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Geoscientific Model Development Discussions

Interactive comment on "High resolution air quality simulation over Europe with the chemistry transport model CHIMERE" *by* E. Terrenoire et al.

Anonymous Referee #2

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General comments

The current manuscript describes the results of a CHIMERE model simulation at (0.125 $\times$0.0625 horizontal resolution) performed over Europe for the year 2009. The model evaluation is performed using both rural and urban background stations. Using seasonal and yearly mean statistical indicators authors attempt to highlight advantages and shortcomings of the model.

The paper is poorly written and hard to follow. Authors have a complete disregard to acronym definition to the level that at times it is impossible to understand the text. What does UB stand in the abstract? It is only defined on pg. 4147. What does GFS/WRF stand for? And the list goes on and on. It is not a reviewer's job to correct all the missing acronyms. Just a point, the "Airbase" is not defined and there are three

different versions "Airbase", "AIRBASE", and "AirBase" found in the manuscript.

Introduction is very shallow and needs to be extended to cover other studies in the region, their advantages and shortcomings, etc. Based in this information then authors should identify the research questions and shows the clear need for the additional model development/validation.

I believe Anonymous Referee #1 gave a very nice review and lots of helpful suggestions. In addition to his/her recommendations, I would propose considerable restructuring of the manuscript. In the methods section, please describe the model (with clearly identified improvements) and observational data. In the results section please show the advantages of using new modules. Also instead of using phrases like "logically seen", "catches nicely", etc. describe how does model perform for the selected species. If the agreement is poor, please explain why. Please note that by better discussion of the results I do not mean addition of new figures/Tables. There are excessive number of tables and figures in the manuscript. What is missing is clear and concise description of the results. Figures 8,9,10 as well as several tables can be removed (or put as supplementary online material).

Specific Comments

Please clarify that CHIMERE is not a CTM but a regional CTM. The difference between CTMs and GCMs can be found elsewhere. It is also not clear why authors believe that CTMs were initially designed only for the ozone concentration simulations.

Pg 4140 Ln.17 Please explain what does nested mean, nested how?

Pg. 4140. Ln. 20. Fig 7 should come after Fig. 1-6.

Ln. 4141 Ln.5. I am not sure I understand the logic here: are reanalysis data compared to the model results? If so, please explain why. If not, please reword to make it less confusing. The rational for the choice of January, 2009 as a "selected period" is also not clear.

Pg. 4141, Ln. 25. Please explain how the model with 7 x7 km2 horizontal resolution and 8 vertical layers can resolve the urban canopy. How were wind speed and the vertical diffusion (Kz coefficient) modified within the CHIMERE version used in the current study to resolve the urban boundary layer? What else was “corrected”? What is meant "rather strong impact"? What does qualify as strong vs. weak? Instead of comparing model-to-model, Figure 2 should compare model results (with and without urban canopy correction) to measurements. This chapter should be made as part of the results section and should be expanded.

Pg. 4142, Ln 22 Change “Non Methanic” to “non-methane”

Pg. 4143, Classification should either go into a table or be removed.

Pg. 4143, Ln. 20 Please reword “whose high resolution (1 km) preserves the accuracy in term of emission spatialisation.”

Pg. 4144, Ln. 15 Please include a reference for “because biomass burning emissions are less influent on gas phase pollutant than particulate matter.”

Pg. 4145, Ln. 11. Please explain who is IIASA and how/based on what were coefficients recommended for different chemical species. Are these just tuning coefficients for the results to be closer to the observations? If so, please state clearly. Please place the major urban cities on all figures where it is proposed that urban corrections can have considerable effect on the model performance.

Pg. 4145, Ln. 13 please reword the sentence “In a second time, an aggregation step is performed to lump NMVOCs into model species following Middleton et al. (1990).”

Pg. 4146, Ln. 5. Please explain calculations for daily energy demand. Does the fact that the constant offset, C is used mean that production of hot water is associated with the same energy consumption during summer as for the winter? Also how reasonable is it to assume that energy consumption by the population is the same in developing and well developed countries, and is only function of the ambient temperature?

Pg. 4147, Ln. 19. Please explain what does it mean “In this paper, we perform an “operational evaluation” (Dennis et al., 2010).”

Pg. 4149, Ln. 21 Please explain what does it mean “concentrations is very well simulated. ” Are over 10 ppb differences (i.e. $\sim$40% error) in daily mean ozone concentrations acceptable?

Table 1 is confusing. Please explain what do S1 to S11 stand for.

Fig. 11. Please convert NO2 concentrations from ug/m3 to ppbs to be consistent with the rest of the manuscript. Also explain what the different symbols are on the figure.

Interactive comment on Geosci. Model Dev. Discuss., 6, 4137, 2013.