UP 3 Atmosphärische Spurengase und Aerosole: Intrumentelles I

Zeit: Montag 14:30–16:00 Raum: TU TA201

Fachvortrag UP 3.1 Mo 14:30 TU TA201

Identification of tropospheric emissions sources from satellite observations: Synergistic use of HCHO and NO2 trace gas measurements — •Thierry Marbach, Steffen Beirle, Ulrich Platt, and Thomas Wagner — Institut für Umweltphysik, 69120 Heidelberg

We present case studies for combined HCHO and NO2 satellite observations, derived from GOME instrument measurements. Launched on the ERS-2 satellite in April 1995, GOME has already performed continuous operations over 8 years providing global observations of the different trace gases. The satellite HCHO observations provide information concerning the localization of biomass burning (intense source of HCHO). The principal biomass burning areas can be observed in the Amazon basin region and in central Africa. Other high HCHO emissions can be correlated with climatic events like the El Nino in 1997, which induced dry conditions in Indonesia causing many forest fires. Tree isoprene emissions could also contribute to high HCHO concentrations especially in southwest United States, northern part of the Amazon basin, and in the African tropical rain forest region. Biomass burning are also an important tropospheric source for NO2 emissions and can be compared with the HCHO emissions to discriminate the influence of the vegetation type on the tropospheric emissions of both trace gases during biomass burning: the change in the vegetation type can be followed with the change in the intensity of HCHO and NO2 emissions.

Fachvortrag UP 3.2 Mo 14:45 TU TA201

Applications of SCIAMACHY limb observations: Profile retrievals, proton events, temperature measurements and NLC detections — •G. J. Rohen[1], C. von Savigny[1], K.-U. Eichmann[1], A. Rozanov[1], E. J. Llewellyn[2], A. Bracher[1], M. Sinnhuber[1], H. Bovensmann[1], and J. P. Burrows[1] — [1]Institute of Environmental Physics, University of Bremen, Otto-Hahn-Allee 1, 28359 Bremen — [2]Institute of Space and Atmospheric Studies, University of Saskatchewan, 116 Science Place, Saskatoon, Canada

The absorption spectrometer SCIAMACHY is one of ten instruments onboard of environmental spacecraft Envisat that was launched by ESA on 1 March 2002. It combines three different viewing modes to record radicances scattered, reflected and transmitted light in a wavelength region in the UV and visible range from 240 nm to 2.4 micrometer. The limb viewing mode provides a vertical resolution of about 3 km and a spatial resolution of about 960 km with a spectral resolution of up to 0.25 nm, that allows to retrieve profiles of almost the most trace gases like ozone and nitrogen-dioxide and other features of the atmosphere like temperatures and nocti-lucent clouds. An overview of some retrieval techniques and applications is given with an emphasis to a ozone depletion in the mesosphere and upper stratosphere driven by a solar proton storm in October and November 2003.

Fachvortrag UP 3.3 Mo 15:00 TU TA201

Global Maps of the CH4 and CO vertical column derived from SCIAMACHY onboard ENVISAT — •Christian Frankenberg, Ulrich Platt, and Thomas Wagner — Institut für Umwelphysik, INF 229, 69120 Heidelberg

In the past, differential optical absorption spectroscopy (DOAS) has mostly been employed for trace gas retrieval in the UV/Vis spectral region. New spectrometers such as SCIAMACHY onboard ENVISAT also provide near infrared channels and thus allow the detection of greenhouse gases like CH4, CO2, H2O as well as CO. However, modifications of the classical DOAS algorithm are necessary to account for the idiosyncrasies of this spectral region, i.e. the temperature and pressure dependence of the high resolution absorption lines. This paper presents results of a modified iterative maximum a posteriori-DOAS algorithm (IMAP-DOAS) based on the optimal estimation theory introduced to the remote sensing community by Rodgers (1976). This method directly iterates the vertical column densities of the absorbers of interest until the expected total optical density fits the measurement. Here we present the global maps of the vertical atmospheric column density of CH4 and CO. In contrast to sensors in the thermal infrared SCIAMACHY observations are in particular sensitive to surface near layers.

