UP 9 Poster: Atmosphäre und Klima

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

UP 9.1 Di 10:15 Poster TU HTF

Interactions of sulfur and halogens in the marine boundary layer — •Roland von Glasow[1,2] and Paul J. Crutzen[2,3] — [1]Institut für Umweltphysik, Universität Heidelberg, Heidelberg, Germany — [2]Scripps Inst. of Oceanography, UCSD, La Jolla, USA — [3]Max-Planck Institut für Chemie, Mainz, Germany

The oxidation of DMS is the main source of SO_2, MSA, and non-sea-salt sulfate in the clean marine boundary layer (MBL). Recently the importance of BrO - in addition to OH and NO_3 - has been suggested as oxidant for DMS. Furthermore HOCl(aq) and HOBr(aq) can increase the oxidation of S(IV) to S(VI) in aerosol and cloud particles. Chlorine and bromine in the MBL are derived from seasalt aerosol. We investigated the importance of these processes for the chemistry of the MBL and possible climate links with the one-dimensional chemical and microphysical model MISTRA-MPIC. BrO plays a very significant role as oxidant even under very low mixing ratios of 0.5 pmol/mol. We found that still significant uncertainty exists in the kinetics of DMS oxidation especially with regard to the endproducts of DMS oxidation. Under most conditions that we studied the net effect of halogens, especially under cloudy conditions, is an increase in particulate sulfur (MSA plus nss-sulfate) and decrease of precursors for the formation of new CCN.

UP 9.2 Di 10:15 Poster TU HTF

Water Vapour Retrieval from SCIAMACHY Nadir Data — •Stefan Noël, Michael Buchwitz, John P. Burrows, and Heinrich Bovensmann — Institute of Environmental Physics/Remote Sensing, University of Bremen, Germany

Measurements of the SCanning Imaging Absorption spectroMeter for Atmospheric CHartographY (SCIAMACHY) on-board the European environmental satellite ENVISAT have been used to derive water vapour total column amounts on the global scale.

For this purpose, the Air Mass Corrected Differential Absorption Spectroscopy (AMC-DOAS) approach has been applied to SCIAMACHY's nadir measurements in the spectral region around 700 nm.

Previous investigations already showed a good agreement of the water vapour columns derived from SCIAMACHY with correlative data from e. g. the Special Sensor Microwave Imager (SSM/I) and from the European Centre for Medium-Range Weather Forecasts (ECMWF).

However, these investigations were based on a limited set of SCIAMACHY data. Meanwhile, the AMC-DOAS retrieval method has been applied to a larger amount of data. This presentation will show results of an extended comparison between SCIAMACHY water vapour columns and other satellite and model data.

UP 9.3 Di 10:15 Poster TU HTF

Stratospheric Water Vapor in the Arctic: Measurements and Modelling — •Marion Müller[1], Federico Fierli[2], Vladimir Yushkov[3], Alexander Lukyanov[3], and Sergey Khaykin[3] — [1]Alfred Wegener Institute for Polar and Marine Research, Potsdam, Germany — [2]Institute for Atmospheric Sciences and Climate, CNR, Rome, Italy — [3]Central Aerological Observatory, Moscow, Russia

Water vapor is a greenhouse gas that is found to increase in the stratosphere. Here we present observations of the stratospheric water vapor mixing ratio inside, outside, and at the edge of the polar vortex measured by the FLASH-B Lyman-alpha hygrometer during the LAUTLOS campaign in Sodankylä, Finland, in January and February 2004. Analysing the measurements with the semi-lagrangian advection model MIMOSA, water vapor profiles typical for the polar vortex interior and exterior have been identified, and laminae in the observed profiles have been correlated to filamentary structures in the potential vorticity field. Applying the validated MIMOSA transport scheme to specific humidity fields based on the ECMWF T106 model, large discrepancies from the observed profiles arise. Although MIMOSA is able to reproduce weak water vapor filaments, the simulations reveal a dry bias of about 1 ppmv in the lower stratosphere above 400 K, accounting for a relative difference from the measurements in the order of 20 percent. The large dry bias in the models representation of stratospheric water vapor in the Arctic implies the need for future regular measurements of water vapor in the polar stratosphere to allow the validation and improvement of climate models.

