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.