Supplement of Atmos. Chem. Phys. Discuss., 15, 20561–20596, 2015
http://www.atmos-chem-phys-discuss.net/15/20561/2015/
doi:10.5194/acpd-15-20561-2015-supplement

Atmospheric Chemistry and Physics Discussions

Supplement of

Secondary Organic Aerosol formation from isoprene photooxidation during cloud condensation–evaporation cycles

L. Brégonzio-Rozier et al.

Correspondence to: L. Brégonzio-Rozier (lola.bregonzio@lisa.u-pec.fr), A. Monod (anne.monod@univ-amu.fr)

Table S1: Summary of the maxima increases of the total particle mass concentration observed during cloud events for control experiments.

Experiment*	Increase in mass ($\mu g\ m^{-3}$)	Cloud lifetime (min)
Control experiments		
C290113	1.7	7
C310113	1.3	8
C180313	1.2	7
C150113	0.9	8
C270113	1.5	9
C120313	2.2	8
C220313	1.6	7

*Experimental IDs starting with "C" indicate control experiments.

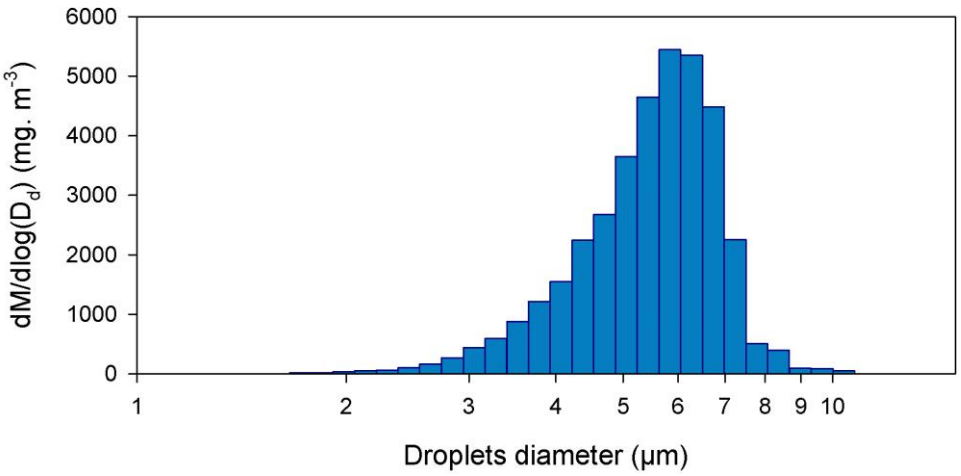

Figure S1: Droplet mass size distribution at the maximum liquid water content (LWC) during a cloud event in a diphasic experiment (D010213).

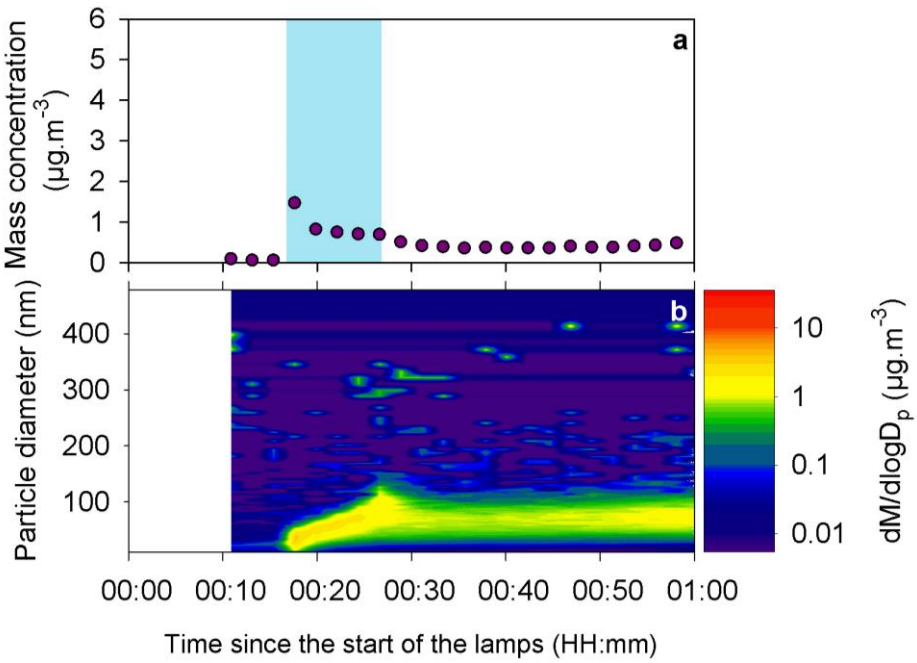

Figure S2: Time profiles of (a) particle mass concentration and (b) mass size distribution during a control experiment (C270113). Blue area indicates a cloud event.

