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

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

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

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

UP 2.20 Tu 16:30 Lichthof

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

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

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

UP 2.21 Tu 16:30 Lichthof

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

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

UP 2.22 Tu 16:30 Lichthof

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

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

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

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

UP 2.23 Tu 16:30 Lichthof

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

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

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

UP 2.24 Tu 16:30 Lichthof

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

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

[1] - J.K. Nielsen et al., Solid particles in the tropical lowest stratosphere, Atmospheric Physics and Chemistry 7, 2007
[2] - J.K. Nielsen et al., Could stratospheric ice particles be stabilized by electrical charge?, Geophysical Research Letters, submitted Nov.2009

UP 2.25 Tu 16:30 Lichthof

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