Environmental Physics Division
Fachverband Umweltphysik (UP)

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Overview of Invited Talks and Sessions

(Lecture hall MER/0002; Poster P1)

Invited Talks

UP 2.4	Tue	10:15–10:45	MER/0002	**Klimakommunikation in der Schule? Mehr als nur darüber reden!** — •Michael Sach
UP 3.1	Tue	11:15–11:45	MER/0002	**Supporting the monitoring and tracking of carbon dioxide and methane emissions with satellites** — •Dominik Brunner, Gerrit Kuhlmann, Yasjka Meijer
UP 5.1	Tue	14:00–14:30	MER/0002	**A path to seamless modelling of the convective atmospheric boundary layer** — •Mirjana Sakradzija

Discussion on Sustainability on Monday during Lunch Break

PSV I	Mon	13:00–13:45	HSZ/AUDI	**Sustainability! And now? – Opportunities for young researchers** — •Roxana Scharpegge, Hiroki Sayama, Thomas Schubatzky, Birte Höcker, Uwe Riedel, John Plane, Pauleo Nimtz, Stefanie Falk

Invited Talks of the joint Symposium The Sustainability Challenge: A Decade of Transformation (SYSC)

See SYSC for the full program of the symposium.

SYSC 1.1	Mon	15:00–15:30	HSZ/AUDI	**Open-Endedness and Community-Based Approaches to Sustainability Challenges** — •Hiroki Sayama
SYSC 1.2	Mon	15:30–16:00	HSZ/AUDI	**Education as a Social Tipping Element: Evidence from Climate and Physics Education Research** — •Thomas Schubatzky
SYSC 1.3	Mon	16:00–16:30	HSZ/AUDI	**Mechanistic and Material Perspectives on Enzymatic Hydrolysis of Semicrystalline Polyesters** — •Birte Höcker
SYSC 1.4	Mon	16:45–17:15	HSZ/AUDI	**Decarbonization Options for Industry** — •Uwe Riedel
SYSC 1.5	Mon	17:15–17:45	HSZ/AUDI	**Impacts of Cosmic Dust and Space Debris in the Terrestrial Atmosphere** — •John Plane

Invited Talks of the Symposium Tipping Points in Socio-Economic and Climate Systems (SYTP)

See SYTP for the full program of the symposium.

SYTP 1.1	Thu	15:00–15:30	HSZ/AUDI	**Social Tipping in Heterogeneous and Polarized Populations** — •Sara Constantino, Sonke Ehret, Elke Weber, Sonja Vogt, Charles Efferson
SYTP 1.2	Thu	15:30–16:00	HSZ/AUDI	**Tipping points and regime shifts in coupled social-climate systems** — •Chris Bauch
SYTP 1.3	Thu	16:00–16:30	HSZ/AUDI	**How to tune Earth system models toward tipping?** — •Sebastian Bathiany, Niklas Boers

SYTP 1.4	Thu	16:45–17:15	HSZ/AUDI	**Algorithmic amplification and contextual sensitivity in political information exposure** — Iris Damião, Ana Vranic, Paulo Almeida, Lília Perfeito, •Joana Gonçalves de Sá
SYTP 1.5	Thu	17:15–17:45	HSZ/AUDI	**The complex interplay between democracy and platform power** — •Philipp Lorenz-Spreen

Sessions

UP 1.1–1.4	Mon	9:30–10:30	MER/0002	**Sustainability: Challenges and Solutions (joint session UP/CPP/SOE)**
UP 2.1–2.4	Tue	9:30–10:45	MER/0002	**Climate Communication**
UP 3.1–3.5	Tue	11:15–12:45	MER/0002	**Air Quality, Exposure and Atmospheric Dynamics**
UP 4	Tue	13:00–13:45	MER/0002	**Members' Assembly**
UP 5.1–5.5	Tue	14:00–15:30	MER/0002	**Modelling and Prediction Across Scales**
UP 6.1–6.6	Wed	9:30–11:00	MER/0002	**Upper Atmosphere, Polar Chemistry and Volcanic Aerosols**
UP 7.1–7.5	Wed	11:15–12:30	MER/0002	**Aquatic Systems: Limnology, Natural Waters, Wetlands and Soilmoisture**
UP 8.1–8.6	Wed	15:00–17:00	P1	**Poster**

Members' Assembly of the Environmental Physics Division

Tuesday 13:00–13:45 MER/0002

- Annual Report
- Upcoming Conferences and Events
- Awards and Appointments
- Miscellaneous

UP 1: Sustainability: Challenges and Solutions (joint session UP/CPP/SOE)

Accompanying session to Symposium SYSC

Time: Monday 9:30–10:30 Location: MER/0002

UP 1.1 Mon 9:30 MER/0002

Making a university climate neutral: First experiences from implementing a Climate Protection Strategy at the University of Greifswald — •Christoph G. Hoffmann, Tiemo Timmermann, and Christian von Savigny — University of Greifswald, Greifswald, Germany

With a resolution of its Academic Senate, the University of Greifswald has in 2021 set the goal to achieve climate neutrality by the end of the decade.

While the aim of achieving climate neutrality within a few years is expectedly ambitious, a university as a bigger research institution has also a unique combination of knowledge to achieve it. This has already led to synergies from which particularly the teaching in the environmental subjects can benefit due to "home-made" practical experiences. This makes the whole University a living lab, in which the opportunities but also challenges of necessary transformations can be explored in an assessable setting.

Therefore, also the environmental physics group aims at contributing to and benefiting from this process. While our group is originally focused on basic atmospheric research, we cover a broader range of environmental physics topics in teaching, which overlap with the needs of the transformation process.

In this talk, we will give a short overview of the Climate Protection strategy of the University of Greifswald before we show some examples from our own work regarding the energy consumption of buildings.

UP 1.2 Mon 9:45 MER/0002

Life Cycle Assessment practices for PV technologies: systematic literature review — •Zeena Patel — Technische Universität Ilmenau

In response to the growing importance of sustainability in solar energy development, this study addresses critical gaps in the application of Life Cycle Assessment (LCA) to photovoltaic (PV) technologies. A systematic review of 48 recent LCA studies across first-, second-, and third-generation PV systems was conducted to evaluate current practices, identify methodological inconsistencies, and highlight emerging trends. Despite increasing research interest and technological diversification, substantial variability exists in the definition of functional units, system boundaries, and impact categories, which hinders comparability and reproducibility. The widespread reliance on secondary databases and the limited use of primary, site-specific data further constrains the accuracy of environmental impact assessments. Additionally, the underutilization of Life Cycle Costing (LCC) and inconsistent application of sensitivity analyses reveal significant gaps in comprehensive sustainability evaluation. To advance the field, this study proposes standardization of LCA methodologies, improved data transparency, and expansion of impact categories beyond global warming potential to include toxicity and resource depletion. These measures are essential for enhancing the robustness, reliability, and policy relevance of PV LCA studies, thereby supporting sustainable innovation and deployment in the solar energy sector.

