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Geoscientific Model Development Discussions
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Interactive comment on "Decadal evaluation of regional climate, air quality, and their interactions using WRF/Chem Version 3.6.1" *by* K. Yahya et al.

Anonymous Referee #1

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The subject is appropriate to GMD. This manuscript presents results of the first decadal application of WRF/Chem v3.6.1 with CB05 from 2001 to 2010 over the continental US using the Representative Concentration Path- way (RCP 8.5) emissions. The capability and appropriateness for long term climatological simulations are assessed on the basis of meteorological, chemical, and aerosol-cloud-radiation variables against data from surface networks and satellite retrievals. The results showed that the model performs very well for the 2m temperature (T2) for the 10 year period with only a small cold bias of -0.3 0C. They also found that in general, the model performs relatively well for chemical and meteorological variables, and not as well for aerosol-cloud-radiation variables. A lot of model evaluations have been done with tremendous observational data. Therefore I recommend clearly the acceptance for publication of this manuscript after minor revisions. Several editorial comments for improving the information content

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Interactive Discussion
Discussion Paper

and presentation of the paper are listed as follows:

1. Title: It should be “Decadal evaluation of regional climate, air quality, and their interactions over the continental U.S. using WRF/Chem Version 3.6.1” because this is your study area.

2. Abstract: Please summarize the results quantitatively instead of qualitatively such as what do you mean by “slightly overpredicted”?

3. P6709, L20-24-61: Regarding the online-coupled models, please add discussions about the recent work for the two-way coupled WRF-CMAQ (such as Yu, Shaocai, R. Mathur, J. Pleim, D. Wong, R. Gilliam, K. Alapaty, C. Zhao, and X. Liu, 2014. Aerosol indirect effect on the grid-scale clouds in the two-way coupled WRF-CMAQ: model description, development, evaluation and regional analysis. Atmos. Chem. Phys. 14, 11247–11285, doi:10.5194/acp-14-1-2014.)

4. P6715, L180-21: Please cite the definitions of MB, NMB, RMSE etc for some references (such as Yu, Shaocai, Brian Eder, Robin Dennis, Shao-hang Chu, Stephen Schwartz, 2006. New unbiased symmetric metrics for evaluation of air quality models. Atmospheric Science Letter, 7, 26-34.)

5. P6727, L25-25-593: Regarding the bad performance of NO3-, one of the reasons is because of partition of total (HNO3+NO3) between gas and aerosol phases as discussed by Yu et al. (Yu, Shaocai, Robin Dennis, Shawn Roselle Athanasios Nenes, John Walker, Brian Eder, Kenneth Schere, Jenise Swall, Wayne Robarge, 2005. An assessment of the ability of 3-D air quality models with current thermodynamic equilibrium models to predict aerosol NO3- Journal of Geophysical Research, 110, D07S13, doi:10.1029/2004JD004718.). Please add this discussion.

6. Regarding the captions of Figures 1, 7 and 8: Please one sentence to say “the observations are represented by diamonds in the figures”.

Interactive comment on Geosci. Model Dev. Discuss., 8, 6707, 2015.