**Geoscientific
Model Development
Discussions**

Interactive comment on "Sensitivity of the Community Multiscale Air Quality (CMAQ) Model v4.7 results for the eastern United States to MM5 and WRF meteorological drivers" *by* K. W. Appel et al.

K. W. Appel et al.

appel.wyat@epa.gov

The authors would like to thank the reviewer for his/her time and effort reviewing this manuscript. Several good points were made and were incorporated into the manuscript. The objectives of the work were clarified in the text.

Reviewer Comment: The authors may want to clarify or possibly redefine the objective of the work.

Author Response: The objectives of the work have been clarified to make clear what is

being presented and why.

Reviewer Comment: What is driving the variability of these variables (i.e. vegetation fraction, friction velocity and cloud fraction)? How is friction velocity calculated?

Author Response: While variables such as vegetation fraction and friction velocity rely to some degree on meteorological parameters that are constrained by the analysis nudging within each model, they are also strongly influenced by parameters that are uniquely derived by each model. Also, even though each model uses analysis nudging, the techniques used are different in each model, and therefore result in different values for those parameters that are nudged (e.g. temperature). The calculations for these parameters are complex and rely are many different factors. For example, friction velocity is strongly dependent on the predicted atmospheric stability, which is in turn strongly dependent on the predicted temperature and wind profiles. Future work will examine the differences in these parameterizations to determine if one method is preferred over another.

Reviewer Comment: I would think that the objective nudging technique that has been used to constrain both models does constrain the variability of these variables. Hence, it might be difficult to identify clearly reasons for large differences in performance of the CMAQ simulations. This point needs to be discussed in the manuscript.

Author Response: See the response above. While the simulations do incorporate analysis nudging techniques, the techniques are different in each model and therefore result in different predictions, even for those parameters that are constrained. We believe that through our investigation we have identified a major factor for the difference in the air quality predictions between the two simulations. Future work will continue to investigate these differences, perhaps employing more quantitative metrics and perhaps more sensitivity analyses. Additionally, longer duration simulations will help determine whether the differences seen are systematic or are simply a result of the time period simulated.