UP 1.3 Mon 10:00 MER/0002

Electrochemical Modeling of SOFCs with Emphasis on Microkinetic and Anode Overpotential — •Iram Gul[1], Gabriela Soffiati[2], and Thiago Lopes[3] — [1]Research Center for Greenhouse Gas Innovation, University of São Paulo (USP), 05508-030, São Paulo * SP, Brazil — [2]Institute of Physics (IFUSP), University of São Paulo, Universidade, R. do Matão, 1371 - Butantã, São Paulo - SP, 05508-090 — [3]Research Center for Greenhouse Gas Innovation, University of São Paulo (USP), 05508-030, São Paulo * SP, Brazil

This study investigates Solid Oxide Fuel Cells (SOFCs) using a CO/H fuel mixture, focusing on thermodynamics, mass transport, and electrochemical kinetics. Thermodynamic properties such as heat capacity, enthalpy, entropy, and Gibbs free energy were analyzed across 600-800°C using MATLAB simulations. The Dusty Gas Model (DGM) revealed key mass transport behaviors in the anode, while Density Functional Theory (DFT) using VASP provided insights into surface reaction mechanisms. A microkinetic model examined the impact of anode overpotential on reaction kinetics and cell performance. Results show that higher temperatures improve mass transport and reduce Ohmic losses but slightly decrease the thermodynamic driving force. This multi-scale model enhances our understanding of SOFC behavior and offers a basis for improving fuel cell efficiency and material performance.

UP 1.4 Mon 10:15 MER/0002

Thermal stability of ceria-zirconia oxides(CeZrO4) nanoparticles using combustion synthesis for the CO oxidation and NOx reduction — •Hamza Mohamed — IMMM, UMRS 6283 CNRS, Le Mans Université, Bd O. Messiaen, 72085 Le Mans Cedex 09, France

The study presents a green synthesis approach for fabricating ceria-zirconia oxide nanoparticles (CeZrO4 NPs) using the solution combustion synthesis method. The synthesized CeZrO4 nanoparticles were characterized using various sophisticated instruments and methods to determine their detailed properties. The UV-Vis spectra showed a characteristic absorbance peak at 242 nm and a band gap (Eg) of 3.05 eV. Simultaneously, Fourier transform infrared spectra of CeZrO4 NPs displayed bands at 418 cm-1, 991 cm-1, 1382 cm-1, 1658 cm-1, 2306 cm-1, 3288 cm-1, and 3643 cm-1, which indicates the presence of phytochemicals that facilitate the reduction and stabilization of CeZrO4 NPs. The major peaks for cubic CeZrO4 NPs were obtained with a crystalline size of 9.6 nm by X-ray diffraction. The microscopic analyses revealed irregular, ovoid, and aggregated morphologies with sizes ranging from 3 to 10 nm. The XPS analysis revealed the existence of Ce3d, Zr3d, C1s, and O1s states with their corresponding atomic percentages. Therefore, this investigation focuses on synthesizing catalysts that demonstrate both thermal stability and high catalytic activity for the oxidation of CO and the reduction of NOx.

UP 2: Climate Communication

Climate communication, public engagement, education, and implementation of sustainability goals.

Time: Tuesday 9:30–10:45 Location: MER/0002

UP 2.1 Tue 9:30 MER/0002

Die AG Klima der DPG - Ziele und Projekte im Bereich Klimakommunikation — •Cedric Hossack — Mitglied des Vorstandes der AG Klima der DPG, Oberaudorf, Deutschland

Der anthropologische Einfluss auf das Erdsystem hat ein kritisches Ausmaß erreicht. Beinahe täglich werden wir mit Nachrichten über Starkregenfälle, Überschwemmungen, Sturmfluten oder Dürreperioden auf der ganzen Welt konfrontiert. Diese Ereignisse sind auf den Klimawandel zurückzuführen und betrifft die Menschen weltweit. Wie können die Menschen sensibilisiert werden und welchen Beitrag kann die Wissenschaft beim Thema Klimakommunikation leisten? Wer erklärt ihnen was da passiert und vor allem warum? Hier setzt Klimakommunikation an. Die Vermittlung von Fakten, der Austausch der Fachleute mit Politik und Gesellschaft.

Die Fakten und Risiken des Klimawandels für die menschliche Gemeinschaft sowie die sich daraus resultierende wissenschaftliche Verantwortung sind der Grund warum sich in der Deutschen Physikalischen Gesellschaft die Arbeitsgruppe Klima gegründet hat.

In diesem Vortrag werden die Ziele, Projekte und Resultate im ersten Jahr des Bestehens der Arbeitsgruppe Klima vorgestellt und was für die Zukunft geplant ist um das Thema Klima wieder in den Fokus des gesamtgesellschaftlichen Diskurses zu bringen.

UP 2.2 Tue 9:45 MER/0002

On the communication of climate research: Who wants to know about it, when and why? — •Mirjam Bourgett — Alfred-Wegener-Institut, Bremerhaven, Germany

Effective climate communication is crucial for translating scientific certainty into climate action, yet it presents unique challenges compared to communicating other scientific fields. This presentation explores the complex communication landscape of climate research.

A focus will be placed on the influence of media and how varying socio-ecological backgrounds shape the reception and perception of climate science. Who seeks climate information, when, and for what purpose? When does the reception of climate science appear to be political? We will also addresses the role of climate emotions and how scientific results trigger emotions. It is important to try to anticipate possible reactions of the public and provide different communication strategies as well as additional information on possible actions and processing strategies.

As an outloook we discuss a set of communication strategies for today's environment, emphasizing: 1) Direct Communication, bypassing traditional news filters; 2) Enrolling the power of climate science by linking it directly to essential planetary and human health outcomes; and 3) Target-Oriented Communication, where the message is adapted to the specific needs of the public. The presentation will conclude with concrete good practice examples to guide researchers in making their work more usable in achieving planetary health.

UP 2.3 Tue 10:00 MER/0002

From Climate Science to Collective Action: How Participatory Formats Shape Organizational Climate Engagement — •Clara Scheve and Thomas Wrona — Hamburg University of Technology, Hamburg, Germany

While climate science has established robust evidence on anthropogenic climate change, translating this knowledge into sustained organizational action remains a critical challenge. Our research investigates how science-based participatory formats function as socio-material devices that bridge climate science communication and organizational transformation. We study "Climate Fresk," a three-hour collaborative workshop format that translates IPCC-based climate science into 42 illustrated cards. Participants collectively reconstruct causal chains of climate change by arranging and connecting these cards, moving from cognitive understanding through emotional engagement to collective sensemaking. Implemented in large industrial organizations (e.g., aerospace, manufacturing, banking), Climate Fresk operates as more than a one-time educational intervention: through train-the-trainer structures, companies internalize the format, creating selfreinforcing "swarm effects" that enable sustained engagement. This work contributes to understanding how climate science communication can be designed not merely for awareness but for fostering collective agency and embedding climate action in organizational infrastructures. By examining how scientific knowledge is translated through participatory formats into organizational transformation, we offer evidence-based design principles for effective climate communication in organizations.

