Atmos. Chem. Phys. Discuss., 10, C1739–C1742, 2010
www.atmos-chem-phys-discuss.net/10/C1739/2010/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Modeling natural emissions in the Community Multiscale Air Quality (CMAQ) model – Part 1: Building an emissions data base" *by* S. N. Smith and S. F. Mueller

S. N. Smith and S. F. Mueller

snsmith@tva.gov

Received and published: 16 April 2010

We greatly appreciate your review and comments. Here we have provided our replies along with the questions you asked.

1. Section 2.1: Additional references should be added other than NAPAP (1991) describing previous US anthropogenic and natural emission inventories (e.g. Guenther et al., 2000, Atmos Environ). How do they compare with the results of the present study or with the results of the studies already mentioned in the paper? AUTHOR REPLY: We will perform a further review of Guenther et al. and consider it for reference in the final revision.

2. Section 3.2.2: Which land use data base did you use for the calculation of coastal wetland emissions? Provide thorough the paper more information on the land use databases used. AUTHOR REPLY: GIS-ready land cover datasets (NLCD 1992 and NLCD 2001, GAP LU/LC (for Florida only), and NOAA Coastal LU/LC) were used to select coastal stands of salt marsh, cord grass, emergent herbaceous wetlands, and the wetland grass specie Spartina Alterniflora within coastal regions of the modeling domain. The NLCD 2002 dataset was unavailable for many areas during this project; therefore, any future modeling of wetland emissions should perhaps consider the use of the NLCD 2002 dataset for spatial distributions. It was discovered that the Spartina Alterniflora species of grass is not native to Mexico and no area distributions (native or non-native) for this grass were readily available; thus, no salt marsh was modeled for Mexico. Spartina Alterniflora wetlands in Canada were approximated based on the "Map of Percentage Coverage of Wetlands" taken from The Atlas of Canada provided by the Natural Resources Canada website (available at http://atlas.nrcan.gc.ca/site/english/learningresources/theme_modules/wetlands) along with the map of Canadian wetlands taken from the 1988 publication entitled "Wetlands of Canada" produced by Environment Canada. We will consider mention of these datasets in the final revision.

3. Section 4.2 (line 10): Do you probably mean western Canada instead of Eastern Canada? AUTHOR REPLY: Based on the plotting of the Canadian inventories containing "natural" wildfires used in this study that were taken from the VISTAS RPO 2002 modeling work it was evident that the highest NOx emissions from "natural" wildfires in Canada were in the Eastern provinces; however, we assume it is possible that some Canadian wildfires were not included in the RPO inventories we used; therefore, if that is the case, one could expect higher natural NOx emissions than what we estimate. We may change the wording of this line to better reflect this scenario.

4. Table A3: The split factors presented in the table shouldn't they be spatially resolved? AUTHOR REPLY: Essentially, they are already spatially resolved since the

natural and anthropogenic emissions components in the ratio calculation had already received spatial allocations. We developed a NOx ratio from our existing gridded emissions database as a surrogate for the separation of anthropogenic and natural HCl and ClNO2 component emissions.

5. It would be interesting to show also a figure (similar to Figure 10) that presents the comparison between anthropogenic and natural emissions for January 2002. In addition, the spatial distribution of the ration between anthropogenic and natural emissions could be shown and used to identify the areas where natural emissions exceed the anthropogenic ones. AUTHOR REPLY: We have attached a plot similar to Fig 10 for January (See Fig. A. in attached supplemental pdf file, RC_C970_SupplementalAC.pdf). Many of the differences from July found in Fig. A stem from large reductions in lightning, wildfire, and biogenic activity one would expect in winter. Regarding the spatial plot of natural-to-anthro ratio, we feel it will simply produce too many figures to do this for all species so we have attached two plots for both January and July, one for total gaseous sulfur and one for NOx (See Figures B-E in attached supplemental pdf file, RC_C970_SupplementalAC.pdf). Here are a few notes on interpretation of these spatial plots: If a value in the map is 75% anthropogenic (as defined in the divergent legend scheme) that means, for that given grid cell, month total anthropogenic emissions were 75% higher than natural emissions; likewise, if the cell value is 75% natural then month total natural emissions were 75% higher than anthropogenic emissions for that given cell. The "Emissions Void" class (i.e. 0) in the legend represents areas where emissions were not provided through the modeling inventory; however, in a few rare instances it represents natural vs. anthropogenic inventory equilibrium.

6. In order to increase the temporal resolution of emissions from some sources, the default SMOKE temporal profiles (diurnal and seasonal) were used. Weren't there any alternatives published in the literature? AUTHOR REPLY: The default profiles were certainly not our first choice. Temporal profile alternatives were discovered in the literature or received from our topic specialist contacts for oceanic DMS, HCL, and ClNO2

and therefore we applied these allocations in our simulations; however, project timelines prevented further research into temporal allocations for other sources/pollutants; it is noted on a few occasions in the paper that further research on temporal variability/allocation should be performed; however, we may make special note of this in our "Conclusions" section.

7. A paragraph discussing the uncertainties of the emissions quantified or used should be added. What are the uncertainties in the seasonal results (January and July 2002) presented in tables 1 to 5 given the fact that for many emission sources there was no seasonal emission variation (e.g for sulfur sources)? AUTHOR REPLY: We plan to provide further information on emissions uncertainties in the final version of the paper.

Please also note the supplement to this comment:
http://www.atmos-chem-phys-discuss.net/10/C1739/2010/acpd-10-C1739-2010-supplement.pdf

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Interactive comment on Atmos. Chem. Phys. Discuss., 10, 1755, 2010.