Design and initial results from a new multiphase atmospheric simulation chamber (CESAM)

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A new indoor environmental chamber facility aiming to the study of atmospheric process leading to the secondary organic aerosols formation, and aerosol aging by oxidative and non-oxidative process, has been constructed in our laboratory recently. It consists of one $4m^3$ stainless steel reactor, equipped with three 4kW XBO lamps which can perfectly simulate the sunlight at UV region and one powerful dry pump for generating the cloud inside the chamber. Thank to these chamber parameters, studies especially concerning on the organic aerosol aging, like the influences of sunlight, the cloud, and the oxidants, have been planed and carried out right after we have finished the chamber characterization. The first generation results showed that the SOA formation by ozonolysis of an selected exocyclic monoterpene (Sabinene) was greatly influenced and reduced by water vapor at high relative humidity, which is in good agreement with the observation by Bonn et al., 2001. On the contrary, when this multiphase mixture was irradiated in the chamber, the initial experiments showed an increase of particle number and volume concentrations. Using the chamber cloud generation as an analytic tool instead of the classic HTDMA, we have observed the SOA formed by oxidation of monoterpene was not or slightly hygroscopic, this was as well observed by Seinfeld et al., 2006. However, the chemical composition analysis by Chiappini et al., 2004 showed the evidence of polar compounds, like dicarboxylic acid, in the new particles formed by Sabinene ozonolysis, which are supposed to be hygroscopic, all these hypothesis deserve more further studies.

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