UP 2: Poster Session

Time: Tuesday 16:30–18:30 Location: Lichthof

UP 2.1 Tu 16:30 Lichthof

Konzept zur nachhaltigen Integration der Offshore-Windenergie mittels dezentraler Biogasnutzung — •Jörg Bendfeld, Martin Tigges und Michael Splett — Universität Paderborn / WUZ, Paderborn, Deutschland

Die Versorgung mit elektrischer Energie hat an der CO2-Problematik einen signifikanten Anteil. Die Sicherstellung der Energieversorgung stellt eine immer komplexer werdende Herausforderung dar. Erneuerbare Energien können nicht nur einen wesentlichen Beitrag zur Versorgungssicherheit leisten, sondern auch einen großen Beitrag zur Vermeidung von klimaschädlichem CO2-Emissionen erbringen. Die Bereitstellung von elektrischer Energie durch die geplanten großen Offshore-Windparks in Nord- und Ostsee kann hierbei aufgrund der Fluktuationen im Winddargebot nur einen Teilbeitrag liefern. Die unberechenbare Größe der regenerativen Energieträger ist die Volatilität. In den Offshore-Windparks mit einer installierten Leistung von jeweils mehr als 400 MW können Fluktuationen entweder zu einer Überproduktion oder zu einem Einbruch in der Energieübertragung führen. Vor allem die Unterdeckung kann Versorgungsstörungen verursachen. In so einem Fall wird Ausgleichsenergie benötigt, die wiederum schnell bereitgestellt werden muss.

Die durchgeführten Untersuchungen der Einspeiseschwankungen erfolgten nicht mittels synthetischer Zeitreihensimulationen, sondern basieren auf der Datenanalyse der deutschen Offshore-Messmasten. Aus diesem Grund kann auf eine Fehlerabschätzung bedingt durch eine synthetische Zeitreihensimulation verzichtet werden.

UP 2.2 Tu 16:30 Lichthof

Draft proposal for an Offshore Metmast for Renewable Energy — •Jörg Bendfeld, Martin Tigges, and Michael Splett — Universität Paderborn / WUZ, Paderborn, Deutschland

The principal objective is to show a draft proposal for an Offshore Metmast. The main purpose will be the measurement of the climate offshore for the installation of renewable energy converter. Such installations have to meet high standards:

*The distance to the coast is more than 20 km

*The water depth is between 20 m and 40 m.

*The measuring platform has to work almost completely autarkically because frequent maintenance would extremely force up costs.

This also includes eco-friendly energy supply with a backup system. It is reasonable to carry out both oceanographic and meteorological measurings. A high availability of data is important. The costs must be in line with the budget. Consequently measurement technology and energy supply have to comply with particular requirements: The measuring instruments must ensure reliability. For there is no frequent possibility to compare the measurements with neighbouring measurements the choice of measuring instruments should guarantee diverse but proven measurement technology application.

UP 2.3 Tu 16:30 Lichthof

Retrieval of Aerosol Profiles using Multi Axis Differential Optical Absorption Spectroscopy (MAX-DOAS) — •S. Yilmaz[1], U. Friess[1], A. Apituley[2], G. de Leeuw[3,4,5], B. Henzing[5], H. Baars[6], B. Heese[6], D. Althausen[6], A. Dell'Acqua[7], M. Adam[7], J.-P. Putaud[7], and U. Platt[1] — [1]IUP, University of Heidelberg, Germany — [2]RIVM, Bilthoven, The Netherlands — [3]FMI, Helsinki, Finland — [4]Department of Physics, University of Helsinki, Finland — [5]TNO, Utrecht, The Netherlands — [6]IFT, Leipzig, Germany — [7]JRC-IES, Ispra, Italy

Combining MAX-DOAS measurements of the oxygen-dimer O_4 with inverse modelling methods, it is possible to retrieve information on atmospheric aerosols. In 2008 and 2009 several intercomparison campaigns with established aerosol measurement techniques took place in Cabauw, Melpitz, Ispra and Leipzig, where simultaneous DOAS, lidar and Sun photometer measurements were performed. Here we present results of the intercomparisons for cloud free conditions. The correlation of the aerosol optical thickness retrieved by the DOAS technique and the Sun photometer shows coefficients of determination from 0.96 to 0.98 and slopes from 0.94 to 1.07. The vertical structure of the DOAS retrieved aerosol extinction profiles compare favourably with the structures seen by the backscatter lidar. However, the vertical development of the boundary layer is reproduced with a smaller resolution by the DOAS technique. Strategies for the near real-time retrieval of trace gas profiles, aerosol profiles and optical properties will be discussed as well.

