UP 6 Poster: Aerosole

Zeit: Dienstag 10:15–12:15 Raum: Poster TU HTF

UP 6.1 Di 10:15 Poster TU HTF

SAGE AEROSOL EXTINCTION MEASUREMENTS IN THE ARCTIC UPPER TROPOSPHERE/LOWER STRATOSPHERE — •Renate Treffeisen[1], Andreas Herber[2], and Larry Thomason[3] — [1]Alfred Wegener Institute for Polar and Marine Research, Am Telegrafenberg A45, 14473 Potsdam, Germany — [2]Alfred Wegener Institute for Polar and Marine Research, Am Handelshafen 12, 27570 Bremerhaven, Germany — [3]NASA Langley Research Center Hampton, VA, USA

The Stratospheric Aerosol and Gas Experiment (SAGE) II has collected vertical profiles of aerosol extinction in the Arctic at four wavelengths (385 to 1020 nm) from its launch in 1984 aboard the Earth Radiation Budget Satellite to the present. SAGE III, launched in late 2001, measures aerosol extinction at nine wavelengths from 385 nm to 1540 nm. While these instruments are nominally designed to measure stratospheric aerosol, they had produced a considerable amount of aerosol extinction observations in the Arctic middle and upper troposphere particularly at the longer wavelength channels.

In this presentation, we will demonstrate the robustness of the measurements. Since SAGE uses the solar occultation technique, the integration path through the atmosphere is long, and inhomogeneity along the path particularly within the troposphere and in the presence of clouds is a significant limitation to the use of this data. The study shows that the presence of clouds can be detected and adequately excluded from the data analysis.

UP 6.2 Di 10:15 Poster TU HTF

Infrarotspektroskopie an levitierten atmospärischen Mikrotropfen — •Daniel Rzesanke, Klaus Hemmelmann und Thomas Leisner — Technische Universität Ilmenau, Institut für Physik, Postfach 100565, 98684 Ilmenau

Mikrotropfen stellen im Bereich der Atmosphärenpysik ein wichtiges Modellsystem dar, an welchem chemische und physikalische Vorgänge in der Atmosphäre repräsentativ untersucht werden können. Zur Erforschung dieser Vorgänge eignet sich eine berührungsfreie Speicherung der Tropfen, ohne störende Grenzflächenkontakte, in einer elektrodynamischen Falle nach dem Paul-Prinzip besonders gut.

Zur Untersuchung der Tropfen wird ein FTIR-Spektrometer in Verbindung mit einem geeignetem Mikroskop verwendet. Mit dieser Technik lassen sich sehr kleine Probenvolumina (picoliter) analysieren, sowie Aussagen über chemische Komponenten und Reaktionen treffen. Eine die Falle umgebende Klimakammer erlaubt es, definierte atmosphärische Bedingungen einzustellen.

Die Anlage ist vielseitig einsetzbar - die im Beitrag vorgestellten ersten Anwendungsergebnisse zeigen den Einsatz zur Bestimmung der Feuchte in Kammer und Tropfen sowie die Untersuchung troposphärischer Schwefelsäuretröpfchen.

UP 6.3 Di 10:15 Poster TU HTF

Coulomb-Instabilitäten geladener Wassertropfen — •René Müller, Denis Duft und Thomas Leisner — Technische Universität Ilmenau, Institut für Physik, Postfach 100565, 98684 Ilmenau

Schon 1882 sagte Lord Rayleigh die Spaltung geladener verdampfender Tropfen über die Instabilität der Quadrupolschwingung voraus. Durch Untersuchungen von hochgeladenen Mikrotropfen in einem elektrodynamischen Levitator (Paulfalle) konnte diese Theorie bestätigt werden. Rayleigh vermutete weiterhin, dass es beim Erreichen der Stabilitätsgrenze zum teilweisen Ausstoß von Ladung und Masse in Form von Jets kommt. Unter Verwendung der ultraschnellen Photographie konnten wir diese Jets bei Glykoltropfen nachweisen.

