

Interactive comment on “Modeling study of PM_{2.5} pollutant transport across cities in China’s Jing-Jin-Ji region during a severe haze episode in December 2013” by C. Jiang et al.

Anonymous Referee #1

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Review comment on “Modeling study of PM_{2.5} pollutant transport across cities in China’s Jing-Jin-Ji region during a severe haze episode in December 2013” by C. Jiang et al.

General comments

This study using chemistry transport model GRAPES_CUACE to simulate a typical haze episode in December 2013 over Eastern China. The results analysis is mainly focusing on the Jing-Jin-Ji region, the national capital region of the Northern China because of its importance of regional source and sink of particulate matter. The mod-

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eled wind fields and PM_{2.5} concentrations are compared against observed ones from weather and air quality stations. The model simulations are comparable to observations. The results are interesting and the study is helpful to get an insight into the regional haze/smog problem in China. I recommend its publication in ACPD after considering the following comments.

Major comments

1. The authors only mention the datasets used for meteorological initial and boundary conditions in Section 2.2. However, the chemical initial and boundary conditions are also needed for driving the regional chemistry transport model. It is necessary to clarify datasets for this purpose.
2. Another regional high PM_{2.5} event occurred on 24-25 in the same month according to observational data shown in Fig.4. I am wondering why the authors did not analyze this episode even they already ran the model for the entire month. In my opinion the analysis include the both episodes certainly makes the study stronger.
3. In order to identify the transport contribution to PM_{2.5} levels in Beijing (PK), the authors estimate the horizontal advective fluxes of PM_{2.5} with a box covering PK. But it is hard to conclude that “the remaining 1230t could be attributed to local emissions” at Line 11 on Page 3757 because sinks (e.g. dry and wet deposition) and sources (e.g. emission and chemical transformation) are not involved the authors’ calculations. Therefore this method cannot quantitatively decouple the contribution of transport process from final results determined by all processes.
4. Due to the aerodynamic effects of large scale topography on the regional wind field, it is not surprising to me the spatial distribution pattern of PM_{2.5} is clearly dependent on topography over the Eastern China. The authors may analyze topographic influences on the regional winds (patterns) and population and emission sources distributions due to the topographic features. It makes sense for regional emissions mitigation policies.

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Minor comments

1. Line 8 on Page 3747: "... , and it changes the climate on a regional ... " may be changed into "... , it also has climate change effect over a regional ... "
2. Line 15 on Page 3747: "the central-eastern China, is not one of China's ... " should be "the central-eastern China, is not only one of China's ... "
3. Line 21-22 on Page 3747: "... to inform policy aimed at averting irreversible environmental ... " might be "... to inform policy aimed at averting environmental degradation ... "
4. Line 3-4 on Page 3749: "... as a unified chemistry model ... " could be changed into "... as a unified chemistry module ... "
5. Line 8-9 on Page 3749: You may remove "with diameter ranges of ... 20.48-40.96 μm " because the size bins have been defined in Gong's paper (Gong, 2003) you cited.
6. Line 21-22 on Page 3750: "Simulated PM2.5 values were similar to the observed PM2.5 values ... " can be changed into "The simulated PM2.5 concentrations are in good agreement with observations..."
7. What does "weather phenomena" mean in the manuscript? (Line 11 and 18 on Page 3751, Line 19 on Page 3757, and in Figure 2 caption). Weather phenomena can be any weather conditions that may and may not be hazardous to human life and property according to my understanding.
8. Line 17-20 on Page 3751: For high simulated PM2.5 in the southeastern Shanxi Province, please provide more evidences or detail explanations of "overestimated emissions".
9. Line 8 on Page 3758: "... 80 hPa ... " should be "... 800 hPa ... "
10. It is much better to develop a single figure to show the difference between mean observed and modeled visibility for 6-7 December 2013 instead of Figure 3 (a) and (b).

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11. Please improve the quality of Figure 4 because it is difficult to read numbers and legends with its normal size.

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