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Fachverband Umweltphysik (UP)

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Übersicht der Hauptvorträge und Fachsitzungen

(Vorträge: GW2 B3009; Poster: GW2 B3010;
Abendvortrag: Universum; Plenarvortrag: HS 2010;
Symposium „Einfluss solarer Variabilität auf Atmosphäre und Klima der Erde“ GW2 B2880
Symposium „Fundamental Physics in Space“ SFG 0140)

Hauptvorträge

UP 2.1	Di	8:45– 9:15	GW2 B3009	**Der Golfstrom** — •Monika Rhein
UP 3.1	Di	11:00–11:30	GW2 B3009	**Future sea level: Antarctica's ways of losing ice** — •Anders Levermann
UP 6.1	Mi	8:30– 9:00	GW2 B3009	**Tandem-L: Highly Innovative Interferometric Radar Satellite Mission for Climate Research and Environmental Monitoring** — •Alberto Moreira
UP 9.1	Mi	16:30–17:00	GW2 B3009	**Observing the impact of the Anthropocene on atmospheric composition using remote sensing from space based and aircraft instrumentation.** — •John P. Burrows
UP 9.2	Mi	17:00–17:30	GW2 B3009	**NO_2 from space: What can we learn?** — •Steffen Beirle
UP 10.1	Do	8:30– 9:00	GW2 B3009	**Application of the FTIR-spectroscopy in the infared via remote sensing and in-situ techniques for studying the carbon cycle** — •Justus Notholt, Thorsten Warneke, Mathias Palm, Matthias Buschmann, Denise Müller, Christof Petri, Yuting Wang, Zhiting Wang
UP 10.8	Do	11:00–11:30	GW2 B3009	**Ozone recovery and climate change: Towards an interactive representation of stratospheric ozone in Earth System Models** — •Markus Rex, Ingo Wohltmann, Daniel Kreyling, Ralph Lehmann, Wolfgang Dorn
UP 14.1	Do	14:30–15:00	GW2 B3009	**Cloud top pressure retrieval from MERIS and OLCI: Global assessment** — •Jürgen Fischer, Ulrich Küster, Cintia Carbajal, Rene Preusker
UP 20.1	Fr	11:00–11:30	GW2 B3009	**Fernerkundung der Erdatmosphäre mittels hochauflösender Infrarotspektroskopie: vom Labor bis in den Weltraum** — •Johannes Orphal
UP 21.1	Fr	11:30–12:00	GW2 B3009	**Einfluss von geomagnetischer Aktivität auf die Atmosphäre: Beobachtungen und Modellstudien** — •Miriam Sinnhuber

Weitere Vorträge von Interesse für die Umweltphysik

PV VIII	Do	11:45–12:30	HS 2010	**Methanhydrate der Meeresböden, Einfluss auf Klima und Stabilität der Kontinentalränder** — •Gerhard Bohrmann
PV IX	Do	19:00–20:00	Universum	**Was sagen uns Satelliten ueber Wetter und Klima? – Fernerkundung in der Umwelt- und Klimaforschung** — •Justus Notholt

Hauptvorträge des fachübergreifenden Symposiums SYPS

Das vollständige Programm dieses Symposiums ist unter SYPS aufgeführt.

SYPS 1.1	Mi	14:00–14:30	SFG 0140	**Magnetospheric Physics – Basic Processes and Open Questions** — •Antonius Otto
SYPS 1.2	Mi	14:30–15:00	SFG 0140	**GRACE/GRACE-FO and LAGEOS/LARES in Geodesy, Earth Observation and Relativity** — •Rolf König, Ignazio Ciufolini, Frank Flechtner, Antonio Paolozzi
SYPS 1.3	Mi	15:00–15:30	SFG 0140	**LISA and LISA Pathfinder** — •Gerhard Heinzel
SYPS 1.4	Mi	15:30–16:00	SFG 0140	**Promises and challenges of Gaia astrometry** — •Sergei Klioner

Hauptvorträge des fachübergreifenden Symposiums SYAK

Das vollständige Programm dieses Symposiums ist unter SYAK aufgeführt.

SYAK 1.1	Fr	8:30– 9:00	GW2 B2880	**Solar Irradiance Variation** — •Natalie Krivova
SYAK 1.2	Fr	9:00– 9:30	GW2 B2880	**Cosmic rays and ground level enhancements** — •Bernd Heber
SYAK 1.3	Fr	9:30–10:00	GW2 B2880	**Impact of precursor gases and ions on new particle formation and climate** — •Urs Baltensperger
SYAK 1.4	Fr	10:00–10:30	GW2 B2880	**Regional Influence of Solar Variability on European Climate** — •Katja Matthes

Fachsitzungen

UP 1	Di	8:30– 8:45	GW2 B3009	**Begrüßung (Prof. Christian von Savigny)**
UP 2.1–2.6	Di	8:45–11:00	GW2 B3009	**Ozeanographie/Hydrosphäre**
UP 3.1–3.10	Di	11:00–15:45	GW2 B3009	**Kryosphäre**
UP 4.1–4.3	Di	15:45–16:30	GW2 B3009	**Boden- und Agrarphysik**
UP 5.1–5.31	Di	16:40–18:10	GW2 B3010	**Postersession**
UP 6.1–6.7	Mi	8:30–11:00	GW2 B3009	**Methoden - Fernerkundung**
UP 7	Mi	11:00–14:00	GW2 B3010	**Festsitzung, Fortsetzung der Postersession**
UP 8.1–8.4	Mi	14:00–16:00	SFG 0140	**Symposium Fundamental Physics in Space**
UP 9.1–9.6	Mi	16:00–18:30	GW2 B3009	**Atmosphäre - Spurengase**
UP 10.1–10.9	Do	8:30–11:45	GW2 B3009	**Atmosphäre - Spurengase (Fortsetzung)**
UP 11.1–11.1	Do	11:45–12:30	HS 2010	**Plenarvortrag Gerhard Bohrmann**
UP 12	Do	12:30–14:00	GW2 B3009	**Mittagspause und Mitgliederversammlung**
UP 13.1–13.2	Do	14:00–14:30	GW2 B3009	**Atmosphäre - Spurengase (Fortsetzung)**
UP 14.1–14.4	Do	14:30–16:15	GW2 B3009	**Atmosphäre - Aerosole/Wolken**
UP 15.1–15.2	Do	16:15–16:45	GW2 B3009	**Klimamodellierung**
UP 16.1–16.3	Do	16:45–17:30	GW2 B3009	**Andere Themen**
UP 17	Do	17:30–19:00	GW2 B3010	**Fortsetzung der Postersession**
UP 18.1–18.1	Do	19:00–20:00	Universum	**Abendvortrag Justus Notholt**
UP 19.1–19.4	Fr	8:30–10:30	GW2 B2880	**Symposium Einfluss solarer Variabilität auf Atmosphäre und Klima der Erde: Von der Heliophysik bis zur Erdatmosphäre**
UP 20.1–20.1	Fr	10:30–11:30	GW2 B3009	**Methoden - Fernerkundung**
UP 21.1–21.11	Fr	11:30–16:00	GW2 B3009	**Atmosphäre - Mesosphäre**

Mitgliederversammlung des Fachverbands Umweltphysik

Donnerstag 12:30 - 14:00 GW2 B3009
Mitgliederversammlung für alle Mitglieder des Fachverbandes mit Mittagsimbiss, Gäste willkommen

UP 1: Begrüßung (Prof. Christian von Savigny)

Zeit: Dienstag 8:30–8:45 Raum: GW2 B3009

Begrüßung

UP 2: Ozeanographie/Hydrosphäre

Zeit: Dienstag 8:45–11:00 Raum: GW2 B3009

Hauptvortrag UP 2.1 Di 8:45 GW2 B3009

Der Golfstrom — •Monika Rhein — IUP, Universität Bremen, Germany

Der Golfstrom transportiert warmes, salzreiches Wasser aus den Subtropen bis in die Arktis und besitzt eine große Bedeutung für das Klima in Westeuropa und Skandinavien. Falls der Ausstoß von Treibhausgasen unverändert weitergeht, wird sich laut den Klimamodellen der Golfstrom erheblich abschwächen, mit Konsequenzen für die weitere Klimaentwicklung auch bei uns. Bis vor kurzem stammte das Wissen über die natürlichen Schwankungen des Golfstroms aus Modellen, da keine entsprechenden Beobachtungen vorhanden waren. Das hat sich in den letzten Jahren durch eine Kombination von Messungen von verankerten Sensoren, von autonomen Driftern und Fernerkundung geändert. Dadurch wurde es möglich, die beobachteten Zeitreihen der Golfstromstärke bis Anfang der 1990er Jahre, dem Beginn der systematischen Altimetermessungen zu verlängern Der Vortrag wird den neuen Erkenntnisstand über die Golfstromzirkulation zusammen fassen.

UP 2.2 Di 9:15 GW2 B3009

Oil spill detection by imaging radars: challenges and pitfalls — •Werner Alpers[1], Ben Holt[2], and Kan Zeng[3] — [1]Universitaet Hamburg, Institut fuer Meereskundede — [2]NASA/JPL. Pasadena, CA, USA — [3]Ocean University of China, Qingdao

Criteria for discriminating between radar signatures of oil films and biogenic slicks visible on synthetic aperture radar (SAR) images of the sea surface as dark patches are critically reviewed. We question the often claimed high success rate of oil spill detection algorithms using single- frequency, single-polarization SARs because the SAR images used to train these algorithms are based usually on subjective interpretation and are not validated by on-site inspections or multi-sensor measurements carried out from oil pollution surveillance planes. Furthermore, we doubt that polarimetric parameters derived from fully-polarimetric SAR data, like entropy, anisotropy, and mean scattering angle are beneficial for discriminating between mineral oil films and biogenic slicks. We conjecture that the results obtained from previous analyses of spaceborne polarimetric SAR data, which seem to show differences in the scattering mechanism between scattering from mineral oil films and biogenic slicks, result from instrument noise. Measurements carried out with the Unmanned Aerial Vehicle Synthetic Aperture Radar (UAVSAR) of NASA/JPL, which has an extremely low noise floor (-53 dB) , confirm this view and show that Bragg scattering theory applies also for scattering from mineral oil films.

UP 2.3 Di 9:30 GW2 B3009

Worldwide First Below-Shelf-Ice Noble Gas Measurements to Investigate Basal Melting Below the Filchner-Ice-Shelf in Antarctica — •Oliver Huhn[1,2], Tore Hattermann[2], Jürgen Sültenfuss[1], Hartmut Hellmer[2], Monika Rhein[1,3], Michael Schröder[2], Torsten Kanzow[2], and Erich Dunker[2] — [1]Institut für Umweltphysik IUP, Abt. Ozeanographie, Universität Bremen, Germany — [2]Alfred-Wegener-Institut AWI, Helmholz-Zentrum für Polar- und Meeresforschung, Bremerhaven, Germany — [3]Zentrum für Marine Umweltwissenschaften MARUM, Universität Bremen, Germany

Low soluble, stable noble gases as helium and neon are ideal tracers to quantify basal glacial melt water in ocean water. Atmospheric air trapped in meteoric ice is fully dissolved when the ice is melted from below due to the enhanced hydrostatic pressure at the underside of an floating ice shelf, leading to an excess of 1280 % for He and 890% for Ne in pure glacial melt water. We have carried out the worldwide first noble gas measurements from below an ice shelf in Antarctica. We constructed and successfully tested a dedicated in-situ water sampler for oceanic noble gas measurements under extremely cold conditions to avoid freezing and gas fractionation. The sampler was released through hot-water drilled bore holes at two locations below the Filchner-Ice-Shelf in the Weddell Sea. We observed substantial melt water fractions below the Filchner Ice Shelf. These measurements will help us obtain a better understanding of basal melting processes at the source and to quantify basal ice shelf melting, which is crucial to investigate the fate of Antarctic and Arctic ice shelves under changing climate conditions.

UP 2.4 Di 9:45 GW2 B3009

Methanakkumulation im Tiefenwasser eines organisch belasteten Sees — •Bertram Boehrer[1], Christin Horn[1], Philipp Metzler[1,2], Karen Ullrich[1,3] und Matthias Koschorreck[1] — [1]Helmholtzzentrum für Umweltforschung - UFZ, Magdeburg — [2]derzeit: Kirchhoff-Institut für Physik, Heidelberg — [3]derzeit: University of Amsterdam

Die beginnende Ausbeutung des Methanvorkommens im Tiefenwasser des Kivusees (Afrika) hat uns veranlasst im organisch stark belasteten Tiefenwasser des Tagebausees Vollert-Sued den Gasgehalt zu bestimmen und die Ausgasung zu quantifizieren. Der See hat weniger als 500m Durchmesser aber eine Maximaltiefe von 27m. Es zeigte sich, dass der Gasdruck in der Nähe zu spontaner Ausgasung liegt, und damit potentiell eine Gefahr darstellt. Er wird vor allem durch Methan erzeugt; Stickstoff und Kohlendioxid liefern kleinere Beiträge. Damit ist das freigesetzte Gasvolumen klein, und die Gefahr einer limnischen Eruption kaum gegeben, wie eine Probeentgasung zeigt. Die Gesamtmenge an Methan könnte für eine kleinskalige Ausbeutung tatsächlich interessant sein.

UP 2.5 Di 10:00 GW2 B3009

Dynamik reaktiver und inerter Gase im Kontext der Anwendung von Edelgasen als Umwelttracer in der Grundwasserhydrologie — •Simon Mayer, Florian Jenner und Werner Aeschbach — Institut für Umweltphysik, Heidelberg, Germany

Traceranwendungen inerter Gase in Grundwasserstudien erfordern ein tiefgründiges Verständnis zugrundeliegender biogeochemischer Prozesse. Dies ist die erste Studie, in der auf Basis von Edelgasen sowohl Bodenluft als auch Grundwasser simultan untersucht werden. Erhobene Messdaten bestätigen allgemein grundlegende Annahmen entsprechender Traceranwendungen. Insbesondere wird der Ansatz einer löslichkeitsbasierten Beschreibung von Luftüberschuss und Grundwasserentgasung motiviert. Daneben werden auch Aspekte aufgezeigt, deren Berücksichtigung essentiell für verlässliche Edelgasstudien ist. Erstens implizieren Langzeitbeobachtungen an flachem Grundwasser einen permanenten Gasaustausch mit in der Porenmatrix eingeschlossenen Luftblasen, selbst Jahre nach der eigentlichen Grundwasserneubildung. Zweitens kann mikrobielle Gasbildung im Grundwasser traditionelle Interpretationsansätze erschweren, in Abhängigkeit von der Menge des Luftüberschusses und dessen Fraktionierung. Drittens legen Bodenluftanalysen eine potenzielle Verfälschung von Edelgastemperaturen um bis zu 2°C nahe, hervorgerufen durch Sauerstoffzehrung und einen reduzierten Summenwert von O_2+CO_2. Die Relevanz dieses Effektes wird für tropische Regionen, als auch für flaches Grundwasser der mittleren Breiten nach ausgeprägten Niederschlagsperioden im Sommer bestätigt.

UP 2.6 Di 10:15 GW2 B3009

Modellierung der Dynamik von Gasen im Untergrund im Kontext von Edelgas-Traceranwendungen — •Florian Jenner[1], Simon Mayer[1], Werner Aeschbach[1], Bernhard Peregovich[2] und Carlos Machado[3] — [1]Institute of Environmental Physics, Heidelberg, Germany — [2]Instituto de Engenharia e Geociências, Universidade Federal do Oeste do Pará, Santarém, Brazil — [3]Instituto de Ciências da Educação, Universidade Federal do Oeste do Pará, Santarém, Brazil

Traceranwendungen von Edelgasen sind von Relevanz für die Untersuchung der Gasdynamik in der ungesättigten Bodenzone, ebenso wie im Kontext von Kontamination und Austauschprozessen zwischen Boden

und Atmosphäre. Im Rahmen dieser Studie werden Modellansätze angewendet, ergänzt durch ein umfangreiches Set gemessener Bodenluftdaten von verschiedenen Standorten. Zum einen erlaubt ein einfacher Modellansatz die Identifikation relevanter Einflussfaktoren für Konzentrationen inerter Gase in der Bodenluft. Zum anderen wird die Modellroutine Min3P zur Beschreibung der Messdaten verwendet, um der Komplexität gasdynamischer Prozesse gerecht zu werden. Ergebnisse von Messung als auch Modellierung implizieren signifikante, saisonal auftretende Abweichungen von Edelgaskonzentrationen in der Bodenluft von denen in der Atmosphäre. Dieser Effekt ist insbesondere eine Folge reduzierter Summenwerte von O_2+CO_2 aufgrund mikrobieller Sauerstoffzehrung und der Lösung von CO_2 in Bodenwasser. Der diffusive Ausgleich auftretender Konzentrationsgradienten führt zu einer permanenten massenabhängigen Fraktionierung der Bodenluft.

Kaffeepause (30 min)

UP 3: Kryosphäre

Zeit: Dienstag 11:00–15:45 Raum: GW2 B3009

Hauptvortrag UP 3.1 Di 11:00 GW2 B3009

Future sea level: Antarctica's ways of losing ice — •Anders Levermann — Potsdam Institute for Climate Impact Research, Germany — Physics Institute, Potsdam University, Germany — Columbia University, USA

The state of discussion on future sea level rise is discussed for different magnitudes of future warming. As one important contributor to future sea level rise, the Antarctic ice loss is singled out. A scaling analysis of the ice dynamic equations is provided and the different outlet glaciers that bear the potential of an ice instability are discussed in light of this scaling analysis. This way the fastest and slowest potential instabilities of Antarctica are identified.

UP 3.2 Di 11:30 GW2 B3009

Sea ice in the Arctic and Antarctic: recent developments and understanding — •Gunnar Spreen[1], Malte Gerken[1], Christian Haas[2], Stefan Hendricks[2], Christian Melsheimer[1], Marcel Nicolaus[2], Renate Treffeisen[1], Justus Notholt[1], and Georg Heygster[1] — [1]University of Bremen — [2]Alfred Wegener Institute

Air temperatures in the Arctic are increasing twice as fast as the global mean. As a consequence, the sea ice extent in the Arctic is declining (4%/decade). In summer the decline is strongest. In conjunction also ice thickness, volume, and age decrease while ice drift speed and melt season length increase. 2016 was an extreme year: due to mild temperatures, the winter sea ice maximum in March was the lowest on record. The modal ice thickness was about 35% below average. Due to cooler Arctic summer temperatures, the 2016 sea ice minimum was only second lowest. In autumn above average air temperatures prevailed, causing a late Arctic sea ice freeze up. The average sea ice extent in November 2016 was the lowest November value observed. The average 2016 sea ice extent therefore likely will be the lowest on record. In the Antarctic, sea ice extent is increasing by 1.5%/decade due to more divergent ice dynamics in recent years. In early Antarctic summer 2016, however, the ice extent is much below climatology. While not connected, the low ice extent in Arctic and Antarctic result in a record low worldwide sea ice area. We will present the latest data and discuss causes of the unusual 2016 sea ice situation. Observations from multiple satellite sensors allow a comprehensive analysis by not only taking ice area but also ice thickness and drift into account.

