UP 10: Poster: Umweltphysik

Zeit: Donnerstag 17:48–19:00 Raum: VMP 9 Poster

UP 10.1 Do 17:48 VMP 9 Poster

HOx radical measurements in the lower troposphere using an airborne laser-induced fluorescence instrument on a Zeppelin NT — •Andreas Oebel, Sebastian Broch, Dominik Raak, Birger Bohn, Franz Rohrer, Frank Holland, Andreas Hofzumahaus, and Andreas Wahner — Forschungszentrum Juelich, Institute for Chemistry and Dynamics of the Geosphere ICG-2: Troposphere, Germany

The radical chemistry of the lower troposphere was investigated during the ZEPTER-2 field campaign at Lake Constance in October/November 2008, using the unique capabilities of a modified Zeppelin NT as an airborne measurement platform. The Zeppelin was equipped with in-situ instruments for measurement of OH and HO2 radicals, the main radical precursors (O3, HONO, HCHO), photolysis frequencies, and prime reactants (NOx, CO, VOCs) of OH. The instrumentation has been used to chemically characterize the planetary boundary layer and the lower free troposphere. Vertical profiles of the trace gases were observed at altitudes up to 1000m above different land surfaces, including Lake Constace, the city of Ravensburg and forests. In this presentation technical details of the measurement platform Zeppelin NT will be presented as well as first results of the HOx radical measurements.

UP 10.2 Do 17:48 VMP 9 Poster

Barotropic and baroclinic processes in the transport variability of the Antarctic Circumpolar Current — •Karsten Lettmann[1] and Dirk Olbers[2] — [1]ICBM, University of Oldenburg, Germany — [2]AWI, Bremerhaven, Germany

Variability of the Southern Ocean wind field result in transport variations of the Antarctic Circumpolar Current (ACC). It is observed that these transport fluctuations are highly coherent with the bottom pressure field all around the Antarctic continent in the high-frequency range. The coherence pattern, in contrast to the steady state ACC, is steered by the geostrophic f/h contours passing through Drake Passage and circling closely around the continent. At lower frequencies, with interannual and decadal periods, the correlation with the bottom pressure continues but baroclinic processes gain importance.

To clarify the dynamic processes we apply a circulation model with simplified physics (the BARBI model) and use two types of wind forcing: NCEP wind fields spanning three decades, and an artificial wind field constructed from the first three EOFs of NCEP wind field. We analyze trends and variability of the model runs. Particular emphasis is placed on coherence and correlation patters between the ACC transport, the wind forcing, the bottom pressure field and the pressure associated with the baroclinic potential energy. A simple stochastic dynamical model is developed which describes the dominant barotropic and baroclinic processes and represents the spectral properties for a wide range of frequencies, from monthly periods to hundreds of years.

UP 10.3 Do 17:48 VMP 9 Poster

Concentrated atmospheric nanoparticle beams in vacuum for X-ray and optical spectroscopy. — •Jan Meinen[1,2], Svetlana Khasminskaya[1], and Thomas Leisner[1,2] — [1]Institute for Meteorology and Climate Research, Aerosols and Heterogeneous Chemistry in the Atmosphere (IMK-AAF), Forschungszentrum Karlsruhe GmbH, Germany — [2]Institut for Environmental Physics (IUP), Atmosphere and Remote Sensing, Ruprecht-Karls-Universität Heidelberg, Germany

The IPCC AR4 points out the important role of aerosol in the radiation budget of the earth. In the model prediction, direct and indirect contribution of the atmospheric aerosol causes a net cooling of the earth. Understanding the fundamental physical and chemical processes of heterogeneous nucleation of water on nanoparticles could help improving the models.

Here we present the first stage of the TRAPS apparatus (Trapped Reactive Atmospheric Particle Spectrometer) consists of a nanoparticle source, an aerodynamic lens and differential pumping system, a linear ion trap with driving electronics and particle detectors. This assembly is capable to inject nanoparticles into vacuum chambers in a highly efficient way. The dilution of the particle number concentration arising from the gas expansion from room pressure into vacuum is compensated by concentrating the particles in a small cylindrical volume by electrodynamic trapping. The enlargement of the target density compared to a free molecular beam provides a tool for various techniques of spectroscopy used on smaller ions by routine.

