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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Impacts of emission reduction and meteorological conditions on air quality improvement during the 2014 Youth Olympic Games in Nanjing, China" *by* Qian Huang et al.

Anonymous Referee #2

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This study investigated the variation of and the relative contributions of meteorology and emission reduction to air quality during the 2014 Youth Olympic Games in Nanjing through observation analysis and WRF-CMAQ simulation. It states that under unfavorable meteorological conditions, emission reduction is a dominant factor to improve air quality, which is successful in controlling air pollution during the event in Nanjing. This study could be useful to the understanding of haze formation mechanism in east China related to meteorology and emission variation, however, this version of manuscript lacks in-depth analysis of pollutant evolution and some interpretation is not sound and insufficient, so I recommend a major revision of this manuscript.

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Specific comments:

1. line 112-113, 'the 9 state controlling air sampling sites in Nanjing were chosen to represent the whole Nanjing'. Looking at fig 1b, I found 9 stations almost concentrate in the urban area, which is small compared with the whole Nanjing, so I doubt the 9 sites can represent the whole Nanjing, and it's better to collect some observations at rural sites of Nanjing for model validation.

2. Line 149-160 presents the comparison between August 2014 and August 2013 and states ' emission reductions did help the alleviation of air pollution.....', you didn't look at and discuss the difference in meteorological conditions between the two years, how can you rule out the potential influence of meteorology, so please add meteorology comparison here. Also, there are evident emission reductions during August 2014, with 22.1% for SO2, 12.5% for NOx, and 21.4% for PM2.5, why the decrease in PM2.5 concentration at CCM is just 9.8%, how about the proportion and relative changes of primary and secondary PM2.5?

3. Line 182-191, when comparing simulations in August 2014 with that in July and September 2014, you try to say ' the pollutant concentrations declined with emission control, but rebounded after releasing control', however, the simulated SO2 concentration in August is larger than that in July (5.1%), whereas NO2 (19.8%) and CO (21.1%) in August are larger than in September, how do you explain the larger SO2, NO2 and CO concentrations in August although strict emission abatement is implemented than those in July and September with no emission reduction?

4. line 227-228, 'Consequently, Exp.2 resulted in higher pollutant concentrations for all species as shown in Fig.7', this is not true, although the domain averages of pollutant values increase from Exp3 to Exp2, it is apparent that the spatial distribution did not show a consistent increase in the domain, such as the large decreases in all components but O3 to the northeast, and the decreases in SO2, NO2, CO, O3 in portions of Nanjing, so the meteorological condition in August 2014 did not necessarily lead to

increases in pollutant levels, so I suggest more discussion on the different responses to meteorology in the domain with analysis of meteorological variable changes.

5. section 3.3, similar problems in this section, when emission reduction lead to apparent decreases in concentrations of all pollutants except O3, how do you explain the apparent increases in the southern parts of Nanjing (Fig. 8)? are there some feedbacks among aerosols, radiation (photolysis), cloud and consequent effects on chemical processes, please elaborate on mechanisms behind these changes instead of just presenting model results.

6. Regarding Fig. 9, please explain how the meteorological change lead to day-to-day variations (either increase or decrease) of pollutant concentration.

7. Some tables like Table 4 and 5 can be removed because this manuscript is not a data report.

8. Please describe clearly the spatial and time scales of the presented data or model results and the comparison between cases throughout the manuscript, such as line 266 ' Fig.9 displays the effect of meteorological factors and emission reduction', please write clearly the numerical experiments, the time period and which domain for average etc.

9. The English in this manuscript should be carefully checked and much improved by correcting grammatical errors and rewording sentences, some of them are misleading and ambiguous.

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