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Observations of total peroxy nitrates and aldehydes: measurement interpretation and inference of OH radical concentrations

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Abstract. We describe measurements of total peroxy nitrates (Σ PNs), NO_2 , O_3 and several aldehydes at Granite Bay, California, during the Chemistry and Transport of the Sacramento Urban Plume-2001 (CATSUP 2001) campaign, from 19 July–16 September 2001. We observed a strong photochemically driven variation of Σ PNs during the day with the median of 1.2 ppb at noon. Acetaldehyde, pentanal, hexanal and methacrolein had median abundances in the daytime of 1.2 ppb, 0.093 ppb, 0.14 ppb, and 0.27 ppb, respectively. We compare steady state and time dependent calculations of the dependence of Σ PNs on aldehydes, OH, NO and NO_2 showing that the steady state calculations are accurate to $\pm 30\%$ between 10:00 and 18:00 h. We use the steady state calculation to investigate the composition of Σ PNs and the concentration of OH at Granite Bay. We find that PN molecules that have never been observed before make up an unreasonably large fraction of the Σ PNs unless we assume that there exists a PAN source that is much larger than the acetaldehyde source. We calculate that OH at the site varied between 2 and 7×10^6 molecule cm^{-3} at noon during the 8 weeks of the experiment.

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