# UP 23 Atmosphäre und Klima

Zeit: Mittwoch 16:30–17:30 Raum: D

## Fachvortrag

UP 23.1 Mi 16:30 D

**Laboratory experiments to determine the fractionation of stable isotopes in speleothems** — •Denis Scholz, Elke Wiedner, Augusto Mangini, and Ricardo März — Heidelberger Akademie der Wissenschaften, Im Neuenheimer Feld 229, 69120 Heidelberg, Germany

Recent studies have shown that speleothems are a promising archive for past climate. Stalagmites can be dated very precisely with the Th/U method and stable isotopes that can be measured at a spatial resolution corresponding to few years of growth, respond very sensitively to climate changes. We performed a series of laboratory experiments to study the fractionation of oxygen and carbon isotopes during the precipitation of carbonate with the aim to better understand the non-equilibrium precipitation of calcite, which most often is met in natural speleothems. Carbonate was precipitated under controlled conditions both from a body of standing water and from a solution flowing along a rod. Slow degassing of $CO_2$ produced a carbonate with $\delta^{18}$O values in equilibrium with the solution, but with a significant enrichment of $\delta^{13}$C which was inversely proportional to the height of the solution. The resulting slope of $\Delta\delta^{18}O/\Delta\delta^{13}$C was 0. Fast degassing of $CO_2$ along the rod at a relative humidity of 100

## Fachvortrag

UP 23.2 Mi 16:45 D

**Global anthropogenic SO2 emissions monitored by GOME instrument** — •Muhammad Fahim Khokhar, Steffen Beirle, Ulrich Platt, and Thomas Wagner — Institut für Umweltphysik, Universität Heidelberg, Germmany

The industrial revolution increased the concentrations of greenhouse gases, aerosols and aerosol precursor gases. All of them have potential to alter the climate on regional and global scale. In this work, we present analysis of GOME observations for anthropogenic SO2 emissions from different parts of the world. Additionally, a comparison with GOME observations of anthropogenic NO2 column amounts is presented. The GOME observations showed enhancements of SO2 column amounts due to anthropogenic emission sources. These enhancements are identified from the regions with extensive burning of coal, smelting of metal ores and heavy industrial activities such as from China, Eastern USA, the Arabian Peninsula, Eastern Europe, South Africa, and particularly Norilsk, Russia (see figure 6.20). GOME*s ability to detect anthropogenic SO2 emissions even at higher latitude particularly over Norilsk (Russia) makes it apart from the other conventional instruments carried by other spacecrafts.

## Fachvortrag

UP 23.3 Mi 17:00 D

**Satellite Chartography of Atmospheric Methane and carbon monoxide from SCIAMACHY onboard ENVISAT** — •Christian Frankenberg — IUP Heidelberg

The UV/Vis/near infrared spectrometer SCIAMACHY onboard the European ENVISAT satellite enables total column retrieval of atmospheric methane with high sensitivity to the lower troposphere. We apply an Iterative Maximum A Posteriori DOAS approach to derive vertical column densities of methane and carbon monoxide. The retrievals have been compared with methane abundances derived from the atmospheric transport models TM4 and TM5. High correlations between observed and simulated global $CH_4$ column averaged mixing ratios are calculated for the entire 2-year period from 2003 through 2004. The theoretical retrieval precision of about 1.8% corresponds well with the observed average standard deviation between observations and simulations, which is on the order of 30 ppb. On the global scale, the most pronounced $CH_4$ signal arises from source regions over India and South East Asia, broadly consistent with model simulations. SCIAMACHY retrievals, however, indicate higher $CH_4$ abundances over tropical Africa and tropical America, pointing to hitherto underestimated $CH_4$ emissions from tropical landmasses. Apart from the presentation of the retrieved methane abundances, we discuss the retrieval algorithm and quantify possible impact factors on precision and accuracy (such as clouds and aerosols). Further, latest results of carbon monoxide retrievals revealing the seasonal patterns in biomass burning regions are shown.

## Fachvortrag

UP 23.4 Mi 17:15 D

**Estimating the NOx produced by lightning from GOME and NLDN data: A case study in the Gulf of Mexico** — •Steffen Beirle[1], N. Spichtinger[2], A. Stohl[3], K. Cummins[4], T. Turner[4], D. Boccippio[5], O. Cooper[6], M. Wenig[7], M. Grzegorski[1], U. Platt[1], and T. Wagner [1] — [1]IUP Heidelberg, Germany — [2]TUM Munich, Germany — [3]NILU, Norway — [4]Vaisala, USA — [5]GHCC, USA — [6]NOAA, USA — [7]NASA GSFC, USA

Nitrogen oxides (NOx=NO+NO2) play an important role in tropospheric chemistry, in particular in catalytic ozone production. Lightning provides a natural source of nitrogen oxides. The range of recent estimates of lightning produced NOx (LNOx) still are of the order of 5 Tg [N] per year with still high uncertainties in the range of one order of magnitude. The Global Ozone Monitoring Experiment (GOME) on board the ESA-satellite ERS-2 allows the retrieval of tropospheric vertical column densities (TVCDs) of NO2 on a global scale. Here we present the GOME NO2 measurement directly over a large convective system over the Gulf of Mexico. Simultaneously, cloud-to-ground flashes are counted by the U.S. National Lightning Detection Network (NLDN). A series of 14 GOME pixels shows largely enhanced TVCDs over thick and high clouds, coinciding with strong lightning activity. The enhancements can not be explained by transport of anthropogenic NOx and must be due to fresh production of LNOx. A quantitative analysis, accounting in particular for the visibility of LNOx from satellite, yields a LNOx production of 77 (27-230) moles of NOx, or 1.1 (0.4-3.2) kg [N], per flash. This corresponds to a global LNOx production of 1.5 (0.5-4.5) Tg [N]/yr.