An integrated effort for a better understanding of atmospheric multiphase chemistry: laboratory, modeling and field studies

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Tropospheric multiphase chemistry needs to be studied by all three approaches used in the atmospheric sciences. Field measurements, laboratory experiments and modelling studies are to be applied. The atmospheric degradation of oxygenated hydrocarbons is mainly driven by radical reactions both in the gas and in the aqueous phase. The oxidation processes in the latter can be study applying a laser flash photolysis technique. Rate constants for the reactions of the most important atmospheric radicals (e.g., OH, NO_3 and halogene containing radicals) with oxygenated hydrocarbons were obtained in aqueous solution in temperature range between 278 K and 328 K. The kinetic data obtained are essential input parameters for tropospheric chemistry models. Upon development based on laboratory measurements tropospheric multiphase models can be applied for the interpretation of complex field campaigns characterising gases, particles as well as cloud droplets and their respective interactions.
The latest version of CAPRAM (Chemical Aqueous Phase Radical Mechanism), which includes a detailed description of the aqueous phase chemistry of organic compounds up to 4 carbon atoms, was used to interpret the results of a complex field experiment on aerosol and cloud chemistry and physics, namely FEBUKO.
The FEBUKO experiments at the three research sites in the Thüringer Wald (Germany) were carried out in the autumn of 2001 and 2002, respectively, to characterise the aerosol and cloud water with respect to their chemical composition and physical properties.
A compilation of the main findings of this concerted effort on the study of aerosol-cloud interaction will be given comprising experimental results from chemical measurements and complex model development.