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Atmospheric Chemistry and Physics Discussions

Interactive comment on "How skillfully can we simulate drivers of aerosol direct climate forcing at the regional scale?" *by* P. Crippa et al.

Anonymous Referee #3

Received and published: 5 November 2015

This manuscript presents the evaluation of high-resolution WRF-Chem simulations over North America. The model skill in reconstructing the Aerosol Optical Depth and Angstrom Exponent is investigated by comparing model results with observations from MODIS Aqua and Terra as well as the ground networks AERONET and EPA. The research topic is certainly within the scope of the ACP. The article is well written and the methodology is clearly described. Moreover, aerosol optical properties are generally poorly constrained in modelling evaluation, especially at high-resolution resolution. For these reasons, I consider that such work should be published in ACP, but only after some revisions. It would have been worth to treat some aspects into more details, and to clarify some points of the discussion. I think that the authors should consider all the corrections of Anonymous Referee #2. In addition to his/her recommendations, I would

propose some further corrections in the following.

General remarks:

- A major concern is that authors never make the connection to aerosol climate forcing, although the title suggests this kind of analysis. A thorough discussion on aerosol climate forcing is necessary. Otherwise the authors should modify the title.

- In many occasions, authors try to explain model biases in AOD estimations with an overestimation/underestimation of aerosol-nitrate and aerosol-sulfate, but no evidence are shown in the text to support this.

Technical corrections and comments:

Page 27316, line 9-14: This sentence is a bit confusing. Please restructure it.

Page 27322, line 3: Table 3 shows that MODIS and AERONET data are poorly correlated. In this section it is important to explain the reasons of this disagreement and the effects on the model evaluation.

Page 27323, line 9: What is i?

Page 27325, line 6-9: Did your results suggest the same? Did you compare AOD biases with sulfate biases? Did you find a correlation between aerosol-sulfate and AOD estimations?

Page 27326, line 5-8: Do you have evidence about this? You should support di statement with some elaborations.

Page 27329, line 17-23: One more time, you only did some hypothesis but no evidence to support these statements. Please, show some elaborations that include particle composition evaluation.

Page 27329, line 23-24: Why higher uncertainties at coastlines? Do you have some previous studies to cite in order to support this?

Page 27330, line 18 :Table 3 suggests that AERONET MFB is 0.5

Page 27331, line 6: AERONET MFB is -0.59 according to Table 3

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 27311, 2015.