UP 2.4 Tu 16:30 Lichthof

Höhenprofilmessung der NO_2 Konzentration in einer Straßenschlucht mittels Langpfad-DOAS — •Sebastian Landwehr[1], Denis Pöhler[1], Ming-Yi Tsai[2] und Ulrich Platt[1] — [1]Institut für Umweltphysik, Universität Heidelberg, Deutschland — [2]Institut für Sozial- und Präventivmedizin am Schweizerischen Tropeninstitut, Basel, Schweiz

Die NOx Konzentrationen in städtischen Gebieten stellen eine gesundheitliche Belastung für die Bewohner dar. Entgegen den meisten Umweltschadstoffen nimmt die NO_x Konzentration auch in den Städten von Industrieländern weiter zu. Im Rahmen des ESCAPE Projektes wird in zahlreichen Europäischen Städten der Zusammenhang zwischen lokaler Schadstoffbelastung und Krankheitsfällen in der Bevölkerung untersucht. Die dafür üblicherweise eingesetzten Passivsammler mitteln über einen Zeitraum von zwei Wochen. Daher wurden in einer typischen bewohnten Straßenschlucht (mittelmäßige Verkehrsbelastung) in Heidelberg zusätzlich NO_2 Messungen im April 2009 mittels multiaxialer Langpfad Differentiellen Optischen Absorptionsspektroskopie (LP-DOAS) durchgeführt, die hier vorgestellt werden. Die Messungen ermöglichen die Berechnung des NO_2 Vertikalprofiles der Straßenschlucht, mit einer zeitlichen Auflösung von einer Stunde. Mit den Ergebnissen kann somit die Schadstoffbelastung für verschiedene Höhen untersucht werden. Ein Vergleich, mit anderen Messorten in der Stadt, zeigt zusätzlichen in wie weit die Konzentration durch lokale Emissionen in der Straße oder durch großräumige Konzentrationsschwankungen bestimmt sind.

UP 2.5 Tu 16:30 Lichthof

Wavemeasurements with different principles (ast and bouy) — •Jörg Bendfeld, Martin Tigges, and Michael Splett — Universität Paderborn / WUZ, Paderborn, Deutschland

In most cases a wave is described mathematically by a wave equation in only two dimensions (namely deflection and propagation direction of the wave). If it is the intention to consider the wave motion holistically and thus to describe the real sea behaviour, it is necessary to superimpose a plurality of individual waves having different frequency and amplitude values, so an exact mathematical description becomes very complicated and almost impossible on account of the large number of imponderables. The superimposition is not trivial. It involves nonlinear components (particularly in the case of wind-induced waves), which are predictable only with great difficulty or not at all. It is simpler to assess the wave events according to the probability of their occurrence. In this case measurements of the wave height are of primary interest. Thereby the distance between ground and surface (ast, acoustic surface tracking) or the accelerated motion of the water surface (buoy) is utilised as measured signal. Thus the two measuring methods differ fundamentally in their physical functional principle. Therefore all parameters that are relevant with respect to the measuring instrument must be evaluated separately. Subsequent comparisons and any differences in the respective measuring sequences can thus be interpreted.

UP 2.6 Tu 16:30 Lichthof

The SO2 camera Theoretical basis of measurement and data evaluation — •Peter Lübcke, Christoph Kern, Leif Vogel, Felix Kick, Markus Wöhrbach, and Ulrich Platt — Institute of Environmental Physics, University of Heidelberg, Im Neuenheimer Feld 229, 69120 Heidelberg, Germany

The SO2 camera is a novel technique for the remote sensing of volcanic emissions based on measuring the ultra-violet absorption of SO2 in a narrow wavelength window around 310 nm by employing a bandpass interference filter and a 2D UV-sensitive CCD detector. Solar radiation scattered in the atmosphere is used as a light source for the measurements. The effect of aerosol scattering can be eliminated by additionally measuring the incident radiation around 325 nm where the absorption of SO2 is no longer significant, thus rendering the method applicable to optically opaque plumes. The ability to deliver spatially resolved images of volcanic SO2 distributions at a frame rate on the

order of 1 Hz makes the SO2 camera a very promising technique for volcanic monitoring. However, we show here that the relationship between SO2 column density and measured signal is non-trivial. Due to the finite filter transmission window, the camera's sensitivity to SO2 depends on parameters such as the solar zenith angle, the total ozone column, the filter illumination angle, and even on the SO2 column itself.

