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Geoscientific Model Development Discussions

Interactive comment on "EURODELTA-Trends, a multi-model experiment of air quality hindcast in Europe over 1990–2010" *by* Augustin Colette et al.

Anonymous Referee #2

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The paper describes a multi-model experiment including 12 one year long air quality simulations for Europe and two simulations with a length of twenty years. The volume of work presented in this model experiment description paper is really impressive and the paper should be published after some revision as a basis for the hopefully following numerous papers going more into the details.

In its currents form the paper starts quite nicely but it is weakening toward the end. In particular, it is disappointing that not even a single result is presented. At least some overview results have to be included (which is also required according to the requirements for model experiment description papers in GMD), although a more in-depth discussion must of course be left to more specific papers.

In addition, some aspects of the model setup should be explained in more detail.

Specific comments:

The description of the model setup is not always precise. Several questions remain open illustrated below using the example of the model grids: Ìű

- According to the (too brief) section 4 WRF-Chem is run on a 0.25° x 0.4° lat-long grid. Was a rotated grid used for the WRF-Chem runs?
- Line 34 on page 6 and line 1 on page 7 indicate that WRF-Chem was run for a Lambert conformal grid at 25 km resolution ('A similar strategy [as for the meteorological driver for CMAQ] was used for WRF-Chem . . .'). This is contradictory to the statement above.
- According to Tab. 3 the horizontal grid width is approximately 25 km whereas the grid width of HIRLAM is approximately 22 km. However, in section 4 it is mentioned that all simulations were performed for the same lat-lon projection with 0.25° x 0.4°, with CMAQ being the only exception. Does this mean that MATCH has a different grid width than its meteorological driver? Please explain in more detail.
- Including an additional line with the name and the applied resolution of the meteorological driver in Table S1 might be helpful.
- Tab. 3 implies that the boundary conditions for the WRF-Chem simulation were derived from WRF simulations with 0.4°x 0.4° grid width. Is this true, or does 'WRF-0.44 simulation used by other EDT models' just mean that the WRF-Chem run and WRF-0.44 use the same ERA-Interim data for deriving the meteorological boundary conditions? If this was the case: Was meteorology nudging applied during the WRF-Chem run?
- Was nudging applied for RACMO and HIRLAM? This information could be added to Table 3.

Therefore, the setup of the models must be described in more detail.

Page 9, lines 21-22: Please add some more details and also remarks concerning the quality of these data.

Section 8.2: Please add some more details here (resolution, etc.)

Section 9: The 'Additional diagnostics' part looks just like copy paste from the modelling protocol. A table might be more useful. Eventually, this type of list might be moved to an appendix. Finally, although the reader can guess the meaning of all abbreviations e.g. O3_HL, it should be explained.

A few overview results including all contributing models (e.g. Taylor diagrams, box plots, for axamples see Solazzo et al., 2012 (doi:10.1016/j.atmosenv.2012.02.045) or Im et al., 2015, (http://dx.doi.org/10.1016/j.atmosenv.2014.09.042) or a table) should be added.

In their current form, the conclusions are more like a summary and outlook. But even the current outlook needs to be enhanced. Is there any concept concerning the further analysis of the results and future papers? Which detailed analysis is under work by the members of the consortium?

Minor Points

Further previous multi-model studies should also be mentioned in the introduction (at least multi-model studies with a minimum length of one year of simulation).

Page 5 line 9: Do the authors mean chemistry boundary conditions here?

Page 5: Is the WRF version (v3.3.1 according to Tab. 3) the same as described in Stegehius et al, 2015.?

Page 7: Section 6 is a bit meager. It should be either enhanced or incorporated into a section, which dedicated to all types of emissions.

Figure 2: The red dots as well as the blue dots are not well resolved in the figure, i.e most of the blue dots look more like a line.

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