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Geoscientific Model Development Discussions

Interactive comment on "The implementation of NEMS GFS Aerosol Component (NGAC) Version 2.0 for global multispecies forecasting at NOAA/NCEP: Part I Model Descriptions" *by* Jun Wang et al.

Anonymous Referee #1

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1 General comments

This manuscript describes the implementation of the new version of the NEMS GFS Aerosol Component (NGAC) and shows some forecast results and impacts to some applications. The evaluations of the model are described in the companion paper.

The authors describe the aerosol forecast and its applications. Especially, a vegetation fire event case is demonstrated to examine its performance. The aerosol model

is based on GOCART aerosol module (Colarco et al. 2010): it is not very new or innovative but well documented and utilized by previous studies and suitable for operational forecast. While the manuscript is easy to read and the general performance of the NGACv2 model seems good, I think some of the specific points of the model and results need more description and revision: please see my Specific comments.

I recommend this manuscript to be published with a minor revision.

2 Specific comments

p.5, line 16- : "Sources for sulfate are ... biofuel and fossil fuel emissions from Aerosol Comparisons between Observations and Models (AeroCom) anthropogenic emissions." This contradicts with Table 1, which lists sources of anthropogenic SO2 is EDGAR V4.2 and International ships SO2 is EDGAR V4.1.

p.5, line 18: "DMS source uses climatology of oceanic DMS concentrations": How do you treat water-to-gas exchange (piston velocity) of DMS?

p.5, line 19-20: The biofuel and fossil fuel emissions are stated "climatology". Specifically, which years are taken to make the climatology and is it reasonable to use for current forecast?

p.8, line 26: Please expand the abbreviation ASRC at its first use.

p.7, Section 4.2: The forecasted AOD by NGACv2 show reasonable agreement with MODIS and VIIRS retrieved AOD and the multi-model ensemble forecast. However, NGACv2 does not show large AOD over the south of the Great Lakes that is shown in the satellite retrievals and the MME.

p.8, line 2: "The figure shows that using the NGAC forecast as the CMAQ lateral boundary condition significantly improved the CMAQ forecast": Figure 3 shows the impact of

providing lateral boundary from NGACv2 to CMAQ, but this does not necessary means improvements since it is not evaluated with observations.

p.8, line 4-: The inclusion of the lateral boundary from NGACv2 to CMAQ forecast does not seems to improve to reproduce the highest peak of PM2.5 in Fig. 4a and 4b.

p.8, Section 5.2 and 5.3: These results show sensitivities of the aerosol loadings to the SST retrieval and insolation on the Earth surface. However, these results do not guarantee the improvements of the real situations.

p.9, lines 7-12: It is strange that the conclusions of the validation by the companion paper (Bhattacharjee et al. 2017) is written in the conclusion of this manuscript.

3 Technical corrections

p.4 line 1: "Updates in NEMSGSM" -> "Updates in NEMS GSM"? (Whitespace between NEMS and GSM)

p.4, line 5: "(RRSM)" : Right parenthesis is in italic.

p.4, line 17: "NEMSGSM" -> "NEMS GSM"?

p.4, line 21: "other atmospheric aerosols" : Maybe "other" is not necessary

p.4, line 27 and hereafter in this paragraph: the parentheses of the citation are in brackets (AGU style?)

p.7, line 15: "imaginary" : "imagery" or just "image"?

p.7, line 12 and line 26: "Jun" -> "June" or “Jun.”

p.8, line 8: "condtion" -> "condition"

p.8, line 29 and line 32: "Figure 6 a)" and "Figure 6 b)": Right parentheses are not

necessary.

p.8, line 30: What is the "Perez model"? (It is probably the "the semi-empirical GOES satellite global and direct horizontal irradiance estimation model developed at ASRC" but not stated.)

p.10 line 3: "inline": In other part of the manuscript, it is written as "in-line".

The model name: Mostly written as “NGACv2” but sometimes written as “NGAC v2” or “NGAC V2” or “NGAcv2”: whitespace and capitalization are not consistent.

Please check the citation and reference list more carefully, What I found are:

p.2, line 21: Fan (2015) -> Fan et al. (2015)

p.3, line 2: Murphy (2014) -> Murphy et al. (2014)

P.3, line 5: Zhang (2016) -> Zhang et al. (2016)

p.4, line 9: (Han et AL. 2015) -> (Han et al. 2015)

p.5, line 22: (Gong S., 2003) -> (Gong 2003)

Table 1: Guenther et al. (1995) and Lana et al. (2011) are not found in the references.

Table 2: (Colarco. P. et al, Res., 2010) -> (Colarco. et al. 2010)?

References: Diehl et al. (2012) is ACP but the doi (url) there is acpd.

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