Invited Talk UP 2.4 Tue 10:15 MER/0002

Klimakommunikation in der Schule? Mehr als nur darüber reden! — •Michael Sach — Studienseminar für Gymnasien Bad Vilbel, Burggymnasium Friedberg, Uni Frankfurt

In diesem Kurzvortrag stelle ich einige Facetten der Klimabildung in Schulen mit speziellem Bezug zum Physikunterricht vor. Dabei beziehe ich mich auf alltägliche Unterrichtserfahrungen im Spannungsfeld curricularer Rahmenbedingungen und pädagogischer Herausforderungen der Klimakrise, auf das didaktische Konzept des Bildungsprogramms der LMU München (Klimawandel - verstehen und handeln), auf unterschiedliche Konzepte der BNE (Bildung für nachhaltige Entwicklung) sowie auf eine kritische Perspektive auf die Etablierung von Klimaschulen in Deutschland.

UP 3: Air Quality, Exposure and Atmospheric Dynamics

Remote sensing and transport modeling complemented by urban exposure, renewable energy-aerosol interactions, particle transport mechanics, and large-scale dynamics affecting aerosol transport.

Time: Tuesday 11:15–12:45 Location: MER/0002

Invited Talk UP 3.1 Tue 11:15 MER/0002

Supporting the monitoring and tracking of carbon dioxide and methane emissions with satellites — •Dominik Brunner[1], Gerrit Kuhlmann[1], and Yasjka Meijer[2] — [1]Empa, Dübendorf, Switzerland — [2]European Space Agency (ESA), Noordwijk, the Netherlands

Achieving the goals of the Paris Agreement to limit global warming to no more than 2°C above pre-industrial levels requires drastic cuts to emissions of carbon dioxide (CO2) and methane (CH4). The Enhanced Transparency Framework of the Paris Agreement requires all countries to provide transparent information on the implementation and achievement of their national mitigation objectives. The atmospheric community supports this process by providing independent emission monitoring based on atmospheric concentration measurements from ground and space. The European Copernicus CO2 Monitoring mission, CO2M, will be a constellation of three satellites to be launched from 2027, is designed to greatly enhance our capabilities to quantify CO2 and CH4 emissions from industrial sources, cities and countries. In this presentation, we will provide an overview of the CO2M mission, explain how CO2 and CH4 will be retrieved from spectral radiance measurements, and show its complementarity to other observations. We will present examples of how CO2M contributes to quantifying emissions, outline the atmospheric modelling frameworks that will assimilate its observations, and present a long-term perspective of how CO2M together with other observations will support policymakers in reaching the goals of the Paris Agreement.

UP 3.2 Tue 11:45 MER/0002

Stratification patterns of soil particle electric charge distribution boost wind-blown sand transport — •Danilo da Silva

Borges, Sandesh Kamath, Gerhard Wurm, and Eric Josef Ribeiro Parteli — Faculty of Physics, University of Duisburg-Essen

Since the pioneering studies by Michael Faraday in the 19th century, it is known that wind-blown sand transport generates electric fields reaching various MV/m. Such fields are caused by contact electrification of sand particles during wind-blown transport, but their effect on the minimal threshold wind velocity (u_{ft}) required for wind-blown sand transport initiation remains controversial. Elucidating this effect is of utmost relevance for a broad range of fields, from desertification research to the geology of Mars. Here we show, by means of CFD–DEM simulations, that u_{ft} can be substantially affected not only by the presence of a particle charge distribution, but also by the spatial distribution of the charges within the granular soil. While a random spatial distribution of charges enhances u_{ft}, the presence of domains of like electric charges in the soil lowers the onset for sand transport. In a general fashion, our simulations suggest that the total electrostatic to gravitational potential energy ratio, C_0, is the most important control parameter, with u_{ft} increasing (decreasing) with the charge magnitude when C_0 is negative (positive). Our findings provide a theoretical framework for the interpretation of wind-tunnel and field data, and demonstrate that spatial charge patterns constitute a key parameter for wind-blown sand transport.

UP 3.3 Tue 12:00 MER/0002

Effective UV doses for the production of cutaneous vitamin D in Athens, Greece: assessing aerosol-related uncertainties in satellite-based retrievals — •Theodora Stavraka[1,2,5], Ilias Fountoulakis[1,5], Kostas Eleftheratos[2,5], Panagiotis Nastos[2,5], Thomais Papazoi[1], Konstantinos Fragkos[3], Andreas Kazantzidis[4], Vassilis Amiridis[6], and Christos Zerefos[1,5,7,8] — [1]Academy of Athens, Greece — [2]University of Athens, Greece — [3]The Cyprus Institute, CARE-C, Nicosia, Cyprus — [4]University of Patras, Greece — [5]Biomedical Research Foundation of the Academy of Athens, Greece — [6]National Observatory of Athens, Greece — [7]Navarino Environmental Observatory, Messenia, Greece — [8]Mariolopoulos-Kanaginis Foundation, Athens, Greece

The purpose of this study is to evaluate satellite- and reanalysis-based retrievals of the UV effective dose for cutaneous vitamin D production using ground-based measurements over Athens, Greece. We evaluate data from (1) the climatology by Fragkos et al., (2024) based on CAMS information combined with OMI and MSG satellite data, and (2) the UV climatology of TEMIS also based on data from various sensors analyzing air quality. Ground-based spectral solar UV irradiance measurements performed with a Brewer MKIV spectrophotometer operating at the Academy of Athens have been used for the evaluation, as well as AOD measurements from a co-located CIMEL sun-photometer, part of the AERONET network. The analysis covers 2008 - 2021 when both the CIMEL and the Brewer were operating side-by-side.

