UP 7: Posters

Time: Wednesday 16:30–18:30 Location: ELP 6: Foyer

UP 7.1 Wed 16:30 ELP 6: Foyer

Revisiting the question "Why is the sky blue?" — •Anna Lange[1], Alexei Rozanov[2], and Christian von Savigny[1] — [1]Institute of Physics, University of Greifswald, Germany — [2]Institute of Environmental Physics, University of Bremen, Germany

The common answer to the question "Why is the sky blue" is usually Rayleigh scattering. In 1953 Edward Hulburt demonstrated, that the blue colour of the zenith sky at sunset is to 1/3 caused by Rayleigh scattering and to 2/3 caused by ozone absorption. In this study, an approach to quantify the contribution of ozone to the blue colour of the sky for different viewing geometries is implemented using the radiative transfer model SCIATRAN and the CIE XYZ colour system. The influence of ozone on the blue colour of the sky is calculated for solar zenith angles of 10°-90° and a wide range of viewing geometries. For small solar zenith angles, the influence of ozone on the blue colour of the sky is minor, as expected. However, the effect of ozone increases with increasing solar zenith angle. The calculations for the Sun at the horizon confirm Hulburt's estimation with remarkably good agreement. More stratospheric aerosols reduce the ozone contribution at and near the zenith for the Sun at the horizon. The exact contribution of ozone depends strongly on the assumed total ozone column. The calculations also show that the contribution of ozone increases with increasing viewing zenith angle and total ozone column. Variations in surface albedo as well as full treatment of polarised radiative transfer were found to have only minor effects on the contribution of ozone to the blue colour of the sky.

UP 7.2 Wed 16:30 ELP 6: Foyer

Langzeitmessungen von Halogenoxiden in der Arktis: Projektübersicht und erste Ergebnisse — •Bianca Lauster[1,2], Sebastian Donner[1], Udo Friess[2], Ulrich Platt[2], Lucas Reischmann[1], William Simpson[3], Steffen Ziegler[1] und Thomas Wagner[1,2] — [1]Max-Planck-Institut für Chemie, Mainz — [2]Universität Heidelberg — [3]University of Alaska Fairbanks

Die Halogenchemie ist ein zentrales Element des troposphärischen Ozonabbaus im polaren Frühjahr. Entstehungsmechanismen reaktiver Halogene, ihr Transport und deren Wechselwirkungen sind jedoch nicht vollständig verstanden. Darüber hinaus hat das sich ändernde arktische Klima potentiell einen starken Einfluss auf die Halogenaktivierung.

Im Dezember 2023 wurde ein LP-DOAS (Lang-Pfad Differentielle Optische AbsorptionsSpektroskopie) Instrument in Utqiagvik (Barrow), Alaska, für Langzeitmessungen aufgebaut. Das Instrument wurde speziell für seinen vorherigen Einsatz an der deutschen Forschungsstation Neumayer in der Antarktis konzipiert, wo es über zwei Jahre lang erfolgreich betrieben wurde (Nasse, 2019). Mit den jetzigen Messungen in der Arktis sollen die komplexen Wechselwirkungen zwischen Halogenen und anderen Spurengasen, wie z.B. NO2, auch unter dem Einfluss anthropogener Luftverschmutzung näher untersucht werden.

Um die Datenqualität zu verbessern, wurde der Instrumentenaufbau vorab basierend auf den Erkenntnissen aus der vorangegangenen Messkampagne optimiert. Hier werden die Instrumenteneigenschaften sowie die Zielsetzung des Projekts präsentiert und erste Ergebnisse der LP-DOAS Daten mit Fokus auf Datenqualität und -analyse gezeigt.

UP 7.3 Wed 16:30 ELP 6: Foyer

Characterisation and deployment of a Pandora DOAS instrument in Heidelberg — •Johannes Hägele, Karolin Voss, Ralph Kleinschek, and André Butz — Institute of Environmental Physics, Heidelberg University, Germany

Over the past five decades, Differential Optical Absorption Spectroscopy (DOAS) has been used successfully for the measurement of various atmospheric trace gases such as O_3 and NO_2. In order to establish a global network of DOAS measurements, NASA and ESA collaborate on the Pandonia Global Network using their custom-built Pandora instruments.

Here, we report on our progress in deploying a Pandora setup at the Institute of Environmental Physics in Heidelberg. The instrument is suitable for both direct sun and moon as well as sky scanning measurements and uses 2 Czerny-Turner spectrometers with a wavelength range of 280-530 nm and 380-900 nm, respectively. It will be set up at the institute's roof close to the city centre. So far, we have optically and electronically characterized the spectrometers using a set of different lamp and dark measurements. For spectrometer 1, the electronic readout induces a spatially oscillatory signal of unknown origin which influences the instrument noise.