UP 10.4 Do 17:48 VMP 9 Poster

Cavity Enhanced DOAS - Instrument design and theory — •Jan Meinen[1,2], Jim Thieser[3], Denis Pöhler[2], Ulrich Platt[2], and Thomas Leisner[1,2] — [1]Institute for Meteorology and Climate Research, Aerosols and Heterogeneous Chemistry in the Atmosphere (IMK-AAF), Forschungszentrum Karlsruhe GmbH, Germany — [2]Institut for Environmental Physics (IUP), Atmosphere and Remote Sensing, Ruprecht-Karls-Universität Heidelberg, Germany — [3]Max-Planck-Institut für Chemie, Division of Atmospheric Chemistry, Mainz, Germany

Cavity enhanced methods in absorption spectroscopy have seen a considerable increase in popularity during the past decade. Especially Cavity Enhanced Absorption Spectroscopy (CEAS) established itself in atmospheric trace gas detection by providing tens of kilometers of effective light path length using a cavity as short as 1 m. This device combines the small size of the cavity with the enormous advantages of the DOAS approach in terms of sensitivity and specificity, and lends itself to the application of the DOAS technique to analyse the derived absorption spectra. While the Cavity Enhanced-DOAS approach has enormous advantages in terms of sensitivity and specificity of the measurement, an important implication is the reduction of the light path by the trace gas absorption, since cavity losses due to absorption by gases reduce the quality of the cavity. We show the basic concept of a Cavity Enhanced-DOAS instrument, discuss the relationships caused by the light path reduction and present methods to correct the obtained trace gas concentrations.

UP 10.5 Do 17:48 VMP 9 Poster

Satellite validation of column-averaged methane on global scale: Harmonized data from 13 FTIR ground stations versus last generation ENVISAT/SCIAMACHY retrievals — R. Sussmann, •F. Forster, T. Borsdorff, and FTIR validation team — Research Center Karlsruhe, IMK-IFU, Garmisch-P.

Global measurements of column-averaged methane have recently shown a step forward in data quality via year 2003 and 2004 retrievals from two different processors (Frankenberg et al., 2008; Buchwitz et al., 2008). Accuracy and precision have approached the order of 1 %, and can be considered for inverse modelling of sources and sinks. This means that quality requirements for ground-based validation data have become higher. In order to guarantee a consistency of <1 % we performed a harmonization effort for 13 globally distributed mid-infrared FTIR stations. Station-to-station biases are eliminated by using identical micro-windows, spectroscopic line lists, retrieval parameters, sources of ancillary data like pressure-temperature profiles, and water vapor data for deriving dry air columns. Furthermore, a geophysically consistent set of prior information for the retrievals at all stations was established. Our study utilizes the validation strategy developed during the first validation of ENVISAT/SCIAMACHY column-averaged methane by FTIR (Sussmann et al., 2005). The outcome of the new study is the accurate determination of the satellite-ground station biases as a function of latitude on global scale, as well as an assessment of the ability of ENVISAT/SCIAMACHY to measure true day-to-day variability.

UP 10.6 Do 17:48 VMP 9 Poster

High-precision measurements of column-averaged CO2 and CH4 derived from near-infrared FTS at the TCCON site Garmisch (47 °N, 11 °E, 744 m asl.): First year of operation and contribution to OCO validation — R. Sussmann, M. Rettinger, •T. Borsdorff, and F. Forster — Research Center Karlsruhe, IMK-IFU, Garmisch-Partenkirchen (Germany)

Since 2007 at Garmisch, Germany (47.48 °N, 11.06 °E, 744m a.s.l.) a Bruker IFS125HR near-infrared Fourier-Transform-Spectrometer is operated as part of the Total Carbon Column Observing Network (TCCON; http://www.tccon.caltech.edu). Solar absorption spectra in the wave number range 4000 - 16 000 cm-1 are recorded continuously during clear sky conditions using dual acquisition from an InGaAs detector and a Si diode. From these spectra, accurate and precise

column-averaged mixing ratios of CO2 and CH4 are retrieved using measured column ratios CO2/O2 and CH4/O2. These observations are used to validate measurements of the NASA Orbiting Carbon Observatory (OCO) satellite mission and will also provide input data for the inverse modeling of sources and sinks of these Kyoto gases. Due to the high atmospheric background columns of CO2 and CH4 a single-column-measurement precision of better than 0.1% is required to be able to detect the relatively small effects from the sources and sinks of these species. This paper describes the observatory set up and shows an analysis of the first year of measurement data with a focus on quality control, and on annual as well as diurnal cycles of CO2/O2 and CH4/O2.

UP 10.7 Do 17:48 VMP 9 Poster

Laborexperimente zur Wechselwirkung elektrisch geladener Aerosole mit Wolkentropfen - Kontaktgefrieren und Entladung unterkühlter Wolkentropfen in einem Aerosolstrom — •Daniel Rzesanke[1] und Thomas Leisner[1,2] — [1]Institut für Umweltphysik, Universität Heidelberg — [2]Institut für Meteorologie und Klimaforschung, Forschungszentrum Karlsruhe

Im Rahmen des internationalen Projektes CAWSES werden mögliche Kopplungen terrestrischer Klimaschwankungen mit der Sonnenaktivität untersucht [1,2]. Einer der vorgeschlagenen Kopplungsmechanismen zwischen der oberen und mittleren Atmosphäre und der Troposphäre beruht dabei auf dem globalen elektrischen Kreislauf und seinem Einfluss auf den Ladungszustand von Aerosolteilchen und Wolkentröpfchen [3].