UP 3.4 Tue 12:15 MER/0002

Observations of double aerosol layers below an altitude of 30 km with different causes of formation — •Christian Löns[1], Ronald Eixmann[2], and Christian von Savigny[1] — [1]University of Greifswald, Germany — [2]Leibniz-Institute of Atmospheric Physics at the University of Rostock, Germany

In December 2011, it was possible to observe a second layer with an increased Mie signal above the stratospheric aerosol layer in measurements taken with a Doppler lidar in the southern high latitudes during the collapse of the polar vortex. The signature descends from an altitude of 28 km within a few days and can be observed as a broad aerosol layer after about a week. The signature is also observable in satellite measurements of the aerosol extinction coefficient by OSIRIS and SCIAMACHY. In December 2018, the Kamchatka asteroid, approximately 10 m in diameter, exploded over the Bering Sea. It was the third largest recorded impact on Earth after the Tunguska event and the Chelyabinsk meteor. The expected transport path can be modelled using trajectory analyses. Using measurements of the aerosol extinction coefficient from OMPS-LP, signatures of the Kamchatka asteroid can be observed at an altitude of 26 km one week after its explosion. The signature can be observed on several consecutive days as an increase in the extinction coefficient at an altitude of ∼26-28 km during its transport over the North Atlantic from America towards Europe.

UP 3.5 Tue 12:30 MER/0002

Validation of Airborne HALO Wind and Aerosol Measurements Using Ground-Based Lidar and Radar Observations in Kühlungsborn — •Ronald Eixmann[1], Gerd Baumgarten[1], Frederik Ernst[1], Jan Froh[1], Josef Höffner[1], Philipp Joppe[2], Christian Löns[3], Thorben Lüke-Mense[1], Alsu Mauer[1], Mira Pöhlker[4], Pablo Saavedra Garfias[1], Marina Schimpf[5], and Marius Zecha[1] — [1]Leibniz-Institute of Atmospheric Physics, Kühlungsborn, Germany — [2]Max Planck Institute for Chemistry, Mainz, Germany — [3]University of Greifswald, Greifswald, Germany — [4]Leibniz Institute for Tropospheric Research, Leipzig, Germany — [5]German Aerospace Center, Germany

On 20 August 2025, a scientific research flight was conducted over northern Germany with destination Kühlungsborn as part of the HALO-South mission and its preparatory activities. Flight operations were led by the Leibniz Institute for Tropospheric Research (TROPOS), Leipzig, with coordination by the Max Planck Institute for Chemistry, Mainz, in collaboration with the German Aerospace Center (DLR), Oberpfaffenhofen. Ground-based measurements were carried out by the Leibniz Institute of Atmospheric Physics (IAP), Kühlungsborn.

This contribution presents the first validation results combining ground-based lidar and radar observations with airborne HALO measurements at the tropopause level to assess wind fields and aerosol distributions. The campaign demonstrates the potential of coordinated airborne and ground-based observations to provide a comprehensive, multi-dimensional characterization of atmospheric dynamics and aerosol variability at a single site.

UP 4: Members' Assembly

Agenda:

- Annual Report of PA Environmental Physics
- Upcoming Conferences
- Awards and Appointments
- Miscellaneous

Time: Tuesday 13:00–13:45 Location: MER/0002

30 min break

UP 5: Modelling and Prediction Across Scales

Seamless prediction and boundary-layer physics; the session then broadens to cross-cutting modelling, multiscale methods, data assimilation, computational techniques, and optimization of fuel combustion.

Time: Tuesday 14:00–15:30 Location: MER/0002

Invited Talk UP 5.1 Tue 14:00 MER/0002

A path to seamless modelling of the convective atmospheric boundary layer — •Mirjana Sakradzija — Ludwig Maximilian University of Munich, Germany

Numerical weather prediction (NWP) has reached operational grid spacings of less than 1 km at several leading weather centres. The possibility of using the same model configuration across various applications and spatial scales, ranging from local large-eddy-resolving cases to global NWP and climate simulations, is now a reality. I will explore one such possibility by using an operational NWP model at sub-km resolutions and examining its ability to represent relevant processes in the atmospheric boundary layer (ABL) compared with standard large-eddy simulations, and micro- and sub-mesoscale meteorological observations. Next, I will discuss the current state of development of a unified parameterization of ABL turbulence, convection, and clouds, and the prospects for a smooth transition from parameterized to resolved scales. The importance of land-atmosphere coupling emerges at all spatio-temporal scales as the key forcing factor for the ABL and one of the largest sources of uncertainty in both modelling and observations.

UP 5.2 Tue 14:30 MER/0002

Projected variability of solar resources in the Eastern Mediterranean and Middle East — •Nikolaos Papadimitriou[1,2], Kostas Douvis[2], Stergios Misios[2], Antonis Gkikas[2], Andreas Kazantzidis[1], Christos Zerefos[3,4,5], and Ilias Fountoulakis[2] — [1]Department of Physics, University of Patras, Patras, Greece — [2]Research Centre for Atmospheric Physics and Climatology, Academy of Athens, Athens, Greece — [3]Biomedical Research Foundation, Academy of Athens, Athens, Greece — [4]Navarino Environmental Observatory (N.E.O.), Messinia, Greece — [5]Mariolopoulos-Kanaginis Foundation for the Environmental Sciences, Athens, Greece

Climate change is expected to alter key atmospheric parameters influencing downwelling solar irradiance, including cloudiness and aerosol concentration. The Eastern Mediterranean and Middle East region, identified as a climate hotspot and known for its high levels of solar exposure, constitutes a particularly relevant case study for assessing future variability of solar energy potential. We use data from three global climate models that participated in the 6th phase of the Climate Model Intercomparison Project (CMIP-6): CNRM-CM6-1-HR, INM-CM5-0, and MPI-ESM1-2-HR. Projections were evaluated under three different Shared Socioeconomic Pathways (SSPs 245, 370, 585). In this study, we analyzed trends in surface downwelling solar irradiance and associated climatic drivers and estimate the photovoltaic (PV) power potential by performing simulations with the climate data interface of the GSEE model.

UP 5.3 Tue 14:45 MER/0002

An optimization-based approach to track the Asian summer monsoon anticyclone across daily and interannual variability — •Oleh Kachula, Bärbel Vogel, Gebhard Günther, and Rolf Müller — Forschungszentrum Jülich, 52428 Jülich, Germany

The Asian summer monsoon anticyclone (ASMA) is an upper troposphere-lower stratosphere (UTLS) meteorological circulation system that develops over Asia during summer months in the Northern Hemisphere. It strongly influences regional weather, particularly monsoon rainfall, and shapes the climate of densely populated regions such as India and Southeast Asia. The ASMA also plays a major role in transporting near-surface anthropogenic pollutants to the UTLS, with important implications for air quality and stratospheric chemistry. Improving our understanding of this complex system is essential for enhancing weather prediction capabilities and for better assessing climate and environmental impacts.

We present a novel method based on the absolute vortex moments that defines the ASMA boundary by solving an optimization problem. Here, we address the ASMA's climatology (1980-2023), interannual variability, the variability of the start and end dates and the duration of the anticyclone peak phase calculated with help of the defined novel method by using the ERA5 reanalysis provided by ECMWF. Our findings show that the ASMA area decreases at 370, 390 and 410 K over the period 1980-2023 in contrast to previous studies. Further, we provide evidence of possible bimodality of the ASMA.

