UP 5: Poster Session

Time: Wednesday 14:00–16:00 Location: P2/4OG

UP 5.1 Wed 14:00 P2/4OG

Temperature and precipitation relationship during the last Glacial from pollen records and climate simulations — •Anna Sommani, Nils Weitzel, and Kira Rehfeld — Institute of Environmental Physics, Heidelberg, Germany

The hydrological response to radiative forcing is much less understood than the thermal one: many climate models have difficulties in simulating seasonal rainfall and its variability. Confident projections of precipitation are of crucial importance particularly for regions where agriculture is highly dependent on seasonal rainfall, such as South and Central Asia. It was shown that, while temperature and precipitation are negatively correlated on short timescales (10^{-3} to 10^{0} years), on longer timescales (10^{1} to 10^{3} years), proxy and instrumental data observations have a positive correlation between temperature and precipitation. Climate models in contrast simulate a negative correlation on all timescales for Asia. Here, temperature and precipitation from four high resolution pollen records at mid-latitudes in the Northern Hemisphere are reconstructed, investigated and compared with climate model simulations. We focus on the last Glacial period, characterized by pronounced millennial-scale climate fluctuations. The differences between reconstructed and simulated temperature–precipitation relationship as well as orbital- and millennial-scale variability are examined. In particular, we explore whether thermodynamic laws can explain the observed relationship between temperature and precipitation.

UP 5.2 Wed 14:00 P2/4OG

Assessing variability and possible decline of Atlantic Overturning in the past two millennia through temperature fingerprints — •Shirin Ermis[1], Paola Moffa-Sánchez[2], Alexandra Jahn[3], and Kira Rehfeld[1] — [1]Institute of Environmental Physics, INF 229, 69120 Heidelberg, Germany — [2]Department of Geography, Lower Mount Joy, South Road, Durham, DH1 3LE, UK — [3]Department of Atmospheric and Oceanic Sciences and Institute of Arctic and Alpine Research, University of Colorado Boulder, Campus Box 450, Boulder, CO 80309-0450, USA

The Atlantic Meridional Overturning Circulation (AMOC) is essential to maintain the temperate climates of Europe and North America. It redistributes heat from the tropics, and stores carbon in the deep ocean. Yet, its variability and evolution are largely unknown due to a lack of direct circulation measurements. Previous studies suggest a connection between the variabilities of the AMOC strength and a temperature dipole in the North Atlantic. These results suggest a substantial decline in the strength of the overturning at around 1850.

Here, we compare temperature reconstructions from four sediment cores in the North Atlantic and model simulations of CESM1 as well as the HadCM3 for the past two millennia. We test the robustness of previously used temperature fingerprints and assess drivers of variability in the ocean circulation and a possible decline in strength. Due to the particularly high resolution of available temperature reconstructions this study could provide new insights into the variability of Atlantic Overturning on decadal time scales and beyond.

UP 5.3 Wed 14:00 P2/4OG

Identification and Characterization of Cirrus Clouds at Higher Latitudes from Lidar Data — •Jennifer Hartisch[1], Jörg Gumbel[2], and Christian v. Savigny[3] — [1]Greifswald University, Physics Institute, Germany — [2]Stockholm University, MISU, Sweden — [3]Greifswald University, Physics Institute, Germany

Cirrus clouds are thin ice clouds that occur in the cold upper troposphere. Clouds have both a warming and a cooling effect on the Earth's system. Which of these processes dominates depends on surrounding conditions and properties of the cloud, especially on their optical thickness. The cirrus' net warming effect is strongest in the tropics, where they occur at very high and cold altitudes. The effect of cirrus clouds at higher latitudes, where they occur at 8-10 km altitude is much less known. From 1987 to 2017 observations of cirrus clouds in Northern Sweden with a Rayleigh/Mie/Raman lidar at Esrange Space Center have been performed. To identify and characterize cirrus clouds in these lidar data, appropriate analysis methods are needed that start out from the particle backscattering at the primary lidar wavelength of 532 nm. A particular challenge is to distinguish the cirrus scattering from molecular Rayleigh scattering by the background atmosphere. This is achieved by invoking measurements of molecular Raman scattering. This research describes analysis algorithms that let us derive important cirrus parameters like occurrence, height, optical thickness, as well as extinction and scattering coefficients. A central goal is to establish a climatology of the clouds' occurrence and optical properties as a function of meteorological conditions at these high latitudes.

