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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Comparison of Chemical Lateral Boundary Conditions for Air Quality Predictions over the Contiguous United States during Intrusion Events" *by* Youhua Tang et al.

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Thank you for your review. Here are the answers to your comments

This manuscript describes air quality simulations with EPA's CMAQ model over the contiguous United States with a focus on the use of dynamic chemical lateral boundary conditions from a global model, Geos-chem snd investigates the predictive skill for ozone and PM.5 with an emphasis on dust events and fires. CMAQ model predictions for air quality are improved with use of dynamic chemical lateral boundary conditions. The authors identify an important and timely problem and investigate it well. I recommend the paper for publication after the following items are addressed.

There has been a lot of work on developing boundary conditions for CMAQ in particular and for aerosols in particular. That literature is not cited here and that surprises me. Can the authors put their work here In that context? Here is one example: https://gmd.copernicus.org/articles/7/339/2014/

âĂć You are right that we missed some references. We added the reference that you referred and some corresponding statement in the introduction session.

This work may have implications for policy-relevant background and exceptional event determination. Can the authors provide any context for this?

âĂć This work is actually for supporting our operational forecast. We added some related statements in the introduction

When discussing figure 10 in the manuscript the authors point out that they were unable to capture fireworks however the observed [PM2.5] peaks in figure 10 occur on July 5 not July 4. I understand the time is in UTC, but it looks to be a whole day apart and not just eight or nine hours.

âĂć You are right that the local effect of firework emissions won't last long. However, most firework emission were injected in elevated levels, and the associated pollutants can be transported to extended downstream areas. If the downstream area are big and adjacent one another, the regional averaged effect could appear for a longer time. The following figure show the observed PM2.5 over single state (Oregon) and EPA region 10 (three states), and the effect of fireworks obviously last longer in the area of three states than that in one state, as the EPA region 8 represents a bigger receptor area. In Figure 10, the Northcentral region includes 9 states, and Northeastern region represents 12 states, which are much bigger than the EPA region 10. So it is not surprised that the effect could last so long since the receptor areas are so big that the transported pollutants have enough time to affect extended downstream areas before moving out of the region.

Sonntag et al., 2014 is not the best reference for AERO6.

âĂć You are right. We added another one (Foley, 2010, https://doi.org/10.5194/gmd-3-205-2010)

Please provide a link or reference for the wild fire emission method?

âĂć Added a reference https://doi.org/10.5194/gmd-13-2169-2020

Thank you again for your comments

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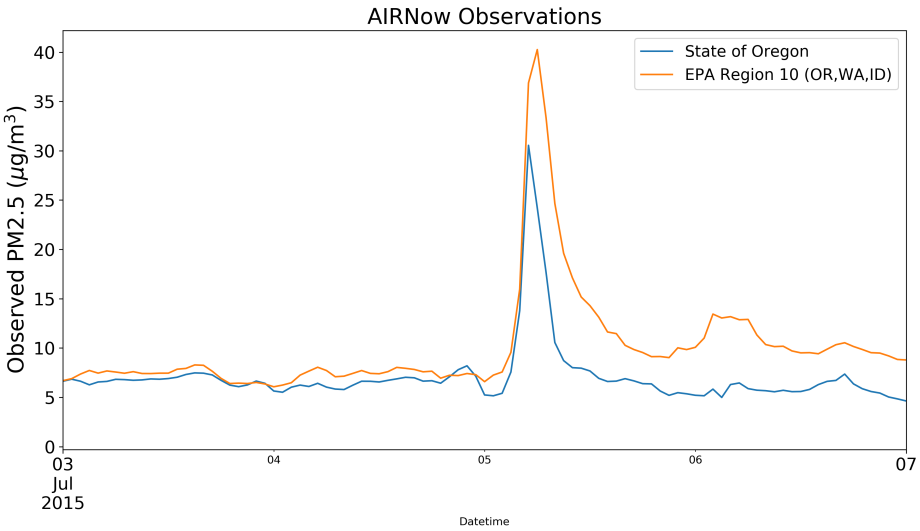

Fig. 1.