

Interactive comment on “Can a coupled meteorology-chemistry model reproduce the historical trend in aerosol direct radiative effects over the Northern Hemisphere?” by J. Xing et al.

J. Xing et al.

xingjia@tsinghua.org.cn

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We thank the referee for a very thoughtful review and an overall positive assessment of our manuscript. Incorporation of the reviewer's suggestions has led to a much improved manuscript. Below we provide a point-by-point response to the reviewer's comments and also detail how we have addressed them in the revised manuscript.

General

[Comment]: suggest the authors include a short discussion on steps they are taking to address identified shortcomings in emissions and model parameterizations to improve

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future similar model investigations.

[Response]: Following the reviewer's suggestion, in the revised manuscript we have included a discussion on how we will be addressing in the future identified shortcomings in the model emissions and parameterizations, as follows:

(P27, L19-P28, L2) “An accurate temporally resolved biomass emission inventory (van der Werf et al., 2006; Shi and Yamaguchi, 2014), an improved dust emission model (Kok et al., 2014) and an advance scheme to model atmospheric organic aerosol (Koo et al., 2014; Zhao et al., 2015) are suggested for future model investigations. We are currently conducting a similar study with a finer-scale simulation and relatively better spatially and temporally resolved emission inventories over the continental U.S. domain. Further analysis of those model calculations and assessment of the impacts of the higher resolution emissions can be found in Gan et al. (2015).”

References:

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Shi, Y., and Yamaguchi, Y.: A high-resolution and multi-year emissions inventory for biomass burning in Southeast Asia during 2001–2010. *Atmospheric Environment*, 98, 8-16, 2014.

Kok, J. F., Mahowald, N. M., Fratini, G., Gillies, J. A., Ishizuka, M., Leys, J. F., Mikami, M., Park, M.-S., Park, S.-U., Van Pelt, R. S., and Zobeck, T. M.: An improved dust emission model – Part 1: Model description and comparison against measurements, *Atmos. Chem. Phys.*, 14, 13023-13041, doi:10.5194/acp-14-13023-2014, 2014.

Koo, B., Knipping, E., and Yarwood, G.: 1.5-Dimensional volatility basis set approach for modeling organic aerosol in CAMx and CMAQ. *Atmospheric Environment*, 95, 158-

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Zhao, B., Wang, S., Donahue, N. M., Chuang, W., Hildebrandt Ruiz, L., Ng, N. L., Wang, Y., and Hao, J.: Evaluation of One-Dimensional and Two-Dimensional Volatility Basis Sets in Simulating the Aging of Secondary Organic Aerosol with Smog-Chamber Experiments. *Environmental science & technology*, 49(4), 2245-2254, 2015.

Gan, C.-M., Pleim, J., Mathur, R., Hogrefe, C., Long, C. N., Xing, J., Wong, D., Gilliam, R., and Wei, C.: Assessment of multi-decadal WRF-CMAQ simulations for understanding direct aerosol effects on radiation "brightening" in the United States, *Atmos. Chem. Phys. Discuss.*, 15, 17711-17742, doi:10.5194/acpd-15-17711-2015, 2015.

Specific Comments

[Comment]: p. 14032, line 26: I believe it should be "retrievals" instead of "retrieves".

[Response]: The typo has been corrected in the revised manuscript (P6, L22).

[Comment]: p. 14033, line 23: Should be "... the satellite datasets are interpolated ...".

[Response]: The typo has been corrected in the revised manuscript (P7, L19).

Please also note the supplement to this comment:

<http://www.atmos-chem-phys-discuss.net/15/C6137/2015/acpd-15-C6137-2015-supplement.pdf>

Interactive comment on *Atmos. Chem. Phys. Discuss.*, 15, 14027, 2015.

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