UP 3.3 Di 11:45 GW2 B3009

changes in Arctic sea ice dynamics observed by satellites — •Alexandra Kazlova and Gunnar Spreen — IUP, University of Bremen, Otto-Hahn-Allee 1, D-28359 Bremen, Germany

From buoy and satellite observations it is known that Arctic sea ice speed and deformation has increased during recent decades by 10*15% per decade. Buoys, however, do not cover the complete Arctic Basin and the number and location of observations changes with time. Satellite observations were not yet fully analysed for long-term ice deformation changes, which is the topic of this study. How much the different elements in the sea ice force balance have contributed to the observed changes in sea ice dynamics is not fully understood. Here, different satellite remote sensing datasets of sea ice drift and deformation are analyzed for changes in space and time (e.g., trend patterns). Synthetic Aperture Radar (SAR) satellite observations deliver high resolution, all weather and season observations of the Arctic sea ice cover since the 1990s. Recently, with the launches of Sentinel-1a & b this dataset got much more extensive. Available SAR datasets of sea ice drift and deformation are analyzed for changes in space and time (e.g., trend patterns). Findings will contribute to better quantify the changes in Arctic sea ice dynamics and help evaluate sea-ice models.

UP 3.4 Di 12:00 GW2 B3009

Snow on Antarctic Sea Ice: Distribution and Trends — Torben Frost[1], Stefan Kern[2], and •Georg Heygster[1] — [1]University of Bremen, Institute of Environmental Physics — [2]University of Hamburg, Integrated Climate Data Center

Snow on sea ice is an important cryospheric parameter. It is needed to determine the energy flux between ocean, sea ice and atmosphere, the sea ice thickness from altimeter observations, the solar radiation at and underneath sea ice, and the high snow load on Antarctic sea ice frequently leads to flooding and formation of superimposed ice when the water on top of the ice freezes. Moreover, snow depth is needed operationally because the ship friction of snow is similarly high as that of sea ice.

Currently the only operationally used algorithm for snow depth retrieval from satellite observations is the one introduced by Markus and Cavalieri [1998]. It was originally developed for the passive microwave sensor SSM/I and uses for more recent AMSR-E/2 data a linear regression between the brightness temperatures of the two sensors. Within the framework of the Antarctic Option of the ESA Sea Ice Climate Change Initiative project, the algorithm has been re-derived for AMSR-E data from ship based snow depth estimates according to the ASPeCT (1981-2011) protocols. Based on the new snow depth algorithm we will present monthly snow depth means as well as snow depth trends and trend uncertainty maps for the AMSR-E and AMSR2 observation period 2002-2016. Monthly regions of positive, negative and uncertain trends will be identified.

UP 3.5 Di 12:15 GW2 B3009

Multiyear sea ice concentration estimates using ASCAT and AMSR2 data — •Yufang Ye[1], Gunnar Spreen[1], Georg Heygster[1], and Mohammed Shokr[2] — [1]University of Bremen, Bremen, Germany — [2]Environment and Climate Change Canada, Toronto, Canada

Arctic sea ice area is decreasing rapidly during recent decades. Especially strong is the decrease of old multiyear ice (MYI), which survived at least one summer. MYI concentration can be retrieved from passive or active microwave satellite observations. One of the algorithms that combine both types of observations is the Environmental Canada Ice Concentration Extractor (ECICE). In this study, data from the Advanced Scatterometer (ASCAT) and the Advanced Microwave Remote Sensing Radiometer 2 (AMSR2) are employed to retrieve MYI concentration. Combined active and passive microwave data can help to identify MYI, however, the retrieval shows flaw under specific weather conditions. Here, two corrections are applied to the MYI concentration retrievals. One correction utilizes air temperature to restore the underestimated MYI concentrations under warm conditions, the other mainly uses sea ice drift to correct the overestimated MYI concentrations. The results are compared with the Canadian Ice Service (CIS) charts and the sea ice age dataset available from the National Snow and Ice Data Center (NSIDC). The MYI concentration from ASCAT/AMSR2 agrees well with that in the CIS charts. Compared to the ice classified as two years or older in the sea ice age dataset, the MYI concentration from ASCAT/AMSR2 is approximately 50% or greater.

Mittagspause (90 min)

UP 3.6 Di 14:00 GW2 B3009

Sea ice concentrations at 1 km resolution from combined optical and passive microwave data — •Valentin Ludwig, Larysa Istomina, and Gunnar Spreen — University of Bremen

Although it covers only about 1.5% of the Earth's surface, Arctic sea ice

is a key element of the climate system. The percentage of sea ice within a grid cell (sea ice concentration) is of special importance for various disciplines. For more than 40 years, passive microwave measurements from space have been used for monitoring sea ice in general and sea ice concentration in particular. Their capability to provide year-round daily measurements almost independently of the state of the atmosphere and their good spatial coverage make them a powerful tool for sea ice concentration retrieval. However, they suffer from a coarse spatial resolution of 5 km at maximum. Optical measurements provide higher spatial resolution and complementary errors: while depending on daylight in the visible spectrum and cloud-free conditions in the whole optical spectrum, they come with spatial resolutions of 250 m to 4 km for daily Arctic-wide coverage. We present sea ice concentrations from optical data at a resolution of 1 km and their evaluation against a higher-resolution dataset. The so-derived uncertainty estimates are used to merge optical and passive microwave sea ice concentrations. A multi-year time series is analysed to assess the algorithm's performance throughout the year.

UP 3.7 Di 14:15 GW2 B3009

Atmospheric Correction of Sea Ice Concentration Retrieval of 89 GHz AMSR-E Observations — •Junshen Lu, Georg Heygster, and Justus Notholt — University of Bremen, Institute of Environmental Physics, Otto-Hahn-Allee 1, 28359 Bremen, Deutschland

An improved sea ice concentration (SIC) retrieval algorithm named ASI2 using weather corrected polarisation difference (PD) in brightness temperatures (TBs) at 89 GHz measured by AMSR-E is developed. Effects of wind, total water vapour, cloud liquid water and surface temperature on the measured TBs are evaluated through a fast radiative transfer model, and corrected by simulating changes in TBs caused by the atmospheric influences using reanalysis data fields as atmospheric profiles. ASI2 is tested on (i) a validation dataset called Round Robin Data Package (RRDP) consisting of TBs measured by AMSR-E over pure surface types of open water and 100% SIC, and (ii) AMSR-E Level 2A re-sampled swath data from 2008. The correction on the RRDP dataset significantly reduces both standard deviation and bias in SIC over open water throughout the year, yet causes higher bias in summer over consolidated ice possibly due to melt ponds. A qualitative comparison with MODIS images shows that ASI2 using AMSR-E swath data resolves a more realistic ice gradient across the ice edge than the original ASI algorithm. In March 2008, the ASI2 SIC is about 10% to 35% higher than ASI along the ice edges.

UP 3.8 Di 14:30 GW2 B3009

Daily lead map of the European Arctic from Sentinel-1 SAR scenes — •Dmitrii Murashkin[1], Gunnar Spreen[1], and Marcus Huntemann[2,1] — [1]Institute of Environmental Physics, University of Bremen, Germany — [2]Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany

Leads are linear-like areas with open water within sea ice cover. They are of interest for environmental science, weather forecasting and ship navigation in polar regions. Here, an algorithm that provides an automatic binary classification of leads is proposed. Synthetic Aperture Radar (SAR) satellites provide all-weather and season observations and the necessary high resolution to identify leads. Previously often a single co-polarized band was used for ice-water classification which can result in misclassification of leads under windy conditions. The presented algorithm benefits from the use of Sentinel-1 SAR dual channel products which include measurements in co- and cross-polarized modes. Exploiting information from both, the algorithm is capable to identify leads which can not be identified using single co-polarized measurements. The algorithm is based on Haralick texture features and a supervised classification algorithm. Its stability and high parallelization makes Random Forest Classifier a perfect tool for SAR image feature recognition. It allows per-pixel processing of images with speckle noise. Leads are identified in single SAR scenes, which are then compiled to maps covering a larger region from a set of individual products. Maps of lead distributions for the European Arctic with a resolution of 200 meters are presented.

UP 3.9 Di 14:45 GW2 B3009

Microwave emission from growing sea ice at L-band: a modeling study — •Marcus Huntemann[1,2] and Georg Heygster[2] — [1]Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany — [2]University of Bremen, Bremen, Germany

Satellite based microwave observations of sea ice are taken continuously since the late 70s while even lower frequencies like L-band became available just recently with SMOS (2010), Aquarius (2012) and SMAP (2015). At L-band the penetration depth into sea ice is deeper compared to the higher frequencies and many studies found a relation with the actual ice thickness up to about 50 cm. We simulated many cases of the sea ice evolution using a thermodynamic ice growth and snow accumulation model driven by atmospheric reanalysis data. The resulting profiles of sea ice and snow parameters are used as input for a microwave emission model to model the emitted radiation. This large database of sea ice conditions and corresponding simulations of emitted radiation serves to analyze the sensitivity of the emitted radiation to variation in the geophysical parameters. We find correlations with physical parameters like ice thickness, temperature and salinity, as well as snow densification and thickness. Using specialized models, we additionally quantify the influence of coherence effects originating from thin snow cover and the roughness of the sea ice top and bottom interfaces. Most of these parameters are simplified or unconsidered in current emissivity models and retrievals of ice thickness from L-band satellite observations.

UP 3.10 Di 15:00 GW2 B3009

Cloud screening over sea ice and snow for MERIS/OLCI data — •Larysa Istomina, Henrik Marks, and Georg Heygster — Institute of Environmental Physics, University of Bremen, Bremen, Germany

An accurate cloud screening over snow/ice is important for many remote sensing applications such as satellite retrievals concerning atmospheric parameters or snow and sea ice properties. As optical properties of sea ice/snow and clouds are alike, an accurate cloud screening in the Arctic is a challenging task. Some satellite sensors are better equipped for this task, e.g. with a set of thermal infrared bands. However, they may be not suited for certain retrieval methods due to various other limitations. That is why it is important to develop quality cloud masks also for sensors which are not specifically designed for the task.

In this work, we present a cloud mask developed specifically for retrievals over bright snow and sea ice surfaces from MERIS/OLCI data. The presented dataset consists of pixelwise cloud probability for each available MERIS/OLCI swath. The newly developed cloud screening procedure utilizes data from MERIS/OLCI oxygen A band as well as synergy with SLTSR/AATSR in order to benefit from their infrared bands. The method is able to correctly classify over 90% of the sea ice observations from MERIS during the period May to September if compared to a high-quality cloud mask derived from AATSR.

Kaffeepause (30 min)

UP 4: Boden- und Agrarphysik

Zeit: Dienstag 15:45–16:30 Raum: GW2 B3009

UP 4.1 Di 15:45 GW2 B3009

Assessment of the hydrological effect of fire-induced vegetation changes on evapotranspiration at a regional scale — •Melanie Häusler[1], João Manuel Neves Silva[1], João Pedro Nunes[2], Paula Soares[1], Thorsten Warneke[3], Jan Jacob Keizer[4], and José Miguel Cardoso Pereira[1] — [1]CEF, Centro de Estudos Florestais, Instituto Superior de Agronomia, Universidade de Lisboa, Tapada da Ajuda, 1349-017 Lisboa, Portugal — [2]CE3C, Centre for Ecology, Evolution and Environmental Changes, Faculdade de Ciências, Universidade de Lisboa, 1749-016 Lisboa, Portugal — [3]Institute of Environmental Physics, University of Bremen, 28359 Bremen, Germany — [4]CESAM and Department of Environment and Planning, University of Aveiro, Aveiro, Portugal

This study aims to understand the changes of evapotranspiration (ET) in eucalyptus stands in the Caramulo Mountain range, located around 30 km inland from the city Aveiro, Portugal. A two-source energy balance model in combination with medium-resolution imagery (Landsat 8) was used to estimate ET and its changes over time. The fire events occurred from 2011 to 2013, and their effects on fire-driven changes in ET, albedo and partial vegetation cover (Pv) were assessed for the years 2013 to 2015. Model estimates were compared to ground-based measurements, where evaporation was assumed to be equal to interception (Gash model to retrieve rainfall interception) and transpiration estimated by a water balance fed by soil moisture measurements. Results show that ET and its evolution over time was driven by fire severity and forest properties.

UP 4.2 Di 16:00 GW2 B3009

Soil moisture measurement at the hectometer scale with cosmic-ray neutrons — •Markus Köhli[1], Jannis Weimar[1], Martin Schrön[2], and Ulrich Schmidt[1] — [1]Physikalisches Institut, Universität Heidelberg, Heidelberg, Germany — [2]Helmholtz Zentrum für Umweltforschung, UFZ, Leipzig

Soil Moisture at the hectometer scale has turned out to be feasible by detecting environmental albedo neutron density. This non-invasive technique relies on the measurement of neutrons originating from cosmic particle air showers and reflected by the soil. The key characteristic of the method is the exceptionally high moderation strength of hydrogen. It slows down fast neutrons whereas other heavier elements independent of the chemical composition rather reflect them. In the recent years the interest was set to understanding neutron transport - and therefore the footprint of the method - by Monte-Carlo simulations. Meanwhile a manifold of experiments have been conducted targeting different characteristics of the method. This especially allows data interpretation for mobile applications, which is the current focus of development in Heidelberg and which will be presented in this talk.

UP 4.3 Di 16:15 GW2 B3009

Detection systems for neutron-based soil moisture measurements — •Jannis Weimar[1], Markus Köhli[1], Martin Schrön[2], and Ulrich Schmidt[1] — [1]Physikalisches Institut, Heidelberg, Deutschland — [2]Helmholtz-Zentrum für Umweltforschung, Leipzig, Deutschland

During the past years an interdisciplinary community of scientists has established a non-invasive soil moisture measurement technique using secondary cosmic ray neutrons. The method is based on the characteristic of hydrogen to effectively moderate neutrons. Consequently the amount of reflected fast neutrons strongly depends on the water content of the soil. The method has proven to be capable of closing the gap in spatial resolution between satellite and point-like measurements by providing a footprint of several hectares, which makes it a promising candidate for multiple applications in environmental science.

Neutron detection systems involve materials that convert weakly interacting neutrons into ionizing particles. For a long time such have relied on Helium-3 as an efficient agent with a high absorption cross-section. Its current scarcity demands for technological solutions with other converters. In Heidelberg a boron-10-lined detector has been designed offering lower costs at good detection rates. It is also the onset for a mobile detection system which allows for measurements on larger scales at otherwise inaccessible terrain. The talk will cover preliminary measurement results and comparisons to recent Monte-Carlo simulations.

UP 5: Postersession

Zeit: Dienstag 16:40–18:10 Raum: GW2 B3010

UP 5.1 Di 16:40 GW2 B3010

Evaluating the potential for improved vertical sensitivity of MAX-DOAS measurements — •Andreas Richter, Tim Bösch, Enno Peters, Folkard Wittrock, and John P. Burrows — Institut für Umweltphysik, Universität Bremen, Bremen, Germany

Ground-based Multi-Axis DOAS (MAX-DOAS) measurements can be used to derive vertical profiles of trace gases and aerosols in the lower troposphere. Together with the integrated tropospheric columns, these profiles are interesting information for comparison with in-situ measurements and atmospheric models.

One limitation of this technique is the rapid loss of sensitivity with altitude which results from the measurement principle providing the highest sensitivity close to the altitude of the instrument. Extending the profile sensitivity to higher altitudes would increase the applicability of MAX-DOAS measurements, in particular for observations of long-range transport events.

In this study, several possible approaches to extend the vertical profiles are investigated using the radiative transfer model SCIATRAN. Tests include the use of several wavelengths, combination of different azimuthal directions, application of a fixed background spectrum and exploitation of polarised measurements. First results indicate that there is some additional profile information in such measurements but that the effect for practical applications is limited.

UP 5.2 Di 16:40 GW2 B3010

Comparison of NO2 vertical columns from satellite measurements with ground based measurements over Xianghe, China — •Lisa K. Behrens[1], Andreas Hilboll[2], Andreas Richter[1], Enno Peters[1], Francois Hendrick[3], Michel van Roozendael[3], and John P. Burrows[1] — [1]Institute of Environmental Physics, Bremen, Germany — [2]MARUM, Bremen, Germany — [3]Belgian Institute for Space Aeronomy, Belgium

NO2 is an important indicator for air pollution from anthropogenic sources. Due to its relatively short atmospheric life time, polluted areas can clearly be identified in global maps of satellite-derived NO2 abundances. For a better understanding of anthropogenic air pollution, there is constant need for validation of the satellite measurements using independent data sources. Here, we show a comparison of ground based and satellite measurements of NO2 tropospheric vertical columns (VCs) over Xianghe in Eastern China for the time period 2010-2013. The ground based data are from measurements by a Multi-Axis Differential Absorption Spectrometer (MAX-DOAS), located at 39.75°N and 116.96°E. For this study, the data of different satellite instruments were used.

The ground based measurements are compared with two different NO2 VCs retrievals from satellite measurements which are based on two different sets of a priori data. We investigate the influence of the satellite retrievals' a priori assumptions and other parameters on their agreement with the ground based observations, providing valuable information to further improve the satellite retrievals over China.

UP 5.3 Di 16:40 GW2 B3010

High Precission NO2 and NOx measurements with the ICAD instrument during s-b-s campaign Hohenpeißenberg 2016 — Denis Pöhler[1], •Erik Lutz[1], Martin Horbanski[1], Johannes Lampel[1], and ACTRIS s-b-s Team[2] — [1]Institute of Environmental Physics, Uni Heidelberg — [2]ACTRIS s-b-s intercomparison NOx 2016 Team

Nitrogen Oxides (NOx) play a major role in air pollution and atmospheric chemistry. Beside health effects they influence e.g. acid rain, ozone and oxidation capacity. But precise NO2 and NOx measurements are still difficult. During a ACTRIS side by side (s-b-s) intercomparison campaign at the Meteorological Observatory Hohenpeißenberg (DWD) 2016 the performance of different instruments for NO2, NO and NOx were investigated under natural and artificial conditions. We present results of our ICAD Instruments for direct optical NO2 and NOx measurements. The inter-comparison demonstrates excellent performance of ICAD in terms of accuracy and drift. Also different conditions like different humidity's, temperatures and possible interfering gases do not influence the measurement result.

