

Interactive comment on “Seasonal climate and air quality simulations for the northeastern US – Part 1: Model evaluation” by H. Mao et al.

Anonymous Referee #1

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General comment

This study focuses on evaluation of regional climate and air quality simulations for summers of 20001-2005. In particular, the evaluation of summer air quality simulations is rigorous, where comprehensive observational data are used as the reference to identify model biases and possible explanations. These data include measurements from conventional monitoring sites and intensive field campaigns for both surface ozone and vertical profiles. This evaluation is a prerequisite for subsequent applications of the modeling system. As such, the topic of the manuscript is important and suitable for publication in ACP. The following are my suggestions that may help the authors to revise the manuscript for a more concise presentation.

Specific comments

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[1] While the manuscript is strong for evaluation of ozone modeling, it is relatively weak on that for climate. As driven by NCEP observational reanalysis, the regional climate model (RCM) is required to well reproduce the large-scale circulation patterns. Hence, the “reasonable agreement” between the modeled and observed circulation patterns is fully expected. Should the authors wish to address the RCM downscaling ability, they could emphasize more on whether the RCM downscaled regional climate quantities like precipitation, surface air temperature and mesoscale meteorology are more realistic than the driving reanalysis. Since this aspect has not been addressed and to my opinion is not critical to the main focus of the manuscript, I suggest that the evaluation on “climate” be de-emphasized. In particular, the title may better be changed to something like “Evaluation of summer ozone simulations for the northeastern US”. By the same argument, the abstract and summary shall be revised accordingly.

[2] Page 17855 line 5 “A common problem in model simulated O₃ levels has been underestimation of high O₃ values”. This statement may not be a general one, as Huang et al. (JAMC, 2007) has shown that the summer ozone peaks (especially for the northeastern U.S.) are realistically simulated. Thus the underestimation is model dependent.

[3] Page 17856 line 13 “constrained with” may better be “driven by”

[4] Page 17859 line 6 “1449 sites” - that’s a lot. Do you really mean that (different locations)?

[5] Page 17859 lines 9-11, regarding CCM2 problem, you may refer to Liang et al. (JCL 2004). They found that the CCM2 radiation package produces a deficit of up to 80 Wm⁻² in solar radiation reaching the surface as compared with station measurements in Illinois. They also provided a solution to correct this problem.

[6] Page 17860. Since the RCM run is driven by the observational reanalysis, the large-scale weather patterns are required to resemble each other between RCM and OBS. As such not only frequency of the pattern is close, but also temporal correlation

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or correspondence must be high. The agreement between RCM and OBS only implies that the nudging (via dynamic relaxation) of the lateral boundary conditions from the reanalysis is effectively done. See also comment [1].

[7] Page 17861 lines 3-19. The caption of Table 2 indicates that the result shown is for daily 1-hr max ozone, while the text in line 4 is confusing. This confusion continues in lines 11-15. The “mean bias” refers to daily 1-hr max in line 5, but implies daily mean in the subsequent lines. Otherwise the statement “. . .the nighttime overestimated daily minima and daytime underestimated peaks” would not be reasonable explanation.

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