UP 9.4 Di 10:15 Poster TU HTF

Modellierung der chemischen Entwicklung von Schiffsemissionen — •Klaus Franke[1], Heinrich Bovensmann[1], Veronika Eyring[2] und John P. Burrows[1] — [1]Institut für Umweltphysik, Universität Bremen, Otto-Hahn-Allee 1,28359 Bremen, Deutschland — [2]DLR-Institut für Physik der Atmosphäre, Oberpfaffenhofen, 82234 Wessling, Deutschland

Im Rahmen der Arbeiten der Helmholz-Hochschul-Nachwuchsgruppe SeaKLIM werden die Auswirkungen von Schiffsemissionen auf die chemische Zusammensetzung der Atmosphäre untersucht. Ein Aspekt der Nachwuchsgruppe ist es, mit Hilfe von photochemischen Boxmodellstudien die Ausbreitung der Schiffsabgasfahnen in der maritimen Grenzschicht zu simulieren. Damit soll der Übergang von der lokalen Ausdehnung kurz nach dem Ausstoß aus dem Schornstein hin zur weiträumigen Verteilung mehrere Stunden danach vollzogen werden. Hierbei wird das Abgasgemisch unter Vermischung mit der Umgebungsluft chemisch umgewandelt. Ziel der Rechnungen ist es, die Lücke zwischen der lokalen Emission und der großflächigen Messerfassung durch Satelliten zu schließen. Erste Ergebnisse werden dargestellt und mit Messdaten verglichen.

UP 9.5 Di 10:15 Poster TU HTF

Atmospheric trace gas measurements in the tropics by ground-based FTIR-spectrometry — •Thorsten Warneke[1], Justus Notholt[1], Voltaire Velazco[1], and Otto Schrems[2] — [1]Institute of environmental physics, University of Bremen, Bremen — [2]Alfred Wegener Institute, Bremerhaven

The tropics play a central role in global climate. Emissions within the tropics, especially from biomass burning, contribute substantially to the global budgets of many important trace gases. These pollutants significantly influence tropospheric and stratospheric chemistry. Solar absorption-FTIR measurements have been performed in Paramaribo (Surinam) to study the composition of the whole atmosphere, including the Tropical Tropopause Layer (TTL) and the stratosphere.

UP 9.6 Di 10:15 Poster TU HTF

Zeitreihen stratosphärischer Spurengase aus bodengebundenen FTIR-Messungen in Kiruna (Schweden) — •Sabine Mikuteit, Thomas Blumenstock und Frank Hase — IMK-ASF, Forschungszentrum Karlsruhe, Postfach 3640, 76021 Karlsruhe

Im Rahmen des NDSC (Network for the Detection of Stratospheric Change) betreibt das IMK zusammen mit dem IRF (Institutet för Rymdfysik) in Kiruna (Schweden, 68°N, 20°E, 420 m NN) seit 1994 ein FTIR-Spektrometer (Fourier-Transformation-InfraRot).

Gemessen werden atmosphärische Absorptionsspektren mit der Sonne als Strahlungsquelle. Aus diesen Messungen werden Profile und Gesamtsäulen verschiedener stratosphärischer Spurengase (O3, HCl, HNO3, ClONO2, ClO und HF) bestimmt, welche an der Ozonchemie beteiligt sind. Die Daten der Station in Kiruna sind besonders interessant, da dort ab Mitte Januar solare Absorptionsmessungen durchgeführt werden können und der Polarwirbel bis Ende März zeitweilig über Kiruna liegt. Somit können sehr gut chemische Prozesse wie Chloraktivierung, Denitrifizierung und Ozonabbau beobachtet werden.

Die erstellten Zeitreihen erstrecken sich über den Zeitraum 1996-2004. Hierfür wurden ca. 900 Messtage ausgewertet. Mit dieser Zeitreihe wird unter Berücksichtigung der Lage des arktischen Polarwirbels die Variabilität der arktischen Winter untersucht. Aus den Sommermonaten werden erste Trends für die einzelnen stratosphärischen Gasen abgeleitet.