UP 2.7 Tu 16:30 Lichthof

Sensitivity enhancement of an Er^{3+}-doped fiber laser to intracavity absorption — •Benjamin Löden, Peter Fjodorow, Klaus Sengstock, and Valeri Baev — Institut für Laserphysik, Universität Hamburg, Luruper Chaussee 149, 22761 Hamburg

The emission spectrum of a broadband Er^{3+}-doped fiber laser is very sensitive to intracavity absorption, which allows extremely sensitive spectroscopy [1]. The highest sensitivity can be achieved with a cw laser and it is limited by nonlinear mode coupling. With a proper choice of laser parameters the nonlinear mode coupling can be reduced allowing highest sensitivities. One of the most important nonlinear mode coupling mechanisms is the spatial inhomogeneity of the gain. It can be reduced by increasing the number of oscillating laser modes using longer laser cavities. With a 2-m-cavity the sensitivity to intracavity absorption is measured to be corresponding to the effective absorption path length of 50 km. The increase of the effective absorption path length over 1000 km is demonstrated with the cavity length of 80 m at low pump rates. Further enhancement of the sensitivity is possible by reducing the mode coupling with the application of a unidirectional ring laser. In this laser the complete elimination of the spatial gain inhomogeneity can be achieved. Besides that a reduction of stimulated Brillouin scattering in the fiber and a decrease of spectral noise is expected. A system with such a high sensitivity can be used for the detection of trace gases and for environmental or medical applications.

[1] A. Goldman, I. Rahinov, S. Cheskis, B. Löhden, S. Wexler, K. Sengstock, V.M. Baev, Chem. Phys. Lett 423, 147 (2006)

UP 2.8 Tu 16:30 Lichthof

Comparison of precipitation data between the Arctic and East Africa — •Naoki Itoh[1] and Jürgen Kurths[2] — [1]Interdisciplinary Center for Dynamics of Complex Systems, Potsdam, Germany — [2]Potsdam-Institut für Klimafolgenforschung e.V., Potsdam, Germany

The comparison of climate change between the Arctic land (71.25^{o}N and 179.75^{o}E) and the equatorial area (Kenya) is performed by singular spectrum analysis (SSA) which is applied to the monthly precipitation of 1900's. This method can be used to decompose the time series into some useful components. From the climate data such as precipitation trends, periodic-(annual cycle), quasi periodic and noise components can be extracted as information in the time series. Their results give us reasonable interpretation in the climate sense.

UP 2.9 Tu 16:30 Lichthof

Different wavelength evaluation ranges in the retrieval of trace gases with DOAS at the example of BrO — •Leif Vogel[1], Holger Sihler[1,2], Johannes Lampel[1], Ulrich Platt[1], and Thomas Wagner[2] — [1]Institut für Umweltphysik, Universität Heidelberg — [2]MPI für Chemie, Mainz

Optical remote sensing via scattered sunlight Differential Optical Absorption Spectroscopy (DOAS) is routinely used to determine various trace gases in the atmosphere. Different applications and platforms (e.g. DOAS of volcanic plumes, Satellite measurements, Zenith DOAS or Max-DOAS) differ in measurement conditions, cross correlations of absorptions of different trace gases and their respective concentrations. Here, we present a method to determine the optimal evaluation range at the example of Bromine Oxide (BrO).

With strongest absorption features of BrO between 315nm - 360nm, its retrieval results can depend on cross correlations with strong absorber like Ozone (O_3) or sulfur dioxide (SO_2). Whereas O_3 influences especially Satellite and stratospheric measurements, SO_2 cannot be neglected in the case of high volcanic gas emissions. Absorption features of both species are most pronounced at low wavelengths, but their diminished influence at higher wavelength ranges competes with a higher detection limit of BrO. The study is performed with artificial spectra and the results are compared with retrievals from real spectra of volcanic plumes, satellite and marine Max-DOAS measurements.

UP 2.10 Tu 16:30 Lichthof

Daytime ozone and temperature variations in the mesosphere: A comparison between SABER observations and HAMMONIA model — •Sebastian Dikty[1], Hauke Schmidt[2], Mark Weber[1], Christian von Savigny[1], and Martin Mlynczak[3] — [1]Institute of Environmental Physics, Bremen, Germany — [2]Max Planck Institute for Meteorology, Hamburg, Germany — [3]Langley Research Center, NASA, U.S.A.