UP 7.4 Wed 16:30 ELP 6: Foyer

Single particle polarimetry of volcanic ash in a plasma traps — •Franko Greiner[1], Alexander Schmitz[1], Thor Hansteen[2], and Christian von Savigny[3] — [1]Institute of Experimental and Applied Physics, Kiel University, Kiel, Germany — [2]Dynamics of the Ocean Floor, GEOMAR Helmholtz Centre for Ocean Research Kiel, Kiel, Germany — [3]Institute of Physics, University of Greifswald, Greifswald, Germany

Numerous aspects of volcanic effects on the atmosphere and climate remain poorly understood. A significant but often overlooked factor is the presence of volcanic ash in aerosol plumes, which is typically ignored in satellite observations in the optical spectral range due to limited data on the ash's complex refractive index (CRI). Accurate identification of volcanic ash in these observations requires understanding both the CRI and its variability among different eruptions.

We propose a new, less assumption-dependent laboratory method for measuring the CRI of volcanic ash. Using a plasma trap and assessing angle-resolved Mie scattering of single ash particles, this approach aims to provide high-precision CRIs. The project's main goal is to explore whether the CRI of a specific volcanic event may be determined based on ash amorphicity and chemical composition.

UP 7.5 Wed 16:30 ELP 6: Foyer

Determination of radioactivity levels and radiological hazards of soils from the Bitola region — •Irena Zlatanovska[1], Trajče Stafilov[2], Robert Šajn[3], Bojana Dimovska Gonovska[4], Snežana Dimovska[5], Jovan Janusheski[5], and Lambe Barandovski[1] — [1]Institute of Physics, Faculty of Natural Sciences and Mathematics, Ss Cyril and Methodius University in Skopje, POB 162, 1000 Skopje, Macedonia — [2]Institute of Chemistry, Faculty of Natural Sciences and Mathematics, Ss Cyril and Methodius University in Skopje, POB 162, 1000 Skopje, Macedonia — [3]Geological Survey of Slovenia, Dimičeva ul. 14, 1000 Ljubljana, Slovenia — [4]Scientific Tobacco Institute, St. Kliment Ohridski University, Kičevska bb, 7500 Prilep, Macedonia — [5]Republic Institute for Health Protection, 50 Divizija 6, 1000 Skopje, Macedonia

To determine the radioactivity levels in soil and evaluate the associated radiological impact, 58 topsoil samples from the town of Bitola and its environs were collected. Gamma spectrometry measurements indicated significant variability in activity concentrations, with median values for 40K, 226Ra, and 232Th exceeding global medians. Calculations for the absorbed dose rate and annual effective dose rate were performed to assess radiological health hazards for the residents. The obtained results were statistically processed, and maps of spatial distribution were prepared, clearly indicating the combined influence of geology and human activities on the outcomes.

UP 7.6 Wed 16:30 ELP 6: Foyer

Investigating the size distribution of stratospheric aerosols following volcanic eruptions during the SAGE-I mission from 1979 to 1981 — •Christian Löns, Felix Wrana, and Christian von Savigny — University of Greifswald

As part of my master's thesis, I retrieved particle size information from satellite solar occultation measurements of SAGE-I, which collected data from February 1979 to 1981. The particle size was derived with a fixed distribution width using a Mie code via two aerosol extinction coefficients at 450 nm and 1000 nm. To verify the results, they were compared with in situ particle counter measurements from Laramie. At altitudes of 15 km to 25 km, a good usability of the data set is observed, which improves with an increase in aerosol extinction and thus a lower influence of NO_2 on the 450 nm channel. While the volcanic eruptions of Mt. St. Helens (1980) and Alaid (1981) in the northern mid-latitudes tended to increase the average aerosol size, the tropical volcanic eruptions of Sierra Negra (1979) and Ulawun (1980) led to a reduction in the median radius.

UP 7.7 Wed 16:30 ELP 6: Foyer

Ground-based Hyperspectral Imaging of Greenhouse Gases

Using a Physics Inversion Algorithm — •Helge Haveresch, Marvin Knapp, Benedikt Löw, Leon Scheidweiler, Felix Külheim, Ralph Kleinschek, and André Butz — Institute of Environmental Physics, Heidelberg University, Im Neuenheimer Feld 229, 69120 Heidelberg

Emissions of carbon dioxide (CO_2) and methane (CH_4) drive anthropogenic climate change significantly. Monitoring point sources of greenhouse gas emissions is crucial for validating mitigation strategies. We present the results of imaging CH_4 emission plumes from a coal mine in Silesia using a NEO HySpex SWIR-384 hyperspectral camera in a ground-based geometry. The camera is positioned at a distance of kilometres from the source, capturing images in the shortwave infrared (1-2.5 μm) approximately every minute. Methods like the matched filter technique only work well for CO_2 and CH_4 analysis given homogeneous backgrounds. However, based on statistical analysis, this method fails in heterogeneous scenes, as seen at passively degassing volcanoes like Mount Etna, where aerosols accompany gases. To overcome this, we developed a physics-based inversion routine based on the single scattering solution of atmospheric radiative transfer, which retrieves aerosol parameters and measures CO_2 and CH_4 columns. The method shows promising agreement with previous results obtained by the matched filter analysis for homogeneous scenes at the coal mine. For measurements of volcanic CO_2 emission under heterogeneous conditions at Mt. Etna, we discuss implications and challenges.