

Interactive comment on “Contribution of atmospheric processes affecting the dynamics of air pollution in south-western Europe during a typical summertime photochemical episode” by M. Gonçalves et al.

Anonymous Referee #1

Received and published: 19 November 2008

General comments:

The authors present a very detailed modeling case study of summertime air pollution over the Iberian Peninsula. While earlier studies have analyzed some of the phenomena described in this study, the use of the process analysis feature in the photochemical model represents a new contribution and provides new insights. The setup of all components of the modeling system utilized in this study reflects best modeling practices. The horizontal resolution of the two case study domains is sufficiently fine to resolve the physical and chemical effects of the complex topographic features and steep emis-

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sion gradients present in these areas. While the modeling results presented in this study are sound, there are several areas in the analysis and interpretation sections where the authors could draw a clearer distinction between hypotheses, speculations, findings from earlier studies, and findings supported by results presented in the current study. I favor publication of the manuscript after the authors address the following specific and editorial comments:

Specific comments:

Page 18,467, line 24. Please update the US-EPA 2005 reference. The final guidance was published in 2007 and is called "Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, PM_{2.5}, and Regional Haze", EPA -454/B-07-002, 262 pages. Please also note that this final guidance does not suggest any MNBE, UPA, and MNGE threshold criteria to determine acceptable model performance in regulatory applications (see section 18.6 of the above document)

Page 18,468, lines 11-13: Was the WRF-ARW model evaluated for this particular case study to confirm that daytime wind flows were underestimated? The findings by Jimenez et al. (2006) were based on MM5 simulations and may not be applicable here. In the absence of a more detailed analysis of the meteorological fields, this possible explanation for the ozone overpredictions remains a hypothesis that cannot be substantiated.

Page 18,468, lines 18 - 20: Which analyses were performed to establish that the weakness of the meteorological model indeed is responsible for the NO₂ overpredictions in the CIP? How did the authors rule out that errors in emissions and/or chemistry contributed to the overprediction?

Page 18,468, lines 20 - 23: Which analyses were performed to establish that inaccuracies of the model chemistry are responsible for the NO₂ overpredictions in the NEIP domain? How did the authors rule out that errors in emissions and/or meteorology

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contributed to the overprediction?

Page 18,468, lines 23 - 29: Couldn't this point to a problem with the emission inventories?

Page 18,470, lines 3-6: Was the WRF-ARW model evaluated for this particular case study to confirm that surface winds were overestimated during this time period? Was this overestimation observed at all observation sites?

Page 18,471, lines 17 - 18: Please specify if these concentration gradients are primarily horizontal, vertical, or both.

Page 18,472, lines 14 - 24: Please clarify if the description of circulation patterns in the coastal domain was based on previous work or was established specifically for this episode. If it was based on previous work, please provide references and information to support that these findings are applicable to the episode studies here. If it was based on an analysis of the WRF-ARW fields for this study, please provide the supporting figures and analyses.

Page 18,473, lines 15 - 18: Figure 5 shows ozone production only for the 10:00 UTC panels which does not really correspond to the "central hours" of the day

Page 18,477, lines 13 - 27: Please clarify how you define "chemical sensitivity" and "NO_x sensitive" in this context. Is it based on indicator ratios, NO_x/VOC ratios, etc? Please provide an explanation and references. Maybe it would be better to think of this analysis in terms of chemical regimes?

Page 18,489, line 10: please modify the wording given that the latest US-EPA modeling guidance does not recommend strict pass/fail criteria for model acceptance.

Page 18,489, lines 11 - 22: Please make sure to distinguish between hypotheses and speculation on the one hand and conclusions on the other hand in this section.

Page 18,489, lines 24 - 25: How was mass consistency tested in this study?

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Figure 4: Suggest replacing the full date/time labels with labels showing only the simulation hour (1 - 48) for better readability.

Figures 8 - 11: It is very difficult to distinguish between the colors and shading patterns in these figures. This is most pronounced for Figures 8 and 10. Please rework the color scale using a more distinguishable palette, possibly along the lines of Figures 2-3 which are much easier to read.

Editorial comments:

Page 18,459, line 10: please specify what these air quality targets are or provide a reference

Page 18,459, line 11: suggest inserting "processes contributing to" between "fundamental tool to assess the" and "air quality levels"

Page 18,460, line 4: please replace "pretends to assess" with "aims to assess"

Page 18,465, line 3: please replace "being the sum of $\text{abs}(\%PC_i)$ exactly" with "but the sum of $\text{abs}(\%PC_i)$ is exactly"

Page 18,466, line 6: please remove "by" from the phrase "contributing also by 24%"

Page 18,468, line 9 / Table 2: Please clarify if these statistics are based on all hours, daytime hours, or peak values.

Page 18,478, line 3: please change "information about atmospheric processes" to "information about simulated atmospheric processes"

Page 18,479, lines 10 - 11: Please reword the following phrase: "but having the chemical formation some importance at low levels"

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 18457, 2008.

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