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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Response of fine particulate matter concentrations to changes of emissions and temperature in Europe" *by* A. G. Megaritis et al.

Anonymous Referee #1

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This was a useful and interesting paper, particularly from the standpoint of science policy: the authors make use of a regional air pollution model to carry out multiple scenario simulations over Europe, investigating the possible effects of changes in different primary emissions on ambient concentrations of particulate matter. My concerns with the paper are more with presentation and formatting rather than the methodology - I've therefore rated these revisions as minor, though some rewriting of the paper would help make it more accessible to the scientific and policy community. The paper will be suitable for publication in ACP after the following revisions:

1. Section 4 (Results) needs to be condensed and reorganized. The information pre-

sented is useful, but the length makes it difficult for the reader to form an overall impression of what has been learned through the authors' work. This also makes it harder to assess the relative impact of the different scenarios on the particulate matter generated by the model. Table 2 is invaluable in this regard: I would strongly recommend that the authors create a larger summary table of their results, to be presented at the start of section 4, with a breakdown by regions I-V, with values and percentages for each region. Subsequent discussion should be with reference to this table as well as to the figures in the submitted manuscript. One axis of the table (e.g. columns) should contain the different scenarios, while the other axis (rows) should contain the impact by either region (regions according to the authors' Figure 1), or by country, and by species. The cells of the table would contain the the average change and their percentages, for each region. This table will allow an easy, quantitative comparison of the results of the different scenarios, and would make the work much more accessible to the scientific and policy communities who would be interested in referencing the authors' results. This should also result in a shortening of the text of section 4, which is currently too long and in need of summarizing. An example format for such a table is attached to this review as a bitmap (see Fig 1)

2. The section on model evaluation is extremely brief; here, more details are required. The impression given is that the authors made use of only 4 stations for their model evaluation, which seems inadequate for the evaluation of a regional model code (compare to multi-model comparisons by McKeen et al; TEXAS-AQ papers, or AQMEII comparisons, where multiple stations over a long time period were used). More stations should be used, or an argument as to why this could not be done needs to be presented. The authors state their evaluation in terms of percent agreement within given ranges – they should also state other standard statistical measures, such as the mean bias of the model with respect to the observations, the mean error, the root mean square error, etc.

Minor issues: a. The time period over which the simulations took place is not given –

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how many summer days were simulated? How many winter days? The authors should make an argument as to whether or not their time period is representative of typical conditions for the region studied. b. Suggestion on the colour contour maps: could the same scale be used on each panel for a given sensitivity run figure? This would allow the reader to easily distinguish the relative impact on the different components of PM. c. Figures 3 and up show reductions in PM2.5: add "(control-scenario)" to the figure captions to indicate that red areas represent reductions, if that's the intent. d. VOC:NOx ratio discussion is quite interesting (page 8784): the discussion might be aided by a plot of the average VOC:NOx ratio (including the 5.5:1 value as a contour line), to show how the ratio changes with the VOC and NOx scenarios. e. Page 8791, first few lines: one important conclusion here is that the nitrate increases are less than the sulphate decreases; the net impact on PM2.5 is a reduction. Similar increases in nitrate have been noted in North America following reductions in the emissions of SO2 in the Ohio river valley f. Page 8793, line 1: begs the question: how well does the model do in comparison to obs for the relative ratio of SOA to POA? AMS measurements were mentioned under model evaluation section: was there an opportunity to compare HOA to OOA ratios, for example?

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 8771, 2012.

		Scenario (ug/m3, and percent change)		
Region	Species Impacted	-50% NH3	-50% NOx	Etc...
I	PM NH4	-5.4 (-20%)	-1.2 (-12%)	Etc...
	PM NO3	Etc..	Etc.	
	PM SO4			
	PM OA			
	PM2.5			
	O3			
II	PM NH4			
	PM NO3			
	PM SO4			
	PM OA			
	PM2.5			
	O3			
III	etc	etc	Etc	

Fig. 1.

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