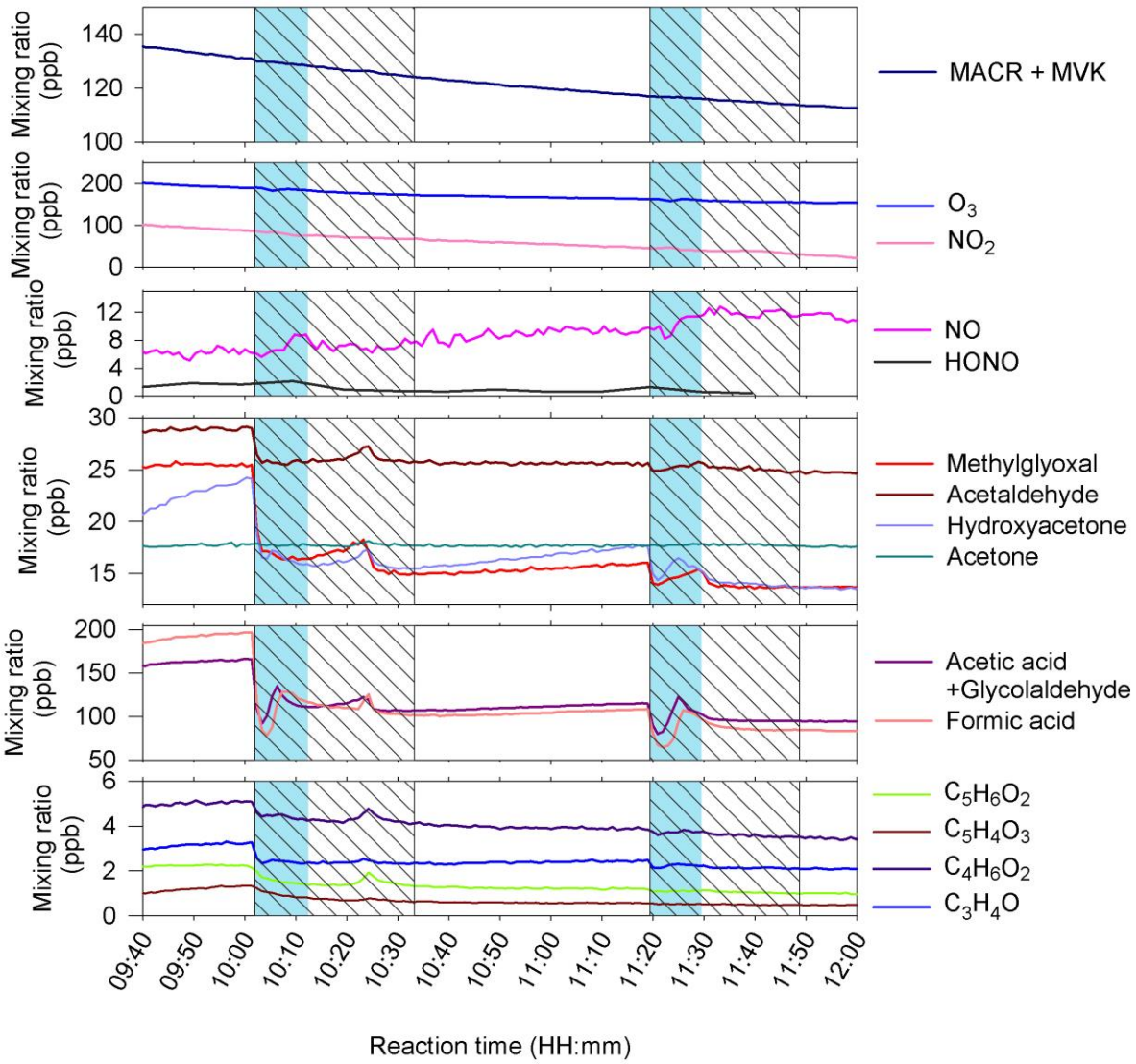

Figure S3: Time profiles of the gas phase reactants and isoprene oxidation products during a triphasic experiment (T280113). Blue areas indicate cloud events and hatched areas indicate time needed for PTR-ToF-MS stabilization after the start of cloud generation (droplet and memory effects in the sampling line).

