UP 1: Atmosphäre und Klima I

Time: Monday 9:30–11:00 Location: H48

UP 1.1 Mon 9:30 H48

The importance of aerosol water for air pollution effects on weather and climate - a new concept — •Swen Metzger and Jos Lelieveld — Max-Planck-Institute für Chemie, Abt. Chemie der Atmosphäre, Joh.-J.-Becher-Weg 27, D-55128 Mainz

We present a new concept to study air pollution effects on weather and climate, which is based on thermodynamic principles that explain hydration and osmosis - including the required transformation of laboratory based concepts to atmospheric conditions. Under ambient conditions the equilibrium relative humidity (ERH) determines the saturation molality, solute and solvent activities (and activity coefficients), and the aerosol associated water mass, since the water content is fixed by ERH for a given aerosol concentration and type. As a consequence, aerosol water drives the gas/liquid/solid aerosol partitioning, ambient aerosol size-distributions and directly links aerosol hygroscopic growth into haze and cloud formation. Various modeling results indicate that a) our new concept is not limited to dilute binary solutions, b) sensitive aerosol properties such as the pH of binary and mixed inorganic/organic salt solutions up to saturation can be computed accurately, and c) that anthropogenic emissions can be directly linked to visibility reduction, cloud formation and climate forcing, if we explicitly account for the aerosol water mass. Our new concept is more explicit than the traditional CCN concept as it abandons the use of ambiguous terms such as 'marine' and 'continental' aerosols, and refines lumped categories such as mineral dust, biomass burning, sea salt, organic or sulfate aerosols currently used in atmospheric modeling.

UP 1.2 Mon 9:45 H48

Ship-borne measurements of UV irradiance in the northern and southern hemisphere — •Sigrid Wuttke, Saad El Naggar, and Otto Schrems — Alfred-Wegener-Insitut für Polar- und Meeresforschung, Bremerhaven, Deutschland

Ship-borne measurements of spectral as well as biologically effective UV irradiance have been performed aboard the German research vessel Polarstern during an Atlantic transect from Bremerhaven (Germany) to Cape Town (South Africa) from 13 October to 17 November 2005. Such measurements are necessary to validate satellite-derived surface UV irradiances but also to study the effects of UV radiation on marine organisms.

Parameters having an effect on the UV irradiance at the surface, such as total ozone column, vertical ozone distribution and aerosol optical depth have been measured simultaneously. The data have been used as input in a radiative transfer model to quantify their effect on UV irradiance facilitating an assessment of UV radiation in a marine environment in various climate zones. These cloud free radiative transfer calculations support the investigation of this latitudinal dependence.

The maximum daily dose of erythemal irradiance of $5420 Jm^{-2}$ in the tropics was observed south of the equator. It should have been observed with the Sun in the zenith during local noon. However, stratiform clouds reduced the dose to $3835 Jm^{-2}$. In comparison, the daily erythemal doses in the mid-latitudinal Bay of Biscay reached only values between 410 and $980 Jm^{-2}$ depending on cloud conditions.

UP 1.3 Mon 10:00 H48

Long-Path-DOAS measurements of aromatics,polyaromatics and HOx precursors in Mexico City — •André Merten[1], Rainer Volkamer[2], Phillip Sheehy[2], and Ulrich Platt[1] — [1]Institut für Umweltphysik, Im Neuenheimer Feld 229, 69120 Heidelberg — [2]MIT, Cambridge, MA 02139

Two Long-Path-DOAS instruments were installed in Mexico City in March 2006 as part of MCMA-2006 field campaign to measure VOC and radical precursors of HOx (Glyoxal, HCHO, HONO) and other species in a megacity urban environment. A particular focus of the combined DOAS set-up was to assess horizontal gradients of species that were measured by both instruments on different spatial scales and directions. The DOAS#1 telescope primarily measured aromatic volatile organic compounds (VOCs) as precursors for secondary organic aerosol (SOA) formation, among other species like O3 and SO2. Measured VOCs included benzene derivatives e.g. toluene, styrene, phenol, cresols and xylenes, as well as two ring aromatic compounds,naphthalene and methylnaphthalene. Episodes of remarkably high concentrations of toluene (e.g.190 ppb) and styrene (14,5 ppb) were observed for selected direction, probably due to plumes of solvents moving through the city. DOAS#2 was dedicated mainly to measure HOx radical precursors like Glyoxal, HONO, HCHO and Ox. Glyoxal, a product of VOC oxidation, showed maximum concentrations between 0.5 and 1.4 ppb. HONO measurements results in night time maximal values about 9ppb and 0,2ppb for day time and clear sky conditions.