The scope of this paper is to investigate the latest version 1.07 SABER (Sounding of the Atmosphere using Broadband Emission Radiometry) tropical ozone and temperature data with respect to daytime variations in the upper mesosphere. For a better understanding of the processes involved we compare these daytime variations to the output of the three-dimensional general circulation and chemistry model HAMMONIA (Hamburg Model of the Neutral and Ionized Atmosphere). The results show good agreement for ozone. The amplitude of daytime variations is in both cases approximately 60 % of the daytime mean. During equinox the daytime maximum ozone abundance is for both, the observations and the model, higher than during solstice, especially above 80 km. We also use the HAMMONIA output of daytime variation patterns of several other different trace gas species, e.g., water vapor and atomic oxygen, to discuss the daytime pattern in ozone. In contrast to ozone, temperature data show little daytime variations between 65 and 90 km and their amplitudes are on the order of less than 1.5 %. In addition, SABER and HAMMONIA temperatures show significant differences above 80 km.

UP 2.11 Tu 16:30 Lichthof

Comparison of nanoaerosol sources and their applications. — •Svetlana Khasminskaya[2], Jan Meinen[1,2], Markus Eritt[2], Andreas Comouth[1,2], and Thomas Leisner[1,2] — [1]Karlsruhe Institute of Technology (KIT), Institute for Meteorology and Climate Research, Atmospheric Aerosol Research (IMK-AAF), Karlsruhe, Germany — [2]Institute for Environmental Physics (IUP), Ruprecht-Karls-University, Heidelberg, Germany

A variety of sources for atmospheric aerosols in the nanometer range (electrospray ionization, microwave plasma reactor, atomizer and soot generator) are presented. Different materials, such as silicon oxides, iron oxides and soot, were tested with helium or air as carrier gas. The aerosol size distribution (SMPS, TEM, TOF, PMS) and the fraction of charged particles (Quartz Crystal Microbalance) are shown. The influence of different source parameters such as carrier gas and pressure and finally the applicability for laboratory experiments with atmospheric relevance and nano-toxicological topics is discussed.

UP 2.12 Tu 16:30 Lichthof

Crystal structures and microcrystal distributions resulting from efflorescence of ternary aerosols — •Lennart Treuel, Alice Sandmann, and Reinhard Zellner — Universität Duisburg-Essen, Essen, Germany

The behaviour of aerosols towards changes in the ambient RH is normally described by their deliquescence and efflorescence. It is established that the addition of organic components may change the deliquescence relative humidity (DRH) of internally mixed salt/organic/water aerosols relative to the pure salt. The deliquescence of complex atmospheric aerosols will inevitably depend on the crystal structures of the effloresced components present in the aerosol. Since the efflorescence process leads to a kinetically controlled crystallisation from highly supersaturated solutions the resulting crystal structures differ greatly from the crystals formed under thermodynamically controlled conditions and hence they may show very different thermodynamic properties. Scanning electron microscopy and the X-ray diffractometry, were used for investigations of crystal structures resulting from the kinetically controlled crystallisation (efflorescence) of highly supersaturated binary and ternary solution droplets. Moreover, scanning Raman microscopy was used to determine the spatial distribution of crystals formed during the efflorescence process within the aerosol particle. The results show a very diverse behaviour of organic and inorganic components, a finding that presents fundamentally new challenges to the pursuit of understanding the very basic principles governing the phase behaviour of complex solutions.

UP 2.13 Tu 16:30 Lichthof

Statistical Analysis of Aerosol Optical Thickness from Satellite Retrievals using BAER and AERONET over Several Regions — •jongmin yoon, wolfgang von hoyningen-huene, alexander a. kokhanovsky, marco vountas, and john p. burrows — IUP, University of Bremen, Bremen, Germany

Aerosol affecting radiative forcing still remains one of poorly understood problems in climate research. To understand its effect, many algorithms for aerosol remote sensing have been developed. This study helps to understand its effect using analysis of the long-term trends of aerosol optical thickness for several regions using BAER (Bremen AErosol Retrieval) algorithm with SeaWiFS (Sea-viewing Wide Field-of-view Sensor) L1b data. The BeNeLux, the Po Valley, the Eastern Europe, the Eastern Mediterranean, and the Pearl River Delta in South China are chosen as several regions for studies in CityZen project because they are densely-populated and mostly influenced by land aerosol sources (e.g. mineral dust, industrial pollutant, and biomass burning). From additional statistical analysis of spectral Aerosol Optical Thickness (AOT), Single Scattering Albedo (SSA), and phase function from AERONET level 2.0 (cloud-screened and quality-assured), we estimate more reliable long-term aerosol characteristics in this study. Most of European sites showed generally negative tendency (decreasing of AOT with time) due to the environmental regulation. On the other hand, the trend over Perl River Delta was obviously positive. This is due to the rapid economical development and massive industrial emission.