In unsere Arbeitsgruppe werden mit elektrodynamischer Levitation wolkenphysikalische Prozesse an geladenen Tropfen und Aerosol erforscht, indem unterkühlte, geladene Wolkentropfen einem Aerosolstrom ausgesetzt werden.

Der Beitrag stellt erste Ergebnisse zum Kontaktgefrieren und Entladen der gespeicherten Tropfen in Abhängigkeit der eingesetzten Aerosolpartikel und deren Größe vor.

[1] - www.bu.edu/cawses/, (November, 2008) [2] - E. Friis-Christensen, Solar variability and climate, Space Science Reviews 94, 2000 [3] - B. Tinsley, Influence of solar wind on the global electric circuit, and inferred effects an cloud microphysics, temperature, and dynamics in the troposphere, Space Science Reviews 94, 2000

UP 10.8 Do 17:48 VMP 9 Poster

Ramanspektroskopie zur Untersuchung von Phasenübergängen von Mikrotropfen — •Christiane Wender[1,2], René Müller[3] und Thomas Leisner[1,2] — [1]Forschungszentrum Karlsruhe, Institut für Meteorologie und Klimaforschung, Karlsruhe, Deutschland — [2]Universität Heidelberg, Institut für Umweltphysik, , Heidelberg, Deutschland — [3]TU Ilmenau, Institut für Physik, Ilmenau Deutschland

In unserem Betrag beschreiben wir einen experimentellen Aufbau dem es ermöglicht Ramanspektroskopie an Mikropartikeln unter atmosphärischen Bedingungen zu betreiben. In einem elektrodynamischen Levitator werden geladene Partikel (0,1mm Durchmesser) gefangen und untersucht. Durch die berührungsfreie Speicherung ist es möglich auch metastabile Zuständen (Unterkühlung, Übersättigung) ohne den störenden Einfluss von Grenzflächen zugänglich zu machen. Ramanspektroskopie gibt Aufschluss über die chemische Zusammensetzung der Proben so dass hiermit Phasenübergänge detektiert werden können. In diesem Beitrag präsentieren wir erste Ergebnisse in denen Phasenübergänge von Zitronensäure beobachtet wurden.

UP 10.9 Do 17:48 VMP 9 Poster

Bestimmung von Meereisparametern aus passiven Mikrowellendaten im küstennahen Bereich — •Nina Maass und Lars Kaleschke — Institut für Meereskunde, Universität Hamburg

Mit passiven Mikrowellenradiometern wie den satellitengetragenen Sensoren SSM/I und AMSR-E kann beispielsweise die Meereisbedeckung abgeleitet werden, die ein wichtiger Parameter im Klimasystem ist. Auf Grund der groben horizontalen räumlichen Auflösung, die durch die verwendete Frequenz und die Antennengröße bestimmt wird, ergeben sich allerdings Schwierigkeiten im Küstenbereich.

Mit Hilfe eines hochaufgelösten Datensatzes für die Küstenlinie und der Antennengewinnfunktion kann ein Modell für die am Satelliten gemessene Helligkeitstemperatur aufgestellt werden. Die Faltung des Antennenmusters mit jedem Bildpunkt ergibt ein überbestimmtes Gleichungssystem, da benachbarte Integrationsfelder sich wegen der Abtastrate der Sensoren überlappen. Daraus werden getrennte Helligkeitstemperaturen für Land- und Wasseroberflächen abgeleitet.

Die Eignung dieser für Land-Wasser-Übergänge entwickelten Methode für Messungen an der Grenze zwischen Land- und Eisoberflächen wird dargestellt. Die Validation der Ergebnisse erfolgt mit höheraufgelösten Satellitenaufnahmen.

UP 10.10 Do 17:48 VMP 9 Poster

Numerical calculation of single fiber efficiency for fibrous filters — •Zienicke Egbert and Grille Hartmut — Institut für Physik, Technische Universität Ilmenau, 98684 Ilmenau

Aeosol filtration has high importance in medicin and environmental sciences to clean polluted air from particulate matter. New EU and US norms for the emission of particulate matter by Diesel engines have stimulated research with the goal to maximize filtering effectivity and to minimize the pressure drop of fibrous filters. A simple standard model of the filtration in fibrous filters is based on the Kuwabara flow around a single fiber in a defined cell volume. From this flow the deposition of micro and nano particles on the fiber is numerically computed by following the paths of the particles in the flow of the carrier gas under the action of Stokes friction and Brownian dynamics. The single fiber efficiency, determined by this procedure, is compared to the analytical approximations based on three echansisms: Interception, Intertial Impaction, and Brownian Diffusion, see [1]. This gives as a result the efficiency of a filter in the unloaded state, i.e. when it is free from deposited particulate matter. The results of our computations are also compared with experimental data. Our approach can be extended to the deposition of particulate matter on fibers with non-circular cross section or to fibers in the loaded state. To this aim our simulation program will be extended by a flow simulation part.

