

The CESAM project : A new multiphase simulation chamber. Tests and first results

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It is now well established that heterogeneous chemistry has a drastic impact on the composition of the troposphere. The complex physicochemical processes involved in this chemistry which include : phase exchange, surface reactions, reactions in condensed phase followed by transfer to the gas phase have to be quantified in order to be able to develop reliable atmospheric models, and thus have a better understanding of the tropospheric chemistry.

Integrating heterogeneous physicochemical parameters (kinetics constants, accommodation coefficients, etc...) requires to develop new tools allowing to perform experiments in conditions as close as possible to natural ones. This is the goal of the new simulation chamber called CESAM (which means Multiphase Atmospheric Experimental Simulation Chamber).

This simulation chamber has been designed specifically to perform in realistic conditions experiments involving several phases like particulate matter, water droplets, ice crystals, and gas phase. This large volume reaction chamber (approx. 4.2 m^3) is adequate to conduct simulations involving trace concentrations of gas compounds and yet let a long enough life time to the particles. This reaction chamber can be emptied to a vacuum as low as 1.6×10^{-4} mbar which limits the memory effect of the chamber between two experiments. It is equipped with analysis systems allowing the characterization of gas, particulate and aqueous phases. An irradiation system composed of three 4000 W XBO lamps has recently been installed on the top of the chamber and will allow us to reproduce the solar irradiation inside the chamber. 12 ports of 350 mm and 450 mm in diameter are distributed around on the side of CESAM in order to be able to welcome the scientific equipment of other international groups. The location of the chamber in a large technical hall on the ground level makes the site particularly accessible for the installation of other equipment. Large scale experiments involving the expertise of different groups (indispensable to be able to integrate complex heterogeneous processes) will thus be possible. The new chamber can be used as well as an intercalibration platform for different systems dedicated to the study of the physics or the chemistry of the aerosol.

We will present here the first tests of the generation of particulate matter (Secondary Organic Aerosol) and the generation of clouds and their life time in the chamber. We will present as well the characterization (intensity and homogeneity) of light flux in the reaction chamber."