UP 5.4 Tue 15:00 MER/0002

Differentiable Operators for Ocean Simulation and Inverse Problems — •Pauleo R. Nimtz[1,2], Vadim Zinchenko[1], Kubilay T. Demir[1], Anthony Frion[1], and David S. Greenberg[1] — [1]Helmholtz-Zentrum Hereon, Geesthacht, Germany — [2]Universität Potsdam, Potsdam, Germany

Gradient-based optimization is a powerful tool for fitting mechanistic simulations to observation data and is crucial for modern machine learning frameworks. However, in established numerical models of ocean hydrodynamics (e.g. NEMO, ICON-O, SCHISM) and biogeochemistry (e.g. ECOSMO, HAMMOC), the required gradients with respect to model input are typically not available. To address this, we implemented a family of differentiable operators in PyTorch, focusing on the transport and interaction of tracers in fluid dynamical simulations. We provide key operations such as advection, turbulent mixing and biogeochemical processes, with native GPU support and efficient vectorized code. Gradients are computed automatically with memory-efficient custom backpropagation routines for implicit time integration. These operators enable auto-differentiable simulations, with applications including model tuning, data assimilation, physics-informed neural networks, and hybrid physical and data-driven models. We demonstrate their utility by performing data assimilation to identify initial conditions in simulations of inert tracer transport and spatially extended models of light- and nutrient-dependent aquatic ecosystems. These tools provide an essential step towards building and tuning differentiable ocean models, and fitting them to observation data.

UP 5.5 Tue 15:15 MER/0002

Approximating the universal thermal climate index using sparse regression with orthogonal polynomials — •Sabin Roman[1], Gregor Skok[2], Ljupco Todorovski[2,1], and Saso Dzeroski[1] — [1]Department of Knowledge Technologies, Jozef Stefan Institute — [2]Faculty of Mathematics and Physics, University of Ljubljana

The Universal Thermal Climate Index (UTCI) is widely used to quantify outdoor thermal comfort, but its standard sixth-degree polynomial approximation can yield substantial numerical errors, especially under extreme conditions. We present a new approximation method that preserves computational efficiency while offering markedly improved accuracy and stability. The method employs sparse regression with Legendre polynomial bases, whose orthogonality ensures well-conditioned models and a hierarchical coefficient structure. Adjusting sparsity constraints yields families of models that span a clear Pareto front between accuracy and complexity. Compared with the standard UTCI approximation, the proposed models substantially reduce mean, absolute, and root-mean-square errors and significantly limit large deviations. Training on only 20% of the data while testing on the remaining 80% demonstrates strong generalization, further supported by bootstrap analysis. The resulting representation acts as a Fourier-like expansion in an orthogonal basis, providing an efficient and highly accurate approximation of the UTCI.

UP 6: Upper Atmosphere, Polar Chemistry and Volcanic Aerosols

Upper-atmosphere, polar processes, volcanic aerosols, remote sensing, and dynamics.

Time: Wednesday 9:30–11:00 Location: MER/0002

UP 6.1 Wed 9:30 MER/0002

Twofold Chemical Properties of Premelting at Ice Surfaces — •Thorsten Bartels-Rausch[1], Jérôme Gabathuler[1], Yanisha Manoharan[1], Luca Artiglia[1], Markus Ammann[1], Rawan Abouhaidar[2], Céline Toubin[2], and Ivan Gladich[3] — [1]Paul Scherrer Institute, Villigen, Switzerland — [2]Universite de Lille, Lille, France — [3]University of Urbino, Urbino, Italy

The physical properties of ice surfaces are a longstanding subject of intense research motivated by their relevance in glacial flow, thunder, (anti-)freezing, and on-water catalysis. How water molecules rearrange at the surface to minimize energy, going as far as evolving liquid-like features in premelting, is under ongoing investigation. Less elusive remains the impact of this disorder on chemistry. This is problematic considering the role of ice and snow interfaces in chemical processes, such as global geochemical cycles. This work presents hexylamine adsorption as a means to investigate the chemical characteristics of the ice- and water-air interface. By analyzing the X-ray photoemission spectra of the adsorbate at the air-ice interface against those at the air-water interface, we discovered experimental evidence indicating differing chemical interactions at these two interfaces. Molecular dynamics and core binding calculations linked these spectroscopic differences to an active interfacial proton transfer.

UP 6.2 Wed 9:45 MER/0002

Bromine Explosion signals in Arctic snow — •Stefanie Falk[1], Hogo El-Mansi[2], Ariane Le Cardinal[1], Luca Reissig[1,4], Bianca Zilker[3], Andreas Richter[3], Hans-Werner Jacobi[2], and Björn-Martin Sinnhuber[1] — [1]Karlsruhe Institute of Technology, Institute of Meteorology and Climate Reseach, Atmospheric Trace Gases and Remote Sensing, Karlsruhe, Germany — [2]nstitute of Environmental Geosciences (IGE), Université Grenoble Alpes / CNRS / Grenoble INP / INRAE / IRD, Grenoble, France — [3]University of Bremen, Institute of Environmental Physics, Bremen — [4]German Weather Service, Offenbach, Germany

Ozone (O_3) volume mixing ratios (VMR) below 5 ppb are frequently observed during springtime in the polar boundary layer. The destruction of O_3 is caused by reactive halogen compounds, likely dominated by bromine (Br_2) released from salty ice and snow. The driving mechanism leads to exponential growth in Br_2 VMR during so-called Bromine Explosions (BEs). Increased vertical column densities (VCD) of bromine monoxide (BrO) are regularly observed by remote sensing. Long-term observations of O_3 at Arctic coastal sites and BrO indicate emerging signals of a changing climate. We also compare modeled bromine deposition on snow to bromide concentrations determined in snow samples taken at Spitsbergen in 2024. To this end, we use the ECHAM/MESSy Atmospheric Chemistry (EMAC) model, including a treatment of bromine release, recycling on ice and snow-covered surfaces, and parameterized emissions from sea salt aerosols. We discuss implications for the assumed sources of Br_2 in the Arctic.

UP 6.3 Wed 10:00 MER/0002

Polar 6 airborne in situ aerosol and turbulence measurements in the Arctic and Antarctica — •Laura Köhler[1], Stephan Borrmann[2], Jörg Hartmann[1], Zsofia Juranyi[1], Christof Lübkes[1], Jonas Schäfer[3], David Simon[3], Frank Stratmann[3], and Andreas Herber[1] — [1]Alfred-Wegener-Institut, Bremerhaven, Germany — [2]Max Planck Institute for Chemistry, Mainz, Germany — [3]Leibniz Institute for Tropospheric Research, Leipzig, Germany

We present three aircraft campaigns conducted with the research aircraft Polar 6, all using similar configurations for in situ aerosol and turbulence measurements. Two campaigns, BACSAM I (autumn 2022) and BACSAM II (spring 2024), were carried out in the Arctic from Longyearbyen. The third campaign, SANAT, will take place in early 2026 from Neumayer III Station in Antarctica. These measurements provide one of the first aerosol profile datasets collected in the vicinity of Neumayer III.