Da hochgeladene Tropfen nicht nur bei verschiedenen technischen Prozessen wie z.B. Tintenstrahldruck, Elektrosprayionisation, Lackierverfahren und Brennstoffeinspritzung, sondern auch bei der Bildung und Verdampfung von Gewitterwolken eine besondere Rolle spielen, erweiterten wir unsere Experimente auf die Untersuchung atmosphärenrelevanter Wassertropfen. In diesem Beitrag präsentieren wir die Ergebnisse der Messungen zum Stabilitätsverhalten hochgeladener Wassertropfen, und zeigen den Einfluss von Temperatur, Tropfengröße und Ladungspolarität.

UP 6.4 Di 10:15 Poster TU HTF

Simulationsexperimente zum Wettbewerb zwischen heterogener und homogener Eisnukleation bei der Bildung von Zirren — •Stefan Benz, Ottmar Möhler, Helmut Bunz und Ulrich Schurath — Forschungszentrum Karlsruhe, IMK-AAF, Pf 3640, D-76021 Karlsruhe

Zirruswolken bedecken ca. 20-50% der globalen Oberfläche und haben einen bedeutenden Einfluss auf die Strahlungsbilanz der Atmosphäre. Die Strahlungseigenschaften der Zirren hängen von deren mikrophysikalischen Eigenschaften wie Anzahlkonzentration, Größenverteilung und Form der Eiskristalle ab. Die Aerosolkammer AIDA des Forschungszentrums Karlsruhe ermöglicht die experimentelle Untersuchung der heterogenen und homogenen Eisnukleation bei simulierten Wolkenbedingungen. Für das homogene Gefrieren von Schwefelsäuretröpfchen, die ein wesentlicher Bestandteil des Aerosols der oberen Troposphäre und der unteren Stratosphäre sind, sind relative Eisübersättigungen von etwa 140 bis 170% in Abhängigkeit der Temperatur nötig. Sind gleichzeitig feste trockene Aerosolpartikel, z. B. mineralisches Wüstenstaubaerosol, vorhanden entstehen Eispartikel bereits bei wesentlich geringeren Übersättigungen durch Deposition von Wasserdampf auf diesen Partikeln. In Abhängigkeit von Temperatur und Kühlrate untersuchten wir den Wettbewerb zwischen heterogenen und homogenen Gefrierprozessen mit atmosphärisch relevanten Anzahlkonzentrationen von flüssigen Schwefelsäuretröpfchen und festen Aerosolpartikeln. Vergleiche der experimentellen Resultate mit einem numerischen Prozessmodell mit geeigneten Parametrisierungsschemata werden vorgestellt.

UP 6.5 Di 10:15 Poster TU HTF

Spektrale optische Eigenschaften von Wüstenstaubaerosolen — •Claudia Linke und Martin Schnaiter — Forschungszentrum Karlsruhe, IMK-AAF, Postfach 3640, 76021 Karlsruhe

Wüstenregionen sind natürliche Quellen für den Eintrag großer Mineralstaubmengen in die Atmosphäre. Mineralstaubaerosole können in der Atmosphäre über weite Entfernungen transportiert werden und beeinflussen damit direkt den Strahlungshaushalt der Erde.

Für die verschiedenen Mineralstäube variiert der Anteil der Absorption an der Extinktion im sichtbaren Wellenlängenbereich. Daraus kann ein insgesamt positiver oder aber negativer Strahlungsantrieb für die Atmosphäre resultieren. Im Labor wurden Extinktions- und Streukoeffizienten unterschiedlicher Mineralstaubaerosole vergleichbarer Partikelgröße gemessen. Parallel dazu wurde die chemische und mineralogische Zusammensetzung der Mineralstäube untersucht. Die Mineralstäube zeigen danach deutliche Unterschiede in ihrer Einfachstreualbedo. Der Zusammenhang zwischen optischen Eigenschaften und Mineralzusammensetzung wird diskutiert.

UP 6.6 Di 10:15 Poster TU HTF

Sedimentation von Staubpartikeln — •Gregor Schmitt-Pauksztat[1,2], Oliver Wallenfang[2], Bernd Diekmann[1] und Wolfgang Büscher[2] — [1]Universität Bonn, Physikalisches Institut, Nussallee 12, 53115 Bonn — [2]Universität Bonn, Institut für Landtechnik, Nussallee 5, 53115 Bonn