UP 2.14 Tu 16:30 Lichthof

The GEOS-Chem tropospheric chemistry model — •Marco Scharringhausen[1], Justus Notholt[1], Thorsten Warneke[1], and Daniel Jacob[2] — [1]Institut für Umweltphysik, Universität Bremen, Fachbereich Physik, Otto-Hahn-Allee 1, 28359 Bremen — [2]Harvard University, Cambridge MA 02138-2901, USA

The GEOS-Chem Atmospheric Model is a tool for three-dimensional modelling of the tropospheric and lower stratospheric chemical composition. It is driven by meteorological data provided by the NASA Goddard Earth Observing System (GEOS). GEOS-Chem is a merge of the GEOS data fields, a chemical transport model and manifold chemistry routines, some of which are

- Sources and sinks of aerosols (anthropogenic/non-anthropogenic) - Burning of fossil fuels (anthropogenic) - Biomass burning (anthropogenic/non-anthropogenic) - Biological emissions (anthropogenic/non-anthropogenic) - Transport - Photolysis

The GEOS-Chem model is parallelized using OpenMP. As open source software, it is being developed and maintained by an worldwide community.

First results of the installation at the Institute of Environmental Physics (IUP) Bremen are presented. Model runs presented focues on the chemistry of CH4, CO and CO2. The model results are compared to measurements of several Fourier Transform Infrared Spectrometer instruments (FTIR) operated by IUP Bremen.

UP 2.15 Tu 16:30 Lichthof

Carbon dioxide and methane over Europe — •Anna Katinka Petersen[1], Janina Messerschmidt[1], Wouter Peters[2], Justus Notholt[1], and Thorsten Warneke[1] — [1]Institute of Environmental Physics, University of Bremen, Bremen, Germany — [2]Wageningen University, Dept. of Meteorology and Air Quality, Wageningen, The Netherlands

Carbon dioxide (CO2) is the most important anthropogenic greenhouse gas. Human activities, primarily fossil fuel combustion and deforestation, are responsible for a continuing increase of its atmospheric concentration. The oceans and terrestrial ecosystems currently act as sinks for atmospheric CO2 and absorb approximately half of the anthropogenic emissions (IPCC, 2007). Ground-based solar absorption Fourier transform spectrometry (FTS) is a well-established remote sensing technique for the measurement of atmospheric trace gases and the most precise ground-based remote sensing technique to measure the total columns of atmospheric carbon dioxide. Our stations include Spitsbergen (78.92°N, 11.92°E), Orleans (47.96°N, 2.1°E), Bremen (53.11°N, 8.85°E) and Bialystok (53.2°N, 22.75°E). The latitude band between 30°N - 90°N of the Eurasian continent is a key region concerning greenhouse gases. We established a homogenized, well calibrated dataset of column CO2 and CH4 and used this dataset for source-sink estimates over Europe by the use of backward trajectory analysis. The Carbon Tracker Europe model is used to interpret our results and to identify sources and sinks of atmospheric carbon dioxide over Europe.

UP 2.16 Tu 16:30 Lichthof

Cloud effects on tropospheric NO_2 measurements from satellite — •Achim Zien, Andreas Richter, Andreas Hilboll, and John P. Burrows — Institut für Umweltphysik, Universität Bremen, Deutschland

The signal of UV/vis remote sensing of trace gases in the troposphere by satellite instruments is strongly affected by clouds. It can be either enhanced or diluted depending on the relative altitudes of cloud and trace gas, the optical thickness of a cloud, and the surface albedo.

The sensitivity of the measurements as function of altitude can be expressed as block-airmass factor (BAMF) which is dependent on parameters such as the viewing geometry, the sun position, the surface albedo and which is strongly affected by clouds. As a result, the distribution of clouds affects the observed shape and magnitude of tropospheric distributions of a trace gas.

It is common practice in tropospheric satellite retrievals to exclude pixels with a cloud cover of more than 20%, thus significantly reducing the spatial and temporal coverage of the measurements. In addition, selection of clear sky scenes biases the observations and will lead to non-representative averages.

Here, we investigate the effects of clouds on satellite data with radiative transfer calculations for different cloud scenarios and an analysis of GOME-2 NO_2 measurements. In addition, we evaluate how data can be corrected for with the knowledge of cloud properties and the trace gas profile and why clouds may help the detection of trace gases over bright surfaces.

