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Geoscientific Model Development Discussions

Interactive comment on "Air quality forecasts at kilometer scale grid over Spanish complex terrains" *by* M. T. Pay et al.

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We would like to thanks the Referee #3 for his/her constructive remarks and comments. All his/her comments have been implemented and discussed accordingly in the reviewed version of the manuscript.

Please, find in the next paragraphs answers to Referee #3.

Referee #3: I would prefer to add a short paragraph on the impact of the (resolutionof the) meteorology on the model results. From the paper it is not quit clear at what resolution the meteorological input is used. If in particular the resolution goes down to 1 km, the local meteorological phenomenae become important.

Authors: Following the same nesting strategy as for the air quality simulations (see

Figure 1), the meteorological fields from WRF are first simulated at 12 km x 12 km over Europe (the mother domain) using the GFS global data for boundary and initial condition. By means of a one-way nesting, the WRF simulates meteorology at 4 km x 4 km horizontal resolution over the Iberian Peninsula and at 1 km x 1 km over the study domains (Andalucia, AND; Barcelona, BCN and Madrid, MAD). The WRF model configuration and set-up is further described in Section 2.2.

The impact of the resolution increase is also analyzed in terms of meteorological parameters. Indeed, the meteorological fields are evaluated for wind speed at 10 m (U10), wind direction (WD10) and temperature at 2 m (T2M) at 10 METAR stations located at airports (6/2/2 stations in AND/BCN/MAD. However, due to the long extension of the paper we have decided to move this discussion to the supplementary material (Sect. S1, http://www.geosci-model-dev-discuss.net/7/2293/2014/gmdd-7-2293-2014-supplement.pdf). Along the discussion some comments and link the meteorological performance are included. Overall, comparison with METAR reveals that the resolution increase slightly improves T2M (bias in 0.1°C), U10 (bias in 0.1 ms-1 and r in 0.1) and WD10 (error in 52° and r in 0.1). However, it slightly decreases WD10 bias (in 2°). High resolutions (ranging from 1 to 5 km) are essential to reproduce mesoscale phenomena, e.g. those controlling O3 transport along the mountainous northeastern Mediterranean coast where features depending on topography like temperature, wind speeds, channelling, convergence/divergence lines and mesoscale circulations are better described (Fay and Neunhäuserer, 2006).

Referee #3: Related to the first point, and also mentioned by Referee# 1, is the issue of the spatial representativeness of the observations. Some clarification is needed in the paper.

Authors: Comments about spatial representativeness have been already discussed in answers to the Referee #1 and Referee #2.

Referee #3: For typographical errors I refer to the other referees.

Authors: Typographical errors mentioned by the Referees #1 and #2 have been amended accordingly.

Interactive comment on Geosci. Model Dev. Discuss., 7, 2293, 2014.