section 4.1: More than know the average value of the statistical indicators over all the domain (!! ) would be more valuable to have the idea of the dispersion of the error (box plots). For the BIAS, for example, considering only the average of the domain, it would leave to misunderstanding of the results (if there is regions with positive and others with negative systematic errors values)

Line 215: please explain. I did not understand: "The v2017r5 was also more accurate...For all situations, the v2020r1 is more able to represent..." ??? (please also correct v2002r1)

Line 219-220: can the authors explain the low values given by v2017r5?

Line 224: why only O3 is mentioned? there are other important pollutants

Figure 7: this scheme could be improved in order to give more detailed...

Line 273: please explain this replacement by the one of Abdul-Razzak and Ghan (2002)

Line 289-290: please review this sentence (english grammar)

Line 291: remove "version"

Line 300: please identify the 5 simulations

Line 311: please review this sentence (english grammar)

Section 6: this development should have a paper dedicated to that. There is too much information/detail that should be given, which is not possible to analyse in a couple of lines (max 20).

Line 419: a brief explanation of what is being presented below should be given here

Section 7.3.1: there is no section 7.3.2: it make sense to exist only one?

Line 575-580: references to support this are missing

Line 581-586: references to support this are missing

Line 605-608: references to support this are missing

Section 8.4: see my comment above about saying only "biomass burning"

Figure 11: I think Figure 11 should be placed only after being mentioned and not before

Section 9: This section is too limited for so much work that should have be done and presented. That's why my suggestion would be to splitt it into 2 papers, in order to be possible to perform a more completed model evaluation, in order to understand the viability and add-value of the different model developments

Line 733: please review this sentence (english grammar)

Section 10, 11: I have doubts if these sections should be included since there is no comparison and model evaluation. It is just information for the model users, which could be just mentioned, referred and reported in the (online) manual

Section 11: an introductory text should exist before Figure 15

Conclusions: there is lack of explanation of how model validation was performed