UP 8: Methods 1

Time: Wednesday 17:15–18:30 Location: HFT-FT 131

Invited Talk UP 8.1 Wed 17:15 HFT-FT 131

From fs-LIDAR Sensing of the Atmosphere to fs-Optical Control — •Ludger Woeste[1], Kamil Stelmaszczyk[1], Roland Sauerbrey[3], Jerome Kasparian[2], and Jean PierreKamil Wolf[2] — [1]Institut für Experimentalphysik, Freie Universität Berlin, Arnimallee 14, 14195 Berlin, Germany — [2]Université de Genève, GAP-Biophotonics, 1211 Geneva 4, Switzerland — [3]Helmholtz Forschungszentrum Dresden-Rossendorf, 01328 Dresden, Germany

When launching sufficiently powered femtosecond laser pulses into the atmosphere, we observed extended (fs) bundles of white light emitting plasma filaments, which extended over km lengths. Their formation is based on a fascinating interplay of non-linear optical processes like Kerr-lensing, plasma-defocusing and self-phase modulation. The filaments emit directional white light in a wide spectral range from the IR to the UV, which allows the remote and simultaneous analysis of a rich variety of gaseous atmospheric constituents. Further, when they hit solid or liquid targets, they emit intensive characteristic plasma light, which allows the remote identification of soil, vegetation, waters and even radioactive isotopes deposited there on. Most interesting properties result from the electrical conductivity of such bundles of plasma-filaments. The effect allows not only to guide and control electric discharges and currents; it even provides a realistic chance to trigger lightning and to assist or initiate water condensation in the remote atmosphere.

UP 8.2 Wed 17:45 HFT-FT 131

How accurately can we calibrate an SO_2 camera? — •Peter Lübcke, Nicole Bobrowski, Sebastian Illing, Leif Vogel, and Ulrich Platt — Institut für Umweltphysik, Im Neuenheimer Feld 229, 69120 Heidelberg

SO_2 fluxes start to be monitored at a considerable number of volcanoes for volcanic risk assessment. The SO_2 camera, based on a 2-D UV sensitive CCD and two band-pass interference filters, is an instrument for remote sensing of volcanic emissions based on measuring the ultraviolet absorption of SO_2 in a narrow wavelength window around 310 nm. A second wavelength interval around 330 nm is used to correct for broad band absorption effects and Mie scattering. To obtain correct SO_2 fluxes that can be compared to other measurement techniques and used for volcanological models, it is important to calibrate the SO_2 camera carefully. Today, the most common approach for calibration is measurements using calibration cells of known concentration, neglecting effects that can occur due to aerosols (e.g., ash) in the volcanic plume. We present results from a case study at Popocateptl, Mexico, 2011, where we calibrated the SO_2 camera with a coaxial Differential Optical Absorption Spectroscopy (DOAS) system. We compare the calibration cell approach to the DOAS calibration method and verify the respective results with measurements from an Imaging Differential Optical Absorption Spectroscopy System (IDOAS). We will discuss the general advantages and limitations of an SO_2 camera and under which conditions the calibration cell method might fail and possibly lead to wrong conclusions about the SO_2 emission flux.

UP 8.3 Wed 18:00 HFT-FT 131

Klassifizierung von Pflanzen für spektroskopische Satelliten-Fernerkundung — •Tobias Mahr[1,2], Eva Peper[1], Denis Pöhler[1], Ulrich Platt[1] und Thomas Wagner[1,2] — [1]Institut für Umweltphysik, Heidelberg — [2]Max-Planck Institut für Chemie, Mainz

DOAS (Differentielle Optische Absorptions-Spektroskopie) erlaubt die Bestimmung von Spurengaskonzentrationen an Hand ihrer charakteristischen Absorptionsstrukturen. Seit 1995 wird dieses Verfahren auch erfolgreich in satellitengestützten Experimenten wie GOME, GOME-2 und SCIAMACHY zur weltweiten Messung stratosphärischer und troposphärischer Gase eingesetzt, beispielsweise von Ozon und Stickoxiden. Jedoch werden in der Auswertung bislang spektrale Signaturen des Erdbodens, von dem ein großer Teil des Sonnenlichts reflektiert wird, vernachlässigt. Dies kann zu Fehlern in der Spurenstoffbestimmung führen, bietet jedoch auch die Möglichkeit, Erdoberflächen sowie verschiedene Gruppen von Vegetation zu identifizieren. Zur Untersuchung dieses Einflusses wurden hochaufgelöste Reflexionsspektren (FWHM von 0,29 nm) von 95 Pflanzen und anderen natürlichen Erdoberflächen zwischen 350 und 1050 nm vermessen. Eine Klassifizierung erfolgte gemäß der biologischen Systematik (Unterabteilung, Klasse, Ordnung, Gattung, ranglose Einteilung), Verbreitung (Kontinente, Klimazonen), Photosyntheseart (C3, C4, CAM) und Umweltbedingungen.

UP 8.4 Wed 18:15 HFT-FT 131

Microwave transmission: A new tool for remote sensing precipitation and humidity — •Christian Chwala[1], Uwe Siart[2], Andreas Gmeiner[1], Susanne Hipp[2], and Harald Kunstmann[1] — [1]Karlsruher Institut für Technologie, Institut für Meteorologie und Klimaforschung - Atmosphärische Umweltforschung (IMK-IFU), Garmisch-Partenkirchen — [2]Lehrstuhl für Hochfrequenztechnik, Technische Universität München

Recent high resolution models for weather forecast and hydrology need precise observation data of precipitation and humidity to allow for correct initialization and validation. We present a new technique which uses both attenuation and phase shift data of microwave transmission through the atmosphere, aiming to complement and thus to improve the established methods using station and weather radar data.

For line integrated precipitation observation we analyze attenuation data from commercial microwave backhaul links around Garmisch-Partenkirchen. Because of severe fluctuations even during dry periods, we introduce an algorithm based on spectral time series analysis to distinguish between rainy and dry periods. After processing, comparison with rain gauge and weather radar data shows good correlation.

Additionally, we operate a dual frequency (22.235 GHz and 34.8 GHz) and dual polarization transmission experiment at a hydrometeorological test site in the TERENO pre-alpine observatory. Besides attenuation data its coherent monostatic configuration provides very precise phase information. This allowed us to derive very fast line integrated measurements of absolute humidity.