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Interactive comment on “Highly time-resolved chemical characterization of atmospheric submicron particles during 2008 Beijing Olympic Games using an Aerodyne High-Resolution Aerosol Mass Spectrometer” by X.-F. Huang et al.

Anonymous Referee #2

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General comments:

This paper reports the characteristics of submicron aerosol in Beijing during the 2008 Olympic Games. The authors use an Aerodyne High-Resolution Time-of-Flight AMS to measure the chemical composition of aerosol particles. The dataset is unique and may be useful for assessing the effect of strict emission controls on the air quality during this time period. However, my impression is that this paper is a preliminary study. It needs important revisions before publication. Major comments are summarized below.

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Major comments:

- AMS measurements: One of the major conclusions of this paper is that the average PM₁ concentration in the summer of 2008 was lower by 31% than that in 2006. Is this number well above the absolute accuracy of the AMS measurements? Is the AMS measurement in this study comparable to that by Sun et al. (2010)? I have a critical question about the AMS collection efficiency. In Figure 1, the ratio of AMS mass to TDMS volume (i.e., density) often exceeds 2 (sometimes close to 3), which is unlikely the case with ambient aerosol. In addition, I have a critical question about the uncertainty associated with the AMS size cut. Previous studies observed relatively large contributions of supermicron particles to the accumulation mode in the Beijing atmosphere (van Pinxteren et al., JGR, 2009; Guo et al., ACP, 2010). A subtle change in the ambient size distribution may result in substantial difference in the mass concentration detected by the AMS. The authors should address these points and reconsider the significance of their conclusion (31% difference).

- Cooking related organics: The COA mass spectrum extracted in this study was compared with those of chicken and hamburger cooking. Why chicken and hamburger? Are these foods representative in this region? The peaks associated with the lunch and dinner times are plausible, but the comparison of the mass spectra seems to me very superficial.

- OOA-1 and 2: The authors say that the mass spectra of OOA-1 and OOA-2 are similar. What is the importance of the separation of OOA-1 and OOA-2 in this case? Without other supporting data, I do not believe that the two types of OOA correspond to organic aerosols from different source regions.

- Scientific significance of this study: There have been a number of publications discussing the characteristics of aerosol in Beijing (especially the CAREBeijing-2006 special issue in JGR) and a number of publications discussing the effects of emission controls on the air quality during the Beijing Olympic Games (e.g., Witte et al., GRL,

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2009). The authors should cite these previous studies and clarify the scientific significance (new findings) of this study.

Minor comments:

- Abstract and other sections: The authors suggest that northern air masses were influenced by local emissions. What was the spatial scale of the local emissions?
- Table 1: Table 1 should be included in the supplemental material. This information is not useful for general readers.
- Ion balance: What was the ion balance during the time period?
- Nucleation: I am curious to see if there was a nucleation event during the time period.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 13219, 2010.

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