UP 1.4 Mon 10:15 H48

Cirrus and dehydration at the tropical tropopause — •Franz Immler[1], Kirstin Krüger[2], Masatomo Fujiwara[3], and Otto Schrems[1] — [1]Alfred-Wegener-Institut für Polar- und Meeresforschung, Bremerhaven, Deutschland — [2]IFM-GEOMAR, Kiel, Deutschland — [3]Hokkaido University, Saporro, Japan

Thin ice clouds were frequently observed in the tropical tropopause layer (TTL) around 17 km altitude with our mobile aerosol Raman lidar instruments during our recent ground-based (Paramaribo, Suriname, 6°N, 55°W) and ship-borne (RV Polarstern) measurement campaigns. In the tropics, the cloudiness in the upper troposphere was found to be very high, since cirrus was present in more than 80% of all our measured profiles. Transport processes in the TTL were investigated with a newly developed trajectory model which is coupled with a radiative transfer model. This analysis suggests that clouds are always present in the TTL where the air is saturated with respect to ice due to adiabatic cooling. Also, we find evidence, that thin cirrus efficiently dehydrate ascending air. The temperature in the TTL is strongly influenced by downward propagating equatorial Kelvin waves. We find a strong correlation between the phase of the waves and the occurrence of cirrus. Extremely thin layers of solid particles which occur frequently at the cold point tropopause seem to be rather composed of NAT than of pure water ice.

UP 1.5 Mon 10:30 H48

Geographic distribution of polar stratospheric clouds — •Philipp Reichl, Christian von Savigny, and John Burrows — Institute of Environmental Physics (IUP), University of Bremen, Germany

In the cold polar winters at temperatures less than 195 K, stratospheric aerosols can form Polar Stratospheric Clouds (PSCs). These clouds play a key role in the depletion of ozone in the stratosphere. They contribute to the formation of the ozone hole by facilitating the conversion of chlorine from inactive compounds to active Cl_2 on the surface of the cloud particles.

It is possible to detect PSCs from limb scattering measurements using a color index approach. The SCIAMACHY instrument onboard the European Space Agency's satellite Envisat provides limb scattering data since summer 2002, allowing the comparison of the geographic distribution of PSCs over the course of several years. The results of the PSC distributions of both hemispheres are shown in connection with ECMWF temperature data.

UP 1.6 Mon 10:45 H48

DOAS measurements of halogens in the framework of the MAP (Marine Aerosol Production) project — •Katja Seitz, Ulrich Platt, Denis Pöhler, Torsten Stein, and Maria Martin — Institut für Umweltphysik, Heidelberg, Deutschland

Recent field and laboratory studies are indicating a great relevance of reactive iodine in new particle formation processes. Since particles in the marine atmosphere affect the microphysical properties of clouds, they have a potential impact on climate. Objective of MAP was to quantify the key processes associated with primary (PMA) and secondary marine aerosol (SMA) production from natural sources.

To get seasonal information of the correlation between biological activity and the iodine oxides as precursor of SMA two Mini-MAX-DOAS instruments were established at Mace Head research station. In order to validate the results of the Mini-MAX-DOAS and also due to the better detection limit and the possibility to also measure at nighttime during an intensive campaign in june additional longpath DOAS measurements have been performed. Simultaneous there were Mini-MAX-DOAS measurements on board the Celtic Explorer research vessel cruising the Northern Atlantic in front of the Irish west coast.

Results from Mace Head as well as the Celtic Explorer will be presented.