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Technical note: Investigating the influence of NO on the Comparative Reactivity Method

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Hydroxyl (OH) radicals play a key role in driving the chemistry of the atmosphere and maintaining its self cleansing capacity. Quantifying the total atmospheric OH sink accurately, in tandem with measurements of both OH production rates and ambient OH concentrations, will significantly aid understanding of the OH driven atmospheric chemistry.

Recently a new technique called the comparative reactivity method (CRM), has been shown to be capable of measuring the total OH sink (reactivity) of ambient air. It was reported that high NO in ambient air could influence the OH reactivity measurements made with this new technique, due to recycling of OH by the NO + HO_2 reaction, within the experimental set up. In this paper, we investigate the influence of NO on the measured OH reactivity signals of the new instrument in detail. Five different OH reactivities of circa 5 s^{-1}, 16 s^{-1}, 40 s^{-1}, 60 $s^{-1}$and 80 s^{-1} due to propane were introduced into the set up and at each of these OH reactivities, NO at 0.6 nmol mol^{-1}, 1.2 nmol mol^{-1}, 3 nmol mol^{-1} and 5 nmol mol^{-1}, was introduced. For ambient air sampling in the set up, this corresponds to an ambient OH reactivity range of 8 s^{-1} – 150 s^{-1} and NO mixing ratio range of 1 nmol mol^{-1} – 10 nmol mol^{-1}. Chemical box model calculations of the experiments incorporating a comprehensive propane degradation mechanism were also undertaken, and the joint model and experimental results characterizing the NO influence on the new instrumental technique will be presented.