UP 2.17 Tu 16:30 Lichthof

Ozonabbau über dem offenen Ozean? — •Katja Grossmann, Jens Tschritter, Udo Friess und Ulrich Platt — Institut für Umweltphysik, Heidelberg, Deutschland

BrO und IO spielen eine wesentliche Rolle in der Photochemie von Ozon. In der Troposphäre zerstören sie Ozon katalytisch, führen zur Bildung neuer Aerosolpartikel oder dienen als Oxidationsmittel für Dimethylsulfid. Die reaktiven Halogenverbindungen entstehen in der Grenzschicht durch unterschiedliche Prozesse, wie zum Beispiel durch die Freisetzung aus Meersalzaerosolen oder aus bestimmten Algen. IO wird vor allem in Küstennähe von Makroalgen produziert. Allerdings ist die Situation über dem offenen Ozean bislang ungeklärt. Dort treten völlig neue Parameter der Halogenfreisetzung auf, sowie signifikant höhere Ozonabbauraten als in den derzeitigen Klimamodellen angenommen werden.

Messungen von BrO und IO erfolgten mittels der multi-axialen differentiellen optischen Absorptionsspektroskopie (MAX-DOAS). Bei diesem Verfahren erhält man durch Spektralanalyse des gestreuten Sonnenlichtes, das bei verschiedenen Elevationswinkeln aufgenommen wurde, Informationen über die vertikale Verteilung der Spurengase, sowie über die Spurengaskonzentration.

Während der Schiffskampagne "Transbrom" im Westpazifik von Tomakomai, Japan (42°38'N, 141°37'E) nach Townsville, Australien (19°11'S, 146°50'E) wurden mittels spektroskopischer Messungen die Säulendichten von BrO und IO innerhalb der marinen Grenzschicht bestimmt, die Aussagen über deren Höhenverteilung erlauben.

UP 2.18 Tu 16:30 Lichthof

Direct moonlight DOAS for nighttime studies of volcanic plumes — •Johannes Zielcke, Nicole Bobrowski, Leif Vogel, Christoph Kern, and Ulrich Platt — Institute of Environmental Physics, University of Heidelberg, Germany

Passive Differential Optical Absorption Spectroscopy (DOAS) utilizing scattered sunlight is a widespread tool to study the chemistry of trace gases such as sulphur dioxide (SO_2) and halogen oxides (e.g. BrO, ClO) in volcanic plumes. At night however, the moon is the only feasible light source available for passive instruments. Within the Network for Observation of Volcanic and Atmospheric Change (NOVAC), passive scanning DOAS instruments were developed and deployed at several degassing volcanoes. These instruments can be adapted to track the moon and conduct direct light measurements to study the plume composition at night.

As the speciation of bromine and other halogenic compounds relies on photodissociation of their respective elementary molecules, a discrepancy between day and nighttime chemistry is expected. While emissions during the day have been studied for some time now, little is known about the reactions occuring at night.

We present direct moonlight measurements carried out at Mount Etna during December 2009. SO_2 slant column densities of $2 \cdot 10^{18}\ molec/cm^2$ were detected and spectra are analyzed for halogen compounds in the UV and visible wavelength region. The results are compared to scattered and direct sunlight measurements during the day.

UP 2.19 Tu 16:30 Lichthof

GOME-2 satellite observations of NOx emissions from ships — •Andreas Richter, Andreas Hilboll, Achim Zien, and John P. Burrows — Institut für Umweltphysik, Universität Bremen, Bremen

The volume of international shipping has been rapidly increasing over the last decades, and further increases are expected for the coming years. A large fraction of shipping is close to coastal areas but for intercontinental transport, shipping routes also pass through the remote oceans. As the volume of transported goods is increasing, so is the amount of shipping related pollutant emissions into the marine boundary layer.

Satellite observations of NO2 and HCHO by GOME and SCIAMACHY have been used to identify shipping emissions mainly in the Indian Ocean, where high vessel densities and low background pollution levels facilitate the detection of small signals. With the better spatial coverage of recent satellite instruments such as GOME-2 and OMI, the statistics improved and better detection limits can now be achieved.

In this study, three years of GOME-2 data of NO2 have been systematically examined for shipping signals. Compared to previous studies, additional shipping tracks could be identified in the NO2 maps. Comparison with SCIAMACHY measurements shows changes in the paths taken by the ships in the Gulf of Aden and the Indian Ocean. The observed patterns in ship emissions will be discussed with respect to reported vessel densities and GOME-2 measurement uncertainties.