[1] William C. Hinds, Aerosol Technology, 2nd ed. (1999) John Wiley & sons, New York.

UP 10.11 Do 17:48 VMP 9 Poster

Fernerkundung des Meereisvolumenexports durch die Framstraße für die Jahre 2003 bis 2008 — •Gunnar Spreen, Stefan Kern, Detlef Stammer und Lars Kaleschke — Universität Hamburg, ZMAW, Institut für Meereskunde, Hamburg, Deutschland

Der Export von Meereis durch die Framstraße in die Grönlandsee stellt die größte Quelle von Süßwasser im Europäischen Nordmeer dar und ist daher von zentraler Bedeutung für den Süßwasserhaushalt des Nordatlantiks. Es wird ein neues Verfahren vorgestellt, den Meereisvolumenfluss alleinig aus Satellitenfernerkundungsbeobachtungen mittels eines Multi-Sensoransatzes abzuleiten. (1) Aus Höhenmessungen des Laseraltimeters GLAS auf dem Satelliten ICESat (verfügbar seit 2003) wird zunächst das Eisfreibord bestimmt. Unter Annahme hydrostatischen Gleichgewichts kann daraus eine Eisdicke bestimmt werden. (2) Meereiskonzentration und -drift werden aus Daten der 89 GHz Kanäle des AMSR-E Radiometers berechnet. (3) Das Produkt aus Eiskonzentration, -drift und -dicke ergibt die Meereisvolumenflussverteilung. Aus dieser wird für Schnitte quer zur Framstraße der Framstraßen-Meereisvolumenexport abgeschätzt. Es werden Beispiele für die Verteilung und den Volumenexport durch die Framstraße für die Jahre 2003 bis 2008 präsentiert. Mit der hier vorgestellten Methode kann nicht nur, wie bisher, der Betrag des Volumenflusses durch einen Querschnitt in der Framstraße bestimmt werden, sondern auch die Dynamik nördlich bzw. südlich dieses Schnittes besser verstanden werden.

UP 10.12 Do 17:48 VMP 9 Poster

Charakterisierung eines Gegenstromimpaktors zur Messung von Eiskeimen — •Caroline Oehm[1,2], Monika Niemand[1], Ottmar Möhler[1] und Thomas Leisner[1,2] — [1]Forschungszentrum Karlsruhe, Institut für Meteorologie und Klimaforschung (IMK-AAF), Deutschland — [2]Ruprecht-Karls-Universität Heidelberg, Institut für Umweltphysik, Deutschland

An der Wolkensimulationskammer AIDA des Forschungszentrum Karlsruhe können Tröpfchen- und Eiswolken unter realistischen Bedingungen erzeugt und beobachtet werden. Dadurch ist es möglich, mikrophysikalische Wolkenprozesse im Labor zu untersuchen.

Um die gebildeten Eispartikel untersuchen zu können ist es notwendig sie vom interstitiellen Aerosol zu trennen. Dies geschieht mittels eines gepumpten virtuellen Gegenstromimpaktors (PCVI), welcher die durchströmenden Partikel entsprechend ihrer Trägheit trennt. Der einströmende Fluss aus der Wolkenkammer wird durch eine Vakuumpumpe erzeugt und seitwärts abgeführt. Partikel mit hoher Trägheit können diesen Stromlinien nicht folgen und treffen auf einen kleinen partikelfreien Gegenstrom. Nur Partikel mit ausreichend großer Trägheit durchdringen diesen Gegenstrom und treten in einen Sammelstrom ein. Die Stärke des Gegenstromes sowie die kinetische Bremslänge der

Partikel bestimmen den Abschneidedurchmesser für einen bestimmten Pumpstrom.

Das Poster zeigt den Aufbau eines typischen AIDA - Experimentes, erklärt die Funktionsweise des PCVI und beschreibt erste Ergebnisse zur Bestimmung des minimalen Abschneidedurchmessers.

