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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 1: Aerosol distributions and meteorological features" *by* H. Wang et al.

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Received and published: 14 January 2015 , Review comment on "Mesoscale modeling study if the interactions between aerosols and PBL meteorology during a haze episode in China Jing-Jin-Ji and its near surrounding region- Part 1: Aerosol distributions and meteorological features" by H. Wang et al. General commentsïjŽ This manuscript, using chemistry transport model GRAPES_CUACE results to investigate aerosol prop-

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Interactive Discussion

Discussion Paper

erties including aerosol optical depth (AOD), single scattering albedo (SSA) and asymmetry parameter (ASY) and meteorological conditions during a haze episode in Jing-Jin-Ji, the national capital region of China also known as biggest urbanized regions in Northern China. The model results are validated with measurements from ground-based stations and space-born satellites (e.g. MODIS, CARSNET, and AERONET). The model simulations are in good agreement with observations and provide the characterized atmospheric aerosol properties during the haze episode. The analysis shows that PBL processes such as horizontal transport and vertical turbulent diffusion within PBL height play a key role in the formation of haze with high PM2.5 concentrations. The results are interesting and the study is meaningful for understanding the formation of the regional haze in China. However, the manuscript is not written in clear and concise English. Please have the manuscript examined by a native English speaker or ask for editor's help to improve the overall language of the paper. I recommend its publication basically in a revision in accordance with the following comments. Major comments 1. The major analysis in this study pays much attention to comparison between modeled and observed data. I prefer this study, based on interaction between gas/aerosol chemical and physical processes, to answer the question how the haze episode builds up makes more scientific sense and that may require further work. Response: Yes, considerable content in this study pays attention to comparison between modeled and observed data. One reason is that the model evaluation is the scientific basic of the following research discussions. Another reason is that this paper is a companion paper of "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". The contents of model evaluations of the two papers are all in this paper.

2. The introduction to datasets used for the model initialization and updating boundary conditions is not clear for both chemistry and meteorology. Line 8 on Page 31685: "The initial values of all tracer gases and aerosol concentrations are based on the 24h forecast made by the previous day's model run". I am wondering what data are used for

initialization at very beginning of model runs. Do not you use simulations from global (or over a larger domain) chemical transport model to serve as initialization and time-dependent boundary conditions? Response: NCEP 1*1 Reanalysis data were used for the model's initial and 6 h meteorological lateral boundary input fields (please see line 6-8 on page 11) The monthly climate mean values of all tracers from observation data are used for initialization at the very beginning of model run. The initial values of all tracer gases and aerosol concentrations are based on the 24h forecast made by the previous day's model run during the model runs. The simulation results after the first three days' model runs are used in this study for eliminating the model errors from the chemical tracer initialization.

Minor comments 1. Line 8 on Page 31685: "The initial values of all tracer gases : : :" might be "The initial values of all long-lived gases in RADM2: : :". As per my understanding, tracer gases are inert in chemistry.

Response: Not only "long-lived gases", but also SO2, NO2 and NH3 etc. are included in the gases. It should be "The initial values of all gases in RADM2 "

2. Line 26 in Abstract: "The momentum transmitting downward of the cold air from above the PBL to the low PBL and surface lead to an increase in surface wind speeds and haze dispersal" may be changed into "The cold air above PBL with high momentum downward to lower atmosphere and surface layer is responsible for increase of surface wind speed. That leads to decreasing of PM2.5 concentration". Response: This is revised in the manuscript.

3. Line 4 on Page 31679: What is the definition of "pollution strength". Response: Pollution strength means PM2.5 values here. " pollution strength (PM2.5)" may be better here.

4. Line 5-14 on Page 3167: The presentation in this part is not clear. Please re-write clearly, correctly, and concisely. Response: I am sorry that Page 3167 can't be found.

5. Line 2 on Page 31685: ": : :, formed the simulation basis of this research." may be changed to ": : :, serve as the base simulations for this research." Response: This is revised in the manuscript.

6. Line 20 on Page 31685: ": : : which fills in data gaps left by : : :" might be ": : : which fills in data gaps remaining in : : :". Response: This is revised in the manuscript.

7. Line 22 on Page 31686: ": : : (SACOL) station on the Lanzhou University campus : : :" should be ": : :(SACOL) station located at the Lanzhou University campus : : :". Response: This is revised in the manuscript.

8. The first paragraph of section 4.2 need to be re-written because it is not logically clear on PBL and processes involved in PBL. Response: This is re-written as following in the manuscript according to the reviewer's opinion . The PBL is in the lower tropospheric layer with its height ranging from several hundred meters to a few kilometers. The heat, moisture and momentum exchanges between the Earth's surface and the rest of the atmosphere all occur in it. The wind speed near the surface, turbulence diffusion atmosphere stability and etc. related with haze pollution are all calculated in PBL and the PBL meteorology is very important for correctly modeling and providing accurate weather forecasts (Vogelezang et al., 1996; Santanello et al., 2005), especially accurate air pollution forecasts (Cheng et al., 2002; Pleim, 2007b).

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 31675, 2014.