UP 5.4 Di 16:40 GW2 B3010

Tower DOAS off-axis measurements of NO2 in Vienna, Austria — Stefan F. Schreier[1] and •Andreas Richter[2] — [1]Institut für Meteorologie, Universität für Bodenkultur, Wien, Österreich — [2]Institut für Umweltphysik, Universität Bremen, Bremen, Deutschland

Off-axis DOAS measurements were carried out on the rotating platform of the Danube Tower in Vienna (about 160 m above ground) in spring 2016. More than thirty rounds, each lasting for about 26 minutes, were performed on five days. After the measurements taken in off-axis direction inside the tower through a glass window, a couple of zenith-sky measurements were recorded from the open terrace (about ten meters below). The DOAS analysis is applied for the retrieval of O4 and NO2 differential slant column densities (DSCDs) in the visible spectral range. First results show a clear spatial variability in the distribution of NO2. Higher values are generally found above industrial areas and busy roads. O4 DSCDs are larger towards the plain, smaller towards the hilly area, and smallest towards the DC Tower (tallest skyscraper in Austria). The recorded spectral measurements have the potential to provide averaged NO2 mixing ratios in the horizontal path at about 160 m altitude for all directions.

UP 5.5 Di 16:40 GW2 B3010

Long-term MAX-DOAS measurement of trace gases and aerosol in the Environmental Research Station Schneefernerhaus — •Zhuoru Wang and Nan Hao — German Aerospace Centre, Remote Sensing Technology Institute (DLR-IMF), Oberpfaffenhofen, Germany

The Environmental Research Station Schneefernerhaus (UFS) is located under the summit of Zugspitze, Germany. It is an observation site with mostly clean and unpolluted air.

A MAX-DOAS instrument has been working in the UFS since February 2011. The telescope is located on the terrace of UFS. During the daytime, the telescope sequentially scans 8 different elevation angles. The instrument has two spectrometers, one for UV region, and the other for VIS region. The spectra measured by the two spectrometers are recorded synchronously.

The DSCDs of O_4, NO_2 and HCHO are calculated from the spectra with DOAS method. A retrieval algorithm, based on the radiative transfer model LIDORT and the optimal estimation technique, is used to provide information on the vertical profiles and VCDs of aerosol and trace gases.

This work presents the results of the MAX-DOAS measurement in the UFS from 2012 to 2015, including aerosol (derived from O_4 measurement), NO_2 and HCHO etc. The vertical profiles as well as the seasonal and diurnal variation patterns of tropospheric aerosol and trace gases will be shown.

UP 5.6 Di 16:40 GW2 B3010

Inter-comparison of glyoxal vertical columns retrieved from SCIAMACHY, OMI, GOME-2 (A and B) instruments — •Leonardo M. A. Alvarado[1], Andreas Richter[1], Andreas Hilboll[1,2], Mihalis Vrekoussis[1,2], Jonh P. Burrows[1], Stelios Myriokefalitakis[3], and Maria Kanakidou[3] — [1]Institute of Environmental Physics, University of Bremen, Bremen, Germany — [2]Center for Marine Environmental Sciences, University of Bremen, Bremen, Germany — [3]Environmental Chemical Processes Laboratory, University of Crete, Heraklion, Greece

Glyoxal is an intermediate product in the oxidation process of most VOC and an indicator of secondary aerosol formation in the atmosphere. Similar to other VOC, glyoxal is mainly emitted from natural processes, however has also a significant contribution from fires and anthropogenic sources. Since many years the number of retrievals of glyoxal abundances from satellite instruments using the DOAS method has increased. Most recently, some studies focused on improving the retrieval of glyoxal from different satellite measurements in order to reduce the uncertainties in the glyoxal columns and in estimation of VOC emissions. This study focuses on a new homogenized glyoxal product using AMF computed based on profiles simulated with the TM4-ECPL chemistry transport model. This retrieval algorithm is applied to (a) SCIAMACHY, (b) OMI, and (c) the two GOME-2 (A and B). Overall, the retrieved glyoxal column amounts from the homogenized retrieval algorithm show similar seasonal behavior among the instruments over selected regions.

UP 5.7 Di 16:40 GW2 B3010

Nachweis von nicht-identifiziertem Spurenstoff durch spektroskopische Fernerkundung im Hafengebiet von Hamburg. — •Stefan Schmitt[1], Andreas Weigelt[3], Barbara Mathieu-Üffing[2], André Seyler[2], Folkard Wittrock[2], Johannes Lampel[1], Denis Pöhler[1] und Ulrich Platt[1] — [1]Institut für Umweltphysik, Universität Heidelberg — [2]Institut für Umweltphysik, Universität Bremen — [3]Bundesamt für Seeschifffahrt und Hydrographie

Im August 2016 wurden über einen Zeitraum von 6 Wochen Langpfad-DOAS Messungen zur Überwachung von Schiffsemissionen im Hafengebiet von Hamburg durchgeführt. Dabei wurden Spurenstoffe innerhalb eines ca. 6 km langen Lichtweges über dem Fluss Elbe gemessen. Neben Absorptionen der bekannten Spezies NO_2, SO_2, O_3 und HCHO konnte auch eine bisher nicht identifizierbare Absorptionsstruktur nachgewiesen werden, welche im Wellenlängenbereich zwischen 280 nm bis 330 nm eine Progression von Absorptionsbanden besitzt und mit außerordentlich hohen optischen Dichten von bis zu 2% auftrat. Der Absorber hat einen ausgeprägten Tagesgang und wurde überwiegend tagsüber (bei solarer Einstrahlung) nachgewiesen, was ein Indiz für einen durch Photolyse gebildeten Spurenstoff ist. Die Absorptionsstruktur konnte noch keinem aus der Atmosphärenchemie bekannten Spurenstoff zugeordnet werden und auch nicht in bisherigen Datensätzen gefunden werden. Die spektrale Struktur ähnelt anderen bekannten UV-Absorbern und ein instrumentelles Problem kann ausgeschlossen werden.

UP 5.8 Di 16:40 GW2 B3010

Measurements of shipping emissions and trends in air quality with different methods — •Barbara Mathieu-Üffing[1,2], Lisa Kattner[1,2], André Seyler[1], Folkard Wittrock[1], Andreas Weigelt[2], Stefan Schmolke[2], and John Burrows[1] — [1]University of Bremen, Institute of Environmental Physics (IUP), Bremen, Germany — [2]Federal Maritime and Hydrographic Agency (BSH), Hamburg, Germany

During the project MeSmarT (Measurement of Shipping Emissions in the Marine Troposphere) the short and long term impact by emissions of nearby passing individual ships on air quality is monitored by in-situ measurements of NO, NO_2, O_3, SO_2 and CO_2, by DOAS (Differential Optical Absorption Spectroscopy) measurements and diffusive sampling of NO_2 and SO_2 at two stations, at river Elbe and at Neuwerk island. At times in parallel AQMesh® sensors were tested for suitability for measuring individual ship's emissions and air quality trends.

Variations and trends in background concentrations and pollution rate of some trace gases and differences between the two stations can be seen. The comparison of results shows chances and limitations of these methods with aspect to its application in environmental monitoring in atmospheric science and control of regulatory limits, i.e. to the MARPOL regulation of marine fuel sulphur content and its effect on air quality.

UP 5.9 Di 16:40 GW2 B3010

Monitoring shipping emissions in the German Bight using MAX-DOAS measurements — •André Seyler[1], Folkard Wittrock[1], Lisa Kattner[1,2], Barbara Mathieu-Üffing[1,2], Enno Peters[1], Andreas Richter[1], Stefan Schmolke[2], and John P. Burrows[1] — [1]Institute of Environmental Physics (IUP), University of Bremen — [2]German Federal Maritime and Hydrographic Agency (BSH), Hamburg

Shipping emissions contribute substantially to air pollution in coastal areas and harbor towns. The North Sea has one of the highest ship densities in the world.

A three-year time series of ground-based MAX-DOAS measurements of NO_2 and SO_2 on the island Neuwerk in the German Bight has been analyzed for contributions from shipping emissions. Measurements of individual ship plumes as well as of background pollution are possible

from this location, a few kilometers away from the shipping lane towards the port of Hamburg. More than 2000 individual ship emission plumes have been identified in the data and analyzed for the emission ratio of SO_2 to NO_2. Contributions of ships and land-based sources to coastal air pollution levels have been estimated. Since January 2015, much lower fuel sulfur content limits of 0.1% (before: 1.0%) apply in the North Sea Emission Control Area (ECA). The impact of this change in regulations on the coastal SO2 levels has been investigated.

This study is part of the project MeSMarT (www.mesmart.de), a cooperation between the University of Bremen and the German Federal Maritime and Hydrographic Agency (BSH).

UP 5.10 Di 16:40 GW2 B3010

Measurement of atmospheric trace gases using solar absorption spectroscopy in the Inner Tropics — •Mathias Palm[1], Cornelius Becker[2], Thorsten Warneke[1], Christof Petri[1], and Justus Notholt[1] — [1]Universität Bremen — [2]Meterologische Dienst Suriname

Measurements of atmospheric trace gas distributions in the inner tropics are sparse. The AG Notholt of the Universität Bremen has been active since 2004 in Paramaribo, Suriname, 6N. Until 2012 measurements were only conducted on campaigns during the dry periods in spring and autumn.

Since 2012 measurements could be extended to cover the whole year. We show the first results of whole year measurements above Paramaribo and compare them to independent measurements from satellite and some first model results. This is of interest because the inner tropical convergence zone (ITCZ) sweeps over Paramaribo and allows measurements of the southern and northern atmosphere and the transition thereof.

One trace gas, HCl, which is linked to Ozone depletion, shows since a few years a very distinct seasonal cycle. First attempts of the interpretation of those measurements will be shown and discussed.

UP 5.11 Di 16:40 GW2 B3010

LED Based Quarz Enhanced Photoacoustic Spectroscopy: A cost effective solution for in-situ detection of volcanic Sulfur Dioxide? — •Lukas Tirpitz, Simone Wald, Nicole Bobrowski, Ulrich Platt und Jonas Kuhn — Institut für Umweltphysik Heidelberg

Volcanic gas measurements, particularly of sulfur dioxide (SO2) play an essential role for the examination of volcanic degassing processes. In the field application, in-situ instruments are frequently affected by harsh environmental conditions and the high corrosivity of volcanic gas species, making such measurements laborious, expensive, and frequently unreliable. Sensors for volcanic SO2 based on quartz enhanced photoacoustic spectroscopy (QEPAS) use the fact, that SO2 is the dominant absorber of UV-radiation around 300 nm wavelength. Thus the amount of radiation absorbed by the sample gas depends only on its SO2 content. Since the absorbed radiation is converted to heat, illumination by a pulsed light source causes the temperature and thus pressure of the sample gas to oscillate and to emit an acoustic wave. A small resonant 32.8 kHz quartz tuning fork (as it is used in any quartz clock) serves as a microphone to detect the signal intensity and to determine the SO2 concentration. Typically, large and expensive laser systems are used as light sources. We are developing a cost effective, mobile, and potentially ultra-compact QEPAS instrument using commercially available UV light emitting diodes, which we expect to be sufficient to reliably detect typical volcanic plume SO2 abundances at useful detection limits (<1 ppm).

UP 5.12 Di 16:40 GW2 B3010

Development of the Scanning Mobile ATMONSYS Lidar for water Vapor, Aerosol and Temperature — •Hannes Vogelmann, Thomas Trickl, Matthias Perfahl, and Stefan Biggel — KIT IMK-IFU, Garmisch-Partenkirchen, Germany

Water vapor is the most important greenhouse gas and dominates weather patterns, the atmospheric energy budget and atmospheric dynamics. For analysing dynamic processes of the planetary boundary layer we developed a scanning lidar for measuring water vapor, aerosols and temperature. In order to obtain 3-dimensional information it is equipped with a scanner covering the entire hemisphere above the system. Water vapor is measured with the differential absorption method (DIAL), aerosol with simple backscatter from different wavelengths and temperature with the rotational Raman-backscatter of air-molecules. We present the design of the three-stage laser-system including a diode-pumped Nd:YAG-Laser, a single mode two-wavelengths Ti:Sapphire oscillator and a regenerative Ti:Sapphire amplifier. We also give insight into the design of the lidar receiver with separate telescopes for near and far field, the scanning optics, the structure of the polychromators and the data aquistion. Additionally we report from our first field campaign (ScaleX) with the new system in summer 2016 in Peißenberg.

UP 5.13 Di 16:40 GW2 B3010

Results of the imaging DOAS instrument IMPACT at CINDI-2 and comparison to MAX-DOAS-observations — •Mareike Ostendorf[1], Enno Peters[1], Anja Schönhardt[1], Andreas Richter[1], André Seyler[1], Folkard Wittrock[1], Stefan Schreier[2], Mihalis Vrekoussis[1,3], and John P. Burrows[1] — [1]Institut für Umweltphysik (IUP), Universität Bremen, Bremen, Deutschland — [2]Institut für Meteorologie, Universität für Bodenkultur Wien (BOKU), Wien, Österreich — [3]Zentrum für Marine Umweltwissenschaften (MARUM), Bremen, Deutschland

This contribution presents and discusses the new ground-based instrument IMPACT (Novel Imaging MaPper for Atmospheric observaTions) developed at the IUP Bremen. The instrument uses Differential Optical Absorption Spectroscopy (DOAS) to measure trace gas column amounts, e.g. of NO_2. The special characteristic of the imaging DOAS instrument is the capability to measure in 50 vertical viewing directions (elevation angles) simultaneously. By combination with a pan-tilt head for azimuthal movements, complete hemispheric scans are achieved within a short time. See also accompanying talk by E. Peters.

The measurement and retrieval procedure results in images of distributions of NO_2 and O_4, which yield information about local sources, transport and diurnal variations.

The poster focuses on results and comparisons to MAX-DOAS measurements, which were obtained during the CINDI-2 campaign in summer 2016 in Cabauw, Netherlands.

UP 5.14 Di 16:40 GW2 B3010

20 years of tropical tropospheric ozone columns from nadir retrievals of GOME, SCIAMACHY and GOME-2 using the Convective Clouds Differential technique Elpida — •Elpida Leventidou[1], Mark Weber[1], Kai-Uwe Eichmann[1], John P. Burrows[1], and Andrea Pozzer[2] — [1]Inst. of Environmental Physics, University of Bremen, Bremen, Germany — [2]Max-Planck-Institut for Chemistry , Mainz, Germany

Tropical tropospheric ozone columns can be retrieved with the Convective Cloud Differential (CCD) technique using retrieved total ozone columns and cloud parameters from space-borne observations. A CCD-IUP algorithm has been developed and applied to GOME, SCIAMACHY, and GOME-2 weighting function DOAS total ozone data. A 20 years record of monthly averaged tropical tropospheric ozone columns (20S - 20N) was created starting in 1996 and was extensively validated by comparisons with SHADOZ ozonesonde data. The comparison shows good agreement. Biases where found to be within 5 DU and the RMS errors less than 10 DU. The dataset has been harmonized into one consistent time series and was later used to determine tropical tropospheric ozone trends. The mean tropical tropospheric ozone trends range between +/-5 DU/Decade, with a mean value of 1.15 +/- 1.1 DU/Decade. The influence of 2015 el Niño event has been investigated in a case study using simulations from the ECHAM/Messy Atmospheric Chemisty model. Enhanced tropospheric ozone columns have been found over the Indonesian region (~ 8DU) and reduced over the eastern Pacific (~-10 DU).

UP 5.15 Di 16:40 GW2 B3010

Retrieval of stratospheric ozone profiles from OMPS measurements in limb viewing geometry — •Carlo Arosio[1], Alexei Rozanov[1], Kai-Uwe Eichmann[1], Elizaveta Malinina[1], John P. Burrows[1], Glenn Jaross[2], and Pawan K. Bhartia[2] — [1]Institute of Environmental Physics, University of Bremen, Germany — [2]NASA, Goddard Space Flight Center, USA

Due to its crucial role in the radiative budged of the stratosphere as well as its importance as an absorber of UV radiation, a continuous monitoring of the stratospheric ozone has been a priority for the scientific community. After the European ENVISAT satellite ceased its operations in 2012, only a few older satellite missions have been still contributing to this task. At the end of 2011, SUOMI-NPP mission carrying OMPS instrument was launched, enabling the study of the vertical distribution of stratospheric ozone by analyzing the intensity of the scattered solar light in limb viewing geometry.

The focus of our study is to adapt the algorithm developed at IUP

for the retrieval of stratospheric ozone profiles from SCIAMACHY limb measurements to OMPS observations, with the final aim to obtain a continuous data set from both instruments. The retrieval settings account for the instrumental design by exploiting different spectral ranges at UV and VIS wavelengths. A cloud filter based on the Color Index Ratio is applied and surface albedo is retrieved simultaneously, accounting for stratospheric aerosol. The retrieval results over 6 months are compared in this poster with the NASA retrieval product and validated using MLS and ozonesondes collocated observations.

UP 5.16 Di 16:40 GW2 B3010

Vergleich der Aerosol-Extinktionsprofile aus SCIAMACHY Okkultations- und Limbmessungen — •Jacob Zalach und Christian von Savigny — Universität Greifswald

Im Rahmen des ROMIC-ROSA Projekts wurden stratosphärische Aerosol-Extinktionsprofile mitsamt der Teilchengrößenverteilung aus Sonnenokkultationsmessungen gewonnen. Die Messungen wurden mit dem Spektrometer SCIAMACHY auf EnviSat, dem ersten europäischen Okkultationssatelliten, gewonnen. Sie erstrecken sich über den Zeitraum 2002-2012 und überdecken den Wellenlängenbereich von 240 bis 2340 nm. Neben der Darstellung der Datenverarbeitung werden die errechneten Extinktionsprofile mit denen aus unabhängigen Limb-Referenzmessungen verglichen.

UP 5.17 Di 16:40 GW2 B3010

Merged Total Water Vapour product from AMSU-B and AMSR-E data in the Arctic region — •Arantxa Triana Gómez, Georg Heygster, and Christian Melsheimer — Institute of Environmental Physics, University of Bremen, Bremen, Germany

Water vapour plays a key role in the global climate system, and its global continuous knowledge is required for numerical weather prediction and climate models. Microwave imagers like SSM/I or AMSR-E have routinely provided daily vertically integrated water vapour content (total water vapour, TWV) over open ocean for more than 30 years, but not over the vast areas of the polar sea and land ice. Over those surfaces, a newer method based on data of the microwave humidity sounders AMSU-B and MHS, on the NOAA and METOP satellites respectively, gives the TWV. However, at the edges of the coverage of both methods some discrepancies have been observed. The first steps towards merging these two complementary datasets will be presented. This will eventually provide an Arctic-wide daily dataset of 50 km resolution with seamless coverage from the high Arctic to mid-latitudes from 2002 until now. With that, an assessment of water vapour distribution and temporal variations is possible.

UP 5.18 Di 16:40 GW2 B3010

Vergleich von Methoden zur Bestimmung der Nichtlinearität von Spektrometern — •Erik Lutz, Denis Pöhler, Martin Horbanski und Ulrich Platt — IUP, Heidelberg, Germany

Ist das elektrische Auslesesignal von Spektrometern nicht linear proportional zur einfallenden Lichtintensität, so spricht man von auftretender Nichtlinearität. Gerade bei DOAS Anwendungen mit kompakten Spektrometern, können diese Abweichung bis zu 5% des detektierten Signals ausmachen. Deshalb ist es dort unabdingbar, diese Effekte zu korrigieren um auftretende Absorptionsstrukturen korrekt zu erfassen.

