

In-cloud processing of secondary organic aerosols

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Clouds continuously appear and disappear through evapo-condensation cycles. Particles and water soluble pollutants become dissolved in cloud droplets where they undergo photochemical reactions. When clouds dissipate, the pollutants evaporate and the low volatile compounds condense to new particles. This is a new route for secondary organic aerosols (SOA) formation which is potentially very important, but has never been experimentally investigated before.

We performed the following experiments sequentially in the PSI smog chamber and in an aqueous phase photoreactor (brought from LCP-Marseilles) to simulate multiphase processes: 1) gas-phase photooxidation of three different VOC (isoprene, 1,3,5-TMB, and α -pinene), leading to the formation of particles (SOA_{gas}); 2) particle-to-liquid transfer of soluble species using filters followed by water extraction ; 3) aqueous-phase photoreaction of the obtained water extracts, in the aqueous phase photoreactor ; and 4) cloud evaporation and formation of new SOA (SOA_{cloud}), simulated by nebulization of the solutions.

Physical and chemical properties of SOA_{gas} and SOA_{cloud} were measured to determine the impact of multiphase photooxidation of the studied VOC on the formation of SOA in the atmosphere. The first results show that, depending on the initial VOC, the chemical composition of SOA_{gas} can be very different from that of SOA_{cloud}.