

# The implementation of NEMS GFS Aerosol Component (NGAC) Version 2.0 for global multispecies forecasting at NOAA/NCEP: Part I Model Descriptions

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Response to the final review comments.

General comments:

*The authors have appropriately addressed all the comments raised during the discussion phase. The additional Figure 2, and inclusion of observations in Figure 4 (was 3) are greatly appreciated.*

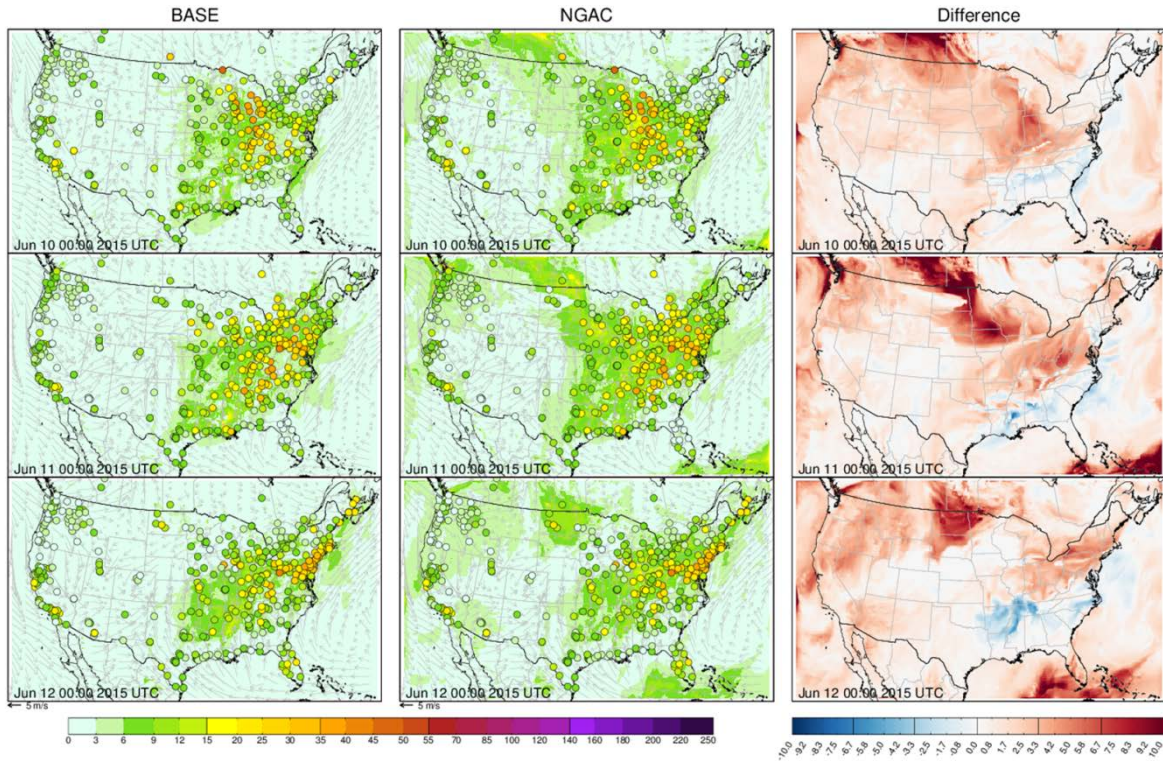
*There's one technical recommendation I would make before publication, which is that in Figure 4 the observations should be superimposed on both models (BASE and NGAC) rather than only the newer one, for easier comparison of how well they perform.*

*Aside from that, I am pleased to recommend the revised version for publication in ACP.*

- Response: The authors really appreciate the reviewer's comments and suggestions. Figure 4 is updated with observations superimposed on both experiments BASE and NGAC for easy comparison. The synoptic features are removed from the second NGAC plots as we focus on to compare PM<sub>2.5</sub> forecast and there is no synoptic condition discussion in the context. The section 5.2 is updated and the updated figure is attached.

Page 9, line 4 – line 12:

Figure 4 shows an event on June 10-12, 2015 when smoke from Canada was moving into the United States. The left side panel is the PM<sub>2.5</sub> forecast on June 10th, 11th and 12th from the CMAQ run using GEOS-Chem model 2006 monthly average values for all the aerosol species at the lateral boundary. The middle panel is the PM<sub>2.5</sub> forecast from CMAQ during the same period using NGACv2 multi-species aerosols as the lateral boundary condition. PM<sub>2.5</sub> observations in cycled dots are also shown in both panels to compare CMAQ forecast with observations. The right panel is the difference between the two runs. The figure shows that no smoke was predicted over central Canada and the US in the run using the climatology as the lateral boundary condition; while the run using NGAC multi-species aerosols as the boundary condition shows a large amount of smoke passing the US-Canadian border and coming across the Great Lakes region. The figure shows that using the NGAC forecast as the CMAQ lateral boundary condition significantly improved the CMAQ forecast.



**Figure 4: PM<sub>2.5</sub> forecasts from regional air quality model CMAQ during the smoke event on Jun 10-12, 2015. Base: using GEOS-Chem model 2006 monthly average as lateral boundary condition; NGAC: using NGAC forecast as lateral boundary condition, observations are the cycled colored dots. Differences between the two forecasts are shown in third column.**