

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

**Anonymous Referee #2**

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This paper presents a comparison of air quality forecasts for several domains over Spain at 4km and 1km (and some 12km) horizontal grid resolutions for April 2013 using the CALIOPE-AQFS modeling system. Comparisons are made between forecast concentrations for several pollutants (e.g. O<sub>3</sub>, PM<sub>2.5</sub>). This type of analysis is important in order to provide the public the best information (air quality forecast) possible so that they make the best decisions regarding their activities and protect their health. Overall, the work presented is interesting and useful, and the authors have done a fairly thorough job presenting a wide range of results (perhaps too much in some parts). The tables and figures included are generally well done and easy to interpret. The overwhelming issue with the manuscript in its present form is the poor grammar and general writing of the article. In some parts of the manuscript the writing is poor enough that it is difficult to understand the point trying to be made by the authors (at least not

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without significant deciphering). I believe that the work is worthy of publication, but the authors need to greatly improve the writing before the article can be accepted for publication. There are too many grammatical errors in the manuscript to address specifically. The authors are encouraged to have the manuscript reviewed and edited by a native English speaker before resubmitting the article. I've provided some specific comments below. I would enjoy reading the manuscript again after the language in the text is improved to provide and final comments/suggestions.

General Comments: While I do agree with the other reviewer's comment regarding the length of the analysis being presented (one month), given the amount of effort required to perform a thorough analysis of the data for multiple domains and grid resolutions, the short duration does not, in my opinion, significantly harm the analysis presented. However, it does make it impossible to make any general, sweeping conclusions regarding the performance of 4km vs 1km grid resolutions, since model performance can change significantly throughout the year (and from year to year as well). I don't believe the authors make any of these types of generalized conclusions, so that is not an issue. Perhaps in the future the analysis could be extended to a longer time period (perhaps cutting down on the number of domains analyzed). And incommensurability between observations and model values will always be an issue, and should probably always be noted, as the comparisons being made are between point observations and grid volume concentrations. But noting whether the measurements are instantaneous values or hourly average values would be useful (same goes for the model values).

Specific Comments: P2294L4: Define “main pollutants” here. P2294L12: Replace “in” with “by”. This change applies to the entire article. P2295L23: Define CAMx and CMAQ here. I don't believe they have been defined yet. P2296L28: What is meant by “larger spatial concentration”? P2297L16: Define OPANA. P2298L23: I assume the numbers provided in parentheses are the length of the mountain ranges and not height. That needs to be made clear in the text. P2298L25: What is meant by “Central System”? Figure 1: In Figure 1 the domains are labeled d1-d5, but here they are named.

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They should be made consistent. P2299L6: What is meant by “logistic”? Section 2.2: What land-use data is used in the WRF simulation? P2300L25: After collapsing, how many CMAQ layers are in the PBL? P2301L4: Why is the reference here to the previous version of CMAQ stated as v4.5? The previous version of CMAQ before 5.0 is 4.7 (and before that 4.6). P2301L8: Why use AERO5 and not AERO6? P2301L24: What is meant by “300 min”? P2301L27: What is meant by “soft reservation”? Section 2.3: I’m not sure how much value this section adds to the manuscript. Every group uses a different computer configuration for their modeling efforts, so these numbers are really unique to your modeling exercise. While some readers may find the information interesting, I think most readers will not find the information overly useful. If a strong argument can be made for keeping the section, then fine. Perhaps it could be consolidated into a single paragraph however. P2302L12: I assume the 1 ug/m3 is a MINIMUM cut-off. That should be made clear. P2302L16: Define METAR. P2303L14: What is meant by “considering the 75% of the values”? It’s not really clear here. P2303L25: What is meant by “maps are conserved”? P2304L8: Not sure the language “significantly better textured” is appropriate here. I think the authors are just trying to indicate that the roadways are more easily identified and better defined in the 1km simulation than the 4km, but that doesn’t necessarily mean they are “better”. P2305L25: The authors need to be consistent with their language when describing the results. Here, the authors state “monthly r slightly decreases when resolution increases from 0.67 to 0.58”. That’s a difference of 0.09. However, just above the authors state “slopes significantly improve with resolution increase from 0.72 to 0.77 for NO2 and from 0.50 to 0.54”. Both of those increases are much less than the decrease for PM10. The authors need to be fair here and use consistent language instead of highlighting the improvement as “significant” and the degradation as “slightly decreases”. P2305L26: Surely the value here should not be 0.4 (I assume it should be 0.04). P2306L14: A lot of these values lack units. Units need to be added for all values where appropriate. P2307L11: I authors say “bias” but the values are in percent, so it must actually be some kind of normalized bias being presented. P2307L16: A number of times the incorrect abbreviation CIS

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is used instead of CSI. P2310L3: A reference should be included here regarding the model performance for morning and evening transitions. P2314L10: Change “better captured” to “more evident”. Also, the NO2 measurements are likely not made right on the roadway, so it’s probably not possible to attribute the improvement in NO2 performance at finer resolution to only the roadways. If the NO2 measurements are made right at the roadways, it would be good to state this earlier in the text regarding the proximity of the NO2 measurements to the major roadways. P2316L20: This detail should be included earlier in the text. Also, why was such an old land-use data set employed? Using a more up-to-date land-use data set could improve the model results significantly. P2316L30: What is the CORINE data set? A very brief description of the data would be nice here.

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

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