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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Attribution of projected changes in US ozone and $PM_{2.5}$ concentrations to global changes" *by* J. Avise et al.

Anonymous Referee #1

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Review of paper acpd-2008-0327; Attribution of projected changes in US ozone and PM2.5 concentrations to global changes;, by Avise et al.

The paper presents an analysis of the simulated impact of global changes in climate, land use, anthropogenic and (a selection of) biogenic emissions on US air quality indicated by changes in ozone and PM2.5. A companying paper by Chen et al. (2008) describes the applied modelling framework and the overall impact of global change on these parameters where Avise et al. focus on establishing the contribution by the various global change components. The paper is well written, addresses an interesting topic but going through the text there are issues of concern.

What does this study add to previously conducted analysis of future air quality in terms

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of the magnitude of the predicted changes in ozone and PM2.5? It would be good if the authors would indicate more specifically what this particular analysis adds to the assessment of future air quality as a function of global change.

What about inconsistencies; I didn't find any discussion about the treatment/potential relevance of the feedback between atmospheric chemistry and climate. The global model simulations that have provided the boundary conditions might have considered to some extent the role of ozone in climate change but the regional meteorological model system reflects only the role of future land use in climate change and not as such how greenhouse gases and aerosols will alter future climate.

One particular issue of great concern of the presented analysis are the simulated changes in meteorology along the coasts. From Figure 7 it can be inferred that there are all along the coast predicted temperature increases up to 5K and increases in PBL height up to 400m compared to present day conditions. This is explained in the paper in terms of "a slight mismatch in the land-surface classifications for the present-day and future 2050 scenarios". It addresses the difficulty of such kind of analysis based on the use of a multi-model system with respect to the use of a consistent set of input parameters (emissions, land use) for the different model systems with different resolutions. The reason why I really have a difficulty with this is that, making an assessment of air quality in the US, the coastal regions with the large population density are actually very important. In addition one can expect that these simulated, potentially overestimated, impacts on meteorology will affect the simulated transport and chemistry for a larger domain than just the coastal zone. It would be interesting to see how land-sea breeze phenomena are represented in the future simulations. The resolution might still be too coarse but it is expected that the "misrepresentation"; of the coastal meteorology will result in enhanced transport due to the large gradients. This is relevant to assess since the analysis shows that actually the anticipated changes in long-range transport, e.g. the supply of pollution from Asia, is one key component in explaining future US air quality in the west. This is actually not discussed at all in the paper.

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8, S7208–S7210, 2008

Interactive Comment

What about other land-use related changes in emissions, in particular in biogenic N emissions due to changes in the application of fertilizers? From the discussion on the biogenic emissions it is inferred that only the impact of land use on BVOC emissions is considered where land use is actually expected to result in a decrease in BVOC emissions, partly explaining a decrease in the contribution of SOA to PM2.5. However, in many of the regions with an important contribution by biogenic emissions to the total emissions one can expect an important role of management practices. These could result in a complex change in the exchange of momentum, energy, moisture and mass (changes in deposition and emissions) which could all potentially affect aerosol production and fluxes. It would be useful to introduce some discussion on this.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 15131, 2008.