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Interactive comment on “Atmospheric photochemistry of aromatic hydrocarbons: OH budgets during SAPHIR chamber experiments” by S. Nehr et al.

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We thank Referee 2 for the positive evaluation and give detailed answers to specific questions and recommendations below.

(1) The use of CO as a reference compound is treated with very self-evident way by the authors. There are referenced within the paper explaining the reason why it is used but I would like to get a few sentences on why CO is used as a reference compound. Maybe the measurement results of CO could be shown in figure 2 with the aromatic compounds to better visualize the data quality if possible.

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Reply: In Sect. 3 we included the following sentences to explain why CO was chosen as a reference compound:

"CO was selected as a reference compound because its photochemistry is comparatively simple. It is unreactive towards all gas-phase species except OH and the only known product of this reaction is HO₂ under the conditions employed."

Moreover, we included a new figure with a collection of all OH production and destruction rates obtained in the CO experiments (see Fig. 1 below).

(2) What is the temperature during these chamber studies? Do you have a strong temperature changes during measurements? How does it affect the experiments?

Reply: We forgot to specify the experiment temperatures. Of course, measured temperatures were used for the calculations of the rate constants used in Eq. (2). Typically temperatures rose by about 5 K during an experiment because of rising ambient temperatures and radiative heating. We included the mean temperatures, maxima and minima in Tab. 1. As to the influence of temperature on the experiments we assume that this is minor because rate constants of OH + aromatics are not strongly temperature dependent. The same is true for the unsaturated primary products reacting mainly by OH addition and for the OH recycling reactions (4) and (5).

(3) I would also like you to note comment (4) by Referee 1 and for the authors to consider explaining more about the systematically higher ratios for low NO experiments, what causes that? In figure 2 it also seems that the chemical structure may affect your measurements at least in the case of *p*-xylene. In Discussion there is a note that the degradation mechanism is similar to all aromatics but could you speculate if the chemical structure plays a role in the OH budget at all?

Reply: Please refer to reply (4) to Referee 1. Regarding *p*-xylene, we do not think that it has any special chemical properties compared to the other compounds. Accidentally the *k*_{OH} remained fairly constant during the experiments with *p*-xylene and HO₂ and

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NO were strongly anti-correlated which resulted in the very narrow distribution of data points in Fig. 2.

(4) Figures need to be rearranged or modified, they are too small and I have hard time to recognize the colors (which one is which). Also you could put a marker in where the injection of the aromatic compound was executed in all of the subfigures.

Reply: Fig. 1 will be increased by a factor of two to fit in one column of the final two-column format. Colors are more easily recognizable then. We put in a vertical line to indicate the injection of the aromatic. Fig. 2 was split up to allow for an expansion of the size

(5) Some measured parameters like O_3 and NO_2 are not presented in figure 1, is there a reason for that?

Reply: We limited the number of species for clarity and importance for the OH budget (with the exception of the aromatic to indicate the experiment progress). We included O_3 in the first panel and NO_2 in the third panel.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 5535, 2014.

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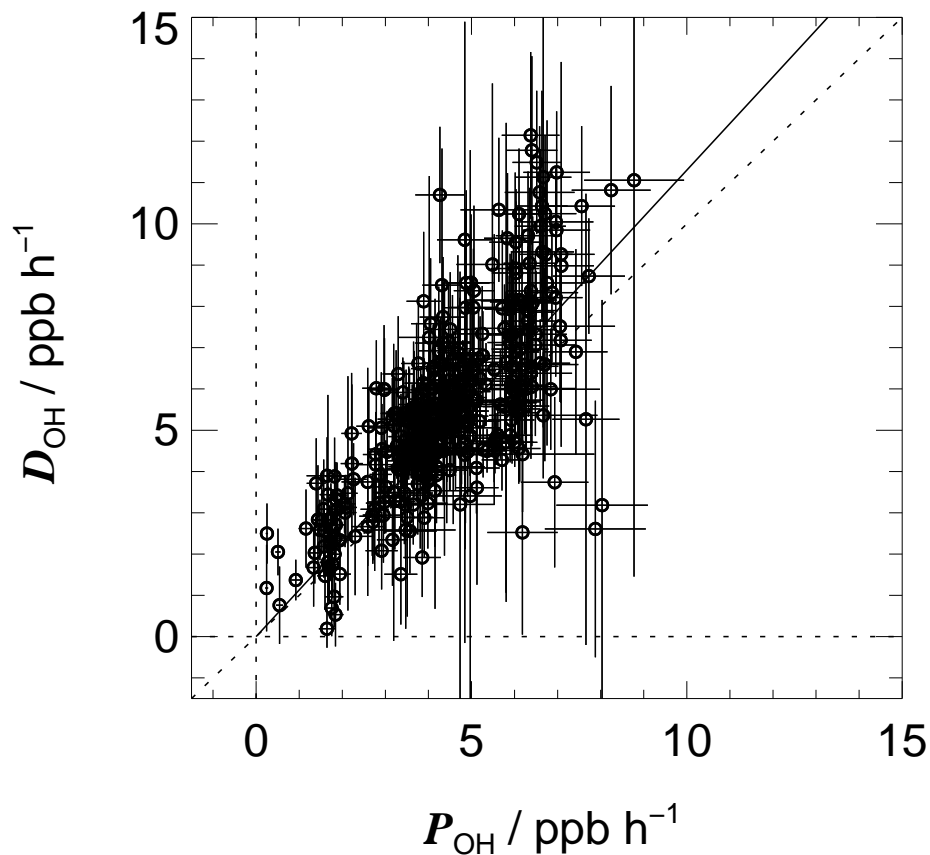


Fig. 1. Correlation of OH destruction and production rates from all SAPHIR experiments with CO in 2010 and 2011. The solid line corresponds to a mean ratio of 1.13, the dashed line indicates a 1:1 ratio.