UP 15 Poster: Atmosphäre und Klima

Zeit: Dienstag 14:00–16:00 Raum: C

UP 15.1 Di 14:00 C

Ozone Depletion Events, in the Polar Boundary Layer in Spring: A Model Study — •Matthias Piot and Roland von Glasow — Institut fuer Umweltphysik 69120 Heidelberg

Reactive halogens play a major role in ozone depletion events (ODE). The reaction of bromine atoms with ozone, followed by the self-reaction of bromine oxides (BrO) represents a catalytic loss mechanism for ozone in the polar boundary layer (PBL). However, the triggering of the so-called "bromine explosion" remains unclear. We used the chemical and microphysical model MISTRA to study the mechanisms leading to these observed depletions in the boundary layer. We will present model results where we used prescribed bromine or chlorine fluxes as responsible for ODEs. Our sensitivity study consisted in a set of four-day runs where we changed initial mixing ratios or fluxes (or both) of 19 different species (including halogens, NOx, NOy, DMS, H2O2, HCHO...) and compared the results with base runs. Temperature and humidity has also been examined. We investigated the importance of these compounds for the chemistry of the PBL and focused on species which influence the occurrence of an ODE. In addition to the sensitivity study, we are now examining the role that frost flowers play in the bromine explosion, using MISTRA in the lagrangian 1D mode. The considered column passes over a field of frost flowers, followed by an area of open lead. We observed that all the bromide from sea salt aerosols is released to the gas phase. Our results indicate that aerosols from frost flowers are probably not directly responsible for the bromine explosion and that additional cycles have to been taken into account.

UP 15.2 Di 14:00 C

Retrieval of tropospheric NO_2 by synergistic use of ENVISAT/SCIAMACHY and ground-based solar FTIR measurements at the Zugspitze — •Ralf Sussmann[1], Wolfgang Stremme[1], Johan P. Burrows[2], Andreas Richter[2], Wolfgang Seiler[1], and Markus Rettinger[1] — [1]Forschungszentrum Karlsruhe, IMK-IFU, Garmisch-Partenkirchen — [2]Universität Bremen, Institut für Umweltphysik

Columnar NO_2 from FTIR measurements at the Zugspitze (47° N, 11° E, 2964 m asl.) was investigated synergistically with SCIAMACHY satellite data (Univ. Bremen algorithm UB1.5). A new concept to match FTIR data to the time of satellite overpass makes use of the NO_2 daytime increasing rate retrieved from the FTIR data set. SCIAMACHY data within a 200-km selection radius were considered, and a pollution-clearing scheme was developed to select only pixels corresponding to clean background tropospheric conditions. Analysis of the averaging kernels gives proof that at mountain-site FTIR is a highly accurate measure for the stratospheric column, while SCIAMACHY shows significant tropospheric sensitivity. Based on this finding, we set up a combined a posteriori FTIR-SCIAMACHY retrieval for free tropospheric NO_2. It yields an annual cycle with variations between 0.75-1.54E+15 cm^{-2} and an intermediate phase between that of the well known boundary layer and the stratospheric annual cycles. The outcome is a concept for an integrated global observing system for tropospheric NO_2 that comprises DOAS NADIR satellite measurements and a set of latitudinally distributed mountain-site or clean-air FTIR stations.

UP 15.3 Di 14:00 C

Modeling halogen chemistry in volcanic plumes — •Roland von Glasow[1], Nicole Bobrowski[1], and Alessandro Aiuppa[2] — [1]Institute of Environmental Physics, University of Heidelberg, Germany — [2]Dipartimento CFTA, Universita di Palermo, Italy

Bromine oxide has been measured in the plumes of several slowly erupting volcanoes. We compared field mesurements from Mt. Etna, Italy with results from a one-dimensional model that was initialized with volcanic plume compositions according to a thermodynamic model. Assuming an "effective source region"where plume air is being mixed with ambient air at still high temperatures we were able to reproduce the measurmnets for BrO and SO_2 very well. The model includes a parameterization for the horizontal entrainment of background air as well as a detailed set of gas-phase and aerosol-phase reactions. We will show a comparison with data and discuss the results and possible implications of this for the chemistry of the troposphere.