Dieser Beitrag präsentiert zwei Methoden zur Bestimmung der Nichtlinearität von kompakten Spektrometern; die Methode der Belichtungszeitvariation sowie die Methode der differentiellen Intensität. Im Fokus steht jedoch letztere von beiden, bei welcher zwei LEDs per Faserkopplung superponiert werden, um die Sensitivität des Detektors über den kompletten Sättigungsbereich zu erfassen. Eine LED dient hierfür als variable Lichtquelle um das jeweilige Sättigungslevel einzustellen, die andere, temperaturstabilisiert und von geringer Intensität, als "differentiellen" Offset der während der Messung in alternierender Weise hinzugeschalten wird.

Es werden Labormessungen mit beiden Methoden gezeigt und deren Vor- und Nachteile diskutiert.

UP 5.19 Di 16:40 GW2 B3010

Development of a measuring device to detect the angular distribution of solar irradiance — •Jörg Bendfeld, Stefan Balluff, Tobias Harst, Stefan Wübbecke, and Johannes Becker — Universität Paderborn, Paderborn, Deutschland

The precise knowledge of solar resources is important for the most efficient conversion of irradiation into solar energy.Global Horizontal Irradiance (GHI) is the total amount of solar radiation received from the sun by a horizontal surface. This value is a base information for photovoltaic installations and includes both Direct Normal Irradiance (DNI) and Diffuse Horizontal Irradiance (DHI).Direct Normal Irradiance (DNI) is the solar irradiation received by a surface that is normal to direction of the sun. The DNI is of importance for concentrating solar thermal installations and tracking Units. Diffuse Horizontal Irradiance (DHI) is the irradiation without the direct DNI. This diffuse irradition is caused by scattering of molecules and particles in the atmosphere. The new device will be able to detect all of this parameters and will be able to differentiate between the direction of all irradiation components. In contrast to classical pyranometers, the new device responds to the solar irradiation with an angular range sensor instead of a single horizontally oriented receptor surface. These tubular optical system is mounted on a gear to reach every azimuth and elevation angle over a hemispherical surface with a configuration which minimises overlap and missed regions of the sky. The internal surfaces of the tubular optical systems are designed to suppress reflections. This ensures sharply defined delimitation of the individual sky regions.

UP 5.20 Di 16:40 GW2 B3010

Box-Modell der Spriteentzündung in der Mesosphäre — •Philipp Richter, Holger Winkler und Justus Notholt — Universität Bremen, Institut für Umweltphysik

Ein Sprite (dt. Kobold) ist eine Entladung, welche in der Mesosphäre in Höhen von ungefähr 80 km über Gewitterwolken auftreten kann. Mithilfe eines für diese Arbeit entwickelten Modells der Elektrostatik in der Mesosphäre wird das notwendige Strommoment bestimmt, welches für die Entstehung eines Sprites notwendig ist. Das Modell löst gewöhnliche Differentialgleichungen, welche sich aus der Kontinuitätsgleichung und der Poisson-Gleichung sowie Reaktionsgleichungen ergeben, zur Berechnung der (reduzierten) elektrischen Feldstärke, sowie Teilchendichten von e-, N2+, O2+, O-, O+, N+, N2 und O2. Dazu werden Ratenkoeffizienten von BOLSIG+, Borisov et al./Sentman et al. und Pasko et al. verwendet. Abhängig von den verwendeten Ratenkoeffizienten liegt die kritische reduzierte elektrische Feldstärke zwischen 93 Td und 138 Td, sowie das für einen Sprite notwendige Strommoment bei ungefähr 200 kA km. Ein Streamer kann bei denselben reduzierten elektrischen Feldstärken entstehen.

UP 5.21 Di 16:40 GW2 B3010

Atmospheric gravity waves activity in the polar mesopause region based on PMSE observations — •Nikoloz Gudadze, Jorge L. Chau, and Gunter Stober — Leibniz Institute of atmospheric physics at Rostock university, 18225 Kühlungsborn, Germany

Atmospheric gravity waves (AGW) has important influence on mesosphere-lower thermosphere dynamics. It assumed that the part of the Atmospheric gravity waves breaks and/or dissipates in the mesopause region. Continuous Observations of the polar summer mesosphere with the Middle Atmosphere Alomar Radar System (MAARSY) have been used to investigate dynamical structures of well-known phenomenon - Polar esosphere Summer Echoes (PMSE), an important tracer in the summer polar mesopause region. We use Signal to Noise Ratio (SNR) and Doppler radial velocity from the PMSEs to investigate the wave-like motions with periods larger than 5 minutes. Such oscillations are studied in terms of atmospheric gravity waves (AGWs). Analysis shows dominance of wave-like oscillations with periods close to 15 minute in the range of short-period wave activity. PMSE layering, which could also connected with AGWs, is studied in connection with the background conditions of the neutral atmosphere. Background winds are obtained from collocated meteor radar (MR) and also based on PMSE radial velocities observed during multi-beam experiments. Local enhancement method is used for the processing of altitude-time SNR images to detect and characterized layers in the PMSEs.

UP 5.22 Di 16:40 GW2 B3010

Combining L-band sensor data for thin sea ice thickness retrieval — •Catalin Patilea, Georg Heygster, Marcus Huntemann, and Justus Notholt — University of Bremen, Institute of Environmental Physics, Bremen, Germany

Thin sea ice thickness retrieval has been developed for the L-band radiometer Soil Moisture Ocean Salinity (SMOS) using daily means of high incidence angle (40-50°) data. The algorithm uses the correlation between brightness temperature intensity and polarization difference for retrieving sea ice thickness up to 0.5 m.

Fit functions for the dependence of the horizontal and vertical polarized brightness temperatures (Tbs) on incidence angle have been used

for each SMOS grid point and day so that Tbs for any incidence angle can be extracted. This avoids daily introduction of a bias by the averaging process and it replaces the Radio Frequency Interference (RFI) filter used formerly which removed the whole snapshot if it contained one data point over 300 K which resulted in large areas with no data.

The L-band conically scanning radiometer Soil Moisture Active Passive (SMAP) has satellite level RFI filtering yielding a more complete coverage. A combined product is developed regressing SMAP Tbs to those of SMOS at 40° incidence angle. The combined sea ice thickness data has a better daily coverage and less noise.

UP 5.23 Di 16:40 GW2 B3010

Observations and Models of Low Mode Internal Waves in the Ocean — •Maren Walter[1], Christian Mertens[1], Janna Köhler[1], Jonas Löb[1], Jin-Song von Storch[2], and Monika Rhein[1] — [1]MARUM/IUP, Otto-Hahn Allee, 28359 Bremen — [2]MPI für Meteorologie, Bundesstrasse 53, 20146 Hamburg

Internal gravity waves in the ocean are generated by tides, wind, and interaction of currents with the seafloor. Models predict a global energy supply for the internal waves of 0.7-1.3 TW by the conversion of barotropic tides at mid-ocean ridges and abrupt topographic features. Winds acting on the oceanic mixed layer contribute 0.3-1.5 TW and mesoscale flow over topography adds 0.2 TW. Globally, 1-2 TW are needed to maintain the stratification of the deep ocean by diapycnal mixing that results from breaking internal waves. Ocean circulation models show significant impact of the spatial distribution of internal wave dissipation and mixing on the ocean state, e.g. stratification and meridional overturning. Observations indicate that the local ratio of generation and dissipation of internal waves is often below unity and thus the energy available for mixing must be redistributed by internal tides and near-inertial waves at low vertical wavenumber that can propagate thousands of kilometers from their source. Eddy-permitting global ocean circulation models are able to quantify the sources of energy input and to simulate the propagation of the lowest wave modes. However, the variation of the internal wave energy flux along its paths and its ultimate fate by dissipation remains to by parameterized.

UP 5.24 Di 16:40 GW2 B3010

Variability of transport and pathways of the North Atlantic Current: a comparison of satellite altimetry data and observational data from pressure inverted echo sounders — •Hannah Nowitzki[1,2], Monika Rhein[1,2], Achim Roessler[1,2], and Dagmar Kieke[1,2] — [1]MARUM - Center for Marine Environmental Sciences, Bremen, Germany — [2]Institute of Environmental Physics, University of Bremen, Germany

The North Atlantic with its major currents being part of the Atlantic Meridional Overturning Circulation (AMOC) is one of the major climate relevant regions and of special interest in the context of climate change. The North Atlantic Current (NAC) forms the upper branch of the AMOC and transports warm and saline water from the subtropics into the subpolar North Atlantic. This provides the energy for basal melt of the Greenland Ice Sheets and also leads, for instance through the exchange of heat between the sea surface and the atmosphere, to relatively mild winter temperatures in northern Europe. The strength of the NAC and its pathways, both examined in this work, are thus closely linked to the global climate.

To study the circulation in the subpolar North Atlantic with a focus on the NAC, satellite altimetry data is combined with NAC transports measured with pressure inverted echo sounders. This data is then related to the North Atlantic Oscillation in order to study the link between the NAC circulation and atmospheric fluctuations.

UP 5.25 Di 16:40 GW2 B3010

detection and variability of frontal structures in the North-West Atlantic from satellite observations — •Aleksei Buinyi[1], Dagmar Kieke[1], and Paul Myers[2] — [1]MARUM/IUP, University of Bremen, Bremen, Germany — [2]Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton, Alberta, Canada

The Subpolar North Atlantic (SPNA) is known as one of the climate relevant regions of the world's oceans. This region receives both warm and salty water masses of tropical/subtropical origin that are being transported to higher latitudes as well as cold and fresh waters from polar latitudes being transported southward. As a consequence, front formation takes place at the "meeting point" of these water masses. The present study deals with the analysis of Sea Surface Temperature (SST) and AVISO altimetry datasets in the western part of SPNA with the aim of detecting oceanic fronts and eddies and determining their shape, strength and location. Both datasets have a spatial resolution of 0.25°x0.25°, temporal resolution of one day, cover the time interval from 1993 to 2015. We examine the region bounded by longitudes 65°W-35°W and latitudes 35°N-65°N. For the detection of the fronts an algorithm based on the so-called gradient method was applied. Identifying the position of the highest SST gradients allows us to allocate thermal fronts. Dynamic topography fields from AVISO are used to detect dynamic fronts as places of divergence or convergence of velocity fields. As a result, usage of different data sources allows us to detect fronts with higher rate of evidence and get information about their genesis and variability.

UP 5.26 Di 16:40 GW2 B3010

Variability of Labrador Sea Water transport through Flemish Pass in 2015-2016 — •Fanny Wischnewski[1], Dagmar Kieke[1,2], Linn Schneider[1], and Monika Rhein[1,2] — [1]IUP, University of Bremen, Bremen, Germany — [2]MARUM, University of Bremen, Bremen, Germany

Labrador Sea Water (LSW), the lightest component of North Atlantic Deep Water, originates in the Labrador Sea and is transported southward by the Deep Western Boundary Current (DWBC). At the western margin of the subpolar North Atlantic at about 46°N up to 48°N, Flemish Pass represents an alternative pathway to the major DWBC pathway bypassing the underwater plateau Flemish Cap further offshore. Constrained by the Grand Banks and by Flemish Cap, Flemish Pass is a shallow underwater passage with a sill depth of 1200m that avoids zones of potential stirring and potential deflection of water masses into the interior North Atlantic. The passage allows about 20% of upper LSW to pass southward, and combined with the volume flowing within the DWBC around Flemish Cap, this makes an important contribution to the cold return branch of the Atlantic Meridional Overturning Circulation (AMOC). On the basis of sustained mooring data and ship-based measurements, recorded in 2015 and 2016, estimations of the recent volume transport of LSW through Flemish Pass are undertaken, and the variability of the resulting transport time series and possible variability-generating processes are analyzed. The findings of this study will contribute to a better understanding of this shallow cold return branch of the AMOC.

UP 5.27 Di 16:40 GW2 B3010

Wollingster See: Dating of lake sediment core using natural and artificial radionuclides — •Manuel Perez-Mayo[1], Hareem Ikram[1], Daniela Pittauer[2], Dirk Enters[3], and Helmut W. Fischer[1] — [1]Institute of Environmental Physics, University of Bremen, Germany — [2]MARUM, University of Bremen, Germany — [3]Geopolar, University of Bremen, Germany

Lake sediment cores are valuable archives of the changing environment. They contain information on local and regional atmospheric deposition, including material from surroundings brought through erosion and specially metal pollutants. A very well know method to dating the last 100 years is based on the signal of $^{210}Pb_{xs}$ often supported by the peaks of ^{137}Cs as absolute time markers (e.g. atmospheric bomb test fallout and Chernobyl).

Natural and artificial radioisotopes as ^{210}Pb, ^{214}Bi, ^{214}Pb, ^{40}K, ^{137}Cs, ^{241}Am and plutonium isotopes were analysed in a sediment core taken in a deep part of the lake Wollingster See (NW Germany) in order to provide a reliable chronology enabling to reconstruct the environmental changes.

Actual results show very high and apparently also quite variable sediment accumulation rates. ^{137}Cs cannot be used as precise marker, as the bomb test and Chernobyl maxima can not be clearly indentified. In that case, we need to seek for information from additional radioisotopes like ^{241}Am using techniques of spectra summing in gamma spectrometry and measuring Pu isotopes by alpha spectroscopy to distinguish better between nuclear weapons testing and Chernobyl deposition.

UP 5.28 Di 16:40 GW2 B3010

Re-examination of Cs-137 depth profiles in undisturbed soils in Northern Germany — •Aikaterini Anesiadou[1], Maria Evangelia Souti[1], Helmut Fischer[1], and Gerald Kirchner[2] — [1]Institute of Environmental Physics, University of Bremen, Germany, email: aanesiad@uni-bremen.de — [2]Hamburg University, Germany

Knowledge of the evolution of Cs-137 vertical profile in soils after a surface contamination is crucial for predicting the transfer to human food chains and/or groundwater contamination. The objective of this study is the re-examination the vertical distribution of Cs-137 originating from the Chernobyl accident and nuclear weapons fallout at

undisturbed soil profiles in northern Germany sampled in 1992 and 1994 and recently in 2014 at two identical locations. The goals are to measure and compare the depth distributions between the two sampling dates and also between the two regions. Moreover, a mathematical model based on the convection-dispersion equation will be fitted to the data of each soil core. The comparison between profiles taken at different times is expected to provide more reliable modelling results.

For both locations, the first one characterised as Orthic Podsol and the second one as Umbric Gleysol, Cs-137 could be detected until 72 cm respectively 48 cm depth. Results, in general, demonstrate decreasing activity concentrations with depth with values ranging from about 29.5 to 0.1 Bq/kg and from about 11.5 to 0.1 Bq/kg respectively. Additionally, the expected downward migration of Cs-137 between the past and recent soil core is observed.

UP 5.29 Di 16:40 GW2 B3010

Mathematische Neubetrachtungen der katalytischen Wasserstoff- Sauerstoffverbrennung — •Mathias Schmitz — confiducia GmbH, 69118 Heidelberg

Die regenerativen Energiequellen haben bei allen Vorzügen ein Problem, das darin besteht, dass in der Regel die Energieerzeugung diskontinuierlich abläuft. Das Sonnenergie- und Windangebot unterliegt täglichen und jahreszeitlichen Schwankungen, die nicht der Energienachfrage entsprechen. Damit stellt sich die Aufgabe, die Energie zwischenzeitlich zu speichern. Leider sind die technisch eingesetzten Speichersysteme für thermische und elektrische Energie sehr teuer und daher sind in den meisten Anwendungen Speicher unwirtschaftlich. Besonders dann, wenn die Speicherzeiten aus dem Stundenbereich in den Tagebereich verlängert werden, ist die Wirtschaftlichkeitsgrenze schnell überschritten. Insbesondere ist die eMobilität von leistungsfähigen Speichern abhängig. Eine Lösung dieser Problematik bietet das Konzept der Wasserstoffwirtschaft. Im Rahmen der Wasserstoffwirtschaft wurde auch die katalytische Verbrennung untersucht. In meiner Diplomarbeit mit dem Thema: *Untersuchungen zum Mechanismus und zur Kinetik der Reaktion explosiver Wasserstoff-Sauerstoff-Gemische an selbstbegrenzenden Palladium-Katalysatoren* führte ich Messungen zu einem katalytischen Rechenmodell durch. Nun, über 30 Jahre später stelle ich dieses Rechenmodell in Frage, wie bereits in der Diplomarbeit dargestellt ist.

UP 5.30 Di 16:40 GW2 B3010

Parameter for forecasting of offshore wind farms — •Jörg Bendfeld and Stefan Balluff — Universität Paderborn, Paderborn, Deutschland

Data from operational offshore wind farms is only available over a short time period. Consequently, it is difficult to extrapolate current data to future deployments. The alternative approach is to estimate wind climate using wind speed data from met masts like FINO I, II and III or the met masts Amrumbank West, Arkona Becken Südost and climate model data like MERRA. There are very few stations that record offshore wind speed and climate. Offshore wind speed, especially in areas that are not close to land, is not subject to many of the spatial factors that influence changes in wind speed onshore; as a result is likely to be more homogeneous over larger areas. The Fetch is important to keep in mind. Predicting the short term wind speed and the resulting energy is of high importance. The chosen meteorological and geographical parameters are very important to improve the forecast/nearcast. Among several parameters the trend of wind speed, wind direction, thermal layering and pressure are important.

UP 5.31 Di 16:40 GW2 B3010

Evidenz und Kausalität der schädlichen Wirkung von Infraschall — •Joachim Schlüter. — Badenweiler

Die Richtigkeit der in vielen Fallstudien erhobenen Behauptung, Infraschall (IS) mache auch unterhalb der Hörschwelle krank, ist von Wanka und Cooper experimentell bewiesen worden. Der Einwand der Befürworter der Windkraft, windradgenerierter IS reiche ohnehin nur 700 m weit, beruht auf der fehlerhaften Auswertung einer Messung: Glättung eines harmonischen IS-Spektrums durch geringe Auflösung. Solche Spektren jedoch können Mensch und Tier wahrnehmen und als Zeichen der Annäherung eines Predators interpretieren. Mit dieser Hypothese wird die krankmachende Wirkung des IS erklärt. Sie wird zusätzlich durch Alltagsbeobachtungen gestützt. Die Umweltbelastung durch IS beruht auf dem Informationsgehalt diskreter Spektren und kann daher nur mit Hilfe des Signal-Rausch-Verhältnisses, nicht aber des Schallpegels bewertet werden.