UP 2.20 Tu 16:30 Lichthof

Simultaneous observations of IO and BrO over the Antarctic from space — •Anja Schönhardt[1], Andreas Richter[1], Mathias Begoin[1], Folkard Wittrock[1], and John P. Burrows[1,2] — [1]Institut für Umweltphysik, Universität Bremen, Deutschland — [2]Centre for Ecology and Hydrology, Wallingford, United Kingdom

Reactive halogen species (RHS, i.e., iodine, bromine, chlorine, and their oxides) are important for atmospheric composition, e.g., through ozone depletion, mercury oxidation (by bromine monoxide, BrO) or new particle formation (initiated by iodine oxides). Research on RHS has therefore intensified, as open questions still remain, e.g., on the atmospheric sources of RHS and differences between individual halogen species.

Recently, it has become possible to measure iodine monoxide (IO) columns using the SCIAMACHY satellite instrument. IO has been detected over the Antarctic around and on the continent, the ice shelves and the sea ice. In the present study, simultaneous satellite measurements of IO and BrO distributions are compared, utilizing multi-year averages of short time periods. Although both species occur partly in the same region and time, differences are identified in the detailed spatial and temporal patterns. While BrO mainly appears on the sea ice with a maximum from early spring until summer, IO reveals a more detailed evolution, e.g., with high amounts close to the continent in early spring and rising amounts over sea ice regions only towards late spring and summer. The observations provide arguments for different release pathways of the two halogen compounds and evidence increases that iodine is mainly released from the biosphere.

UP 2.21 Tu 16:30 Lichthof

Validation of the Limb-Nadir-Matching Method for the Determination of Tropospheric Ozone in the Subtropics and Middle Latitudes — •Stefan Bötel, Annette Ladstätter-Weissenmayer, Christian von Savigny, and John P. Burrows — Universität Bremen, Bremen, Germany

SCIAMACHY (Scanning Imaging Absorption Spectrometer for Atmospheric ChartographY) launched in March 2002 measures sunlight, transmitted, reflected and scattered by the earth atmosphere or surface (240 nm - 2380 nm). SCIAMACHY measurements yield the amounts and distribution of O3, BrO, OClO, ClO, SO2, H2CO, NO2, CO, CO2, CH4, H2O, N2O, p, T, aerosol, radiation, cloud cover and cloud top height in limb as well as nadir mode. In this study data for the time period of 2003-2008 is used for the determination of tropospheric O3. Comparisons of the results of the retrieval of tropospheric O3 using satellite based data and sonde profiles will be shown for latitudes in the subtropics and middle latitudes. The main focus will be validation of the Limb-Nadir-Matching method for tropospheric O3 retrieval using sonde date.

UP 2.22 Tu 16:30 Lichthof

Harmonization of GOME, SCIAMACHY and GOME-2 ozone absorption cross-sections — •Victor Gorshelev, Anna Serdyuchenko, Wissam Chehade, Mark Weber, and John Burrows — Institute of Environmental Physics, University of Bremen, Otto-Hahn-Allee 1, 28359 Bremen, Germany

The global monitoring with satellite borne sensors plays a unique role in the generation of long-term datasets of atmospheric trace gases (in particular ozone). Currently there are three instruments in orbit and two more satellites are planned to be launched in the next decade, resulting in two or more decades of ozone observations. As the lifetime of individual satellite missions is limited, information from different sensors needs to be combined.

The goal of the presented work is to derive a consistent set of absorption cross-sections in the UV/VIS/NIR spectral region for satellite spectrometers. For this purpose the harmonization of cross-sections is carried out by a combination of re-evaluation of the pre-flight laboratory measurements with the satellite spectrometers and new experimental work.

The results of this work are expected to improve the ozone data quality and time series as required for climate, air quality, and stratospheric ozone trend studies. Updated cross-sections will be available for reprocessing with GOME (Global Ozone Measuring Experiment), SCIAMACHY (the Scanning Imaging Absorption Spectrometer for Atmospheric Chartography) and GOME2 and to the scientific community as well. Work is supported by European Space Agency.