Die Technische Anleitung zur Reinhaltung der Luft setzt in ihrer Fassung aus dem Jahr 2002 erstmals Grenzwerte für die Emissionen und Immissionen luftfremder Stoffe wie Staubpartikel aus Tierställen fest. Zur Gewährung rechtlicher Sicherheit bei der Standortfindung und -sicherung dienen Modellrechnungen der Immissionsprognose. Die korrekte Modellierung der Staubausbreitung erfordert Kenntnisse über die physikalischen Eigenschaften der Partikel. Am Institut für Landtechnik der Universität Bonn werden in Zusammenarbeit mit dem Physikalischen Institut die Eigenschaften von Stäuben verschiedener Tierarten untersucht. Dazu gehört neben Masse, Dichte und Form der Partikel die Sedimentationsgeschwindigkeit, die bei der Ausbreitung der Partikel eine große Rolle spielt. In dieser Präsentation werden die verschiedenen Staubarten verglichen und die Auswirkungen der Unterschiede auf das Ausbreitungsverhalten diskutiert.

UP 6.7 Di 10:15 Poster TU HTF

New particle formation in the coastal boundary layer — •Susanne Marquart and Roland von Glasow — Institut für Umweltphysik, Universität Heidelberg

During low tide, several alkyl iodines can be released by marine algae. Some of these organoiodine compounds photolyse quickly, forming I radicals which can be chemically transformed into various inorganic iodine-species. There is some evidence that iodine oxides may play a substantial role in the formation of new particles in the marine coastal environment. To investigate this further, we present some sensitivity model studies. We used the one-dimensional model MISTRA-MPIC, which includes detailed aerosol microphysics and chemistry in the gas and aqueous phase. This model has already been used for investigating the role of halogens for the chemistry of the marine boundary layer. Besides chlorine and bromine chemistry, the model contains a detailed iodine reaction scheme and is extended by a nucleation parameterisation which connects the "real"nucleation rate of thermodynamically stable clusters with an "apparent"nucleation rate in the model's lowest size bin. The results of our sensitivity studies are compared to available observations.

UP 6.8 Di 10:15 Poster TU HTF

Polar Stratospheric Clouds in the Arctic and Antarctic - A Statistical Approach — •Marion Müller[1], Roland Neuber[1], Paola Massoli[2], and Francesco Cairo[2] — [1]Alfred-Wegener-Institut für Polar- und Meeresforschung, Potsdam, Germany — [2]Institute for Atmospheric Sciences and Climate, CNR, Rome, Italy

Polar stratospheric clouds (PSCs) play a crucial role for the stratospheric ozone layer in the polar regions. Their various forms of appearance - e.g. the state of aggregation and size of their particles- have a decisive influence on the amount of activated chlorine leading to ozone destruction. Differences in Arctic and Antarctic PSC occurrence are to be expected due to the different vortex stability and temperatures. Our study is based on PSC lidar observations from Ny-Alesund [79°N, 12°E] and McMurdo [78°S, 167°E]. As expected, we find large differences in the occurrence frequency of the various PSC types. Yet, the statistical analysis reveals some surprises, e.g. it is found that the most common PSC type at the Antarctic station is made from solid NAT particles, while only a small fraction of the observed cloud layers consist of ice particles. On the other hand, the majority of PSCs at the Arctic station is found to consist of liquid particles. As the PSC type has an influence on the heterogeneous activation rate, these results have to be carefully validated and taken into account by ozone chemistry models.

UP 6.9 Di 10:15 Poster TU HTF

Global measurements of bromine monoxide and comparison with model results — •Ninad Sheode — Univ. Bremen, IUP/IFE, Otto-Hahn Alle, 28329, Bremen, Germany

Bromine compounds play an important role in the depletion of stratospheric ozone. They are more efficient at destroying ozone at per molecule level than for an equivalent amount of chlorine. However, despite their significant role in ozone depletion, the measurements of bromine species have been sparse. And hence the chemical mechanisms of bromine chemistry have also not been thorougly validated.

SCIAMCHY launched on board ENVISAT in March 2002 is measuring bromine monoxide globally for the first time. Bromine monoxide forms 40 to 70 percent of total inorganic bromine in the atmosphere. The global measurements of bromine monoxide give us a good opportunity to understand and validate our understanding of bromine chemistry.

