

## ***Interactive comment on “Ground-level ozone concentration over Spain: an application of Kalman Filter post-processing to reduce model uncertainties” by V. Sicardi et al.***

**V. Sicardi et al.**

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**Interactive comment on “Ground-level ozone concentration over Spain: an application of Kalman Filter post-processing to reduce model uncertainties” by V. Sicardi et al**

**Referee #2:** *This paper presents another good example of Kalman filter application to post-process raw model outputs to significantly improve ground-level ozone forecast skills, and this should be the direction that the current air quality forecasting programs take. The analysis is scientifically sound and the manuscript is generally well pre-*

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*sented. However, the authors need pay attention to the English writing and there are many running and incomplete sentences. After addressing the following comments and corrections, this manuscript should be published at GMD*

### **Response to Referee #2**

**Authors:** We acknowledge the referees #2 for the constructive comments done. We appreciate the suggested corrections that we have applied them to improve the paper. Besides we have revised the English writing.

### **General comments**

**Referee #2:** *The authors should carefully check the text and make sure any nickname is defined before its use. For example, the manuscript mentioned the IP domain, but nowhere in the manuscript describes what an IP domain is.*

**Authors:** We have defined explicitly the domain of study and checked all the nicknames.

### **Specific Comments**

**Referee #2:** *1. Page 344, Line 9, “The bias-adjustment technique is found to improve the simulated O3 maximum”, Change to “The bias-adjustment technique improved the simulation of daily O3 maximum”*

**Authors:** We have modified it.

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**Referee #2:** 2. Page 345, Lines 24, 26, and many other places, “the O3”, the word “the” should be removed

**Authors:** Following the suggestions of Referee #2 we have modified it and we have checked carefully all the articles.

**Referee #2:** 3. Page 346, Lines 13 to 16, these sentences should be rewritten

**Authors:** We agree with the referee and we have rewritten the cited sentences

**Referee #2:** 4. Page 348, Line 15, “adapting to 22 the land-use categories:”Don’t understand?

**Authors:** The 22 land-use categories used in the HERMES model are inferred from the CORINE land cover map, which has 44 land cover categories. That is the 44 CORINE land-use categories are grouped in 22 categories following the methodology in Arevalo, 2004.

The text has been rewritten as follows:

The HERMES model uses 22 land-use categories. These land-use categories are obtained for each grid cell from CORINE Land Cover 2000 map (44 land-use categories) according to Arévalo et al. (2004).

**Referee #2 :** 5. Page 349, Lines 4 to 5, “for the same period has been done the statistical analysis of the model skills”, what has been done?

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**Authors:** We have reformulated this sentence as follow: “The statistical model skills have been analyzed for the whole year 2004”

**Referee #2:** 6. Page 349, Line 13, it should be “were subject to”, not “were subjected by”

**Authors:** We agree with the referee and we have modified it

**Referee #2:** 7. Page 354, after Line 12, the following two paragraphs should be shortened. It is not necessary to describe all the numbers in detail. In fact, it doesn’t mean anything for a mean bias value changed from -2.16 ug/m3 to -1.27 ug/m3.

**Authors:** We have summarized the main statistical results

**Referee #2:** 8. Page 355, Line 10, “in a single polar plot the RMSE”, should be “in a single polar plot of RMSE”

**Authors:** We agree. We have corrected this sentence.

**Referee #2:** 9. Again the description of categorical performance can be significantly reduced and it is not necessary to mention all these specific numbers.

**Authors:** We have modified this part, as the Referee suggested.

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**Referee #2:** 10. Page 359, Line 2, “In the figure are depicted the”, it is not a correct English sentence.

**Authors:** We have modified this sentence as follows: “The lower and upper quartiles and the median are also shown in Figure 8”

**Referee #2:** 11. Page 358, about the spectral decomposition and Figure 8, it is impossible for a reader to understand the concept and what is doing with this brief description, and the information presented in Figure 8 is so dense for general readers to understand its meaning

**Authors:** We agree that this part adds only little further information about the performance of our model system. However, we have decided to describe the spectral analysis (Dennis, R., 2010) since we want to warrant the ability of the post-process to improve the representation of the temporal variability. In this way we introduce the reader to the strong improvement carried by the KF in the daily cycle.

**Referee #2:** 12. Page 360, Line 4, change “considerably” to “considerable”

**Authors:** We agree with the referee. We have modified it.

**Referee #2:** 13. Figure 4 and Figure 5 can be combined and it is not necessary to present both Max 1-hr and Max 8-hr figures, since they are similar

**Authors:** According to the referee’s suggestion we have merged Figure 4 and 5 in one Figure. Yet, we consider important to leave the comparison between the Max 1-hr and

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Max 8-hr cases, since both cases are explicitly regulated by the Directive 2008/50/CE and by the Spanish Real Decreto 102/2011, (BOE, 2011).

Arévalo, G., Salvador, R., Gassó, S., Millán, M., Baldasano, J.M.: Application of a high-resolution emission model in Valencia Community (Spain). Air Pollution 2004. WIT Press, Rhodes, Greece, pp. 31–40, 2004

European Commission, Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe. Technical Report 2008/50/EC, L152. Off. J. Eur. Comm, 2008.

Dennis R., Fox T., Fuentes M., Gilliland A., Hanna S., Hogrefe C., Irwin J., Rao S.T., Scheffe R., Schere K., Steyn D. and Venkatram D.: A framework for evaluating regional-scale numerical photochemical modeling systems. Environ. Fluid Mech. DOI 10.1007/s10652-009-9163-2, 2010.

BOE, Real Decreto 102/2011 (BOE, 2011), de 28 de enero, relativo a la mejora de la calidad del aire. Ministerio de la Presidencia. BOE numero 25. BOE-A-2011-1645.53pp

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Interactive comment on Geosci. Model Dev. Discuss., 4, 343, 2011.

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