UP 10.13 Do 17:48 VMP 9 Poster

Radiative transfer in and around volcanic plumes — •Christoph Kern, Tim Deutschmann, Leif Vogel, Markus Wöhrbach, Matthias Fickel, and Ulrich Platt — Institut für Umweltphysik, Universität Heidelberg, Im Neuenheimer Feld 229, 69120 Heidelberg

Differential Optical Absorption Spectroscopy (DOAS) is becoming an increasingly popular technique for measuring trace gases such as sulphur dioxide (SO_2) and halogen oxides (e.g. BrO, ClO, OClO) in volcanic plumes. Passive DOAS instruments use scattered sunlight as a light source to measure the characteristic absorption structures of the individual trace gases. In order to calculate emission fluxes or plume concentrations from the measured column densities, it is however necessary to determine the light path of the measured photons through the plume. While direct measurement is not possible, several approaches can be made: For one, the known atmospheric concentration of the oxygen dimer O_4 allows its absorption to be used as a tracer for atmospheric photon path lengths. Also, broadband analysis of the measured spectra can give insight into Raleigh and Mie scattering processes while the magnitude of the Ring effect can be used as a measure for inelastic Raman scattering. In this study, 3 dimensional radiative transfer modeling was used to gain a quantitative understanding of these effects. The model results of several case studies are discussed. Also the implementation of retrieval algorithms for photon path lengths in and around volcanic plumes is presented.

UP 10.14 Do 17:48 VMP 9 Poster

Chemistry of N2O5 and NO3 in the Atmosphere: Laboratory and Field Studies — •Jim Thieser and John Crowley — Max-Planck-Institut für Chemie, Abteilung Luftchemie, Mainz, Deutschland

The NO3 radical and N2O5 play an important role in a number of atmospheric chemical processes, including conversion of NOx to nitrate and the nocturnal oxidation of VOC and DMS. Mineral dust is an important component of atmospheric aerosols, and both field observation and modeling studies suggest that mineral aerosols can significantly influence the tropospheric budgets of important trace gases (O3, NOy, and HOy). In spite of the important role played by NO3, N2O5, and mineral aerosols in atmospheric chemistry, observational data on NO3 and N2O5 are limited and heterogeneous interactions of NO3 and N2O5 are not sufficiently well characterised. The lack of data of field observation and experimental studies hinders progress in understanding several aspects of NO3 and N2O5 chemistry in the atmosphere.

UP 10.15 Do 17:48 VMP 9 Poster

Sea ice and frost flowers as sources of sea salt aerosols — •X. Tian-Kunze[1], L. Kaleschke[1], R. Weller[2], G. König-Langlo[2], D. Wagenbach[3], S. Rast[4], G. Santos[4], A. Richter[5], and M. Begoin[5] — [1]Institute of Oceanography, University of Hamburg, Hamburg — [2]Alfred Wegener Institute for Polar and Marine Research, Bremerhaven — [3]Institute of Environmental Physics, University of Heidelberg — [4]Max Planck Insitute of Meteorology, Hamburg — [5]Institute of Environmental Physics, University of Bremen

Sea ice has been considered to be an important source of sea salt aerosols due to the strong sulfate depletion which is observed both in sea salt aerosols and frost flowers which grow on new sea ice. This brought a change in the interpretation of ice core data. Also sea salt aerosols have significant influence on the tropospheric chemistry via the release of reactive gas-phase halogens. Based on the long-term measurement data of aerosol from Neumayer station, Antarctica, backward trajectories and satellite derived ice concentration data, we investigate the physical processes and the parameters which influence the production of sea salt aerosols over sea ice. Trajectories were calculated on the surface layer based on the long-term global atmospheric reanalysis data from Japanese Meteorological Agency (JRA-25). Along each trajectory a contact time of an air parcel over a certain surface type (sea ice, potential frost flowers(PFF) and open water) is calculated. Measured sodium in aerosol at Neumayer station has similar seasonal cycle as the contact time of trajectories with PFF which is an indirect implication that PFFs are an important source of sea salt aerosols.

UP 10.16 Do 17:48 VMP 9 Poster

Long-term Measurements of Reactive Halogen Species, Trace Gases by Multi Axis Differential Optical Absorption Spectroscopy — •Robert Holla, Jens Tschritter, Udo Friess, and Ulrich Platt — Institut für Umweltphysik, Heidelberg, Deutschland

Long term measurements of atmospheric trace gases using multi-axis DOAS instruments are pursued at the new SOLAS observatory on the island of Sao Vicente, (Cape Verde). This research is part of the SOPRAN (Surface Ocean Processes in the ANthropocene) project. Reactive halogen species (RHS) such as bromine- and iodine- containing species play major roles in the chemistry of ozone in both the troposphere and lower stratosphere and thus possibly influence the ozone budget on a global scale. In addition iodine-species emitted from the ocean surface have been shown to be responsible for the production of new atmospheric particles in the marine boundary layer. This may have an effect on cloud formation and radiation transfer on local and global scales. Long term measurements of RHS abundances will help to identify their key regions and processes for formation. A new long term Multi-MAX-DOAS instrument has been installed at the SOLAS observatory on the island of Sao Vicente, (Cape Verde). The main focus of these unique measurements is the investigation of reactive halogen chemistry in the subtropical marine boundary layer based on measurements of BrO, IO, and possibly OIO. Because of its wide spectral range also the use for O4-retrievals to gain aerosol profiles is possible. IO has been detected with mixing ratios up to 1.3 ppt. For BrO an upper limit of 2 ppt could be determined.