UP 6: Methoden - Fernerkundung

Zeit: Mittwoch 8:30–11:00 Raum: GW2 B3009

Hauptvortrag UP 6.1 Mi 8:30 GW2 B3009

Tandem-L: Highly Innovative Interferometric Radar Satellite Mission for Climate Research and Environmental Monitoring — •Alberto Moreira — German Aerospace Center (DLR), Microwaves and Radar Institute, Wessling/Oberpfaffenhofen, Germany

Tandem-L is a proposal for a highly innovative L-band SAR satellite mission for the global observation of dynamic processes on the Earth's surface with hitherto unparalleled quality and resolution. Thanks to the novel imaging techniques and the vast recording capacity with up to 8 Terabytes/day, it will provide vital information for solving pressing scientific questions in the biosphere, geosphere, cryosphere, and hydrosphere. The Tandem-L mission concept is based on the use of two SAR satellites with variable formation flight configurations and is distinguished by its high degree of innovation with respect to the methodology and technology. Examples are the polarimetric SAR interferometry for measuring forest height, multi-pass coherence tomography for determining the vertical structure of vegetation and ice, the utilization of the latest digital beamforming techniques in combination with a large deployable reflector for increasing the swath width and imaging resolution, as well as the formation flying of two cooperative radar satellites with adjustable spacing for single-pass interferometry. Hence, in a time of intensive scientific and public debate on the extent and influence of climate change, Tandem-L will deliver vital missing information for improved scientific predictions upon which socio-political decisions can be based.

UP 6.2 Mi 9:00 GW2 B3009

Automatic detection of polar mesocyclones using satellite microwave humidity sounders — •Christian Melsheimer — nstitute of Environmental Physics, University of Bremen, Germany

Polar mesocyclones are small intense cyclones in polar and subpolar areas. They are challenging to observe, model and predict because of their small size, rapid development and short lifetime. Therefore polar mesocyclones and polar lows (PLs i.e., particularly strong PMCs over the sea) are poorly monitored – yet they have significant influence on atmosphere, ocean and sea ice. Here we present first results of an automatic detection algorithm, based on a simple threshold-based method using data from microwave humidity sounders (AMSU-B and MHS) on several operational meteorological satellites: On maps of the difference between the channels at 183±1 GHz and 183±7 GHz, PMCs over open ocean are visible as small patches of reversed sign. Such PMC signatures can be found by a classification algorithm that determines the size and shape of the patches and joins clusters of them if they are close enough to be considered belonging to the same cyclone. Such an algorithm must be trained, i.e., the distinguishing features of a PMC signature (size, shape, distance to similar signatures) have to be determined. This algorithm training is done by analysing signatures of about 100 known PMCs and PLs cases over the Norwegian Sea between 2000 and 2010. An automatic PMC and PL detection algorithm will allow to compile inventories of PMCs during the whole period of AMSU-B/MHS data (1999 to date). Until now, all such inventories had to be compiled by manual interpretation of satellite data.

UP 6.3 Mi 9:15 GW2 B3009

Experiences with an optimal estimation algorithm for surface and atmospheric parameter retrieval from passive microwave data in the Arctic — •Raul Scarlat and Georg Heygster — University of Bremen - Institute of Environmental Physics Otto-Hahn-Allee 1, 28359 Bremen, Germany

In this study we present experiences in using an integrated retrieval method for atmospheric and surface parameters in the Arctic using passive microwave data from the AMSR-E radiometer.

The core of the method is a forward model which can ingest bulk data for seven geophysical parameters to reproduce the brightness temperatures observed by a passive microwave radiometer. The retrieval method inverts the forward model and produces ensembles of the seven parameters. These are wind speed, integrated water vapor, liquid water path, sea and ice surface temperature, sea ice concentration and multi-year ice fraction. The forward model uses empirically determined sea ice surface emissivities for simulating brightness temperatures in ice covered areas. Three distinct versions of the retrieval method were implemented using the lower eight, ten and all twelve channels respectively.

This study provides an overview of the results for atmospheric and surface parameter retrieval as well as suggestions for future improvements.

UP 6.4 Mi 9:30 GW2 B3009

Impact of ambient conditions on the DOAS retrival of NOVAC data — •Elsa Wilken[1], Florian Dinger[1,2], Simon Warnach[1,2], Nicole Bobrowski[1,3], and Ulrich Platt[1] — [1]IUP, University of Heidelberg — [2]MPI Chemistry, Mainz — [3]University of Mainz

The measurement of magnitude and composition of volcanic gas emissions allow insights in magmatic processes as well as the impact of volcanoes on the atmospheric chemistry. Therefore the Network for Observation of Volcanic and Atmospheric Change (NOVAC) has been installed for monitoring the SO2 and BrO emissions of 30 volcanoes using scanning UV-spectrometers. The volcanic gas emissions are retrieved from the recorded spectra by applying Differential Optical Absorption Spectroscopy (DOAS). While NOVAC records an outstanding amount of gas emission data, the drawback of this automatically operating network is a limited accuracy and precision compared to manual measurements. For accurate retrievals, it is mandatory to find a Fraunhofer reference spectrum (FRS) which is free of volcanic gas and was recorded under similar conditions (e.g., instrument temperature, atmospheric conditions). We present an analysis of the impact of different external parameters on the DOAS fit quality when evaluating spectra using a FRS recorded, for example, on a different day. Based on our findings, an algorithm is introduced which automatically recommends for each plume spectrum a recorded FRS which optimises the accuracy. We show previous data from Tungurahua (Ecuador) and compare them to data created with the FRS with optimised accuracy.

UP 6.5 Mi 9:45 GW2 B3009

Satellite Remote Sensing of Halogens in the Arctic Troposphere — •Ilias Bougoudis, Anne-Marlene Blechschmidt, Andreas Richter, Anja Schoenhardt, and John Burrows — University of Bremen

Halogens play a key role in the atmospheric composition of the Arctic atmosphere. They deplete the major greenhouse gas, Ozone which also is a precursor of OH and thereby potentially change radiative properties and temperature, as well as the oxidizing capacity of the Arctic atmosphere. Previous studies have shown that the recent temperature increase due to climate change is more pronounced in the Arctic compared to other parts of the globe, a phenomenon known as Arctic Amplification. Our primary goal is to investigate if Arctic Amplification affects tropospheric concentrations of halogens in the Arctic during recent years, and how these changes are related to changes of parameters regarded as crucial for release of halogens into the troposphere such as sea ice conditions, oceanic phytoplankton, temperature and wind speed. To assess this goal, satellite retrievals of halogens from different UV-VIS satellite sensors will be used. Preliminary results on intercomparing already existing satellite retrievals of BrO from GOME-2 and SCIAMACHY are presented, indicating a need to improve the retrievals in order to study the evolution of halogens in the Arctic in time under Arctic Amplification.

UP 6.6 Mi 10:00 GW2 B3009

Global phytoplankton functional type products derived from the Ozone Monitoring Instrument using PhytoDOAS — •Julia Oelker[1], Tilman Dinter[2], Vladimir R. Rozanov[1], Andreas Richter[1], John P. Burrows[1], and Astrid Bracher[2] — [1]Institut für Umweltphysik, Universität Bremen, 28359 Bremen — [2]Alfred-Wegener-Institut für Polar- und Meeresforschung, 27568 Bremerhaven

Ocean color sensors measure backscattered radiance in up to eight wavelength bands from which phytoplankton chlorophyll-a concentrations are derived. Various algorithms exist to additionally extract information on phytoplankton community from such multi-spectral sensors, e.g. size classes or phytoplankton functional types (PFT), however, it is generally agreed that hyper-spectral sensors, due to increased spectral information, are more suitable for phytoplankton community studies. So far, no ocean color sensors with hyper-spectral resolution are available. It has been shown though for the hyper-spectral sensor SCIAMACHY, designed for the retrieval of atmospheric trace gases, that retrieval of oceanic paramaters is possible. Chlorophyll-a concentrations of up to four PFTs have been retrieved simultaneously from SCIAMACHY data using PhytoDOAS a method based on Differential Optical Absorption Spectroscopy (DOAS). Here we will present global PFT products from the still-operating Ozone Monitoring Instrument (OMI) in comparison to SCIAMACHY global PFT products. We will highlight the improved spatial resolution and coverage of the PFT data from OMI and give an outlook for upcoming Sentinel missions.

UP 6.7 Mi 10:15 GW2 B3009

Wasserdampfmessungen bis in die untere Stratosphäre: das Hochleistungs-Raman-Lidar am Schneefernerhaus — Lisa Klanner, •Thomas Trickl und Hannes Vogelmann — Karlsruher Institut für Technologie, IMK-IFU, Kreuzeckbahnstr. 19, 82467 Garmisch-Partenkirchen

Infolge des geringen Mischungsverhältnisses von 5 ppm stellen Messungen des stratosphärischen Wasserdampfs eine erhebliche Herausforderung dar. Wir setzen auf die Methode der Raman-Streuung, welche durch Steigerung der Laserleistung und der Größe des Empfangsteleskops im Prinzip des Wasserdampf-Rückstreusignals beliebig hochskaliert werden kann. Das Hochleistungs-Raman-Lidar am Schneefernerhaus (Zugspitze, 2675 m) beruht auf einem 180-W-XeCl-Lasersystem im Einzellinienbetrieb bei 307.93 nm Wellenlänge und separaten Empfangsteleskopen mit 1.5 m und 0.4 m Durchmesser betrieben. Wir präsentieren vertikal hochaufgelöste Messungen von Wasserdampf, akkumuliert innerhalb einer Stunde, welche bis zur Tagung bis in über 20 km Höhe ausgedehnt werden sollen. Die Kalibrierung erfolgt mit dem seit vielen Jahren im selben Labor betriebenen, sehr genauen differentiellen Absorptions-Lidar, wodurch die Probleme mit der hohen räumlichen Variabilität der Feuchte entfallen. Temperatur konnte aus den Rayleigh-Rückstreuprofilen für 308 nm bis in knapp 60 km Höhe ausgewertet werden, wobei das Streulicht noch um fast drei Größenordnungen abgeschwächt werden mußte. Nach Zurüstung eines Choppers, mit dem die ersten 10 km des Signals abgeschnitten werden sollen, werden Temperaturmessungen bis in die Mesosphäre erwartet.

Kaffeepause (30 min)

UP 7: Festsitzung, Fortsetzung der Postersession

Zeit: Mittwoch 11:00–14:00 Raum: GW2 B3010

Festsitzung, Fortsetzung der Postersession

Mittagspause (90 min)

UP 8: Symposium Fundamental Physics in Space

Zeit: Mittwoch 14:00–16:00 Raum: SFG 0140

Hauptvortrag UP 8.1 Mi 14:00 SFG 0140

Magnetospheric Physics – Basic Processes and Open Questions — •Antonius Otto — Geophysical Institute, Univ. of Alaska, Fairbanks

The terrestrial magnetosphere is a unique laboratory to study fundamental plasma physics because it allows the in-situ study of basic processes that are important in many astrophysical plasma environments. Although basic magnetospheric configuration is very simple – a magnetic dipole with an inner boundary at the upper atmosphere and an outer boundary subjected to the solar wind – the detailed physics is extremely rich. Magnetospheres allow the study of different types of shock physics, various macro- and microscopic boundary layer processes, plasma transport across boundaries, wave propagation, energy storage and release, current sheet formation, and magnetic reconnection. This presentation will address several selected topics motivated by the enormous progress that has been achieved in magnetospheric physics during the past decades. We have now a much better understanding of the role of Kelvin-Helmholtz waves and magnetic reconnection for the plasma transport at magnetospheric boundaries and the nature of transient events at the bow shock. Observations have provided a new framework for the energy storage and release during geomagnetic substorms. New evidence suggests that reconnection occurs almost always in bursty individual events. However, there are still basic open questions including fundamental topics such as the cause for the auroral acceleration, the physics of non-adiabatic plasma heating, and the micro-physics of magnetic reconnection.

Hauptvortrag UP 8.2 Mi 14:30 SFG 0140

GRACE/GRACE-FO and LAGEOS/LARES in Geodesy, Earth Observation and Relativity — •Rolf König[1], Ignazio Ciufolini[2], Frank Flechtner[1], and Antonio Paolozzi[3] — [1]Deutsches GeoForschungsZentrum GFZ, Telegrafenberg, 14473 Potsdam — [2]University Salento and Centro Fermi, Italien — [3]Sapienza Universita Roma and Centro Fermi, Italien

GRACE, launched in 2002, and its continuation GRACE-FO, to be launched end of 2017, are dedicated missions for the measurement of the time variable gravity field. We will briefly summarize the major achievements of GRACE in Earth observation so far. In 2004 the early GRACE static gravity field models firstly allowed to measure frame-dragging or the Lense-Thirring (LT) effect by Satellite Laser Ranging (SLR) observations to the LAGEOS satellites with an accuracy of 10%. In 2012 the LARES satellite was launched to complement the LAGEOS constellation, goal of the mission is to improve the accuracy of the LT measurement by one order of magnitude. We will briefly summarize the impact of LARES into geodesy before we focus on the relativity aspect. First results on the LT measurements with LARES are published reporting an accuracy of about 5%. We will independently repeat the LT analysis with a longer data span based on a suite of new gravity field models.

Hauptvortrag UP 8.3 Mi 15:00 SFG 0140

LISA and LISA Pathfinder — •Gerhard Heinzel — Max-Planck-Institut fuer Gravitationsphysik (Albert-Einstein-Inst.) Hannover

This presentation will summarize the status of the planned gravitational wave observatory LISA, and the latest results from its precursor mission LISA Pathfinder which is in orbit now.

Hauptvortrag UP 8.4 Mi 15:30 SFG 0140

Promises and challenges of Gaia astrometry — •Sergei Klioner — Lohrmann-Observatory, Technische Universität Dresden, 01062 Dresden, Germany

ESA's second space astrometry mission Gaia was launched in December 2013 and after an extended commissioning period started its scientific operations in July 2014. During its routine science operations Gaia has already delivered an immense data set of high-accuracy positional observations. In spite of some unexpected difficulties with the instrument, Gaia Data Processing and Analysis Consortium published the first Gaia Data Release in September 2016 and is working towards the second Gaia Data Release in the first half of 2018.

High-accuracy astrometric survey being made by Gaia opens a new window for specific research in the field of fundamental physics. This research window ranges from weak-field tests of General Relativity and its foundations in the gravitational field of the solar system to estimates of energy flux for gravitational wave background in certain frequency domains. These promises of space astrometry will be critically reviewed. The interrelation between astrometric solution, the resulting reference frame and the assumptions on fundamental physical laws made during data processing will be discussed.

UP 9: Atmosphäre - Spurengase

Zeit: Mittwoch 16:00–18:30 Raum: GW2 B3009

Kaffeepause (30 min)

Hauptvortrag UP 9.1 Mi 16:30 GW2 B3009

Observing the impact of the Anthropocene on atmospheric composition using remote sensing from space based and aircraft instrumentation. — •John P. Burrows — Instiute of Environmental Physics, University of Bremen, Bremen

Since the industrial revolution, the earth's population has grown from 1 to ~7.5 Billion and at the same time its standard of living and longevity has increased dramatically. Pollution in the atmosphere now spans all scales from the local to the global. Air quality, stratospheric ozone and climate change are all being influenced by anthropogenic activity, and it is proposed that the earth has entered a new geological epoch the Anthropocene. The global measurement of many atmospheric trace constituents began with the SCIAMACHY (Scanning Imaging Absorption spectrometer for Atmospheric CHartographY) project in the 1980s. As a result of this initiative the following instruments have been developed and launched on satellite platforms into sun synchronous low earth orbit: GOME (Global Ozone Monitoring Experiment - ESA ERS-2 1995-2011), SCIAMACHY (ESA Envisat 2002 to 2012), GOME-2 (EUMTSAT Metop A 2006 to present, Metop B 2012 to present). In addition, the spin off OMI (Ozone Monitoring Instrument - NASA AURA 2004 to present) was developed by NSO. GOME GOME-2 and OMI make measurements of the back scattered electromagnetic up welling at the top of the atmosphere in nadir. SCIAMACHY makes alternate limb and nadir measurements. This presentation will provide an overview of the interpretation of the data provided by these instruments and related instruments developed for aircraft.

Hauptvortrag UP 9.2 Mi 17:00 GW2 B3009

NO_2 from space: What can we learn? — •Steffen Beirle — Max-Planck-Institut für Chemie, Mainz

Since two decades, satellite measurements of UV/Vis spectra allow for the global retrieval of tropospheric NO_2. This dataset has tremen-

dously increased our understanding on the spatial (maps) and temporal patterns (trends, seasonal or weekly cycles) of NO_x sources. Nowadays, a main application is the quantification of NO_x emissions from NO_2 observations via inversion or assimilation techniques, involving CTMs. These approaches implicitly assume that the model describes processes such as transport and tropospheric chemistry accurately enough in order to relate differences in modeled and observed NO_2 columns to the a-priori emissions.

Here we investigate how far the satellite measurements of tropospheric NO_2 can be used to derive information beyond NO_x emissions, i.e. chemistry (NO_x lifetime) and transport, by analyzing and comparing the spatio-temporal patterns above and downwind from strong emission sources.

UP 9.3 Mi 17:30 GW2 B3009

Real Driving NOx Emissions of European trucks — •Tim Adler, Denis Pöhler, Christof Krufzik, Martin Horbanski, Johannes Lampel, and Ulrich Platt — Institute of Environmental Physics, Heidelberg, Germany

NO_x is one of the most problematic pollutants and thus emissions of e.g. trucks are strongly regulated. However, real emissions are typically not investigated. During a study the NO_x emission of more than 200 trucks under real driving conditions on the German highway was investigated. Therefore, a NO_x-ICAD-instrument (Iterative Cavity Enhanced DOAS) together with a CO_2 sensor were used to determine the pollutants in the emissions plume. We developed an algorithm to automatically evaluate the time series and compute the emission for each vehicle based on the plume chasing principle.

For most trucks of our data set the brand, the model name, the country of registration and its EURO class could be determined and used in a statistical analysis. Our data showed that that the emission of individual trucks are much higher than the allowed EURO Norm. The results and statistical analysis including different brands, EURO classes, country of registration etc. will be presented.

UP 9.4 Mi 17:45 GW2 B3009

Comprehensive study of NO_x and SO_2 from shipping emissions measured with on-shore in-situ instruments — •Lisa Kattner[1,2], Barbara Mathieu-Üffing[1,2], André Seyler[1], Folkard Wittrock[1], Andreas Weigelt[2], Stefan Schmolke[2], and John P. Burrows[1] — [1]Institute of Environmental Physics, University of Bremen — [2]Bundesamt für Seeschifffahrt und Hydrographie, Hamburg

Shipping emissions are a significant source of air pollution, especially for coastal areas and harbor towns. The establishment of a Sulfur Emission Control Area (SECA) for North Sea and Baltic Sea by the International Maritime Organization has been a first step to control and reduce SO_2 emissions by consecutively regulating the sulfur content of fuels.

