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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The role of volatile organic compounds in the polluted urban atmosphere of Bristol, UK" *by* A. C. Rivett et al.

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The authors would like to thank the referee for his careful comments. The points raised are answered below. Referee's comments are shown in bold.

Technical comments 1-5, 8-10, 14, 18-21
Altered in text as suggested.

6) Please see the response to a similar question in the other Referees Report (acpd-3-S369)

7) Page 774, an example of exactly how the formula (1) was used
A calculation of daytime [OH] using Propene as an example:

$$[OH] = \frac{ln((X_t/B_t)/(X_i/B_i))}{t(K_B - K_X)}$$

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$$X_i/B_i = 0.769533359$$

$$X_t/B_t = 0.363993344$$

$$K_X = 2.70\,E\text{–}11\,\mathrm{cm}^3\,\mathrm{molecules}^{-1}\,\mathrm{s}^{-1}$$

$$K_B = 1.32\,E\text{–}12\,\mathrm{cm}^3\,\mathrm{molecules}^{-1}\,\mathrm{s}^{-1}$$

$$t = \text{Time between morning rush hour and midday periods } = 16\,200\,\mathrm{s}$$

The ratio of propene to benzene (X_i/B_i and X_t/B_t during the morning rush hour period (7:00-10:00) and the midday period (10:00-16:00) respectively) is the slope from a graph of propene concentration plotted against benzene concentration during those periods, using data from over the whole campaign. K_X and K_B are the rate constants for the reaction of benzene and hydrocarbon X with OH.

$$[OH] = \frac{ln(0.364/0.770)}{16\,200(1.32\times10^{-12} - 2.70\times10^{-11})}$$

$$[OH] = \frac{ln(0.473)}{16\,200(-2.568\times10^{-11})}$$

$$[OH] = \frac{-0.749}{-4.16\times10^{-7}}$$

Calculated Daytime OH Concentration = 1.80×10^6 molecules cm^{-3}

"...which rate constant for benzene that was used (with reference), which results came out of the formula and what was the conclusion (Table 1?)."

Rate constants are given in Appendix 2 and the results in Table 1. The conclusions we drew were... "The average daytime OH concentration calculated over the course of the campaign was 2×10^6 molecules cm^{-3}. This compares well with what would be expected, as the lifetime of OH is less than 1 second and consequently noontime concentrations generally only reach 0.04-0.4 ppt ($10^6 10^7$ molecules cm^{-3}) (Wayne, 2000)."

11) Page 776, formula (6): How do you calculate/know the dispersion factor?

The dispersion factor is calculated from the hydrocarbon decays using Equation 12.

12) The complicated series of equations in Appendix 3 are derived from Equation 6 and these are then used to calculate radical concentrations and the dispersion factor.

13) Page 776, line 12: What is the uncertainty of the value 3.8×10 to the 5 molec cm^{-3}?

The uncertainty in the estimated night-time OH value is the range of concentrations calculated, which are given.

15) Page 778, Why are isoprene and the monoterpenes not included in the calculations?

These species were unfortunately not measured during the campaign. Have added an explanation of this.

16) + 17) The photochemical ozone creation potentials for each of the hydrocarbons are calculated in the following way:

POCP = (Hydrocarbon Concentration/Propane Concentration)$\times\varepsilon^{POCP}$
POCP = (Hydrocarbon Concentration/Propane Concentration) $\times\gamma$R

The ε^{POCP} and γR indices used in the calculations are given in Appendix 4 and were taken from Jenkin, 1998 and not calculated by the authors.

Interactive comment on Atmos. Chem. Phys. Discuss., 3, 769, 2003.

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