UP 10.17 Do 17:48 VMP 9 Poster

Retrieval of snow grain size and soot pollution on sea ice with the optical satellite remote sensing instrument MODIS — •Heidrun Wiebe[1], Georg Heygster[1], and Eleonora Zege[2] — [1]Institute for Environmental Physics, University of Bremen — [2]Institute of Physics, National Academy of Sciences of Belarus, Minsk

Snow fields have potentially significant effects on the planetary albedo and climate. Development of satellite remote sensing of snow is of a great importance particularly for monitoring of snow age, pollution, and grain sizes over the polar regions difficult to access.

As it follows from numerous experimental studies of optical and microphysical snow properties, a snow layer is a multiple scattering close packed medium with irregular shaped non-uniform grains.

The developed algorithm retrieves the effective snow grain size and pollution amount, which does not imply any specific snow model, do not use any a priori suggestions of snow grain shape, and uses the multi-spectral information provided by a satellite optical instrument MODIS. It is especially suitable for polar regions, as it provides a reliable retrieval even at low sun elevations.

UP 10.18 Do 17:48 VMP 9 Poster

Gaussian distribution functions for spreading of pollutants — •Hans Lustfeld — IFF-1, Forschungszentrum Jülich, 52425 Jülich

Spreading of pollutants and tracer particles does in general not develop like a gaussian distribution. Moreover the spreading can be quite different as a function of time, e.g. linear or exponential – or both with a crossover from linear to exponential. Simulating this complicated behavior by a gaussian distribution function describing the complicated phenomena of spreading reasonably well is highly desirable.

An appropriate way to achieve this is a cumulant expansion of the distribution function[1]. In the present contribution distribution functions for transient times are compared with the corresponding gaussian distribution functions obtained from a cumulant expansion.

[1] A. Hyvaerinen, J. Karhunen and E. Oja, Independent component analysis, John Wiley & Sons, Inc., New York, 2001

UP 10.19 Do 17:48 VMP 9 Poster

Implementation of Atom Trap Trace Analysis for ^{39}Ar — •Joachim Welte[1], Florian Ritterbusch[1], Isabelle Steinke[1], Anna Wonneberger[2], Markus Oberthaler[1], and Werner Aeschbach-Hertig[2] — [1]Kirchhoff Inst. f. Physics, University of Heidelberg, Heidelberg/ Germany — [2]Inst. of Environmental Physics, University of Heidelberg, Heidelberg/ Germany

Dating water samples with ^{39}Ar ($T_{1/2}$ = 269a) is currently restricted by the limits of "traditional" Low Level Counting, namely the large samples necessary and the long measurement time. We try to overcome these limitations by Atom Trap Trace Analysis for this isotope and thus bridging the "dating gap" of 100 - 1000 years of water sample age. An ATTA table-top apparatus would find applications in many

different fields due to its small size and "low" cost.

We report on several first steps that have been undertaken, e.g. from the environmental physics side of the project water degassing and gas separation and from the atom-optical side measurement of hyperfine structure of ^{39}Ar, single atom detection and design of an atomic beam including source and collimation.

UP 10.20 Do 17:48 VMP 9 Poster

Passive microwave sensing of tropospheric water properties near the equator — •Harry Küllmann[1], Bing Tan[2], Thorsten Warneke[1], Justus Notholt[1], Christian Mätzler[3], and Niklaus Kämpfer[3] — [1]Institute of Environmental Physics, University of Bremen, Germany — [2]Faculty of technology, University of Suriname, Suriname — [3]Institute of Applied Physics, University of Bern, Switzerland

In the understanding of climate change observations of tropical water vapor are of primal importance due to its dominant abundance as a greenhouse gas and its high variability. The ground-based microwave sensor TRARA now is operated in Paramaribo, Suriname, since two years. The two channel measurements at 21 and 35 GHz allow for the determination of integrated water vapor and cloud liquid water. Results using new statistical retrieval algorithms based on local radiosonde profiles will be presented.

