UP 2.2 Di 12:00 3B

Wassergehalts- und Redox-Messungen im Oberboden — •Bernhard Ruth — GSF - Forschungszentrum für Umwelt und Gesundheit, Institut für Bodenökologie, 85764 Neuherberg

Mikrobielle Prozesse bestimmen die Umsatzraten im Boden und damit auch die Emission von klimarelevanten Gasen wie CO2, N2O und CH4. Grundvoraussetzung für die Prozesse ist ein ausreichender Wassergehalt. Bei Sauerstoffmangel treten die anaeroben Prozesse in den Vordergrund, die z.T. ganz geänderte Reaktionsabläufe zeigen. Das kommt u.A. auch bei der Mineralisierung toxischer Substanzen zum Tragen. Dieser Übergang zu anaeroben Prozessen kann mit Redox-Messungen verfolgt werden.

Obwohl Redox-Sonden üblicherweise in wässrigen Lösungen arbeiten, können auch bei relativ geringem Wassergehalt Redox-Potentiale gemessen werden. Die Messungen dienen zur Idendifizierung von Bedingungen, in denen klimarelevante Gase freigesetzt werden können.

Messungen im Freiland über mehrere Monate zeigen eine hohe Varianz, die durch die Heterogenität im Boden verursacht wird. Darüber hinaus wird der Einfluss von Bodentiefe, Niederschlägen und Temperatur und Vegetationsperiode deutlich.

UP 2.3 Di 12:15 3B

Noble gas measurements on fluid inclusions in speleothems — Tobias Kluge, •Thomas Marx, and Werner Aeschbach-Hertig — Institut für Umweltphysik, Universität Heidelberg

Measurements of dissolved atmospheric noble gases in groundwater enable paleotemperature reconstruction using their temperature dependent solubility. In contrast to groundwater, speleothems allow a more precise dating and offer high resolution records of stable oxygen and carbon isotopes. Unfortunately these data cannot be translated into paleotemperatures easily. By adopting the noble gas temperature (NGT) method to microscopic water-filled inclusions in speleothems it may be feasible to derive paleotemperatures.

Techniques for water and noble gas extraction from inclusions based on crushing and heating have been developed and are still improved continuously. In order to calculate NGTs by inverse modelling, NG concentrations are needed. Thus water amounts of about 0.1 to 1 μl have to be measured precisely, which can be achieved manometrically with a typical uncertainty of ≤ 2 %. The small gas amounts are measured using a sector field mass spectrometer and compared to a diluted standard. Additionally an extensive background control was performed. Most of the examined stalagmites contain too much air inclusions which mask the temperature signal. Methods to separate air from water filled inclusions are currently under development. However, calculation of NGTs was successful for a set of samples from one stalagmite and a soda straw.

UP 2.4 Di 12:30 3B

New Insights in Inverse Modelling of Noble Gases in Groundwater — •Amany von Oehsen and Werner Aeschbach-Hertig — Institut für Umweltphysik, Heidelberg

Inverse Modelling of noble gases in groundwater provides an independent tool for reconstructing past temperatures and has been used as such in a number of studies. The method is based on the temperature dependence of noble gas solubility in water. In many cases concentrations are found to be above the equilibrium for atmospheric conditions, a phenomenon referred to in the literature as excess air. A variety of models have been developed to account for this finding, some of which are very different as to what physical processes play the dominant role. Models are judged according to their performance in a chisquare test. The talk will give an overview over the models and present new insights speaking for and against them.