Within the project MeSmarT, a collaboration between the University of Bremen and the Bundesamt für Seeschifffahrt und Hydrographie, a monitoring system for the sulfur content of ship fuels has been developed. The method is based on in-situ measurements of plumes of ships passing a fixed station at the river Elbe. In addition to SO_2 and CO_2, which are necessary for the sulfur content analysis, nitrogen oxides (NO_x) and O_3 are measured as well. After two and a half years of measurements a large dataset of more than 12000 plumes of ships has been acquired. Based on this dataset, the relations between the exhaust gas components as well as emission factors of different ship types and for various conditions will be presented.

UP 9.5 Mi 18:00 GW2 B3009

Airborne remote sensing of NO_2 air pollution over the city of Zurich — •Gerrit Kuhlmann and Dominik Brunner — Empa, Swiss Federal Laboratories for Materials Science and Technology, Dübendorf, Switzerland

Nitrogen dioxide (NO_2) is an important air pollutant and plays a key role in the formation of photochemical smog. We used the airborne imaging spectrometer APEX to retrieved a high-resolution NO_2 map ($50x50m^2$) over the city of Zurich during a flight campaign on 30th August 2013 (11:24-12:05 UTC).

The retrieval is based on a modified differential optical absorption spectroscopy (DOAS) algorithm, which retrieves NO_2 vertical column densities (VCD) from a wide spectral window (410-510 nm) making full use of APEX's spectral range. To allow for a wide spectral window, we replaced the low-order polynomial traditionally used in DOAS with a cubic spline and applied wavelength-dependent air mass factors pre-calculated with the SCIATRAN radiative transfer model.

The new algorithm improves the quality of the fit and reduces the retrieval noise. NO_2 VCD errors are estimated to about 20% for polluted areas. The retrieved map shows enhanced NO_2 values in populated areas. Furthermore, we find increased NO_2 values near the exit of highway tunnels and along the trajectory of airplanes departing from Zurich airport.

In conclusions, airborne observations allow mapping of the NO_2 distribution in urban areas providing a different perspective on urban air quality which cannot be acquired by ground-based observations.

UP 9.6 Mi 18:15 GW2 B3009

An improved total and tropospheric NO2 column retrieval for GOME-2 — •Song Liu[1], Pieter Valks[1], Gaia Pinardi[2], Isabelle De Smedt[2], Huan Yu[2], and Steffen Beirle[3] — [1]Institut für Methodik der Fernerkundung (IMF), Deutsches Zentrum für Luft- und Raumfahrt (DLR), Oberpfaffenhofen, Germany — [2]Belgian Institute for Space Aeronomy (BIRA/IASB), Brussels, Belgium — [3]Max Planck Institute for Chemistry (MPI-C), Mainz, Germany

This work focuses on an improved algorithm for the retrieval of total and tropospheric NO2 columns from the Global Ozone Monitoring Experiment-2 (GOME-2). A larger 425-497 nm wavelength fitting window with correction for GOME-2 slit function variations is used to determine the NO2 slant column density. The STRatospheric Estimation Algorithm from Mainz (STREAM) is applied to determine the stratospheric column density of NO2. For the calculation of the air mass factor (AMF), a new surface Lambertian equivalent reflectance (LER) climatology based on GOME-2 observations and the IMAGES a priori NO2 profile are used. Examples of the retrieved GOME-2 total and tropospheric NO2 columns are shown for Europe and Asia.

UP 10: Atmosphäre - Spurengase (Fortsetzung)

Zeit: Donnerstag 8:30–11:45 Raum: GW2 B3009

Hauptvortrag UP 10.1 Do 8:30 GW2 B3009

Application of the FTIR-spectroscopy in the infared via remote sensing and in-situ techniques for studying the carbon cycle — •Justus Notholt, Thorsten Warneke, Mathias Palm, Matthias Buschmann, Denise Müller, Christof Petri, Yuting Wang, and Zhiting Wang — IUP, University of Bremen

Remote sensing has been established as a powerful method for studying the atmospheric composition. Using the sun or moon as light source and working in the infrared spectral region using FTIR spectrometers allows measuring the total column concentrations of up to 20 atmospheric trace gases. Analyzing the spectral line shape allows for a few trace gases to derive the concentration profile in 2-4 atmospheric layers up to about 30 km. The observations at about 30 sites worldwide are organized in two international networks, the NDACC (Network for Atmospheric Composition Change) and TCCON (Total Carbon Column Observing Network). Together with model studies the observations have been used to study the atmospheric carbon cycle. Recent results will be presented and discussed.

The relevance of inland waters for the carbon cycle is not well known. Rivers are often treated as passive pipes, which means, the amount of carbon that enters the rivers reach the ocean. Recently an in situ measurement technique based on FTIR-spectrometry has been developed for studying the trace gas fluxes between inland waters and the atmosphere. FTIR spectrometry allows the simultaneous measurement of different trace gases and their isotopes in the atmosphere and in the water. Recent results will be presented and discussed.

UP 10.2 Do 9:00 GW2 B3009

Measurements of the tropospheric column of Ammonia (NH3) above Ispra, Italy. — •Mathias Palm[1], Justus Notholt[1], and Niels Jensen[2] — [1]Universität Bremen — [2]JRC Ispra

Ammonia (NH3) is one of the central compounds in the nitrogen in the soil-atmosphere system. It is a highly reactive molecule and difficult to measure because of it properties. Ammonia plays a central part in the development of smog via its reaction with nitric acid (HNO3) to form ammonium nitrate (NH4NO3).

During a measurement campaign the tropospheric column of Ammonia (NH3) has been measured in solar absorption mode in Ispra, Italy from Spring to Autumn 2016 using a mobile FTIR system. Ispra is located adjacent to the Po valley, a agricultural center in Italy and one of the hot spots for Ammonia in Western Europe. Due to its location it can get air either from the Po-valley, air which travelled over the Alps or air originating on the Mediterranian. This location makes it a valuable place for measurements and a demanding place for model validation.

In this presentation, results from the measurement campaign and first comparisons with the LOTOS-Euro model will be presented. The flexpart model is used to calculate footprints, i.e. source regions for the measured ammonia.

UP 10.3 Do 9:15 GW2 B3009

Das IUP-Bremen imaging DOAS Instrument IMPACT: Charakterisierung und erste Anwendung — •Enno Peters[1], Mareike Ostendorf[1], Anja Schönhardt[1], Andreas Richter[1], André Seyler[1], Folkard Wittrock[1], Stefan Schreier[1], Mihalis Vrekoussis[2] und John P. Burrows[1] — [1]Institut für Umweltphysik, Universität Bremen, Bremen, Deutschland — [2]Zentrum für Marine Umweltwissenschaften (MARUM), Bremen, Deutschland

Dieser Beitrag behandelt die Entwicklung eines neuartigen, bodengebundenen Messgerätes IMPACT (Imaging MaPper for AtmospheriC observaTions), das auf der Differentiellen Optischen Absorptions-Spektroskopie (DOAS-Methode) beruht, einer in der Fernerkundung eingesetzten Technik zur Messung atmosphärischer Spurengase. Im Gegensatz zu herkömmlichen DOAS-Geräten, die Spurengasabsorptionen aus nur einer Richtung zur Zeit detektieren, misst das Imaging-Gerät simultan in 50 vertikalen Richtungen und ist gleichzeitig im Azimut (0°-360°) motorisiert schwenkbar. So entstehen vollständige hemisphärische Bilder der Stickstoffdioxidverteilung (NO2) sowie O4 um den Messstandort herum mit einer zeitlichen Auflösung von ca. 15 Minuten, was Aufschlüsse über die lokalen Quellen, sowie den Tagesgang und Transport von Stickoxiden ermöglicht.

Neben der Charakterisierung des Instruments werden erste Daten und Ergebnisse präsentiert, die auf der internationalen Feldkampagne CINDI-2 gewonnen wurden, an der das Instrument im Sommer 2016 in Cabauw, Niederlande, teilnahm.

UP 10.4 Do 9:30 GW2 B3009

Development of a multi-model Air Quality Forecasting System for China — •Anna Katinka Petersen, Idir Bouarar, and Guy Brasseur — Max Planck Institut für Meteorologie, Hamburg, D

As part of the EU-sponsored projects Panda and MarcoPolo, a multi-model air quality prediction system including 7 models has been developed, providing daily forecasts of ozone, nitrogen dioxide, PM10 and PM2.5 for China. We will describe the forecasting system and show examples of forecasts produced for several Chinese cities and displayed on a web site developed by the Dutch Meteorological service (KNMI). A discussion on the accuracy of the predictions based on a detailed evaluation process using surface measurements from the Chinese monitoring network will be presented.

UP 10.5 Do 9:45 GW2 B3009

Methane retrieval and interpretation using high spatial resolution AVIRIS-NG radiances — •Jakob Borchardt[1], Konstantin Gerilowski[1], Sven Krautwurst[1], Thomas Krings[1], David R. Thompson[2], Andrew K. Thorpe[2], Christian Frankenberg[2,3], Michael Buchwitz[1], Michael Eastwood[2], Robert O. Green[2], Heinrich Bovensmann[1], and John P. Burrows[1] — [1]Institute of Environmental Physics (IUP), University of Bremen, P.O. 330440, 28334 Bremen, Germany — [2]Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Dr, Pasadena, CA 91109, California, USA — [3]California Institute of Technology, 4800 Oak Grove Dr, Pasadena, CA 91109, California, USA

Methane (CH_4) is an important greenhouse gas whose sources and sinks on regional scale are not well quantified. The AVIRIS-NG imaging spectrometer allows for source attribution with high spatial resolution ($\lesssim$ 4 x 4 m^2). The quantitative retrieval of CH_4 total column variations with the "Weighting Function Modified - DOAS" algorithm (WFM- DOAS) originally developed for medium and high spectral resolution instruments ($\lesssim$ 1 nm) was successfully applied to the lower spectral resolution ($\sim$ 5.5 nm) AVIRIS-NG data. The source under investigation was a coal mine ventilation shaft located in the Four Corners region, which is known for it's high CH_4 emissions. In this talk, the adaptation of the WFM-DOAS algorithm to imaging spectroscopy measurements and the flux inversion using a mass balance approach will be presented.

Kaffeepause (30 min)

UP 10.6 Do 10:30 GW2 B3009

Near-surface-sensitive satellite observations of atmospheric greenhouse gases (CO2, CH4): Past, present and future — •Michael Buchwitz, Maximilian Reuter, Oliver Schneising, Jens Heymann, Heinrich Bovensmann, and John P. Burrows — Universität Bremen FB1, Institut für Umweltphysik (IUP), Otto Hahn Allee 1, 28334 Bremen

Carbon dioxide (CO2) and methane (CH4) are Essential Climate Variables (ECVs) because they are important greenhouse gases contributing to global warming. Despite their importance our knowledge about their variable sources and sinks has significant gaps. Near-surface-sensitive global satellite observations of atmospheric CO2 and CH4 in combination with inverse modelling or other approaches helps to close important knowledge gaps. At the Institute of Environmental Physics (IUP) of the University of Bremen (UB) column-averaged dry-air mole fractions of CO2 and CH4, i.e., XCO2 and XCH4, are retrieved from the European satellite instrument SCIAMACHY on ENVISAT and from the Japanese instrument TANSO-FTS onboard GOSAT. Furthermore, IUP-UB is leading two European projects focusing on satellite retrievals of XCO2 and XCH4 and IUP-UB was and is also involved in the specification of future satellites. In this presentation an overview about these activities will be given.

UP 10.7 Do 10:45 GW2 B3009

Wie viel CO_2 wird von der Biosphäre der europäischen Landmassen aufgenommen? — •Maximilian Reuter, Michael Buchwitz, Jens Heymann, Oliver Schneising, Heinrich Bovensmann und John P. Burrows — Institut für Umweltphysik, Universität Bremen, Deutschland

Die Biosphäre der europäischen Landmassen vom Atlantik bis zum Ural nimmt große Mengen des Treibhausgases CO_2 auf. Die Größe dieser CO_2 Senke wurde in der Vergangenheit über verschiedene satelliten- und bodengestützte Verfahren bestimmt. Neben ihrer politischen Relevanz, ist eine gute Kenntnis der europäischen CO_2 Senke z.B. wichtig für das Verständnis des globalen Kohlenstoffzyklus und somit vertrauenswürdiger Klimavorhersagen. Dennoch weichen die derzeitigen Schätzungen stark voneinander ab und die Unterschiede sind nur schlecht verstanden. In unserem Beitrag werden wir den derzeitigen Stand der Forschung erörtern und Ergebnisse aktueller Studien basierend auf satellitengestützten Verfahren präsentieren, die darauf ausgelegt sind die Unterschiede besser zu verstehen.

Hauptvortrag UP 10.8 Do 11:00 GW2 B3009

Ozone recovery and climate change: Towards an interactive representation of stratospheric ozone in Earth System Models — •Markus Rex, Ingo Wohltmann, Daniel Kreyling, Ralph Lehmann, and Wolfgang Dorn — Alfred-Wegener-Institut, Helmholtz Zentrum für Polar- und Meeresforschung, Potsdam, Germany

Interactions between climate change and stratospheric ozone modify both, the evolution of surface climate and the recovery of the stratospheric ozone layer. Accounting for the climate feedbacks from changing ozone as well as the impact of climate change on the evolution of the ozone layer requires the interactive representation of stratospheric chemistry in Earth System Models.

Our understanding of stratospheric ozone chemistry is now mature at the process scale and state of the art Chemical Transport Models (CTM) result in a realistic representation of the global ozone layer and the chemical processes affecting it. But the huge computational effort of these models makes it difficult to include the ozone layer interactively in Earth System Models (ESMs).

We have developed SWIFT, an extremely fast module for interactive ozone chemistry in climate models. SWIFT allows for an interactive treatment of stratospheric ozone in standard ESMs with little numerical overhead. We will present the current status of SWIFT and results

from coupling SWIFT to a climate model.

UP 10.9 Do 11:30 GW2 B3009

Do recent observed stratospheric ozone trends indicate ozone recovery? — •Mark Weber[1], Wolfgang Steinbrecht[2], Stacey Frith[3], Nabiz Rahpoe[1], Melanie Coldewey-Egbers[4], Doug Degenstein[5], and Lucien Froidevaux[6] — [1]Universität Bremen FB1, Bremen, Germany — [2]Deutscher Wetterdienst, Hohenpeissenberg, Germany — [3]NASA Goddard Space Flight Center, Grenbelt, MD, USA — [4]DLR Oberpfaffenhofen, Wessling, Germany — [5]University of Sasketchewan, Saskatoon, Canada — [6]Jet Propulsion Laboratory, Pasadena, CA, USA

Due to the successful phase-out of ozone-depleting substances (ODS) following the Montreal Protocol, ozone is supposed to slowly recover. As the stratospheric halogen (resulting from ODS) is decreasing at a slow rate (as compared to the rate of increase before the 1990s), ozone recovery will be quite slow. Due to the large year-to-year variability in ozone, ODS related trends are thus difficult to establish. So far positive ozone trends since 2000 were only statistically significant in the upper stratosphere according to the recent WMO ozone assessment. In addition to the high variability in ozone, potential instrumental drifts of satellite data add to trend uncertainties. In this presentation actual ozone trends are reported using available and updated total ozone and ozone profile satellite data. Attribution of the observed trends and uncertainties due to long-term stability of the satellite data will be discussed.

UP 11: Plenarvortrag Gerhard Bohrmann

Zeit: Donnerstag 11:45–12:30 Raum: HS 2010

Plenarvortrag UP 11.1 Do 11:45 HS 2010

Methanhydrate der Meeresböden, Einfluss auf Klima und Stabilität der Kontinentalränder — •Gerhard Bohrmann — MARUM, Center for Marine Environmental Sciences, Bremen, Germany, Bremen,

Gashydrate sind feste, eisähnliche Einschlussverbindungen (Clathrate) aus Methanmolekülen und Wasser, welche je nach Wassertemperatur im Ozean und entsprechendem Druck ab 300 bis 900 m Wassertiefe in Form von Methanhydraten vorkommen. Neben Methan bilden andere Gase, wie Kohlenstoffdioxid, Stickstoff und weitere Kohlenwasserstoffe bei höheren Drücken und niedrigen Temperaturen ebenfalls diese feste Verbindung. Wegen der immens großen Vorkommen (von ca. 2.000 - 10.000 Gt C) werden Methanhydrate zum einen als mögliche (fossile) Energieressource der Zukunft gehandelt, zum anderen ist das gespeicherte Methan ein gefürchtetes Treibhausgas, das im Falle einer größeren Freisetzung erheblich zur globalen Erwärmung beitragen kann. Aufgrund der geringeren Temperaturen der hohen Breiten können arktische Gashydrate generell in bereits verhältnismäßig geringeren Wassertiefen vorkommen, woraus sich folgende Fragestellungen ergeben: Wie sind Methanhydrate in den Kohlenstoffkreislauf eingebunden und welche Wechselwirkung und Bedeutung haben sie im Klimageschehen? Sind aufgrund der fortschreitenden Klimaveränderungen in der Arktis starke Freisetzungen von Methan aus Gashydraten zu erwarten? Welche Rolle haben Gashydrate bei der Zementierung der Kontinentalhänge und bei der Auslösung von Rutschungen?

UP 12: Mittagspause und Mitgliederversammlung

Zeit: Donnerstag 12:30–14:00 Raum: GW2 B3009

Mittagspause und Mitgliederversammlung (mit Mittagsimbiss und Getränken)

UP 13: Atmosphäre - Spurengase (Fortsetzung)

Zeit: Donnerstag 14:00–14:30 Raum: GW2 B3009

UP 13.1 Do 14:00 GW2 B3009

Zukünftiger Einfluss bromierter, kurzlebiger Quellgase auf Ozon — •Stefanie Falk[1], Björn-Martin Sinnhuber[1], Gisèle Krystofiak[2], Patrick Jöckel[3] und Phoebe Graf[3] — [1]Karlsruher Institut für Technologie — [2]Université d'Orléans — [3]Deutsches Zentrum für Luft- und Raumfahrt e.V.

Bromierte, sehr kurzlebige Quellgase (VSLS) tragen signifikant zum Bromgehalt in der Troposphäre und Stratosphäre bei. Gegenwärtige Schätzungen gehen davon aus, dass etwa 25% des stratosphärischen Broms aus dem Ozean stammt. Zahlreiche Studien belegen, dass passend eingebundene Ozeanemissionen die Übereinstimmung zwischen Chemie-Klima-Modellen (CCMs) mit verfügbaren Messungen von VSLS verbessern.

Wir stellen Langzeit Veränderungen in Emission und Transport von VSLS, basierend auf CCM-Simulationen, vor und berechnen den Einfluss auf Ozon. Unter der Annahme konstanter, ozeanischer Konzentrationen ergibt sich ein Anstieg der VSLS-Flüsse von etwa 10%. In gleichem Maße erhöht sich das Volumenmischungsverhältnis von Brom in der unteren Stratosphäre um 8-10%. Dieser Anstieg lässt sich nicht alleine auf gestiegene Emissionen zurückführen, viel mehr tragen auch Klima bedingte Änderungen in Transport und Lebensdauer der VSLS dazu bei. Ferner diskutieren wir den Einfluss der Verschiebung der tropischen Tropopausenschicht auf die Interpretation obiger Ergebnisse. Simulationen für Ende des 21. Jahrhunderts deuten auf eine signifikante Reduktion von Ozon durch Brom aus VSLS hin (etwa 3%).