Fachvortrag UP 3.4 Mo 15:15 TU TA201

Der Airbus als Forschungslabor: Ein neues DOAS Instrument für das CARIBIC Projekt — •B. Dix[1], C. Brenninkmeijer[2], U. Friess[3], T. Wagner[1] und U. Platt[1] — [1]Institut für Umweltphysik, Universität Heidelberg — [2]Max-Planck Institut für Chemie, Mainz — [3]Space Research Centre, University of Leicester, UK

CARIBIC (Civil Aircraft for the Regular Investigation of the atmosphere Based on an Instrument Container) ist ein innovatives wissenschaftliches Projekt mit dem Ziel die Chemie und Physik der oberen Troposphaere und unteren Stratosphaeare zu untersuchen. Die dabei zugrunde liegende Idee ist, ein Passagierflugzeug für Messungen auf Langstreckenflügen zu nutzen. Hierfür wird ein eigens gebauter Container mit entsprechenden Messinstrumenten im November 2004 seinen ersten Messflug in einem Lufthansa Airbus A 340-600 antreten.

Neben zahlreichen Instrumenten zur in-situ Messung verschiedener Spurenstoffe und Aerosole, wird ein kleines Multi-Axis DOAS (Differentielle Optische AbsorptionsSpektroskopie)-Geraet Teil dieses fliegenden Luftchemielabors sein. Das CARIBIC DOAS wird eine Reihe von Spurenstoffen wie Ozon, SO2, NO2, BrO, HCHO, OClO, Wasserdampf und O4 messen können. Durch Streulichtmessungen aus drei verschiedenen Richtungen erhält man Informationen über die raeumliche Spurenstoffverteilung.

Wir stellen den instrumentellen Aufbau, wissenschaftliche Ziele und erste Ergebnisse der CARIBIC DOAS Messungen vor und geben einen kleinen Eindruck davon, was es bedeutet, wenn Wissenschaft auf zivile Luftfahrt trifft.

Fachvortrag UP 3.5 Mo 15:30 TU TA201

Tomographic Reconstruction of 2D-Trace Gas Concentration Distributions from Long-path DOAS Measurements: General Approach and Application to an Indoor Validation Experiment — •A. Hartl, K.-U. Mettendorf, B.-C. Song, U. Platt, and I. Pundt — Institut für Umweltphysik, University of Heidelberg

DOAS-Tomography combines DOAS (Differential Optical Absorption Spectroscopy) measurements yielding average concentrations of atmospheric trace gases along long light paths with tomographic methods to retrieve the spatial concentration fields. To investigate the possibility of reconstructing distinct local plumes with only a limited number of light paths (10 to 40), we performed computer simulations with a variable number of Gaussians as test distributions for different peak extensions and for different measurement geometries. Using a discrete approach and iterative projection algorithms from image reconstruction, we show that results heavily depend on peak extensions and that they can be crucially improved in terms of reconstruction errors as well as absolute concentrations by choosing optimal parametrisation. We calculate different contributions to the reconstruction error from discretisation and inversion individually and investigate how they can be further reduced by the recently proposed method "grid translation". Additionally, we discuss the case of a smooth background concentration. Finally, this method is applied to an indoor tomographic DOAS-experiment, including discussion of the effects of measurement errors.

Fachvortrag

UP 3.6 Mo 15:45 TU TA201

Tomographic DOAS measurements of the 2D trace gas distribution above the city centre of Heidelberg, Germany — •Denis Poehler, Bernhard Rippel, Alexander Stelzer, Kai Uwe Mettendorf, Andreas Hartl, Ulrich Platt, and Irene Pundt — IUP Universität Heidelberg

Longpath DOAS (Differential Optical Absorption Spectroscopy) tomography ia a novel methode for the measurement of 2 or 3 dimensional trace gas distributions. Average concentrations of different trace gases are measured along 10 to 40 light paths and inverted into concentration distributions using tomographic techniques (see Mettendorf et al., Hartl et al., this issue). Here we present the instrumental setup and first results from a tomographic configuration set up over the city of Heidelberg in spring 2005. Three Multibeam instruments and 10 to 20 retro arrays will be installed over an area of 3 km x 4 km. From each Multibeam telescope, four to six light beams are emitted simultaneously towards the retro arrays located at 1 to 5 km distance at various buildings. From there, the light beams are reflected back towards the telescopes, where they are coupled into optical fibres and spectrally analysed simultaneously using Cherny Turner spectrometers with 2D CCD detectors. The preliminary aim is to derive 2D distributions of NO2, SO2, O3, HCHO, and HONO.