

## ***Interactive comment on “Sensitivity of PM<sub>2.5</sub> to climate in the Eastern U.S.: a modeling case study” by J. P. Dawson et al.***

### **Anonymous Referee #1**

Received and published: 1 July 2007

#### General Comments:

The manuscript “Sensitivity of PM<sub>2.5</sub> to climate in the Eastern U.S.: A modeling case study” by Dawson et al., discusses a modeling study of the sensitivity of PM<sub>2.5</sub> to different climatic parameters. This is an interesting and important issue since it provides the relative importance of several meteorological parameters to pollutant concentrations. The manuscript is quite well written, and both the modeling approach and the results are presented quite clearly.

However, given the degree of simplifying assumptions (i.e., change one parameter at a time), the reliability of the results in terms of climate change provided by this study, needs to be evaluated with extreme caution since it may be misleading. The reason is

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that changing an individual parameter alone is not representative of the “real world”. For example changing temperature will affect humidity, cloud cover, precipitation etc. In this study no interactions or feedbacks between meteorological parameters are allowed, so, I think that the paper should focus only on the effect of the individual parameters to PM2.5 concentration and any discussion related to climate change should be removed.

Specific comments:

Page 6488 Line 22: “indicate that changes in climate may have important impacts on PM2.5 concentrations”: This study cannot conclude that. The fact that independent meteorological parameters affect PM2.5 concentrations doesn’t mean that climate change will affect pollutant concentrations (see general comments)

Page 6489 Line 18: “Emission control policy is currently made assuming that climate will remain constant”. Do the authors have any indication on how much emissions will be affected under climate change?

Page 6491 Line 27: “Ten aerosol size sections were used—from 40nm to 40um”. The authors do not provide any indication how much the climatic parameters examined here will affect aerosol size distribution. I think that it is important to point out the possible change in aerosol size distribution.

Page 6492 Line 10: The authors use 7 days simulation data after a spin-up period of 3 days. Is the 3 day period enough to wash out possible errors in the initial conditions etc or has this period been arbitrarily chosen? Please elaborate. Is the 7 days period enough to extract representative results? How would the results be affected if the output data used were on a monthly or seasonal basis? Also it would be useful to present daily average values and explain how these differ from the 7 day average results presented here.

Page 6492 Line 13: “In the vertical direction” It is not clear to me why the authors

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chose to use different number of vertical layers and different altitude during January and July. How different would the results be if the same number of layers and the same altitude were used for both modeling periods? How the authors have defined the vertical layers?

Page 6492 Line 16: PM2.5 concentrations are strongly affected by the emissions. Please provide a more detailed description (e.g., tons per day) of the emission inventory used.

Page 6492 Line 20: “PMCAMx performance has been evaluated and area”. I would prefer the authors to give more details for the model evaluation and not a general statement “was found to vary from fair to excellent”. How do the “base case” results compare with observations?

Page 6493 Line 17-22: Please provide references for the fixed concentrations of each PM2.5 species used as boundary conditions. How do the fixed concentrations affect the modeling results presented in this study? How would the sensitivity results differ if a multi-nesting approach was adopted?

Pages 6499-6500, Section 3.6: Please explain why changes in cloudy area affect PM2.5 species concentrations.

Page 6501 Line 23: “changes in area of precipitation” How do the authors define the precipitation area?

Page 6503 Line 10: “ It may be valid to represent a combined change individual sensitivities”. We can’t combine changes caused by different meteorological parameters. The results obtained by such combinations have no practical value or scientific basis and could be largely misleading, as it is not valid to present a combined change in many meteorological variables as the sum of individual meteorological changes (see general comments).

Page 6503 Line 18: “ The sensitivities were multiplied by the potential meteorologi-

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cal changes” Are the sensitivity results presented here linear to the change of each meteorological parameter to do that?

As Dawson et al (2007) have presented sensitivity of ozone using the same framework, a brief paragraph comparing the outputs of both works would be useful.

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Interactive comment on Atmos. Chem. Phys. Discuss., 7, 6487, 2007.

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