UP 15.4 Di 14:00 C

Ground-based solar absorption measurements of CH4 — •Thorsten Warneke[1], Justus Notholt[1], Voltaire Velazco[1], Katinka Peterson[1], and Otto Schrems[2] — [1]Institut für Umweltphysik, Universitaet Bremen — [2]Alfred Wegener Institut, Bremerhaven

Methane (CH4) is an important greenhouse gas in the atmosphere, which is addressed in the Kyoto-protocol. Since pre-industrial times its concentration has more than doubled. For the prediction of the future atmospheric concentration of methane a better understanding of the sources and sinks is needed. Information about atmospheric CH4 is mainly inferred from in situ measurements. The main limitation of these measurements is their sparse spatial distribution. Recently global atmospheric CH4 data retieved from the satellite instrument SCIAMACHY on ENVISAT became available. These data provides important information on methane sources and sinks. However, satellites measure the atmospheric CH4 column which is a different kind of information than the atmospheric CH4 in situ measurements. Especially due the strong decrease of CH4 in the stratosphere the in situ and satellite measurements are not directly comparable. In this work we link the satellite measurements to the in situ measurements by deriving tropospheric and total column concentrations of methane from ground-based solar absorption measurements at Ny Alesund (Spitsbergen, 79°N). The ground-based FTIR-data is compared with in-situ and SCIAMACHY satellite data.

UP 15.5 Di 14:00 C

Ground-based solar absorption measurements of CO - satellite validation and model comparison — •Voltaire Velazco[1], Justus Notholt[1], Thorsten Warneke[1], and Otto Schrems[2] — [1]Institut für Umweltphysik, Universitaet Bremen — [2]Alfred Wegener Institut, Bremerhaven

Ground-based solar absorption measurements using Fourier transform infrared (FTIR) spectrometers provide precise information about the concentration profiles of many atmospheric trace gases. Therefore these measurements play a vital role for the validation of current and future satellite instruments measuring atmospheric trace gases. Carbon Monoxide (CO) volume mixing ratio (VMR) profiles retrieved from ship borne solar absorption measurements recorded on the Atlantic have been compared with space borne measurements by the Measurements of Pollution in the Troposphere (MOPITT) instrument. The higher vertical resolution of the ground-based measurements allows to detect enhancements in the upper troposphere, which are not seen by MOPITT. The contributions of different sources such as biomass burning, fossil fuel combustion and oxidation of methane (CH4) and non-methane hydrocarbons (NMHC) have been quantified.

UP 15.6 Di 14:00 C

Ground-based solar absorption measurements of CO2 — •Ronald Macatangay[1], Justus Notholt[1], Thorsten Warneke[1], and Christoph Gerbig[2] — [1]Institut für Umweltphysik, Universitaet Bremen — [2]Max Planck Institut für Biogeochemie, Jena

Carbon dioxide is the most important anthropogenic greenhouse gas. Remote sensing measurements of CO2 from space are likely to become important constraints on carbon cycle processes in the near future. These measurements cannot be validated with in situ measurements, because the in situ measurements are of a single point and the satellites measure a weighted column integral. The measurement of solar absorption via ground-based Fourier transform interferometers (FTIR) can measure the same column integrals as the satellite but do so at a fixed point, making it amenable to direct comparison with aircraft or in situ observations. First results of solar absorption measurements performed during the Carboeurope Regional Experiment in France are presented.

UP 15.7 Di 14:00 C

Analysis of NO_x mixing ratios in the middle atmosphere determined by HALOE data — •Shahin Kazeminejad, Justus Notholt, John.P Burrows, Christian von Savigny, and Miriam Sinnhuber — Institut für Umweltphysik, Universität Bremen

The chemical composition of the middle atmosphere can be strongly influenced by Solar Proton Events (SPEs) and Energetic Electron Precipitation Events(EEPs). These events are well known sources of NO_x (N,