UP 2.23 Tu 16:30 Lichthof

Ramanspektroskopie zur Untersuchung von Phasenübergängen von Zitronensäuremikrotropfen — •Christiane Wender und Thomas Leisner — Karlsruher Institut für Technologie,Institut für Meteorologie und Klimaforschung, Karlsruhe, Deutschland

Laut IPCC[1] Bericht ist der Einfluss von Wolken einer der höchsten Unsicherheitsfaktoren für die Beschreibung des Strahlungshaushaltes der Erde. Für die Bildung und Lebensdauer von Cirruswolken spielt das Gefrierverhalten von Tröpfchen eine entscheidende Rolle. Jedoch wird angenommen[2], dass neben dem Gefrieren auch ein Glasübergang unter atmosphärischer Bedingung stattfinden kann, welcher feste Partikel erzeugt. Dadurch wird die Wasseraufnahme und das Gefrieren sowie das Kristallwachstum und heterogene chemische Reaktionen behindert. Je nach Viskosität können diese Prozesse auch vollständig gehemmt werden. Damit könnte der Glasübergang eine verminderte Wolkenbildung bei ausreichender Übersättigung erklären, welcher bereits bei Flugzeugmessungen[3] beobachtet wurde. In unserem Betrag beschreiben wir einen experimentellen Aufbau, in dem geladene Mikropartikel in einem elektrodynamischen Levitator gefangen und deren chemische Zusammensetzung mit Ramanspektroskopie analysiert wird. Wir präsentieren Messungen, in denen das Gefrieren von Zitronensäure in der Nähe des Glasübergangs beobachtet wurde.

[1] http://www.ipcc.ch/ 12.10.2009
[2] B. Zobrist et al. Atmos. Chem. Phys.,2008
[3] E. Jensen et al. Atm. C. P. Discuss.,2004

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Laborexperimente zum Verdampfungsverhalten geladener Wolkentropfen — •Christopher Maus[1,2], Daniel Rzesanke[2], Johannes K. Nielsen[3] und Thomas Leisner[2] — [1]Institut für Physik, TU Ilmenau — [2]Institut für Meteorologie und Klimaforschung, KIT Karlsruhe — [3]Dänisches Meteorologisches Institut, Kopenhagen DK

Feldmessungen haben gezeigt, dass Eispartikel in der unteren Stratosphäre trotz eisuntersättigter Umgebung existieren können [1]. Ein Vordringen der Eispartikel aus der Troposphäre in diese Luftschicht ist nur möglich, wenn ein stabilisierender Mechanismus vorliegt. Eine mögliche Ursache für die erhöhte Stabilität kann eine elektrische Nettoladung der Eispartikel sein [2]. In Laborexperimenten die im Rahmen des CAWSES Schwerpunktes durchgeführt wurden, konnte die Abhängigkeit des Dampfdruckes von Wolkentropfen von ihrer Ladung quantifiziert werden. Hierzu wurde das Verdampfen geladener Wassertröpfchen in einem elektrodynamischen Levitator analysiert. In unserem Beitrag stellen wir die Ergebnisse dieser Untersuchungen vor.

[1] - J.K. Nielsen et al., Solid particles in the tropical lowest stratosphere, Atmospheric Physics and Chemistry 7, 2007

[2] - J.K. Nielsen et al., Could stratospheric ice particles be stabilized by electrical charge?, Geophysical Research Letters, submitted Nov.2009

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BrO Labormessungen mit neu entwickeltem CE-DOAS Messgerät — •Daniel Hoch, Joelle Buxmann, Holger Siehler und

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Es wird ein neu entwickeltes Cavity-Enhanced Differentiell Optisches Absorptionsspektroskopie (CE-DOAS) Messgerät, was für Messungen von BrO optimiert wurde, vorgestellt.
Als Lichtquelle dient eine LED im Bereich von 325nm-360nm, die in eine optische Cavity mit variabler Länge (bis 180cm) eingekoppelt wird. Das LED Spektrum wird nach Durchlaufen der Cavity mittels einer Quarzfaser in ein Gitterspektroghraphen eingekoppelt und mit einer CCD(charge coupled device) Kamera detektiert. Mit diesem Messgerät wurden erste Messungen von BrO in einer Smogkammer im BayCEER in Bayreuth durchgeführt.
Mit einer Zeitauflösung von 5.5 min konnte BrO mit einer Nachweisgrenze von (13+-3)ppt gemessen werden. Der dabei verwendete Spiegelsatz hatte eine Reflektivität R=0.9987+-0.0001. Der effektive Lichtweg lag bei (1320+-80)m. Zur genauen Bestimmung der Spiegelreflektivität und des effektiven Lichtweges wurden O3, O4, HONO, HCHO, NO2 gemessen und zusätzlich Cavity Ringdown Messungen durchgeführt.