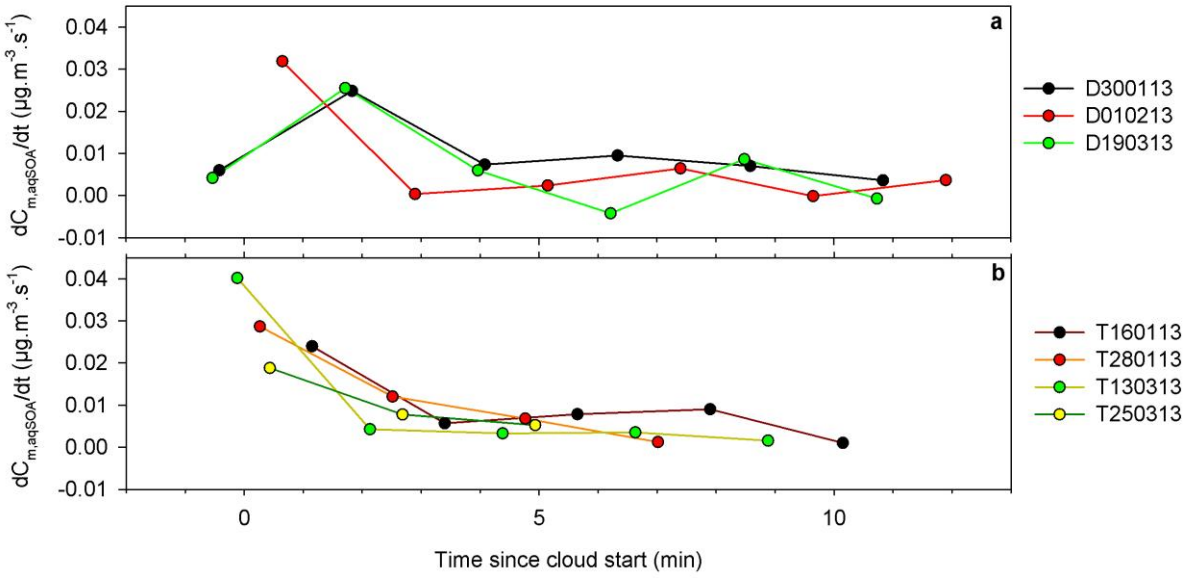

Figure S4: Time profiles of aqSOA production in (a) diphasic and (b) triphasic experiments.

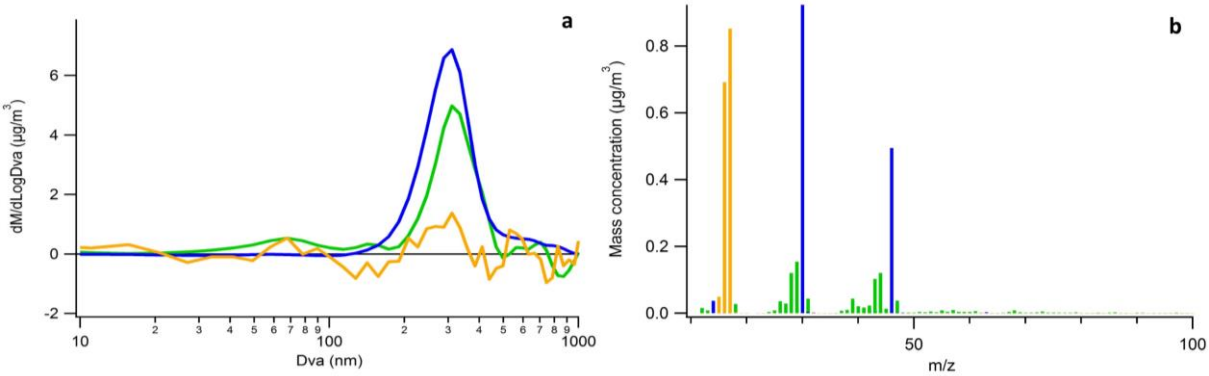

Figure S5: SOA chemical composition measured during a cloud event by an HR-ToF-AMS in a diphasic experiment (D300113): (a) dried aerosol mass size distributions; (b) mass spectra of dried aerosol (organic fragments are in green, nitrate fragments in blue and ammonium fragments in orange).

Supplement Sect. 1: Expected VOCs dissolution in water at cloud start: calculation

Following a hypothesis based on the kinetic determination of the mass-transport of VOCs from the gas phase to water droplets (Schwartz, 1986), Henry's Law equilibrium was considered immediate at the start of cloud generation. Hence, considering the C_{before} values for each measured VOCs, the liquid water content and assuming Henry's Law equilibrium, it was possible to estimate the potential mass of VOCs transferred into the aqueous phase:

$$K_H = \frac{C_{i,a}}{p_i}$$

Where K_H is the Henry's law constant, expressed in M atm^{-1}; $C_{i,a}$ is the concentration in the aqueous phase of a species *I*, expressed in M; and p_i is the partial pressure of the species *i* in the gas phase under equilibrium conditions, expressed in atm.

Hence : $C_{i,a} = K_H \times p_i$

$C_{i,a}$ was converted in mass concentration ($C_{i,m}$; expressed in µg L^{-1}) using the molar mass M_i of the species *i*, expressed in µg mol^{-1}:

$$C_{i,m} = C_{i,a} \times M_i$$

$C_{i,m}$ was then converted in order to express the concentration of the species *i* in the gas phase ($C_{i,g}$, expressed in µg m^{-3}) using the liquid water content (*LWC*) of the generated cloud, expressed in L m^{-3}:

$$C_{i,g} = C_{i,m} \times LWC$$

The potential total mass of VOCs transferred into the aqueous phase was then determined by summing the $C_{i,g}$.