UP 10.21 Do 17:48 VMP 9 Poster

Measurements of NO_2 using MAX-DOAS observations of sun-illuminated targets — •Umar Javed, Henning Kirk, Andreas Richter, Anja Schönhardt, Folkard Wittrock, and John P. Burrows — Institut für Umweltphysik, Universität Bremen, Deutschland

Nitrogen oxide radicals ($NO + NO_2$) are important trace gases in the atmosphere. They originate from combustion processes, lightning and soil emissions and largely control the tropospheric ozone production Since several decades it is possible to measure NO_2 with different techniques. However, for the spatial distribution in the troposphere considerable uncertainty exists. Here we present measurements of NO_2 on and close to the campus of the University of Bremen applying a novel technique: Topographic Target Light scattering Differential Optical Absorption Spectroscopy (ToTaL-DOAS, Frins et al.). The basic idea is to collect scattered sunlight reflected from natural and artificial targets (e.g. high buildings) at different distances from the measuring device. Then recorded spectra are analyzed for NO_2 applying the DOAS method. Simple geometric treatments of the light-path reveal NO_2 concentrations in the boundary layer as a final data set. This study presents NO_2 data in 2008 in the surrounding of the University of Bremen. In addition for some days the ZARM Drop Tower has been used as illuminated target to investigate the vertical distribution of NO_2. Selected data sets have been compared to complementary measurements of the regular iup Bremen MAX-DOAS setup and to the Bremian BLUES air pollution network.

UP 10.22 Do 17:48 VMP 9 Poster

Auto-Max-Doas — •Rainer Volk, Christoph Kern und Ulrich Platt — Institut für Umweltphysik, Heidelberg

Car based zenith DOAS measurements have become a standard tool to asses trace gas fluxes of spatially defined sources such as volcanoes or industrial stacks. The technique utilizes absorption structures in sun light which has passed the zone of interest to determine the amount of gas in the respective light path. In combination with known parameters such as wind speed and direction, emission fluxes can be assessed. This approach was enhanced by an additional measuring angle. The simultaneous measuring at different angles allows the determination of further parameters of the measurement geometry e.g. knowledge about layer heights and can increase the measurement sensitivity to certain gases of interest. In order to provide the operator with a first approximate, evaluation algorithms were adapted to analyse the data in real time, which is extremely useful for determining measurement routes. In this contribution, the results of emission flux measurements performed at German power plants and industrial sites will be presented. Detailed analyses of collected data yielded NO2 fluxes of between 20 g/s and 150 g/s at different German power plants with plume heights ranging between 300m and 1000m.

UP 10.23 Do 17:48 VMP 9 Poster

Observations of volcanic SO_2 using GOME-2 measurements — •Andreas Richter, Folkard Wittrock, and John P. Burrows — Institute of Environmental Physics, University of Bremen, Bremen, Germany

Volcanic activity is a large source of emission of trace gases and aerosols into the atmosphere, both during explosive eruptions and through degassing. In particular volcanic eruptions can produce large plumes of SO_2 that, depending on injection altitude, can be transported over large distances. As the SO_2 plume is often close to ash and both are dangerous for air traffic, fast detection of SO_2 plumes is of interest for aviation control.

Using the strong UV absorption bands of SO_2, it can be detected in satellite measurements of the scattered solar flux. Using the well known DOAS technique, SO_2 emissions from several volcanic eruptions in 2007 and 2008 have been investigated using measurements from the GOME-2 instrument on board of MetOp. The emphasis is on estimating the total amount of SO_2 emitted and evaluating the applicability of the measurements for fast volcanic alerts to air traffic control.

UP 10.24 Do 17:48 VMP 9 Poster

The influence of scattering and absorption processes in sea water on atmospheric radiation - results from ship-borne DOAS measurements — •Anja Schönhardt, Folkard Wittrock, Andreas Richter, Henning Kirk, Hagen Schulte i.d.B, and John P. Burrows — Institut für Umweltphysik, Universität Bremen, Deutschland

Absorption and inelastic scattering within water can influence the upwelling radiation over water bodies. If not identified properly, these effects impact on absorption measurements of trace gases when using nadir observations. Spectral correlations lead to incorrect trace gas amounts and reduced retrieval quality. This presentation reports on Differential Optical Absorption Spectroscopy (DOAS) measurements from a Polarstern cruise in April-May 2008 from South America to Europe. Scattered sun light was measured by two spectrometer units in the visible and UV spectral regions. The light collecting telescope was viewing alternately in different elevation angles: into zenith-sky and at slant angles above and especially below the horizon, intentionally viewing into the ocean water. The DOAS measurements were analysed in different spectral windows to identify structures not associated to well-known effects. Such persistent structures were indeed found in spectra at water viewing angles and may be caused by inelastic scattering at water molecules, by effects from substances in the water (particles, organics, etc) or by processes yet unknown. Analysing these structured residuals helps to characterise the disturbance of optical absorption measurements caused by light transmission through sea water.