UP 5.4 Wed 14:00 P2/4OG

Methode zur Fehlerabschätzung der Bestimmung der fraktalen Dimension von leuchtenden Nachtwolken — •Lukas Depenthal und Christian von Savigny — Universität Greifswald, Institut für Physik, Greifswald

Bei der Vermessung von leuchtenden Nachtwolken wurde bereits in früheren Studien eine Abhängigkeit der Fläche und des Umfangs festgestellt und die fraktale Dimension der Wolken bestimmt. Um die Größe des Fehlers bei der Bestimmung der beiden Parameter besser abschätzen zu können, wird nun eine Methode verwendet, bei der fraktale Objekte, die der Form und fraktalen Dimension einer leuchtenden Nachtwolke ähnlich sind, erzeugt werden. Diese können dann in sehr hoher Auflösung analysiert werden. Anschließend wird dasselbe Objekt in künstlich verschlechterter Auflösung erneut vermessen und dabei die Abweichung des fraktalen Dimensionsparameters ermittelt. Dabei wird ein besonderes Augenmerk auf die Wahl der Gitterbreite und des Schwellenwertes als Parameter der Auflösungsveränderung geworfen. Des Weiteren wird diese Methode auf leuchtende Nachtwolken mittels Fotoaufnahmen des Stratosphärenballons des „EBEX Balloon Borne Experiment“ angewendet.

UP 5.5 Wed 14:00 P2/4OG

Pilotstudie zur Untersuchung von Schwerewellensignaturen in der Mesopausenregion mittels ortsaufgelöster OH-Nightglow Messungen über Greifswald (Deutschland) — •Max Vincent Uzulis, Lukas Depenthal, Martin Rödiger, Christoph Hoffmann und Christian von Savigny — Institut für Physik Universität Greifswald, Greifswald, Deutschland

Die Schwerewellenpropagation in der Mesopause ist immer noch Gegenstand aktueller Forschung. Da in-situ-Messungen in diesen Höhen schwer umsetzbar sind, können bodengestützte Messungen unter den richtigen Wetterbedingungen eine Alternative darstellen. Um Schwerewellen in der Mesopause sichtbar zu machen, können Infrarotemissionen von OH Molekülen, sogenannter Airglow, genutzt werden. Hierzu wurden 2017 Fallstudien über Greifswald durchgeführt, die Schwerewellensignaturen in der Mesopause nachweisen konnten. Die dazu erforderliche Messmethodik erlaubt eine bodengestützte, zeitlich-örtlich aufgelöste Beobachtung des Airglows und der darin auftretenden Wellenereignissen und wird durch ein Infrarotkamerasystem bewerkstelligt. Im Gegensatz zu spektrografischen Messungen, erlaubt die Aufnahme von ganzen Bildern, eine Untersuchung eines weiten Ausschnittes am Nachthimmel, was einen Einblick in die Wellendynamik möglich macht. Durch Fourier-Analyse konnte die Größenordnung der Wellenlängen dieser Schwerewellensignaturen ermittelt werden.

UP 5.6 Wed 14:00 P2/4OG

Validation of the Multiple Airglow Chemistry model applied using zonally averaged data sets — •Olexandr Lednyts'kyy[1], Amirmahdi Zarboo[2], Christian von Savigny[1], and Miriam Sinnhuber[2] — [1]University of Greifswald, Greifswald, Germany — [2]Karlsruhe Institute of Technology, Karlsruhe, Germany

The Multiple Airglow Chemistry (MAC) model proposed to represent the photochemistry in the upper Mesosphere and Lower Thermosphere (MLT) region is applied to retrieve profiles of atomic oxygen (O) concentration ([O]). O is an important tracer for the energy budget of the MLT region. SCIAMACHY (SCanning Imaging Absorption spectroMeter for Atmospheric CHartographY) and SABER (Sounding of the Atmosphere using Broadband Emission Radiometry) aboard two satellites measured multiple nightglow emission rate profiles remotely in the time range 4/2010...3/2011 at ∼22:00 local time; these profiles are employed in the [O] retrievals. Reference [O] profiles, extracted using SABER as well as simulated using the empirical NRLMSISE-00 model and the composition-climate models, are compared with [O] profiles retrieved using the MAC model. Previously, calculations using the MAC model were tuned on the basis of the individual *in situ* pro-

files measured during the ETON rocket campaign and validated using three other rocket campaigns. The results presented in this contribution demonstrate that the MAC model can be used to retrieve [O] profiles on the basis of individual and zonally averaged emission profiles obtained using satellite observations. These observations provide an important basis for evaluation of the O content in models.

UP 5.7 Wed 14:00 P2/4OG

Influence of electrode materials on the dissociation of NO2, NO and CO2 via cold dielectric barrier discharge plasmas — •Maik Szafarska[1,2], Georgia Sourkouni-Argirusi[1], and Wolfgang Maus-Friedrichs[1,2] — [1]Clausthaler Zentrum für Materialtechnik — [2]Institut für Energieforschung und Physikalische Technologien

The purification of exhaust gas via cold dielectric barrier discharge plasmas aims to reduce the amount of emitted carbon dioxide or nitrogen oxides because it is an important aspect concerning air quality and greenhouse gas emissions. To find application in automotives, ships or other devices with polluting properties, dissociation rates have to be high and a cheap, robust and preferentially light reactor has to be developed. Gas mixtures were varied as well as the electrode materials, reactor materials and plasma parameters. Plasma induced changes to the gas mixture were analyzed via quadrupole mass spectrometry. The experimental results show that electrode material selection can have an impact on dissociation efficiency. In some cases, surface reactions between the electrodes and gases can be observed aswell. The tested electrodes consisted of copper, stainless steel and nickel.