UP 6.10 Di 10:15 Poster TU HTF

Global measurements of bromine monoxide and comparison with model results — •Ninad Sheode, Bjoern-Martin Sinnhuber, Alexei Rozanov, and John Burrows — Univ. Bremen, IUP/IFE, Otto-Hahn Alle, 28329, Bremen, Germany

Bromine compounds play an important role in the depletion of stratospheric ozone. They are more efficient at destroying ozone at per molecule level than for an equivalent amount of chlorine. However, despite their important role in ozone depletion , the measurements of bromine species have been sparse. And hence the chemical mechanisms of bromine chemistry have also not been thoroughly validated.

SCIAMACHY, launched on board ENVISAT in March 2002, is measuring bromine monoxide (BrO) globally for the first time. BrO forms 40-40 percent of total inorganic bromine in the atmosphere. the global measurements of BrO give us a good opportunity to understand and validate our understanding of bromine chemistry.

UP 6.11 Di 10:15 Poster TU HTF

Comparison of ground based measurements and model calculations of bromine monoxide in Nairobi (1°S, 36°E) — •Sixten Fietkau, Thomas Medeke, Andreas Richter, Ninad Shoede, Björn-Martin Sinnhuber, Folkard Wittrock, and John P. Burrows — Universität Bremen, Institut für Umweltphysik, Otto-Hahn-Allee 1, 28359 Bremen, Germany

Bromine species have discovered to play an important role in ozone depletion in the stratosphere. Stratospheric inorganic bromine was estimated in 1999 to be 18-21 ppt from organic precursor measurements and from coincident measurements of bromine monoxide (BrO). Its contribution to total stratospheric ozone loss is estimated at about 25 source gas emissions has not yet reached. Measurements of BrO are reported in various studies for high and middle latitudes but there are no long term and only a few campaign measurements in low latitude regions and in particular in Africa. To extend our current understanding of bromine chemistry first systematic ground based measurements of stratospheric BrO at low latitudes over a period of several years are presented. The measurements are compared with calculations of BrO slant column densities from a 1D chemical transport model (CTM) which is coupled with a radiative transfer model to allow direct comparisons between the observed and modelled data.

UP 6.12 Di 10:15 Poster TU HTF

SOURCES OF FORMALDEHYDE: TRACE GAS EMISSIONS FROM AGRICULTURAL FIRES IN NORTHERN ITALY — •Claudia Hak, Kai-Uwe Mettendorf, Achim Bäuerle, Christian Kunz, Ulrich Platt, and Irene Pundt — Institut für Umweltphysik, Universität Heidelberg

Simultaneous measurements of CH2O, NO2, SO2, O3, and HONO were performed with the Multibeam-Longpath-DOAS (Differential Optical Absorption Spectroscopy) method during a field campaign in Lombardia (Italy). The measurements shown focus on the investigation of formaldehyde, an important source of odd hydrogen radicals and hence a precursor of tropospheric ozone. The campaign was part of the European project FORMAT (FORMaldehyde As a Tracer of photooxidation in the troposphere) and took place at three sites in the greater Milano area. Here, we concentrate on one site located at the river Po 40 km south of Milano.

The Po Basin is an area of intensive agricultural and industrial activity. In autumn after harvesting the stubble fields are burnt down forming a considerable local source for hydrocarbons and other gases of interest. The emissions of formaldehyde and sulphur dioxide (SO2) by several fire events are examined in this study.

UP 6.13 Di 10:15 Poster TU HTF

Measurements of tropospheric NO_2 with SCIAMACHY — •Andreas Richter[1], Andreas Heckel[1], Hendrik Nüss[1], Folkard Wittrock[1], Bernd Sierk[2], and John P. Burrows[1] — [1]Institut für Umweltphysik, Universität Bremen, Otto-Hahn-Allee, D-28359 Bremen — [2]Bundesamt fuer Kartographie und Geodaesie (BKG), Observatorio TIGO, Universidad de Concepcion, Concepcion, Chile

The SCIAMACHY instrument on ENVISAT provides amongst other quantities accurate nadir measurements of the UV/visible radiances scattered back from the atmosphere. From these measurements, tropospheric columns of NO_2 can be retrieved using the well known DOAS method and some assumptions on the stratospheric NO_2 fields.

The two main advantages of SCIAMACHY over GOME are the much better spatial resolution (up to 30×30 km^2 compared to 320×40 km^2) and the limb measurements that provide stratospheric profile information over each nadir pixel. Better spatial resolution improves the detection capabilities of tropospheric pollution while the stratospheric limb profiles improve the accuracy of the stratospheric NO_2 fields needed in the data analysis.

