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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Surface ozone trend details and interpretations in Beijing, 2001–2006" *by* G. Tang et al.

G. Tang et al.

tgq@dq.cern.ac.cn

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We would like to thank anonymous referees for his/her comments and helpful suggestions. We revised our paper according to these comments and suggestions. All the fixed figures and tables were uploaded in the supplement.

Response to comments by referee 1

Specific comments:

Question 1: The authors write that "the Quality control checks including automatic zero calibration and span checks of gas analyzers were performed daily, and manual calibrations with standard gases were conducted weekly." I would like some more details on this. What are the instruments for calibration?

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Response: Indeed details about the calibrations are important information for this study. We have described the instrument calibrations in a paragraph added to Section 2. We modified this paragraph on Page 8162 from line 23 as follows: Data quality was evaluated and certified by the China National Accreditation Board of Laboratories (CNAL), consistent with international requirements. IAP personnel strictly adhered to national environmental monitoring standards. Quality control checks including automatic zero-calibration and span checks of gas analyzers were performed daily, and manual calibrations with standard gases were conducted weekly. The NOx analyzers have been zero-checked and span-checked using a zero gas generator (TEI Model 111) and an internal ozone source of a multi-gas calibrator (TEI Model 146C) with NO standard (National Centre for Standard Materials, Beijing, China). Multi-point calibrations of the ozone analyzer were used an ozone calibrator (TEI Model 49CPS). Sampling methods and instrument protocols, as well as quality assurance/quality control (QA/QC) procedures for air quality monitoring are described in detail in the Chinese National Environmental Protection Standard, Automated Methods for Ambient Air Quality Monitoring (HJ/T193-2005; State Environmental Protection Administration of China, 2006).

Question 2: Please list the reasons of applying 95th percentile concentrations for comparison in different sites. Why not to use average daily maximum concentrations?

Response: Absolutely using 95th percentile concentrations will leave years or days with lower concentrations out of consideration. We accepted the suggestion and used average daily maximum and minimum concentrations to illustrate this phenomenon. Amended Table 1 was submitted in the attachment.

Question3: The authors write that “given that the morning maxima of NO and NO2 concentrations reflect the mobile emission of NOx, we conclude that the increasing daily minimum [O3] is likely due to reactions with the decreasing daily morning [NO], accounting for the constant daily minimum [Ox] observed. Please give the daily minimum ozone concentration and ozone trend in Fig. 8.

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Response: We accepted the suggestion and added the daily minimum and maximum ozone concentrations in Fig. 8. Corresponding with the modified figures, the paragraph on page 8167 from line 5 was amended as follows: Figure 8a shows the annual changes in the daily average morning maximum of the relative diurnal variations of NO and NO2. Daily average morning maximum values for NO and NO2 decrease linearly at rates of 3.4 ppbv/yr and 2.5 ppbv/yr, respectively, after 2002, suggesting that mobile emissions of NOx in Beijing may have decreased significantly over the period 2002–2006. Figure 8b shows the annual changes in the daily average maximum and minimum of the relative diurnal variations of oxidants in Beijing. Maximum and minimum O3 concentrations increased linearly at rates of 1.6 ppbv/yr and 0.7 ppbv/yr, respectively. Maximum and minimum Ox concentrations varied linearly at rates of 1.0 ppbv/yr and −0.1 ppbv/yr, respectively. The title of Fig. 8 was amended as follows: Fig. 8. Annual trends (a) in the daily morning maximum concentrations of NO, NO2 and (b) in the daily average maximum and minimum concentrations of O3, Ox, in 2001–2006. The concentration of each species represents an average of measurements taken from the six representative stations in Beijing.

Technical comments:

Question 1: The authors should use the identical abbreviation of “aveb” in Table 1 and “avgd” in Table 2.

Response: We modified “avgd” to “aved” in Table 2. Amended Table 1 was submitted in the attachment.

Question 2: Please add the square brackets around names in Fig.9b just like in Fig.9a.

Response: The square brackets around names have been added in Fig. 9b. Amended Fig. 9 was submitted in the attachment.

Question 3: Figures can be seen clearer when I magnify your manuscript than in original size. I think the reason is too high resolution of your figures. Please lower the

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resolution.

Response: 300 dpi figures using pdf format were submitted in the attachment.

Please also note the Supplement to this comment.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 8159, 2009.