A comprehensive suite of aerosol instruments enables measurements of aerosol parameters such as number concentrations and size distributions, while the aircraft*s nose boom provides high-frequency (100 Hz) meteorological and turbulence data. During all three campaigns, the Turbulence-Bird (T-Bird) was also deployed up to 80 m below the aircraft, carrying additional aerosol and turbulence sensors allowing for simultaneous observations at two altitudes.

This unique setup enables investigations such as airborne particle fluxes. We present the three campaigns, outline the measurement setup, and show examples of the atmospheric conditions encountered.

UP 6.4 Wed 10:15 MER/0002

Stratospheric aerosol size evolution after the Ruang volcanic eruptions in 2024 — •Felix Wrana, Christian von Savigny, and Sandra Wallis — Institute of Physics, University of Greifswald, Greifswald, Germany

The size of stratospheric aerosols is an important factor in their effect on Earth's radiative balance and on atmospheric chemistry. On April 17th and 30th 2024, the Ruang volcano (2.3 °N, 125.37 °E) had two eruptions with a volcanic explosivity index (VEI) of 4, both reaching the stratosphere. Although each eruption injected only around 0.26 Tg of SO_2, they had a considerable effect on the stratospheric aerosol size in the Junge layer, that was at that point in time still affected by the exceptional Hunga eruption of 2022. The evolution of the stratospheric aerosol size from before to after the Ruang eruptions is shown, based on a multi-wavelength retrieval from the satellite solar occultation measurements of the Stratospheric Aerosol and Gas Experiment III on the ISS (SAGE III/ISS). Similarities and differences with other volcanic eruptions that reached the stratosphere in the previous years are shown and discussed, adding to our current understanding of the main driving factors behind observed aerosol size increases vs decreases after volcanic eruptions. Also, the satellite retrieval is validated with balloon-borne in situ measurements.

UP 6.5 Wed 10:30 MER/0002

How long does H2O from a strong tropical volcanic eruption need to reach the polar summer mesopause? — •Sandra Wallis[1], Hauke Schmidt[2], and Christian von Savigny[1] — [1]University of Greifswald, Greifswald, Germany — [2]Max Planck Institute for Meteorology, Hamburg, Germany

It is assumed that the historic 1883 Krakatoa volcanic eruption emitted a large amount of water vapour into the tropical middle atmosphere (20 - 100 km). According to a prominent hypothesis, this volcanic water vapour might have been transported to the polar summer mesopause resulting in the first ever sighting of noctilucent clouds (NLC) two years later. This discussion was recently revived after the 2022 Hunga eruption. We used simulations from the Hamburg Model of the Neutral and Ionized Atmosphere (HAMMONIA) to determine the transport time of water vapour from the tropics to the summer polar mesopause for different volcanic injection seasons and heights. The results suggest that a 1.5 to 2 year transport time period is plausible, strengthening the Krakatoa-NLC hypothesis.

UP 6.6 Wed 10:45 MER/0002

Is there a stratospheric airglow layer caused by the chemiluminescent reaction of NO and O_3? — •Christian von Savigny[1], Christoph G. Hoffmann[1], Wuhu Feng[2,3], and John Plane[2] — [1]Institute of Physics, University of Greifswald, Greifswald, Germany — [2]School of Chemistry, University of Leeds, Leeds, UK — [3]National Centre for Atmospheric Science, Leeds, UK

Airglow, i.e. non-thermal emissions caused directly or indirectly by solar radiation, is a ubiquitous phenomenon in the Earth's atmosphere and also other planetary atmospheres. Most airglow emissions in the terrestrial atmosphere occur in the mesosphere and thermosphere, but some emissions can also extend down to below the stratopause. The most prominent example is the $O_2(^1\Delta)$ dayglow emission at a wavelength of about 1270 nm. Another potential stratospheric emission is a nightglow emission by excited NO_2 that was reported three decades ago by Evans and Shepherd (1996) based on nightglow measurements with the Wind Imaging Interferometer (WINDII) on UARS and model simulations. This emission has not yet been confirmed in other studies. In this contribution we use nightglow simulations based on input from the Whole Atmosphere Community Climate Mode (WACCM) to investigate, (a) how intense the NO + O_3 chemiluminescence is at

stratospheric altitudes, and (b) whether it can likely be identified with a satellite limb viewing spectrometer. Our results indicate that the $NO + O_3$ volume emission rates are orders of magnitude weaker than suggested earlier.

UP 7: Aquatic Systems: Limnology, Natural Waters, Wetlands and Soilmoisture

Cohesive freshwater and wetland focus, combining circulation, properties, biogeochemistry, and innovative sensing/quantification.

Time: Wednesday 11:15–12:30 Location: MER/0002

UP 7.1 Wed 11:15 MER/0002

One Dimensional Thermobaric Mixing in a Deep Lake — •Joshua Marks[1,2], Kazuhisa A. Chikita[3], and Bertram Boehrer[1,2] — [1]Department of Lake Research, Helmholtz Centre for Environmental Research - UFZ, Magdeburg, Germany — [2]Department of Physics and Astronomy, Heidelberg University, Heidelberg, Germany — [3]Arctic Research Center, Hokkaido University, Sapporo, Japan

Thermobaricity is defined as the temperature dependence of the compressibility of water. It leads to a decrease of the temperature of maximum density T_{md} with increasing pressure. This effect has significant impacts in many deep lakes, like Lake Shikotsu, Hokkaido, Japan. Despite this, it is often not implemented in lake models, except in combination with external forcing. We created a simplified 1D model with the surface temperature input as only external forcing, excluding salinity and any other competing influences. For stability considerations, we used the in-situ density. The model recreated the one dimensional deep water renewal with the following key features: (1) at the intersection of the temperature profile with the T_{md} line diffusion induces cabbeling which leads to thermobaricity driven deep water circulation, (2) this deep water circulation cell is detached from the surface, (3) the deep water stays isothermal, (4) and after the winter stratification the temperature profile aligns with the T_{md} line. The results emphasize the necessity and the feasibility of the implementation of thermobaricity in lake models to ensure correct behaviour of the deep water renewal.