UP 9.7 Di 10:15 Poster TU HTF

Spatial and temporal distribution of HCHO concentrations measured from space — •Folkard Wittrock, Andreas Richter, and John P. Burrows — University of Bremen, Institute of Environmental Physics, D-28359 Bremen

Formaldehyde (HCHO) indicates and supports photochemical activity in the atmosphere. Large amounts are expected to found in industrial areas and during biomass burning. HCHO is a major intermediate in the degradation of methane (and many other hydrocarbons). In the absence of heterogenous losses, essentially every methane molecule is converted to HCHO. Therefore it is found throughout the troposphere. It is destroyed via photolysis and reaction with OH. In continental boundary layers, non-

methane hydrocarbons (NMHCs) emitted by biogenic and anthropogenic sources dominate over Methane also as a source of HCHO.

GOME and SCIAMACHY are the first satellite instruments, which allow observations of Formaldehyde on a global scale giving the opportunity to improve our knowledge about emission fluxes of Methane and NMHCs. This study presents GOME measurements of formaldehyde since launch of ERS-2 in 1995. Ground-based measurements are used to validate the GOME HCHO product. In addition time series for selected regions are shown to illustrate the general interannual and interseasonal variation of HCHO depending on the main sources.

UP 9.8 Di 10:15 Poster TU HTF

Spatial distribution of tropospheric NO_2: SCIAMACHY results — •Steffen Beirle, Ulrich Platt, and Thomas Wagner — IUP (Institut für Umweltphysik), Universität Heidelberg

Nitrogen oxides ($NO+NO_2=NO_x$) are important ozone precursors in the troposphere. Column densities of NO_2 are detectable from satellite platforms using differential optical absorption spectroscopy (DOAS). Tropospheric column densities can be retrieved by estimating and subtracting the stratospheric fraction. From GOME observations, a time series of 8 years (1996-2003) of NO_2 column densities is available on a global scale with a spatial resolution of $320*40km^2$. Since March 2002, SCIAMACHY (onboard ENVISAT) provides the continuation of the GOME time series with a widely improved spatial resolution of $60*30km^2$.

Here we present yearly and seasonal composites of the mean distribution of tropospheric NO_2 from SCIAMACHY data. The small SCIAMACHY ground pixels resolve details in the spatial distribution of tropospheric NO_2 and allow the identification of localized NO_x sources like large cities or power plants as well as estimates of the mean lifetime of tropospheric NO_x.

UP 9.9 Di 10:15 Poster TU HTF

Estimate of Global Carbon Monoxide Budget Derived From MOPITT Data — •Holger Bremer — Institut für Umweltphysik, Universität Bremen, Otto-Hahn-Allee 1, 28359 Bremen

Carbon monoxide influences the oxidizing capacity of the troposphere as the major sink of OH radicals. Thus it is very important to have an accurate estimate of the CO budget of the atmosphere. On the basis of measurements the general features of global CO distribution have been established and it is well known, that CO concentrations are higher in the northern hemisphere than in the southern hemisphere. However, another important source of CO is biomass burning, much of which takes place in the southern tropics. In particular the seasonal biomass burning in Africa and South America injects large plumes of CO into the atmosphere which in turn affect tropospheric ozone concentrations. Another very significant emission source is Indonesia, where land-use conversion projects among other reasons have resulted in large biomass burning in recent years. In this work, we used total atmospheric column measurements of carbon monoxide (CO) from the MOPITT (Measurement of Pollution in the Troposphere) instrument to study the CO burden of the atmosphere. The global budget of CO has been estimated from the satellite measurements for the first time. The total emission of CO is estimated to be 1900-2230 Tg/year which is near the lower end of the previous estimates from models and climate change assessment reports. We assumed the reaction with OH to be the primary sink of CO and neglected all others including surface deposition. This sink is estimated to be 1890-2185 Tg, which is also within the range estimated previously.