Die Vorträge finden jeweils um 16.15 Uhr im Hörsaal H3, Egerlandstr. 3 statt.
Alle Interessenten sind herzlich eingeladen.

17. Dezember 2009

Prof. Dr. Dr.h.c. Reinhard Zellner

Universität Duisburg-Essen

Atmospheric Aerosol Surfaces: Chemistry, Microphysics and Climatic Effects.

The laboratory study, the interpretation and the modelling of heterogeneous processes in the atmosphere still represent challenges to atmospheric sciences including laboratory kinetics. This is because the generation and characterization of particles/surfaces in the laboratory which mimic the atmospheric environment is by no means a simple task, nor is the derivation and parameterization of kinetic and mechanistic data to be included in atmospheric chemical-dynamical models. In this lecture we first outline the importance of aerosols for the current understanding of the climate system and climate change. In particular we will emphasize the role of aerosols in ice and water nucleation as well as in cloud formation and processing. In addition we will present the current concepts of heterogeneous atmospheric chemistry with particular emphasis on the relation between fundamental physical-chemical and lumped "practical" quantities. We will then discuss current methodologies for the study of heterogeneous reactions and microphysical properties of laboratory mimics of different atmospheric surfaces as well as the results obtained for a variety of chemical systems of interest. These include: (1) The combination of Knudsen-cell/MS and DRIFTS spectroscopy for the study of soot surfaces interacting with H_2O, NO_2 and SO_2. In particular we show that next to the hydrophobic nature of this surface, NO_2 is a suitable oxidant with the generation of gas phase NO, HONO and CO_2 at elevated temperatures. (2) The combination of a coated wall flow tube reactor (CWFT) with QMS has provided new insight in the thermodynamics and kinetics of the interactions of carbonyl compounds (i.e. acetone) with ice films at low temperatures. With the simultaneous development of a dynamical model for gas / surface interactions in adsorption / desorption experiments we have been able to characterize such processes with much improved accuracy. (3) The application of an electrodynamic balance (EDB) as well as a simple microscopic technique to the hygroscopic growth of ammonium sulphate / dicarboxylic acids has lead to an improved understanding of the deliquescence / efflorescence behaviour of mixed inorganic / organic salts. (4) A molecular beam apparatus has been applied to study the interactions of hyperthermal He, Ne, Ar, Kr and HCl with supercooled sulphuric acid / water films in order to study the mass and temperature dependence of collisional energy transfer.