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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Mesoscale modeling study of the interactions between aerosols and PBL meteorology during a haze episode in China Jing-Jin-Ji and its near surrounding region – Part 2: Aerosols' radiative feedback effects" *by* H. Wang et al.

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Anonymous Referee #2 Received and published: 21 January 2015 The paper addresses the rediative feedback on radiation budget, PBL meteorology and haze formation due to aerosols during the haze episode in China Jing-Jin-Ji and its nearby surrounding region using GRAPES-CUACE/haze model. I believe this manuscript is appropriate for publication in ACP and would recommend publication subject to pri-

marily minor revisions outlined below.

1) How reliable is the analysis about the interactions between aerosols and PBL meteorology in a case study (5-day)? Cloud you please estimate or discuss the uncertainty of results in the paper? This is my biggest concern. Response: It is very difficult to test the reliability of the interactions between aerosols and PBL meteorology exactly because there are not direct observation results to compare with simulation results. However, we can control the uncertainties by evaluating the errors of key aerosols' radiative parameters to determine the radiative feedback-AOD, SSA and ASY. In fact, the model errors and evaluation of these three parameters are given in the companion paper "Mesoscale modeling study of the interactions between aerosols and PBL meteorology during a haze episode in China Jing-Jin-Ji and its near surrounding region – Part1: Aerosol distributions and meteorological features " and we think the simulated results are reasonable. Further, the radiative transfer model developed by the Climate and Radiation Branch, NASA/Goddard Space Flight Center (the CLIRAD_SW and CLIRAD_LW) (Chou et al., 1998, 2001), which are widely used in the aerosol-radiation research, are used in this study. Nevertheless, the results in this paper are only from a case study and more cases are needed to further simulation to verify this result. This is explained in the section 6 Discussion and conclusion.

2) The paper said "Based on official information about national emission sources in 2006 (Cao et al., 2006), the detailed high-resolution emission inventories of reactive gases, i.e. SO2, NOx, CO, NH3 and VOCs, from emissions over China in 2007 were updated to form the current emission data (Cao et al., 2010). How to calculate the anthropogenic aerosol emission over China in 2008? More details about emission inventory should be mentioned. Response: Emission inventory collection is a very complex and hard work process. Normally, anthropogenic gas and aerosol emission inventory data collection is postponed 2-3 years, so it is acceptable that emission data used by model is updated every two or three years. Emission data based on 2006 and 2007 are used in this paper . The emission related content are introduced in brief in

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"Mesoscale modeling study of the interactions between aerosols and PBL meteorology during a haze episode in China Jing-Jin-Ji and its near surrounding region – Part1: Aerosol distributions and meteorological features ". The detailed description of the emission data used here is introduced in the three papers (Cao, et al., 2006; 2010; An et al., 2013). An, X. Q., Sun, Z. B., Lin, W. L., Jin, M., and Li, N.: Emission inventory evaluation using observations of regional atmospheric background stations of China, J. Environ. Sci., 25, 537–546, 2013. Cao, G., Zhang, X., and Zheng, F.: Inventory of black carbon and organic carbon 446 emissions from China, Atmos. Environ., 40, 6516–27, 2006. Cao, G. L., An, X. Q., Zhou, C. H., Ren, Y. Q., and Tu, J.: Emission inventory of air pollutants in China, Chin. Environ. Sci., 30, 900–906, 2010.

3) Please improve all figures in the paper including quality, color bar, words and units. . .. Response: All figures are red-drawn.

4) How to define and calculate the turbulence diffusion coefficient (FKTM) in the paper? More detail information should be mentioned. Response: The turbulence diffusion coeffcient (fktm) appears first time in "Mesoscale modeling study of the interactions between aerosols and PBL meteorology during a haze episode in China Jing-Jin-Ji and its near surrounding region – Part1: Aerosol distributions and meteorological features ". It parameterizes the PBL turbulence diffusion process and the definition is given in another paper (Wang et al., 2010). Wang, H., Zhang, X. Y., Gong, S., Chen, Y., Shi, G., and Li, W.: Radiative feedback of dust aerosols on the East Asian dust storms, J. Geophys. Res., 115, D23214, doi:10.1029/2009JD013430, 2010.

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