UP 13.2 Do 14:15 GW2 B3009

Coupling of Stratospheric Water Vapour and Methane derived from SCIAMACHY Solar Occultation Measurements — •Stefan Noël, Katja Weigel, Klaus Bramstedt, Alexei Rozanov, Heinrich Bovensmann, and John P. Burrows — Institut für Umweltphysik, Universität Bremen

Water vapour and methane belong to the most important greenhouse gases and therefore have a significant impact on climate. In the stratosphere they also play an important role in chemistry, e.g. in ozone loss due to heterogeneous reactions on polar stratospheric clouds. Methane is actually one of the main sources for stratospheric water vapour. Therefore, information about sources or sinks of water vapour in the stratosphere can be obtained from the coupling between water vapour and methane.

Here, we will present recent results for stratopheric water vapour and methane and their combination determined from solar occultation measurements performed by the SCanning Imaging Absorption spectroMeter for Atmospheric CHartographY (SCIAMACHY) onboard the ESA Envisat satellite between August 2002 and April 2012. It is expected that the combination of water vapour and methane data sets from simultaneous measurements by the same instrument using the same retrieval method is especially suited to derive information about the coupling of the two species.

UP 14: Atmosphäre - Aerosole/Wolken

Zeit: Donnerstag 14:30–16:15 Raum: GW2 B3009

Hauptvortrag UP 14.1 Do 14:30 GW2 B3009

Cloud top pressure retrieval from MERIS and OLCI: Global assessment — •Jürgen Fischer, Ulrich Küster, Cintia Carbajal, and Rene Preusker — Freie Universität Berlin

Cloud top pressure (CTP) retrievals from measurements within the O2 A-band of MERIS (Medium Resolution Imaging Spectrometer on board ENVISAT) have been analysed with respect to a decadal variability on a global scale. Clouds are subject of climate studies, because they have a large impact on the earth radiation budget and it is very likely that clouds respond on climate change. Due to the high variability of clouds no significant trend in cloud cover and cloud properties has been identified so far. Nevertheless, recent climate studies indicate that the vertical structure of clouds and zonal shifts of clouds might be caused by climate change. Since the MERIS and OLCI measurements within the O2 A-band are sensitive to the vertical cloud profile, we assessed the global MERIS CTP product during its 10 years of operation to detect regional cloud anomalies. We also compared the single MERIS CTP product with the synergistic MERIS and AATSR CTP product, which is less sensitive to the vertical cloud profile.

UP 14.2 Do 15:00 GW2 B3009

Polarized inelastic scattering by ice clouds and dust aerosols for Sentinel-4 — •Luca Lelli, Vladimir Rozanov, Marco Vountas, and John Burrows — Institute of Environmental Physics and Remote Sensing, University of Bremen, Bremen, Germany

The quantification of rotational Raman scattering (RRS) and the filling in of the oxygen A-band (O2A) by inelastically scattered photons is investigated as it can be used for cloud, aerosol and greenhouse gas characterisation. We present simulation results using the radiative transfer model SCIATRAN. The vector version of SCIATRAN has been extended to account for the spectral effects of RRS in presence of aerosols and clouds.

Upon comparison with previous independent results published in the literature for Fraunhofer lines and O2A, results for the polarized, inelastic radiative transport are shown for various viewing geometries, instrumental specifications and geophysical scenarios. Specifically, bidirectional reflective effects induced by a polarizing surface are taken into account as well as scattering properties of asymmetric dust particles and ice crystals.

Seasonal maps of filling-in and degree of linear polarisation are shown for real viewing geometries of the upcoming geostationary Sentinel-4 mission, equipped with the payload UVN that covers the oxygen A-band at a nominal spectral resolution of 0.12 nm.

UP 14.3 Do 15:15 GW2 B3009

Characterization of optically-trapped submicron aerosol particles by ultraviolet broadband light scattering — •Kivanc Esat, Gregory David, Irina Ritsch, and Ruth Signorell — Laboratory of Physical Chemistry, ETH Zurich, Switzerland

Aerosol particles in the size range from a few 100 nanometers to a few microns have a large impact on our atmosphere. Their shape, size, refractive index, and composition are the key properties governing their interaction with light and determining the processes they experience in the atmosphere such as hygroscopic growth, nucleation and aging. Broadband light scattering (BLS) experiments on single isolated particles are useful to study such processes in the laboratory because they simultaneously measure the particle size and the wavelength-dependent refractive index. Our new BLS setup provides data in the UV and visible spectral ranges (320 - 700 nm). Inclusion of the UV spectral range is crucial for the sizing of submicron particles and allows for the retrieval of refractive indices in a range where such data are rare but urgently needed. In this presentation, we report the combination of a new BLS experiment with counter-propagating optical tweezers facilitating contactless characterization of particles as small as 300 nm. The presentation will highlight the broad applicability of the UV BLS experiment by means of four examples: 1) The sizing of calibrated submicron polystyrene latex sphere (PSL). 2) The evaporation of binary glycerol water droplets. 3) The hydration/dehydration cycling of aqueous potassium carbonate droplets. 4) Photochemical reactions of oleic acid droplets.

UP 14.4 Do 15:30 GW2 B3009

Desert dust outbreaks near West-Africa observed from space — •Abram Sanders[1], Luca Lelli[1], Pepijn Veefkind[2], Johan De Haan[2], Marco Vountas[1], and John Burrows[1] — [1]Institut für Umweltphysik (IUP), Universität Bremen, Bremen, Germany — [2]Koninklijk Nederlands Meteorologisch Instituut (KNMI), De Bilt, Netherlands

The Saharan region is responsible for more than half of the global dust emissions and large amounts of dust are transported across the Atlantic year-round along seasonally varying transport routes. In this study, we retrieve the height of dust plumes over ocean in outflows off the West-African coast from satellite measurements of backscattered solar radiation.

We retrieve Aerosol Layer Height (ALH) from SCIAMACHY measurements of the oxygen A absorption band using the operational retrieval setup for TROPOMI on the Sentinel-5 Precursor. We focus on the time period of 2007-2008, because the SAMUM-2 measurement campaigns took place at Cape Verde during that period and a MACC-II reanalysis run with improved dust parameterizations covering the same period was recently completed. One of the criteria for pixel selection was a high value for the Absorbing Aerosol Index so that we know a priori that pixels contain significant amounts of (elevated) dust.

We will briefly explain the general measurement principle and we will show SCIAMACHY retrieval results and comparisons with external data sets for a number of case studies.

Kaffeepause (30 min)

UP 15: Klimamodellierung

Zeit: Donnerstag 16:15–16:45 Raum: GW2 B3009

UP 15.1 Do 16:15 GW2 B3009

Konsistente 3D-Turbulenzparametrisierung in Zirkulationsmodellen — •Urs Schaefer-Rolffs — Institut für Atmosphärenphysik, Kühlungsborn

Wir präsentieren eine Erweiterung des Dynamischen Smagorinsky-Modells (DSM) zur Parametrisierung der subskaligen Impulsdiffusion in globalen Zirkulationsmodellen (GCM). Im Gegensatz zum Standardansatz des DSM wird der Testfilterbereich zur Bestimmung des Smagorinskyparameters von der Auflösungsskala getrennt, um potentielle Wechselwirkungen ausschließen zu können.

In GCMs werden des Weiteren durch die Schwerkraft bedingt horizontale und vertikale Skalen üblicherweise getrennt behandelt. Während für die turbulente Vertikaldiffusion von horizontalem Impuls ein klassischer Smagorinskyansatz geläufig ist, wird die turbulente Horizontaldiffusion in der freien Atmosphäre zumeist vernachlässigt. Wir zeigen, wie man das verallgemeinerte DSM in einem hydrostatischen GCM als subskalige Horizontaldiffusion formulieren kann, um das GCM ohne Hyperdiffusion stabil laufen zu lassen. Weiterhin wird die Idee der geschichteten Turbulenz verwendet, um auch für die Vertikaldiffusion einen dynamischen Ansatz formulieren zu können.

Beide Verbesserungen erlauben es, im GCM einen realistischen Verlauf des Spektrums der kinetischen Energie bis (fast) zur Auflösungsgrenze zu erzeugen. Die mögliche Übertragung des zugrundeliegenden Prinzips auf potentielle Temperatur oder Spurenstoffe wird abschließend diskutiert.

UP 15.2 Do 16:30 GW2 B3009

Modeling the global bomb tritium transient signal with the AGCM LMDZ-iso: A method to evaluate aspects of the hydrological cycle — •Alexandre Cauquoin[1,2], Philippe Jean-Baptiste[2], Camille Risi[1], Élise Fourré[2], and Amaelle Landais[2] — [1]Laboratoire de Météorologie Dynamique (LMD), Paris, France —

[2]Laboratoire des Sciences du Climat et de l'Environnement (LSCE), Gif-sur-Yvette, France

Improving the representation of the hydrological cycle in atmospheric general circulation models (AGCMs) is one of the main challenges in modeling the Earth's climate system. One way to evaluate model performance is to simulate the transport of water isotopes. Among those available, tritium is an extremely valuable tracer, because its content in the different reservoirs involved in the water cycle (stratosphere, troposphere, and ocean) varies by order of magnitude. Here for the first time, the anthropogenic tritium injected by each of the atmospheric nuclear bomb tests between 1945 and 1980 has been first estimated and further implemented in LMDZ-iso, a version of the LMDZ general circulation model enhanced by water isotope diagnostics; it creates an opportunity to evaluate certain aspects of LDMZ over several decades by following the bomb tritium transient signal through the hydrological cycle. Simulations of tritium in water vapor and precipitation for the period 1950-2008, with both natural and anthropogenic components, are presented in this study. This insight into model performance demonstrates that the implementation of tritium in an AGCM provides a new and valuable test of the modeled atmospheric transport.

UP 16: Andere Themen

Zeit: Donnerstag 16:45–17:30 Raum: GW2 B3009

UP 16.1 Do 16:45 GW2 B3009

Artificial and Natural Radioisotopes as Environmental Tracers and Chronometers — •Helmut Fischer — Institute of Environmental Physics, University of Bremen, Germany

Radioisotopes in the environment, artificial or natural, can pose serious hazards to living organisms and are therefore monitored with highly sensitive equipment. Investigations of environmental pathways are in many cases focused on the radiation dose in the endpoint organism, which is then compared to recommended or imposed limits. Such experimental and modelling studies are necessary for the assessment of effects caused by accidental or routine releases of radioisotopes into the environment, and also for the prediction of effects caused by planned installations like future nuclear waste repositories.

On the other hand, current radiometric methods are able to detect many radioisotopes, and in most environmental media, in concentrations orders of magnitude below a hazardous level. This opens up the possibility to follow these isotopes through many compartments of the ecosphere. This way radioisotopes can become valuable environmental tracers, independent of their radiological relevance, like natural ^{7}Be in the atmosphere or medical ^{131}I in rivers. Furthermore, application of the radioactive decay law offers the possibility for radiometric dating for a variety of isotopes beyond the well-known ^{14}C, e.g. the established ^{210}Pb/^{137}Cs and the experimental ^{32}Si for sediments.

Examples will show environmental tracer and chronology applications of radioisotopes. The results can be of high relevance for non-radiological disciplines, e.g. climatology.

UP 16.2 Do 17:00 GW2 B3009

Angular distribution of artificial light at night in Europe observed by VIIRS–DNB — •Kai Pong Tong, Georg Heygster, and Justus Notholt — Institut für Umweltphysik, Universität Bremen, Bremen, Germany

Measuring angular distribution of upwelling artificial light is important in assessing the ecological impact because various creatures are negatively affected by particular patterns of artificial skyglow. We use the night time radiance data for clear nights without twilight and moonlight from the VIIRS–DNB sensor on board the satellite Suomi NPP to characterize the angular distributions of upwelling artificial light for Europe based on the data of the whole year 2015. We find that for most of the 74 major cities and metropolitan areas, the emissions are higher near the horizon. The mean numbers of overflights, which varied between 1 and 19, means that there are on average less than two overflights per month, potentially affecting the robustness of the analysis. Future analysis may consider using moonlight models to compensate for the retrieval of moonlit scenes in order to improve the statistics.

UP 16.3 Do 17:15 GW2 B3009

Influence of varying opening angle and spectral bandwidth on bidirectional reflectance factors — •Christine Pohl[1], Larysa Istomina[1], Evelyn Jäkel[2], and Georg Heygster[1] — [1]Institute of Environmental Physics, University of Bremen — [2]Institute of Meteorology, University of Leipzig

The albedo of snow covered Arctic ice plays an important role for the Arctic amplification of the global warming. To derive the albedo from observations, the distribution of bidirectional reflectance factors (BRFs) are measured by airborne or satellite instruments which offer amongst others different fields of view (FOVs) and different spectral bandwidths. The diversity in these sensor specifications introduces an uncertainty in the comparison of ground truth and satellite and airborne BRFs, respectively, and accordingly in the derivation of the albedo. The influence of different FOVs and different spectral bandwidths on the BRF are analyzed. Snow BRFs are simulated by the radiative transfer model SCIATRAN in a standard Arctic atmosphere at 75°N under a solar zenith angle of 55°. The dependence of the BRF on the FOV and on the spectral bandwidth of the sensor will be presented, respectively, and will allow to estimate the errors of the different observation techniques.

UP 17: Fortsetzung der Postersession

Zeit: Donnerstag 17:30–19:00 Raum: GW2 B3010

Fortsetzung der Postersession

UP 18: Abendvortrag Justus Notholt

Zeit: Donnerstag 19:00–20:00 Raum: Universum

Abendvortrag UP 18.1 Do 19:00 Universum
Was sagen uns Satelliten ueber Wetter und Klima? – Fernerkundung in der Umwelt- und Klimaforschung — •Justus Notholt — Institut für Umweltphysik, Universität Bremen

Die passive Fernerkundung hat sich als äußerst wichtige Messmethode in der Klima- und Umweltforschung etabliert. Dabei wird z.B. die Sonne als externe Lichtquelle verwendet. Beim Durchgang des Sonnenlichtes durch die Erdatmosphäre ändern die Spurengase die Zusammensetzung des Lichtes. Dies kann gemessen und daraus mit Hilfe mathematischer Auswertemethoden die Zusammensetzung der Atmosphäre hergeleitet werden. Neben der Nutzung der Sonne als Lichtquelle kann auch die Eigenstrahlung der Erdatmosphäre gemessen werden, um daraus deren Zusammensetzung zu bestimmen. Weiterhin erlauben derartige Messungen auch die Untersuchung der Erdoberfläche.

In dem Vortrag werden die Grundlagen der Fernerkundung erklärt, sowie einige aktuelle Anwendungen aus dem Bereich der Klima- und Umweltforschung diskutiert. Dazu gehören Wetter- und Umweltsatelliten zur Untersuchung der Luftverschmutzung, der Meereisausdehnung, des polaren stratosphärischen Ozonabbaus sowie des Kohlenstoffkreislaufs.

UP 19: Symposium Einfluss solarer Variabilität auf Atmosphäre und Klima der Erde: Von der Heliophysik bis zur Erdatmosphäre

Zeit: Freitag 8:30–10:30 Raum: GW2 B2880

Hauptvortrag UP 19.1 Fr 8:30 GW2 B2880
Solar Irradiance Variation — •Natalie Krivova — Max-Planck-Institut für Sonnensystemforschung, Göttingen

The variation of solar irradiance is an important input to Earth's climate and atmosphere models. Direct measurements have been carried out for almost four decades and stimulated the development of models. Irradiance variations on time scales of days to decades and longer, which are of interest to climate and atmospheric studies, are attributed to the ever changing magnetic field pattern on the solar surface. The state-of-the-art models reproduce the existing measurements but some open question remain, which turn to be critical for climate studies. Also, extension of the models into the past is impaired by the deteriorating amount and quality of long-term proxies of solar activity. A review of the latest advances in solar irradiance modelling on time scales of relevance to climate will be given.

Hauptvortrag UP 19.2 Fr 9:00 GW2 B2880
Cosmic rays and ground level enhancements — •Bernd Heber — Christian-Albrechts-Universität zu Kiel, Kiel, Germany

The Sun is both a source of all life on Earth and sporadically of significant hazards. Solar Energetic Particle (SEP) events may provoke extreme space weather near Earth. Space weather causes radiation which may be a hazard for satellites and for the astronauts. Not only can they be measured indirectly by their solar electromagnetic emission, but also directly in space by particle detectors and in extreme cases on Earth by ground based cosmic ray detectors. Solar eruptive events, such as solar flares and Coronal Mass Ejection (CME)s, can accelerate protons and other ions to high energies (>30 MeV). The relative roles of both components and how we can discriminate them remains a key problem in solar and solar-terrestrial physics. Relativistic (>500 MeV) SEPs enter the Earth's atmosphere sporadically and produce cascades, leading to an increase of the intensities recorded by ground based instrumentation i.e. a neutron monitor (NM). These events are known as Ground Level Enhancements (GLEs). The interest in GLEs are manifold and will be discussed in this presentation.

Hauptvortrag UP 19.3 Fr 9:30 GW2 B2880
Impact of precursor gases and ions on new particle formation and climate — •Urs Baltensperger — Paul Scherrer Institute, Villigen, Switzerland

Globally, a significant source of cloud condensation nuclei for cloud formation is thought to originate from new particle formation (aerosol nucleation). With the CLOUD collaboration we investigated the role of nucleating substances such as gaseous sulfuric acid, ammonia, water vapor as well as of ions, produced e.g. by galactic cosmic rays. Using the results in a global model we showed that nearly all nucleation throughout the present-day atmosphere involves ammonia or biogenic organic compounds, in addition to sulfuric acid. A considerable fraction of nucleation involves ions, but the relatively weak dependence on ion concentrations indicates that for the processes studied, variations in cosmic ray intensity do not appreciably affect climate through nucleation in the present-day atmosphere. Recently, we could also show that highly oxygenated molecules (HOMs) produced by the oxidation of biogenic precursors are able to trigger new particle formation on their own, even in the absence of sulfuric acid. We confirmed that this mechanism does occur in today*s lower free troposphere. We also show that this mechanism was important for the formation of additional new particles and cloud condensation nuclei in the preindustrial atmosphere, when sulfur dioxide emissions were substantially lower. This reduces the magnitude of the annual global mean radiative forcing caused by changes of cloud albedo, which implies a reduced climate sensitivity.

