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Geoscientific
Model Development
Discussions

Interactive comment on "How realistic are air quality hindcasts driven by forcings from climate model simulations?" *by* G. Lacressonnière et al.

Anonymous Referee #1

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If chemical-transport models (CTMs) are used as air quality models, they are usually driven by meteorological fields provided by a weather forecast model, which is near to reality due to data assimilation. However, using CTMs for climate air quality prediction inherently includes higher model errors, as the meteorological driving data will be used from a climate model, which is, firstly, not restricted by observations and, secondly, provides the driving data in a coarser resolution. Last but not least, the determination of the error of such a prediction is much more complex. While a usual prediction can be compare to measurement data of that specific date and time, the climate model output can only be interpreted on a statistical basis.

This article comprises an assessment of the use of the MOCAGE CTM as chemistry-climate prediction model. The article is overall well written, and I recommend its pub-

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lication. Nevertheless, before publication minor revisions, as listed below, are necessary.

Scientific questions and content-related remarks:

- Sect. 2: What do you mean exactly by “two-way nested domains”? Does the chemistry in the smaller domain feed back to the larger domain? Or does the chemistry influence the meteorology (ok, this seems to be unlikely for a CTM)?
- Sect. 2: page 2089, line 4: What does “SSTs evolve along the simulation” mean? Are the observed SSTs prescribed for all simulations, or does ARPEGE include an ocean model, or something else?
- Sect. 2.3: Which simulation are you evaluating for the use of the classes? Only ANALY seems to make sense, but this should be stated somewhere.
- Sect. 3.1.1 & Fig. 2: It is really confusing that precipitation is plotted in the second line of Fig. 2 but nothing is said about it in this place. Even if a short reference to it is given in the next subsection. I recommend to add the comparison for the precipitation fields.
- page 2096, line 12: Fig. 2 displays the difference of ANALY-INT, but in Sect. 3.1.2 INT-CLIM is investigated. I would expect that the temperature differences from ANALY-INT and INT-CLIM differ.
- page 2098, lines 22-24: From my point of view the annual amplitude of the ANALY simulation is overestimated as well and not “accurate”.
- page 2100, line 27: “vertical resolution” of what? The models should use the same resolution, if I understood correctly.

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- Fig. 4: I understood from your model description that ANALY, INT and CLIM use the same horizontal and vertical resolution. Why do the pictures for ANALY have a much better resolution as for INT (e.g., the resolution of the mountain ridge)?

Technical corrections:

- Abstract: From my point of view SOMO35 is not a well known abbreviation, so it would be better to not used it without explanation in the abstract.
- Sect. 2: As the chemical mechanism used here is the mixture of different existing reaction mechanisms and few additions, I suggest to give a list of the full reaction mechanism in the electronical supplement.
- page 2095, line 17/18: “Concentrations ...” this sentence seems to be incomplete. Do you mean “High concentrations ...” or generally “SO2 leads to sulphate formation”?
- page 2096, line 17: Fig. 7b is referenced before Fig. 6. Rotate figures or include Fig. 7b into Fig. 5.
- Sect. 3.1.2 and Fig. 7: Fig. 7 a,b,c,d,e are cited but no letters are given in the figure.
- Sect. 3.1.2 and Fig. 7: the unit of the deposition flux in the text and the caption are given as μg m^{-3}s^{-1}. In the plot itself it is given as μg m^{-2}s^{-1}, which is more likely the unit of a flux.
- page 2097, line 12: “In summary, the comparisons between ANALY and CLIM (Fig. 8) have revealed ... “ This sentence is really confusing as Fig. 8 was not mentioned before. Please rewrite the sentence, e.g., “In summary, Fig. 8 providing a comparisons between ANALY and CLIM reveals ... “

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- page 2098, line 16/17: “In Table 6 are summarized the statistics ...” → “Table 6 summarizes the statistics ...”
- page 2098, line 20: the minus sign before 4.6 is missing.
- Sect. 3.2.1: It would be good to state somewhere that the Tables providing the error statistics are discussed in detail in the next subsection.
- page 2099, line 18: add “(Table 10)” behind bias.
- page 2099, line 23: Fig. 9 and Table 9
- page 2101, line 24: Figure 11c → Figure 11b
- Table 1: 6 yr (? , the text says 5 yrs); 2003-2008 (? , the text says 2004-2008)
- Table 3, caption: et → and
- Table 5: for PM_{10} classes 1-2 (text says 1-5)
- Table 9: DM is missing in all entries in the left column.
- Fig. 2: everywhere “PBL” is used, change the annotations in the figure accordingly from BHL to PBL.
- Figs. 2,3,6,9,10,12: Figures are much too small. I had to enlarge them on the screen by more than a factor of 3. This should be readable without zoom in the final version.
- Fig. 6: a,b,c,d, are far too small.
- Fig. 6: “For INT, daytime and nighttime mean deposition velocities reach 0.57 cm/s and 0.24 cm/s, respectively over land (0.06 cm/s and 0.05 cm/s over sea). For CLIM, day-time and nighttime mean deposition velocities reach 0.54 cm/s and

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0.24 cm/s over land (0.05 cm s−1 and 0.04 cm s−1 over sea)." This information does not belong into a caption.

- Fig. 6+7: showing the sulphate difference in Fig. 7, but no sulphate in Fig. 6 is inconsistent.
- Fig. 9, caption last lines: Please state in order, what is displayed in 1) and what in 2).
- Fig. 12: The cross for ANALY is too small.

Interactive comment on Geosci. Model Dev. Discuss., 5, 2083, 2012.