**Atmospheric
Chemistry
and Physics
Discussions**

Interactive comment on "A modelling study of air quality impact of odd-even day traffic restriction scheme before, during and after the 2008 Beijing Olympic Games" *by* H. Cai and S. D. Xie

Anonymous Referee #1

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General comments

This paper analyzes the air quality impacts of a traffic restriction scheme imposed in Beijing during the 2008 Olympic Games. The tool used for this study is a dispersion modelling system that can simulate the urban air pollution from traffic in the relevant spatial and temporal scales. Also, air pollutant measurements from one station are used to test the validity of the model performance before assessing the impacts in the air quality of the Beijing urban area before, during and after the traffic restriction scheme. The dense network of monitored on-road traffic flows has helped towards the realistic representation of the species emission rates used as input in the modelling

system.

The title of the manuscript reflects the contents of the paper and the abstract is concise and sufficient. In terms of scientific quality and significance, the manuscript provides an analysis/assessment of an interesting scheme for short-term reduction of air pollution in a highly populated urban area using a modelling system. The authors made an effort to cover many aspects of the air quality impacts in the area, from the meteorological influence to the diurnal, weekly and spatial variation of the air pollutants. I am in favour of publishing this article in ACP after some specific questions have been answered and clarifications have been made in the manuscript to enhance its quality and clear some vague issues which have raised during the review process. Two main issues are the use of only one measuring station for the model evaluation and the surprisingly good correlation between measurements and model outputs for PM10. This is in contradiction with the fact that the model includes only traffic emissions and according to previous publications the contribution from traffic emissions is really low. The specific comments and technical corrections that follow will help the authors address the above statements.

Specific comments

Page 4, lines 78-81: The list of control measures taken by the government for the traffic is very important in the text. The authors state 6 different measures, 3 of which are the same; decommissioning of high emissions vehicles, banning of large polluting vehicles from the roads and restricted use of high emissions vehicles. The authors should try to clarify these measures in a more appropriate way.

Page 5, lines 101-103: The phrase "This study, based on a modelling simulation with online-monitored data of on-road traffic flows at a high temporal resolution of two seconds from the ITS-TAP system, focuses. . ." indicates that the monitored data of the on-road traffic flows are used during the simulation time (online) of the dispersion model. From the input data section it is clear that the traffic flows are used to calculate the

pollutant emission rates, indirectly taking part in the model simulation. Please clarify the text accordingly.

Page 6, line 123: It is not clear from the text why the authors selected the ADMS-Urban model instead of the other 2 proposed models by the Ministry of Environmental Protection. A comment on that would be appropriate in the text (better know-how of the model as users? use of this particular model for a number of studies in China? Other?).

Section 2.1, page 8: Since the basis of this work is the use of the ADMS-Urban model, the authors should provide more information on how this model was set up for the simulations of the air quality over Beijing area. Information that is missing is whether they used deposition processes, continuous species emission in the domain (in time), the terrain is taken into account or not (buildings, street canyons, etc). What was the horizontal resolution used for the application? This information is important for understanding and criticizing the simulation results.

Section 2.2, page 8: In the description of the study domain it is important to know the townscape around the major roads. Are there tall buildings around? Is there a dense urban web structure or a sparse one? This information will clear the overall picture of the monitoring sites chosen for this study, especially because the authors used only one station for the air quality and one for the meteorological fields. The circulation of the pollutants and the meteorological conditions in the urban area are mostly influenced by the street plan.

Section 2.3.1, page 10: Line 189: How did you determine the "abnormal maximum" driving speeds? What caused these abnormal speeds, a flaw in the automatic monitoring stations? Line 196: Indicate what did you consider as a "large quantity of missing data", 50%, 60%, lower?

Section 2.3.1, page 11: In the discussion about the emissions in the urban area of Beijing, the authors should also describe what other sources of emissions are present

in the domain. Industry, agriculture, biomass burning, residential? A critical discussion on the possible disadvantages of not using a complete emission inventory in the simulations must be added in the manuscript.

Section 2.3.2, lines 246-258: The statement "reveals that northeasterly and southeasterly winds dominated in the daytime while southeasterly wind dominated in the nighttime" is different from the one in section 2.2 (lines 160-161) where the prevailing wind is southeasterly during the day and northerly during the night. Please revise the text accordingly.

Section 3.1.1, page 16: One important disadvantage of the manuscript is the use of only one measuring station to conduct the evaluation of the model results. Scientifically, such a comparison would not be considered as solid and conclusive that the model performance is adequate or not. Why did the authors not use other measuring stations in the study domain? How can the authors be sure that the results are coincidental for some species due to the station location? I would suggest adding one or more stations in the evaluation section and if this is not possible, then try to strengthen the text by explaining why you included only one station and the possible drawbacks of this for the overall model evaluation. This should also be mentioned in the conclusions.

Section 3.1.1, page 18: In several publications for Beijing, as referenced in this paper and elsewhere (e.g. Y. Song, M. Zhang, X. Cai: PM10 modeling of Beijing in the winter, Atmospheric Environment, Volume 40, Issue 22, July 2006, Pages 4126-4136), the high PM10 concentrations found in the area are a result of different sources emitting PM10 (industrial, residential, traffic and natural like dust) with a small contribution from the on-road traffic emissions. Of course, the percentage of contribution from each source depends on the season among others. In this study, the only emissions used are from traffic and someone would expect a significant underestimation of the PM10 model concentrations compared to the observations. This is not evident when looking at the scatter diagram of PM10 in Fig3b or from the statistical evaluation (rather an overestimation is). Is it possible that this result is primarily caused by the selection

of one station to evaluate the model results, making the evaluation coincidental? The authors should comment on that.

Section 3.1.2, page 19: Indicate the time period that the plots in Figure 4 refer to. In Figure 4 you have added a background concentration for each species. Does this come from the DL monitoring station? If yes, then the station can not be characterized as background for ozone since the values are higher than the observed ones, primarily due to the secondary production of ozone that leads the pollutant in the outskirts of the city away from the sources of the precursors. Please clarify this in the text.

Technical corrections

Abstract (and elsewhere in the manuscript): The use of the word "besides" appears very often in the text. The authors should try and use alternative words that will better suit the purpose of each sentence; otherwise the text becomes very poor. (Recommendation: in addition, moreover, furthermore).

Page 5, Line 2: "measurement" should be in plural "measurements"

Page 7, lines 127-133: This sentence is very long in length making it difficult to read. The authors should try to make 2 sentences out of this one. In general, try to avoid the long sentences in other parts of the text also.

Page 9, line 168: The beginning of the sentence with "In addition" is not appropriate since the new phrase does not describe monitoring sites as the previous one.

Page 9, line 175: The phrase "representative receptors, is shown by Figure 1" should be "representative receptors, are shown in Figure 1".

Page 10, line 192: "Accordingly, we treated those hourly sequential data sets".

Page 10, line 197: "that the monitored driving speed was proper".

Table 1, page 12, line 225: The units in the parenthesis is g/km per hour?

Table 2, page 17, line 318: Indicate the time period of the dataset in the title.

Figure 6, caption: Indicate which part of the plot correspond to diurnal and which to hourly flows.

Page 25, line 437: "Pollutant concentration levels are directly related to air quality,..".

Page 25, line 450: "concentrations were about..".

Page 27, line 485: "conformed to the 24 hours CNAAQS Grade II".

Figure 7, caption: "Comparison of daily average predicted concentrations of . . ."

Page 27, line 491: "which was in consistence with the previous. . .".

Figure 8, caption: "Comparison of diurnal predicted variations of . . ."

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