Hauptvortrag UP 19.4 Fr 10:00 GW2 B2880
Regional Influence of Solar Variability on European Climate — •Katja Matthes — GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel — Christian-Albrechts-Universität zu Kiel

Solar variability related to irradiance and energetic particle forcing could be an important source of natural climate variations superimposed on the human-induced warming since the late twentieth century in particular on the regional scale. Because of its prominent 11-year cycle, solar variability offers a degree of predictability and could potentially enhance decadal scale predictions. Understanding the influence of solar variability on climate requires knowledge of solar variability, solar-terrestrial interactions and observations, as well as mechanisms determining the response of the Earth's climate system.

The talk will summarize our current understanding of the impact of solar irradiance and energetic particle forcing on the atmosphere with special focus on the regional changes over the North Atlantic and Europe from observational and modeling studies. We will present feedback mechanisms for the solar signal transfer and discuss the importance of the solar cycle for decadal climate predictions.

UP 20: Methoden - Fernerkundung

Zeit: Freitag 10:30–11:30 Raum: GW2 B3009

Kaffeepause (30 min)

Preisträgervortrag UP 20.1 Fr 11:00 GW2 B3009
Fernerkundung der Erdatmosphäre mittels hochauflösender Infrarotspektroskopie: vom Labor bis in den Weltraum — •Johannes Orphal — Karlsruher Institut für Technologie (KIT) — Träger des Gentner-Kastler-Preises

Die Fernerkundung der Erdatmosphäre mittels hochauflösender Infrarotspektroskopie liefert einzigartige Daten für die Atmosphären- und Klimaforschung. Der Vortrag gibt einen Überblick über die Entwicklung, den aktuellen Stand und künftige Perspektiven dieses Forschungsgebietes.

UP 21: Atmosphäre - Mesosphäre

Zeit: Freitag 11:30–16:00 Raum: GW2 B3009

Hauptvortrag UP 21.1 Fr 11:30 GW2 B3009
Einfluss von geomagnetischer Aktivität auf die Atmosphäre: Beobachtungen und Modellstudien — •Miriam Sinnhuber — Karlsruher Institut für Technologie, Karlsruhe, Deutschland

Änderungen in Stärke und Geschwindigkeit des Sonnenwindes führen zu Fluktuationen der Magnetosphäre, die als geomagnetische Aktivität bezeichnet werden. Hohe geomagnetische Aktivität geht einher mit erhöhten Flüssen von Elektronen aus den Strahlungsgürteln oder der Aurora, die zu Energien von einigen 100 keV bis zu einigen MeV beschleunigt werden, und bis in Höhen von unter 80 km in die Atmosphäre eindringen können. Durch Stöße werden die Hauptbestandteilen der Atmosphäre (N2, O2, O) angeregt, dissoziiert, oder ionisiert; durch die folgenden schnellen Ionenchemiereaktionen kann die chemische Zusammensetzung der (neutralen) Atmosphäre deutlich verändert werden. Von besonderer Bedeutung ist die Bildung von Stickoxiden, die in der Stratosphäre zum katalytischen Ozonabbau beitragen. Diese haben insbesondere im polaren Winter Lebensdauern von Wochen bis Monaten, so dass sie dann von ihrer Quellregion oberhalb von 70 km bis in die Stratosphäre (unterhalb von 45 km) transportiert werden können. Da Ozon wesentlich zum Strahlungsheizen der Stratosphäre beiträgt, hat der mit diesem sogenannten "indirekten Teilcheneffekt" verbundene Ozonabbau einen ähnlichen Einfluss auf Temperatur und Dynamik der Atmosphäre, wie die Änderungen der solaren UV-Strahlung über den solaren Zyklus. In diesem Vortrag wird diese Kopplung von geomagnetischer Aktivität mit der mittleren Atmosphäre anhand von neuen Messungen und Modellstudien diskutiert.

UP 21.2 Fr 12:00 GW2 B3009
Validation of the multiple airglow chemistry model with in-situ measurements — •Olexandr Lednyts'kyy and Christian von Savigny — University of Greifswald, Greifswald, Germany

The developed Multiple Airglow Chemistry (MAC) model is based on more than 60 aeronomical reactions used to reflect the photochemistry of the identified electronic states of molecular oxygen (O_2) in the MLT (upper mesosphere and lower thermosphere) region. The MAC model is validated with rocket in-situ measurements and SABER (Sounding of the Atmosphere using Broadband Emission Radiometry) infrared radiometer data of nightglow observed in January 2004. The previously performed near-global retrieval of atomic oxygen concentration ([O]) profiles in the MLT region with help of SCIAMACHY (SCanning Imaging Absorption spectroMeter for Atmospheric CHartographY) nightglow observations was based on the well-known cubic equation and the extended cubic equation used to reflect the photochemistry of the not identified O_2 electronic states in 12 aeronomical reactions. The coefficients of the well-known cubic equation were initially derived with use of the in-situ measurements of the ETON (Energy Transfer in the Oxygen Nightglow) rocket campaign conducted in March 1982. The results of the [O] retrieval according to the used models and approaches are compared with each other and with the in-situ measurements of [O]. The retrieved volume emission rate (VER) profiles agree with the measured VER profiles very well. Chemical heating rate profiles were estimated and compared with the reference SABER profiles.

UP 21.3 Fr 12:15 GW2 B3009
$O_2(^1\Sigma)$ and $O_2(^1\Delta)$ volume emission rates in the mesosphere and lower thermosphere using SCIAMACHY MLT limb scans — •Amirmahdi Zarboo[1], Stefan Bender[1], Miriam Sinnhuber[1], John Burrows[2], and Johannes Orphal[1] — [1]Karlsruhe Institute of Technology, Karlsruhe, Germany — [2]University of Bremen, Bremen, Germany

Photolysis of ozone by solar radiation and the self-reaction of atomic oxygen produce electronically excited species which deexcite via quenching and radiation, forming the many lines of the oxygen airglow. This airglow contains information about ozone and atomic oxygen as well as other photochemical processes in the mesosphere/lower thermosphere (MLT) region such as, e.g., solar and chemical heating rates. We retrieve volume emission rates (VER) from the airglow of both daytime and twilight $O_2(^1\Sigma)$ and $O_2(^1\Delta)$ emissions in the MLT with the SCIAMACHY special MLT mode on-board the European Space Agency Envisat satellite.

We analyze the daily mean latitudinal distributions and the time series of the retrieved VERs in the altitude range from 53 to 149 km. The mesospheric maxima (>80 km) correlate with the maximum of solar irradiance, with pronounced maximal values during high-latitude summer for $O_2(^1\Delta)$. $O_2(^1\Sigma)$ shows additional high values during high-latitude winter and spring which may be related to downwelling of atomic oxygen, in particular after strong sudden stratospheric warmings (SSW). These data will also be used to infer chemical characteristics such as temperature, ozone abundances, and solar heating rates.

Mittagspause (90 min)

UP 21.4 Fr 14:00 GW2 B3009
A Miniaturized Satellite Payload Hosting a Spatial Heterodyne Spectrometer for Remote Sensing of Atmospheric Temperature — •Ralf Koppmann[1], Michael Deiml[1,2], Martin Kaufmann[2], Martin Riese[1,2], Gordon Shepherd[4], Klaus Mantel[3], and AtmoHIT -Team[1,2,3,4] — [1]Bergische Universität Wuppertal — [2]Forschungszentrum Jülich — [3]Friedrich-Alexander-Universität Erlangen-Nürnberg — [4]York University, Toronto, Canada

In this presentation we report on the development of a highly miniaturized Spatial Heterodyne Spectrometer (SHS) for the deployment on micro- and nano-satellites. The throughput of a SHS is orders of magnitude larger than of a conventional grating spectrometer of the same size. The goal is to deploy such an instrument on a CubeSat to measure the oxygen atmospheric band emission in the middle atmosphere. The instrument resolves individual rotational lines whose intensities follow a Boltzmann law allowing for the derivation of temperature from the relative structure of these lines. The CubeSat AtmoCube-1 is currently developed within the Development Initiative for Small Satellites Exploring Climate Processes by Tomography (DISSECT), initiated by the University of Wuppertal and the Research Centre Jülich. The remote sensing instrument will be tested under near space conditions within the experiment AtmoHIT (Atmospheric Heterodyne Interferometer Test). AtmoHIT is part of the Rocket Experiment for University Students campaign (REXUS 22), realized under a bilateral Agency Agreement between the German Aerospace Centre (DLR) and the Swedish National Space Board (SNSB).

UP 21.5 Fr 14:15 GW2 B3009
Variability of Hydroxyl nightglow from 2003 to 2011: Impact of the 27-day solar cycle — •Georg Teiser and Christian von Savigny — Universität Greifswald, Deutschland

Airglow observations are a commonly used method to study the Earth atmosphere. OH airglow is a selfluminous phenomenon of the middle atmosphere with a peak in the emission altitude of ~87 km. Particularly the emission of chemically excited OH molecules is used to derive kinetic temperature and is therefore a good opportunity to improve

the understanding of middle atmospheric variability. To understand middle atmospheric climate change we need a full understanding of all sources of variability, in particular caused by solar cycle effects. For that reason there is a network of ground-based instruments at locations distributed all over the world to observe the night time OH airglow in the mesopause. In this context the knowledge of the spatial and temporal variability of the nightglow is of importance for the interpretation of ground-based OH temperature measurements. But ground-based measurements of the OH emission altitude are difficult. This gap of altitude information can be filled with satellite measurements.

We used the OH(3-1) band nightglow data set from SCIAMACHY (SCanning Imaging Absorption spectroMeter for Atmospheric CHartographY) on Envisat (from August 2002 to April 2012) and applied a Superposed Epoch Analysis to investigate the solar 27-day effects in the emission altitude as well as in the emission rate and derived kinetic temperature. SCIAMACHY measurements cover most years of one solar cycle.

UP 21.6 Fr 14:30 GW2 B3009

Lidarbeobachtungen von Spurengasen und Dynamik in der polaren Mesopausenregion — •Timo P. Viehl[1], Josef Höffner[1], Wuhu Feng[2], John M.C. Plane[2], W. John R. French[3], Stefan Noll[4], Raimund Wörl[1] und Franz-Josef Lübken[1] — [1]Leibniz-Institut für Atmosphärenphysik an der Universität Rostock, 18225 Kühlungsborn — [2]School of Chemistry, University of Leeds, Leeds, United Kingdom — [3]Australian Antarctic Division, Kingston, Tasmania, Australia — [4]Institut für Astro und Teilchenphysik, Universität Innsbruck, Österreich

Das mobile Fe-Lidar des Leibniz-Instituts für Atmosphärenphysik erlaubt Messungen der meteorischen Eisenschicht, Aerosolen und Temperaturen in der Mesopausenregion mit hoher Genauigkeit. Messkampagnen in der Antarktis (Davis Station, 69°S) in den Jahren 2010-2012 und der Arktis (ALOMAR, 69°N) in den Jahren 2008-2009 und seit 2014 haben einen Datensatz von bisher 4900 Stunden geliefert. Hier präsentieren wir wichtige Ergebnisse über die atomare Eisenschicht, die gasförmige Metallchemie, die Dynamik der Mesopausenstruktur und die Temperaturbestimmung der Hydroxylschicht.

UP 21.7 Fr 14:45 GW2 B3009

Lidar observations of gravity waves. — •Irina Strelnikova, Gerd Baumgarten, Jens Hildebrand, Franz-Josef Lübken, and Michael Gerding — Leibniz-Institute of Atmospheric Physics e.V. at the University Rostock. Kühlungsborn. Germany

Experimental and modeling efforts show that small-scale gravity waves (GW) essentially affect large-scale circulations, thermal states, and dynamics from the surface to the middle atmosphere. In climate modeling and weather-forecasting applications the gravity-wave drag and its interaction with large-scale dynamics are referred to as sub-gridscale, i.e. unresolved processes and are the most uncertain aspect of these models. Recent advances in lidar measurement techniques allow for experimental studies of GWs at very small spatial and temporal scales, which are not accessible by other means. The state of the art Doppler Rayleigh/Mie/Raman lidar at the ALOMAR research station located in Northern Norway (69N, 16E) provides an observational database of GWs at the edge of the polar vortex connected to global dynamics of the Earth atmosphere. In this paper we will present some results of analyses of the GW observations by lidars and discuss implications on atmospheric system.

UP 21.8 Fr 15:00 GW2 B3009

The microphysical formation process of Noctilucent Clouds — •Mario Nachbar[1], Denis Duft[2], and Thomas Leisner[1,2] — [1]University of Heidelberg, Institute of Environmental Physics, Germany — [2]Karlsruhe Institute of Technology - KIT, Institute for Meteorology and Climate Research, Germany

Ablated meteoric material condensates in the upper atmosphere to nanometer sized meteoric smoke particles (MSPs). These particles are believed to serve as nuclei for the formation of so called NoctiLucent Clouds (NLCs) which appear in the polar summer mesopause. However, describing the formation process of these clouds comes hand in hand with large uncertainties mainly due to a lack of experimental data on their microphysical formation process. We produce single charged nanometer sized (1-3 nm) MSP analogues and expose them to realistic mesopause conditions in terms of background pressure, temperature, radiation and water vapor concentration. A time of flight mass spectrometer allows us to observe adsorption and deposition of water vapor subsequent to nucleation as a function of temperature and saturation. This contribution will introduce the nucleation formalisms used to describe the formation of NLCs and will compare these to the latest experimental results of water vapor nucleation on different MSP analogues. Measurements of the adsorption process of water vapor on the pure MSP particles as well as critical saturations as function of particle size and background temperature will be presented. In addition, the heat up of MSPs by absorption of background radiation and its influence on the nucleation process will be highlighted.

UP 21.9 Fr 15:15 GW2 B3009

Ermittlung von Auftretensraten Nachtleuchtender Wolken in SCIAMACHY-Nadir-Messungen — •Martin P. Langowski, Christian von Savigny und Tobias Bachmann — Ernst-Moritz-Arndt-Universität Greifswald, Institut für Physik

Nachtleuchtende Wolken (NLCs) sind Wolken die im polaren Sommer in der zu dieser Zeit besonders kalten Mesopausenregion auftreten. NLCs wurden das erste Mal 1885 beobachtet und sind seitdem regelmäßig beobachtet worden. In Satellitenmessungen lassen sich NLCs am besten in der "Limb" Geometrie (Scans tangential zur Erdoberfläche) beobachten. Allerdings messen die meisten Satelliten nur in "Nadir" Geometrie (Scans in Richtung Erdoberfläche), sodass die längsten Beobachtungszeitserien mit Messungen in dieser Geometrie gemessen wurden. Mit den Satellitengestützten Instrumenten SCIAMACHY, GOME und GOME-2 (2 Satelliten) gibt es derzeit einen Datensatz von 4 sehr bauähnlichen Instrumenten mit einer ähnlichen Lokalzeit, die insgesamt bereits über 20 Jahre lang gemessen haben und deren Messreihen mit einem dritten GOME-2 Instrument (geplant für MetOp C 2018) noch weitergeführt werden. Es ist bekannt, dass die Auftretensrate der NLCs vom solaren 11-Jahres-Zyklus abhängt. Desweiteren können aus Langzeitbeobachtungen Trends beobachtet werden, die für die Untersuchung des Klimawandels in der oberen Atmospäre relevant sind. Wir präsentieren die aktuellen Fortschritte bei der Auswertung des SCIAMACHY, GOME und GOME-2 Datensatzes. Dabei wird der Algorithmus sowie die damit verbundenen Einschränkungen erklärt und es werden Ergebnisse für Beispieljahre gezeigt.

UP 21.10 Fr 15:30 GW2 B3009

Lokalzeitliche Abhängigkeit von leuchtenden Nachtwolken — •Francie Schmidt, Uwe Berger und Franz-Josef Lübken — Leibniz-Institut für Atmosphärenphysik, Kühlungsborn, Deutschland

Leuchtende Nachtwolken (NLCs) bestehen aus Wassereiskristallen und treten bei Temperaturen von 150K und weniger im Sommer in der Mesopausenregion hoher Breiten auf. Sie reagieren sehr sensitiv gegenüber atmosphärischen Änderungen und weisen räumliche und zeitliche Variationen auf. In diesem Zusammenhang werden NLCs als Indikatoren hinsichtlich Klimaänderungen in der mittleren Atmosphäre betrachtet. Das Eismodel MIMAS (Mesospheric Ice Microphysics And tranSport model) wird verwendet, um das lokalzeitliche Verhalten von NLCs zu untersuchen. Wir charakterisieren die Variationen von NLC Parametern im Tagesverlauf in Form von harmonischen Fitfunktionen (24, 12, 8h Perioden). Die Untersuchungen von verschiedenen Breitengraden zeigen einen dominierenden Tagesgang mit einer 24h Periode. Da die breitenabhängigen Variabilitäten Einfluss auf NLC Beobachtungen auf längeren Zeitskalen haben können, ist es wichtig, die täglichen Variationen von NLCs zu verstehen. MIMAS zeigt zum Beispiel für den Eiswassergehalt der NLCs ein Maximum am frühen Morgen, ein Minimum am frühen Abend und variiert mit einen Faktor von bis zu 20 innerhalb des Tages. Diese Modelldaten werden mit Beobachtungen (ALOMAR RMR-LIDAR; AIM-Satellit) verglichen. Hierbei zeigt sich eine gute Übereinstimmung zwischen Beobachtung und Modellierung.

UP 21.11 Fr 15:45 GW2 B3009

Signaturen von lunaren Gezeiten in nachtleuchtenden Wolken beobachtet vom Satelliteninstrument SOFIE — •Christoph Hoffmann[1], Christian von Savigny[1], Mark Hervig[2] und Esther Oberbremer[1] — [1]Ernst-Moritz-Arndt-Universität Greifswald — [2]GATS Inc., Driggs, USA

Eine bisher unzureichend charakterisierte Quelle natürlicher Variabilität nachtleuchtendender Mesosphärenwolken sind Gezeiten, die durch die Gravitationskraft des Mondes verursacht werden. Die Identifikation entsprechender Signaturen für nachtleuchtende Wolken basierte lange auf manuellen, visuellen Beobachtungen. Erst im letzten Jahr wurden sie in den Parametern Eiswassergehalt und Wolkenalbedo in Daten des Satelliteninstrumentes SBUV nachgewiesen.

Hier wird diese Analyse auf weitere Parameter des umfangreichen Datensatzes des Instruments SOFIE (Solar Occultation For Ice Experiment) auf dem Satelliten AIM (Aeronomy of Ice in the Mesosphere)

ausgedehnt, das speziell für die Beobachtung von nachtleuchtenden Wolken konzipiert ist. In vielen Parametern des SOFIE Datenproduktes wurden Signaturen extrahiert, die zur halbtätigen lunaren Gezeit passen, insb. in der Temperatur, dem Wasserdampfgehalt, der Wolkenhöhe und den Teilchengrößen. Für die Signaturen vieler Parameter wird eine starke Höhenabhängigkeit beobachtet. Eine mögliche Beeinflussung der Ergebnisse durch atmosphärische Wellen wird diskutiert.