

## Review of Hogrefe et al. for Atmospheric Chemistry and Physics

### **General Comments**

In “Impacts of Different Characterizations of Large-Scale Background on Simulated Regional-Scale Ozone Over the Continental United States”, Hogrefe et al. evaluated ozone concentrations at the surface and throughout the column from the Community Multiscale Air Quality (CMAQ) model against observations for 2010 with a careful experimental design that investigated the influence of modeled background ozone concentrations. Additionally, they calculated the contribution to the modeled ozone concentrations of different information used by the model (i.e., boundary conditions, emissions) with a brute force approach as well as processes within the model with an instrumented modeling approach. Leveraging results of the Air Quality Model Evaluation International Initiative (AQMEII) and Task Force on Hemispheric Transport of Air Pollution (TF-HTAP) projects, they quantified the impacts to ozone concentrations at the surface and ozone burdens at different heights aloft of using boundary conditions from four different hemispheric or global models.

The authors showed that the choice of global or hemispheric model for boundary conditions has potential to influence substantially the regulatory metric for ozone on the regional scale on an individual day and the model performance metrics, including the direction of bias. The language and structure of the manuscript are impeccable. The manuscript clearly describes the scope of the investigation, places it in the context of previous research as well as the AQMEII and TF-HTAP efforts, highlights novel results of the analysis, and suggests future research directions this analysis uncovered. I recommend this manuscript for publication in Atmospheric Chemistry and Physics with only editorial changes suggested.

### **Specific Comments**

<b>Line</b>	<b>Comment</b>
p. 10, l. 14	“regional-scale simulation”. Consider adding “especially near boundaries.” The following paragraph highlights the different performance further inland, so it seems important to highlight that this statement is pertinent especially near the boundaries.
p. 10, l. 29	Please change “Figure” to “figure”.
p. 12, l. 8	Might “downward” have been intended to be “downwind”?
Table 4c	Is the orange in this table a different color than in Tables 4a and 4b?
Figure 3	“right row”, “left row” are likely intended to be “right column”, “left column”.
Figures 3, 6, 9, 11, 13	These figures nicely represent a single statistical metric (e.g., median, mean) for the information shown; however, more information could be conveyed if the standard deviation about the mean or the 5%/95% about the median were displayed with shading or error bars. Could this additional information please be added?
Figure 8	The units seem to have been cut off of the colorbar for these figures. Please include them. Also, for the sake of ease in comparison of the regional figures with the global

ones, would it be possible to have the y-axes reach the same extent in each but leave white (e.g., a bar across the bottom in the global, a bar across the top in the regional) to indicate that the model did not calculate values at those pressure levels?