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Retrieval of Aerosol Profiles using MAX-DOAS — •Selami Yilmaz, Udo Friess, and Ulrich Platt — Institute of Environmental Physics, University of Heidelberg, Germany

Using Multi Axis Differential Absorption Spectroscopy (MAX-DOAS) measurements of trace gases with a known vertical profile, like the oxygen-dimer O_4, it is possible to retrieve information on atmospheric aerosols. Based on the optimal estimation method, we have developed an algorithm which fits simultaneously measured O_4 optical densities at several wavelengths and elevation angles to values simulated by a radiative transfer model. Retrieval parameters are aerosol extinction profile and optical properties. In the scope of the EU funded project EUSAAR we have developed a new kind of a DOAS instrument, which uses three miniature spectrometers to cover a wide wavelength range (290-790nm), enabling to capture all absorption bands of O_4. Additionally, it is possible to point to any direction in the sky with a 2D telescope unit which is connected to the spectrometers via fiber optics.

In May 2008, an intercomparison campaign with established aerosol measurement techniques took place in Cabauw/Netherlands, where simultaneous DOAS, LIDAR, Sun photometer and Nephelometer measurements were performed. We present first results of selected days from this period. The optical properties of aerosols retrieved by the DOAS technique show very good qualitative agreement with the established measurement techniques demonstrating the progress towards our goal of establishing the MAX-DOAS technique for retrieving optical properties of atmospheric aerosols.

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Infrared Spectroscopy and Microscopy of Optically Levitated Droplets of Aqueous KCl Solutions Near the Crystallization Point — •Mariam Hamza[2], Isik Riza Turkmen[1], Mareike Brettholle[1], Erwin Biller[1], Bernhard Wassermann[1], and Eckart Rühl[1] — [1]Physikalsiche Chemie, Freie Universität Berlin, Takustr. 3, 14195 Berlin — [2]Department of Physics, Suez Canal

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We report the novel FTIR spectra and results from optical microscopy of optically levitated microdroplets (10 - 20 um) containing saturated or dilute KCl salt solutions at room temperature. The relative humidities varied in the range of 50% - 70%. The initial concentrations of KCl in the dilute aqueous solutions were 1 M and 1.5 M . IR spectra were collected at different time intervals between particle injection and the time of crystallization. The IR band at ˜ 3250 cm-1 is assigned to the OH stretching of salt solvated water. The increase in intensity of this band as a function of time is attributed to the increase of salt concentration in the droplet due to solvent evaporation. An abrupt increase in intensity of this band marks the critical concentration of KCl for the crystallization . In addition, micrographs of droplets were taken near the efflorescence point. It follows that initially transparent liquid droplets become opaque as soon as they crystallize. Therefore, the combination of optical microscopy and infrared spectra allow us for the first time to visualize the crystallization of small microparticles containing supersaturated salt solutions and extract the critical salt concentration that is required for crystallisation.

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Zwei Jahre Routine-Messbetrieb mit dem Wasserdampf-Lidar auf der Zugspitze — •Hannes Vogelmann und Thomas Trickl — Institut für Meteorologie und Klimaforschung (IMK-IFU), Forschungszentrum Karlsruhe, Garmisch-Partenkirchen

Seit Anfang 2007 befindet sich das differentielle Absorptionslidar (DIAL) auf der Zugspitze im operationellen Messbetrieb. Trotz der häufig widrigen Wetterverhältnisse konnte das Ziel, an wenigstens ein bis zwei Tagen pro Woche Wasserdampfprofile aufzunehmen, weitgehend erreicht werden. Während bei trockenen Vehältnissen, wie sie typisch für das Winterhalbjahr sind, meist eine Reichweite von 10 bis 12 km erzielt wurde, war die Reichweite unter besonders feuchten Bedingungen teilweise auf 8 bis 9 km limitiert. In diesem Zeitraum konnten interessante Ereignisse hinsichtlich der Variablilität, insbesondere aber hinsichtlich dynamischer Prozesse am Beispiel stratosphärischer Intrusionen beobachtet werden. Es gelangen erste simultane Lidar-Messungen der Vertikalverteilungen von Ozon und Wasserdampf während Stratosphärenluftintrusionen. Generell wurden selbst in sehr dünnen Luftschichten stratosphärischen Ursprungs extrem niedrige Werte der Wasserdampfkonzentration gemessen, die jedoch erstaunlicherweise deutlich unter den In-Situ-Werten vom Zugspitzgipfel liegen. Dies deutet an, dass die Durchmischung dieser Schichten mit Troposphärenluft weit weniger signifikant ist, als bislang aus den Stationsdaten angenommen.