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Interactive comment on "One-Year Simulation of Ozone and Particulate Matter in China Using WRF/CMAQ Modeling System" *by* Jianlin Hu et al.

Anonymous Referee #1

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In this paper, the author presents a yearlong air quality simulation using a chemical transport model to provide detailed temporal and spatial distribution of O3, PM2.5 and PM2.5 chemical compositions in China. The topic is important, the method is generally sound, and the results are generally reasonable. I suggest this manuscript be accepted with revisions described below.

General comments:

(1) The main objective of this study is to provide detailed temporal and spatial distribution of O3, PM2.5 and its chemical components, which supplements the current observational network in China. The key to success is to ensure that the model well reproduces the magnitude and spatiotemporal distribution of these pollutants. However, the author only compared simulated O3 and PM2.5 concentrations with surface obser-

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vations. To better evaluate the modeling results, I suggest the author also compare with satellite observations, such as AOD, NO2 column, SO2 column, and tropospheric ozone residual. Moreover, although the observations of PM2.5 chemical components are not publicly available, some data can be found in the literature. It will be very beneficial if the author can compare the simulated chemical components with some available chemical component data, because the spatiotemporal distribution of chemical components is a major focus of this study.

Furthermore, the comparison results indicate that PM2.5 concentrations are underestimated significantly in some months (e.g., MFB=-48% in July), and the model performance can be quite different in different regions. The author needs to comment how these temporally and spatially variant biases affect the simulation results of spatiotemporal distribution of O3, PM2.5 and PM2.5 chemical composition.

(2) Introduction: The author suggests that most modeling studies focus on a specific pollution episode and extensive model performance evaluation is lacking. In fact, as far as I know, quite a few studies have been done to evaluate the model performance in China for a full year or several representative months (e.g., Gao et al., 2014; Zhang et al., 2016; Liu et al., 2016; Zhao et al., 2013; Wang et al., 2011; Liu et al., 2010), and there are more. The author should review these long-term modeling studies because they highly resemble the work presented here.

Gao, Y., Zhao, C., Liu, X. H., Zhang, M. G., and Leung, L. R.: WRF-Chem simulations of aerosols and anthropogenic aerosol radiative forcing in East Asia, Atmos Environ, 92, 250-266, DOI 10.1016/j.atmosenv.2014.04.038, 2014.

Zhang, Y., Zhang, X., Wang, L., Zhang, Q., Duan, F., and He, K.: Application of WRF/Chem over East Asia: Part I. Model evaluation and intercomparison with MM5/CMAQ, Atmos Environ, 124, 285-300, 10.1016/j.atmosenv.2015.07.022, 2016.

Liu, X. Y., Zhang, Y., Zhang, Q., and He, M. B.: Application of online-coupled WRF/Chem-MADRID in East Asia: Model evaluation and climatic effects of anthro-

pogenic aerosols, Atmos Environ, 124, 321-336, 10.1016/j.atmosenv.2015.03.052, 2016.

Zhao, B., Wang, S. X., Wang, J. D., Fu, J. S., Liu, T. H., Xu, J. Y., Fu, X., and Hao, J. M.: Impact of national NOx and SO2 control policies on particulate matter pollution in China, Atmos Environ, 77, 453-463, DOI 10.1016/j.atmosenv.2013.05.012, 2013.

Wang, S. X., Xing, J., Chatani, S., Hao, J. M., Klimont, Z., Cofala, J., and Amann, M.: Verification of anthropogenic emissions of China by satellite and ground observations, Atmos Environ, 45, 6347-6358, DOI 10.1016/j.atmosenv.2011.08.054, 2011.

Liu, X.-H., Zhang, Y., Cheng, S.-H., Xing, J., Zhang, Q., Streets, D. G., Jang, C., Wang, W.-X., and Hao, J.-M.: Understanding of regional air pollution over china using CMAQ, part I performance evaluation and seasonal variation, Atmos Environ, 44, 2415-2426, 10.1016/j.atmosenv.2010.03.035, 2010.

Specific comments:

(1) Line 222-225: Why does the author filter out these data? How are the thresholds determined?

(2) Line 228: There should be a comma before “PM2.5”

(3) Line 284-291: The PM2.5 concentrations are underpredicted significantly in some months. The author should explain the reason for the underestimation. In addition, the author attributes the underestimation in PM10 to natural and anthropogenic dust emissions. How is wind-blown dust emissions calculated in CMAQ (any reference)? Are there any previous studies showing that the dust emission module embedded in CMAQ underpredict wind-blown dust emissions?

(4) Line 197: The author states that the benchmarks are adapted from Emery et al. (2012). However, the author indicates that these benchmarks are from Emery et al. (2001) in the title of Table 1. The two papers seem quite different and the latter one appears the correct source. Please confirm.

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