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## Gas phase precursors to anthropogenic secondary organic aerosol: detailed observations of 1,3,5-trimethylbenzene photooxidation

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**Abstract.** A series of photooxidation experiments were conducted in an atmospheric simulation chamber in order to investigate the oxidation mechanism and secondary organic aerosol (SOA) formation potential of the model anthropogenic gas phase precursor, 1,3,5-trimethylbenzene. Alongside specific aerosol measurements, comprehensive gas phase measurements, primarily by Chemical Ionisation Reaction Time-of-Flight Mass Spectrometry (CIR-TOF-MS), were carried out to provide detailed insight into the composition and behaviour of the organic components of the gas phase matrix during SOA formation. An array of gas phase organic compounds was measured during the oxidation process, including several previously unmeasured primary bicyclic compounds possessing various functional groups. Analysis of results obtained during this study implies that these peroxide bicyclic species along with a series of ring opening products and organic acids contribute to SOA growth. The effect of varying the VOC/NO<sub>x</sub> ratio on SOA formation was explored, as was the effect of acid seeding. It was found that low NO<sub>x</sub> conditions favour more rapid aerosol formation and a higher aerosol yield, a result that implies a role for organic peroxides in the nucleation process and SOA growth.

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