UP 3: Atmosphäre und Aerosole: Instrumentelles und Laboruntersuchungen

Zeit: Dienstag 14:00–16:00 Raum: 3B

Hauptvortrag UP 3.1 Di 14:00 3B

Recent developments in PTR-MS — •Armin Hansel, Armin Wisthaler, Martin Graus, Pawel Cias, and Markus Müller — Institut für Ionenphysik und Angewandte Physik, Universität Innsbruck, Technikerstrasse 25, A-6020 Innsbruck

Proton-Transfer-Reaction Mass Spectrometry (PTR-MS) is a highly sensitive, real-time analytical technique for detecting volatile organic compounds (VOCs) in air, which was developed in the mid-1990ies in the laboratories of the Institute of Ion Physics at the University of Innsbruck. PTR-MS combines the concepts of soft, nonfragmenting chemical ionization (via proton transfer reactions with hydronium reagent ions) and of highly sensitive and quantitative product ion formation in an ion flow drift tube. Since its inception PTR-MS has become a leading technology in the on-line VOC analysis, spanning a number of research fields that include environmental chemistry, food science, and life sciences. A series of recent technical improvements have greatly improved the instrument's capabilities. A 5 to 10-fold increase in sensitivity has been obtained with current detection limits ranging from 10 to 100 pptV (1 sec signal integration time). The PTR-MS response time has been lowered to about 150 ms, making it one of the fastest currently available VOC sensors. The implementation of sophisticated mass spectrometric equipment (time-of-flight MS, triple quadrupole MS) has led to a gain in duty cycle and in analyte specificity (MS/MS capability). Optimized modes of PTR-MS operation have been developed for the detection of gas-phase ammonia and formaldehyde. An overview of recent advances in PTR-MS will be given.

UP 3.2 Di 14:30 3B

Methane Airborne Mapper (MAMap): A new airborne two channel NIR-SWIR grating spectrometer system for simultaneous remote measurements of tropospheric methane (CH4), carbon dioxide (CO2) and oxygen (O2) — •Konstantin Gerilowski[1], Andreas Tretner[2], Michael Buchwitz[1], Jörg Erzinger[2], John Phillip Burrows[1], and Heinrich Bovensmann[2] — [1]Institute of Environmental Physics / Remote Sensing (IUP/IFE), University of Bremen, Bremen, Germany — [2]GeoForschungsZentrum Potsdam (GFZ), Potsdam, Germany

Beginning in summer 2005, the IUP Bremen and the GFZ Potsdam developed a new type of airborne two channel SWIR-NIR grating spectrometer system, the "Methane Airborne Mapper" (MAMap). From the experience gained with SCIAMACHY, this instrument is capable of direct and quantitative nadir remote measurements of atmospheric methane (CH4) and carbon dioxide (CO2). It covers important parts of the short wave infrared (SWIR)/ near infrared (NIR) spectral windows (around 1600 nm, 1660 nm and 760 nm) for simultaneous detection of CH4, CO2 and O2. The instrument has been designed for flexible operation on board of different airborne research platforms (e.g. Chessna Caravan, DLR Dornier 228, DLR Falcon and the future DLR Gulfstream "HALO" aircraft). Different laboratory and ground based measurements have been performed demonstrating the instrument's performance. Preliminary "in-flight" measurements will also be presented.

UP 3.3 Di 14:45 3B

Utilizing a Cavity Enhanced DOAS device for the detection of NO3 — •Jim Thieser[1], Jan Meinen[2], Ulrich Platt[1], and Thomas Leisner[2] — [1]Institut für Umweltphysik, Im Neuenheimer Feld 229, 69120 Heidelberg — [2]Atmosphärische Aerosolforschung (IMK-AAF), Forschungszentrum Karlsruhe GmbH, 76344 Eggenstein-Leopoldshafen

A new instrument for measuring the trace gas radical NO3 in the ppt region by optical absorption was developed using a cavity enhanced absorption cell (CEAS). This technique provides a long light path in a cavity between two high reflective mirrors. Using a broadband light source in CEAS provides the feasibility of employing a DOAS approach in the data acquisition and evaluation. Therefore required additions of the standard CRD und CEA theory have to be concerned. We call this novel approach Cavity Enhanced Differential Optical Absorption Spectroscopy (CE-DOAS). First laboratory and field data from the NO3/N2O5 intercomparison campaign at the SAPHIR chamber in Jülich will be used to discuss the operational reliability of the instrument. At this campaign a representative section of cavity based trace gas detection devices participated. Photolysis, water vapor and aerosol experiments where performed in the presence of NO3 to verify the correlation of the different trace gas detection approaches.