



## Secondary Organic Aerosol formation from isoprene photooxidation under dry conditions (CUMULUS project)

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Isoprene (2-methyl-1,3-butadiene, C<sub>5</sub>H<sub>8</sub>) is one of the most abundant non-methane hydrocarbons emitted into the troposphere. Its annual global emission has recently been estimated in the range of 440 to 660 TgC (Guenther et al., 2006). Because of its large concentrations and high reactivity with the hydroxyl radical (OH), isoprene can have a strong influence on tropospheric photochemistry. It has been determined recently that isoprene also plays a role in secondary organic aerosol (SOA) formation in the ambient atmosphere even if isoprene leads to low SOA yields. The aim of the present work was to study isoprene photo-oxidation with OH radical in order to investigate its oxidation products and resulting aerosol production. A special care was taken to the realism of the experiment: light source, NO<sub>x</sub> and OH levels and aging time (around 10 hours).

Experiments were performed in the CESAM chamber (Wang et al., 2011) which was designed to investigate multiphase processes under realistic actinic flux, and accurate control of temperature. In each experiment, around 800 ppb of isoprene was injected in the chamber together with the OH source under dry conditions (<5 %RH) before irradiation. Gas-phase composition was analyzed in-situ by a Fourier Transform Infrared Spectrometer (FTIR), a Proton Transfer Reaction Mass Spectrometer (PTR-TOF-MS) and NO<sub>x</sub> and ozone analyzers. A Scanning Mobility Particle Sizer (SMPS) and an Aerodyne High Resolution Time-Of-Flight Aerosol Mass Spectrometer (HR-TOF-AMS) were also used to investigate SOA formation and composition.

In all experiments, we noted a SOA production at the end of isoprene oxidation i.e. exhibiting a clear secondary products type growth. Several results (including SOA densities and yields, and O/C ratios) were obtained using SMPS and AMS data allowing us to characterize SOA formation and composition during the experiments. The characterization of the gaseous and particulate phases will be presented. While the SOA yields in the literature exhibit a general dispersion, the SOA yields obtained during the experiments are consistent with the lowest values found in the literature. Some assumptions concerning the cause of this dispersion, including the role of the irradiation source used, will be discussed.

Guenther, A. et al. (2006). *Atmos. Chem. Phys.* 6(11): 3181-3210.

Wang, J. et al. (2011). *Atmospheric Measurement Techniques* 4(11): 2465-2494.