UP 7.2 Wed 11:30 MER/0002

Sound Speed Contributions of Solutes in Water — •Ivan Selyakov, Lutz Hrdlicka, and Bertram Boehrer — Helmholtz Centre for Environmental Research, Magdeburg, Germany

This study provides a structured investigation of the fundamental property of sound speed in limnic waters, presenting systematic experimental data on the contributions of various electrolytes over a temperature range from 1 °C to 30 °C and concentrations up to 0.05 mol L-1. While established approaches such as the UNESCO formula and the TEOS-10 package describe sound speed in oceanic waters, information on the contributions of specific solutes in freshwater environments remains limited. We observed no evidence of nonlinearities in either temperature or concentration dependences within the studied range and accuracy. Coefficients for calculating sound-speed excess are provided for a range of salts containing all major ions commonly found in natural waters. Contributions in mixtures of salts can be directly added, and a numerical approach is introduced for predicting sound speed in arbitrary mixtures of the investigated ions, including unusual combinations found in volcanic or meromictic conditions. Using our data, isothermal and adiabatic compressibility as well as in-situ density can be calculated with enhanced accuracy. These findings are valuable for applied fields such as acoustic sensing and environmental monitoring, and for advancing theoretical understanding in physical limnology and aquatic thermodynamics. The numerical tool implementing this approach has been validated against the UNESCO formula.

UP 7.3 Wed 11:45 MER/0002

First Observations of Extreme Gas Accumulation in Meromictic Lake Kilevann — •Bertram Reventlow[1,2], Bertram Boehrer[2], Florian Meienburg[1], Joshua Marks[2], Marius Feuerle[1], Martina Schmidt[1], and Werner Aeschbach[1] — [1]Institute of Environmental Physics, Heidelberg, Germany — [2]Helmholtz Centre for Environmental Research - UFZ, Magdeburg, Germany

Lake Kilevann in southern Norway is a former fjord that became isolated from the sea about 8000 years ago due to isostatic rebound. In its deepest basin, a strongly stratified layer of ancient seawater remains trapped between 60 and 100 m depth. Such isolated layers in meromictic lakes tend to accumulate gases, which can lead to limnic eruptions. In Lake Kilevann, we measured methane concentrations among the highest ever recorded in lakes. Isotopic analyses of CO_2 and CH_4 indicate long carbon residence times, a biogenic origin, and active methanogenesis in the water column. Preliminary noble gas measurements suggest strong depletion, supporting the hypothesis of bubble-mediated gas transfer, which could potentially trigger an eruption. On the other hand, the water column is strongly stratified, except for a single double-diffusive convection cell near the lake bottom. Major ions exhibit fractionated depletion relative to oceanic values, indicating that molecular diffusion over the lake's lifetime is a key mechanism driving the dilution of the seawater.

UP 7.4 Wed 12:00 MER/0002

Airborne Lidar Measurements of Methane over Canada — •Arunima Das[1,2,3], Christoph Kiemle[2,3], Sabrina Zechlau[1,2], Martin Wirth[2], and Andreas Fix[2] — [1]Ludwig Maximilian University of Munich — [2]Deutsches Zentrum für Luft- und Raumfahrt — [3]Technical University of Munich

Methane(CH4) is a key greenhouse gas with an atmospheric lifetime of about 10 years and high mitigation potential. Wetlands, coastal zones and offshore oil and gas facilities are major CH4 sources yet quantifying emissions over these remains challenging. Passive sensors struggle over low-albedo water surfaces and in-situ data are sparse. The French-German MERLIN mission aims to address this gap. Its Integrated Path Differential Absorption(IPDA) lidar will retrieve global column-averaged CH4 independent of sunlight. IPDA maintains high precision over dark water, flooded wetlands, and high-latitude regions with low sun angles. A robust retrieval algorithm performing accurately across diverse surfaces is crucial for detecting small CH4 gradients. CHARM-F, MERLIN's airborne demonstrator provides essential testing. During the CoMet 2.0 campaign, it measured XCH4 across Arctic wetlands and lake systems in the Hudson Bay Lowlands with agreement to in-situ vertical profiles within 1%. Further analysis shows negligible bias over land and higher biases over water, majorly driven by varying signal-to-noise ratio. The upcoming campaign CoMet 3.0 will broaden environmental coverage over tropical wetlands in Brazil, further testing CH4 retrieval performance over extensive water-dominated regions. These observations significantly reduce gaps in global CH4 monitoring.

UP 7.5 Wed 12:15 MER/0002

Environmental monitoring with cosmic-ray neutrons: new experiments on ships, blimps, and trains — •Martin Schrön[1], Lasse Hertle[1], Daniel Altdorff[1,2], Solveig Landmark[1], Bernd Heber[3], Sascha Oswald[2], Peter Dietrich[1], and Steffen Zacharias[1] — [1]UFZ - Helmholtz Centre for Environmental Research, Leipzig — [2]Institute of Environmental Science and Geography, University of Potsdam — [3]Institute of Experimental and Applied Physics, University of Kiel

Cosmic-ray neutron sensing (CRNS) technology has emerged as a robust technique for measuring root-zone soil moisture and snow water equivalent at the hectare scale, addressing many limitations of traditional electromagnetic and remote-sensing methods. Here we will present three new applications that utilize mobile cosmic-ray neutron detectors to explore (i) Earth's geomagnetic field with the "Polarstern" research vessel from Bremerhaven to Antarctica, (ii) the soil moisture distribution of inaccessible regions in Germany using hot-air blimps, and (iii) country-scale soil moisture patterns using CRNS on trains along German railway networks. The three experiments showcase recent advancement in CRNS research which may contribute to new applications in hydrology, environmental physics, and even space wheather.

UP 8: Poster

Time: Wednesday 15:00–17:00 Location: P1

UP 8.1 Wed 15:00 P1

Defect-Driven Photoluminescence Quenching in WO3 Micro-Flakes: A simple approach for Bisphenol A Detection — •Hamood Al Shidhani[1], Sumesh Pillai[1], Basim Al Farsi[1], Zainab Al Ruqaishi[2], and Abey Issac[1] — [1]Department of Physics, College of Science, Sultan Qaboos University, P.O Box 36, Al Khoud, Muscat, PC 123, Oman. — [2]Department of Chemistry, College of Science, Sultan Qaboos University, P.O Box 36, Al Khoud, Muscat, PC 123, Oman.

This study presents a novel approach utilizing photoluminescence (PL) spectroscopy of tungsten trioxide (WO*) micro-flakes to detect Bisphenol A(BPA). The WO* was synthesized via a solution phase route, with enhanced sensitivity achieved through controlled annealing. The annealing process increases oxygen vacancy concentrations, which are directional-dependent within the crystal lattice. These vacancies act as emission centers, whose PL response is modulated by BPA concentrations, resulting in measurable quenching effects. The method achieves a detection limit of 0.025 μmol/L, demonstrating sensitivity comparable to other complex analytical techniques, while offering advantages in simplicity and real-time monitoring. The underlying quenching mechanism involves electron transfer from oxygen vacancies to BPA*s H* ions, confirming a static quenching pathway. This work provides an efficient and practical platform for environmental and health monitoring of biohazardous molecules.