In this presentation, results from 30 months of SCIAMACHY tropospheric NO_2 measurements are presented. The focus is on discussion of the effects of improved spatial resolution (in particular with respect to the existing GOME data set) and the impact of the use of limb profiles for the stratospheric correction.

UP 6.14 Di 10:15 Poster TU HTF

Validation of ENVISAT/SCIAMACHY scientific retrievals of CO by solar FTIR at the Ground Truthing Station Zugspitze — •Ralf Sussmann[1], Wolfgang Stremme[1], Alexander Rockmann[1], Markus Rettinger[1], Michael Buchwitz[2], and Rüdiger de Beek[2] — [1]Forschungszentrum Karlsruhe, IMK-IFU, Garmisch-Partenkirchen — [2]Universität Bremen, Institut für Umweltphysik

CO profile retrievals from ground-based FTIR measurements at the Ground Truthing Station Zugspitze (47° N, 11° E, 2964 m asl.), Germany are used to validate columnar CO retrieved from SCIAMACHY spectra (WFM-DOAS v0.4). The WFM-DOAS retrievals of CO include an empirical column scaling factor of 0.5. Therefore, not absolute column levels are validated, but the response of the SCIAMACHY retrievals to the atmospheric inter-annual variability is quantitatively assessed in comparison to the Zugspitze FTIR results. Although CO WFM-DOAS data show a significant scatter, it is possible to retrieve information on the CO annual cycle ($\approx$ 10% amplitude) in a statistically significant fit. This can be achieved by averaging all SCIAMACHY pixels within a certain minimum radius around the Zugspitze for each day.

UP 6.15 Di 10:15 Poster TU HTF

Validation of ENVISAT/SCIAMACHY operational versus scientific retrievals of NO2 by solar FTIR at the Ground Truthing Station Zugspitze — •Ralf Sussmann[1], Wolfgang Stremme[1], Alexander Rockmann[1], Markus Rettinger[1], and Andreas Richter[2] — [1]Forschungszentrum Karlsruhe, IMK-IFU, Garmisch-Partenkirchen — [2]Universität Bremen, Institut für Umweltphysik

NO2 retrievals from solar FTIR measurements at the Permanent Ground Truthing Station Zugspitze (47° N, 11° E, 2964 m asl.), Germany are used to validate columnar NO2 retrieved from ENVISAT/SCIAMACHY. Validating scientific (UB1.0) NO2 total column data (Jul - Jun 2003), a perfect agreement of the annual cycle to the ground FTIR data is found, after removing obvious enhancements due to pollution episodes not captured by the high altitude Zugspitze FTIR. The absolute SCIAMACHY UB1.0 columns are 16% below the Zugspitze FTIR columns. The operational SCIAMACHY NO2 retrievals (DOAS_1, ESA master set), however, are not able to reflect the NO2 decrease in the second half of the annual cycle. Possible reasons for this difference between the scientific versus operational NO2 retrievals will be discussed in the poster.

UP 6.16 Di 10:15 Poster TU HTF

A silencer for exhaust fumes of combustion engines — •Mathias Schmitz — Sitzbuchweg 30, 69118 Heidelberg

The presentation relates to a silencer for exhaust fumes of combustion engines and the procedure of cleaning exhaust fumes produced by combustion engines, which belongs to a patent application and the German technical design NR. 20 2004 002 397.0.

Observations have showed that the increasing combustion of fossil fuels (e.g. Benzene, Petrol, Gasoline, Diesel and Natural Gas) has lead to an increased global warming effect. Furthermore, the European mountains have showed a decline in nascent distance in height and of the zero degree border. These mountains and low mountain region of millennia old glaciers, ice and snow are thawing out. This invention proposes that a connection consists between the combustion of fossil fuels and global warming.

Accordingly, there is a need for cleaning exhaust fumes from combustion heat power machines. The claim is; that a silencer appliance for exhaust fumes of combustion engines with a heat swapper in the exhaust appliance with a liquid conductor of heat bearer cools exhaust fumes. The liquid conductor of heat transports the heat into a cooler and that an opening is arranged for the water from the condensed vapour. The exhaust fumes caused by combustion contain water, which needs to be condensed.