UP 8.2 Wed 15:00 P1

Solar and Geomagnetic Forcing Effects on Middle Atmospheric Dynamics Simulated with ICON-ART*LINOZ — •Amrutha Vasudevan — karlsruhe Institute of Technology — Geomar Helmholtz Centre for Ocean Research Kiel

The paper discusses the effect of solar forcing and geomagnetic forcing on middle atmospheric dynamics, using the ICON general circulation model with ART simulations and LINOZ simulations. Simulations are carried out under solar forcing conditions at solar maximum and minimum, and with and without the upper boundary condition NOy, focusing on the role of energetics forced odd nitrogen. Solar forcing is imposed through irradiance spectra, and geomagnetic forcing through particle precipitation and ionization. In the chemistry-dynamics model, the interaction between ozone and NOy and wind and wave forcing has been considered. The paper finds important middle atmospheric responses in the mesosphere and lower thermosphere regarding zonal wind, wave mean flow, and the distribution of ozone, and there are large differences in the UBC(NOy) simulations compared with the non-UBC simulations. The paper emphasizes the crucial role played by the influx of NOy in simulating the solar and geomagnetically forced middle atmospheric variability.

UP 8.3 Wed 15:00 P1

Laboratory studies of the charging state of giant mineral dust — •Lea Sophie Ebel[1,2], Alexei Kiselev[1], Thomas Leisner[1], and Martina Klose-Albinger[2] — [1]IMKAAF, Karlsruhe Institute of Technology, Germany — [2]IMKTRO, Karlsruhe Institute of Technology, Germany

Giant mineral dust particles, characterized by a diameter $\geq 63\,\mu$m, are observed to travel thousands of kilometers in the atmosphere from the Sahara across the Atlantic ocean to America. Mechanisms counteracting the expected fast gravitational settling of giant aerosols and, therefore, enabling their long-range transport are not yet sufficiently understood. The charging state of mineral dust and its interaction with the atmospheric electric potential gradient are proposed as a force potentially large enough to counteract gravity.

To assess the role of charge in long-range dust transport, single mineral dust particles collected from various desert dust sources are charged and inserted into acoustic and electrodynamic traps to measure charge decay and their aerodynamic properties. Additionally, the morphology and mineralogical composition of the particles are characterized via Scanning Electron Microscopy and Energy-dispersive X-ray spectroscopy to link the charge decay to these properties.

Understanding the exact mechanisms behind the long-range transport of giant mineral dust is crucial to improving the dust representation in weather and climate models and to better quantifying dust climate impacts.

UP 8.4 Wed 15:00 P1

The role of sea salt aerosols in Arctic bromine explosion events — •Ariane Le Cardinal[1], Stefanie Falk[1], Hugo El-Mansi[2], Hans-Werner Jacobi[2], and Björn-Martin Sinnhuber[1] — [1]Karlsruhe Institute of Technology, Institute of Meteorology and Climate Research, Atmospheric Trace Gases and Remote Sensing, Karlsruhe, Germany — [2]Institute of Environmental Geosciences (IGE), Université Grenoble Alpes / CNRS / Grenoble INP / INRAE / IRD, Grenoble, France

Ozone depletion events (ODEs) during Arctic springs are caused by halogen compounds, dominated by bromine (Br). Sea salt aerosols provide an important reservoir of bromide (Br^-). During bromine explosion events, the reaction of atmospheric HOBr with Br^- in the snow or sea ice surface releases molecular bromine Br_2 in the gas phase. Photolysis of Br_2 then rapidly amplifies the amount of reactive Br, causing ozone loss. As polar tropospheric bromine chemistry is currently not included by default in most chemistry climate models, a better understanding of the sea salt distribution in the Arctic snow is needed to better predict ODEs. We compare modelled sea salt emission, transport, and deposition, using ICON-ART at a 13 km resolution (R03B07) with Br_2 released from salty snow. Model results are evaluated using snow samples taken at Spitzbergen (Ny-Ålesund) in 2024, together with satellite observations.

UP 8.5 Wed 15:00 P1

The Impact of Ionic Conductivity on Device Performance in Perovskite Solar Cells — •Immo Petersen[1,2], Aaron Schüller-Ruhl[1,2], Tim Timewell[1,2], Ali Reza Nazari Pour[1,2], Lukas Wagner[1,2], and Jan Christoph Goldschmidt[1,2] — [1]Physics of Solar Energy Conversion Group, Department of Physics, Marburg University, Germany. — [2]mar.quest Marburg Center for Quantum Materials and Sustainable Technology, Marburg University, Germany.

Perovskite solar cells (PSCs) are a promising candidate for cost-effective climate change mitigation; however, their relatively low operational stability remains a major challenge. Recent studies identified mobile ions to be one of the main causes for operational efficiency losses. This work investigates how the density of migrating ions affects the electrical device performance.

For determining the density and mobility of migrating ions, Fast Hysteresis, Mott-Schottky analysis and dark-CELIV measurements are performed. In these methods, a defined voltage protocol is applied to the PSC and the resulting current response is recorded. The measurements are carried out on PSCs with varying electrode materials and different hole transport layers. These layers influence the properties of migrating ions and the surface-recombination rate. In a second step, drift-diffusion simulations are used to model ion dynamics and their influence on the electrical behavior of PSCs.

We found that the magnitude of surface recombination strongly modifies the impact of accumulating ions. Untangling the underlying mechanisms is a central objective of this work.

UP 8.6 Wed 15:00 P1

Evaluation of UA-ICON simulations of Gravity Waves in the Middle Atmosphere for Northern Hemispheric Winter 2016 — •Arwin Marbini, Hella Garny, and Natalie Kaifler — German Aerospace Center (DLR) Oberpfaffenhofen

Gravity waves in middle atmospheric regions are poorly understood, making them a significant scientific object in atmospheric physics. Using numerical simulations, with high horizontal resolution, an understanding of their sources in stratospheric and mesospheric regions becomes a possibility. Here, we evaluate high resolution UA-ICON simulations (20 km horizontal grid size), with JAWARA reanalysis data and lidar observations.

We study the temperature and wind profiles of zonal means for a characterization of the background structure of ICON data. This reveals a warmer stratopause in the ICON simulations, compared to JAWARA.

Furthermore, we analyze temperature perturbations in comparison to the lidar observations in Sodankylä, Finland, to characterize gravity wave activity. With this we test the ability of ICON to simulate realistically gravity wave activity, a prerequisite to study their processes.

This approach aims at closing the gap in our understanding of gravity wave sources, and their influence in our atmosphere.