



EMS Annual Meeting Abstracts

Vol. 18, EMS2021-37, 2021

<https://doi.org/10.5194/ems2021-37>

EMS Annual Meeting 2021

© Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.



Measurements of Atmospheric Variability during the Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAiC) Expedition

Julia Schmale¹ and the MOSAiC ATMOS Team*

¹EPFL, ENAC, Sion, Switzerland (julia.schmale@epfl.ch)

*A full list of authors appears at the end of the abstract

The MOSAiC expedition was designed to better understand the local and remote processes influencing the Arctic climate system. The Arctic is warming two to three times faster than the global average, a process known as Arctic amplification. One of the most significant consequences is the retreat of sea ice, which has already diminished by roughly 40 % since satellite measurements began. The Arctic atmospheric, marine and terrestrial changes have important effects on local processes, such as moisture sources, cloud formation, radiative and energy transfer, amongst other. They also have the potential to induce changes to large-scale circulation, which can impact the mid-latitudes of Eurasia and North America.

Between September 2019 and October 2020 the MOSAiC expedition performed a large number of atmospheric measurements in the high Arctic, drifting most of the time with the sea ice. Instrumentation was operated from the icebreaker Polarstern (Alfred Wegener Institute), on the sea ice and on flying platforms. Observations covered generally: (i) the atmospheric physical structure (e.g., temperature, humidity, wind speed and direction profiles) with radio soundings, ground-based remote sensing, as well as towers; (ii) clouds and precipitation with a host of lidars, radars and radiometers, as well as distrometers and specific hydrometeor observations; (iii) aerosols and trace gases with real-time measurements as well as offline techniques for chemical and microphysical properties; and (iv) the surface energy budget with measurements of radiation, turbulent fluxes and conductive fluxes.

The year-round measurements allow for the study of atmospheric variability during the annual cycle with the important processes of sea ice freeze-up and melting. Other event-based features, such as warm air mass intrusions, cyclones, storms, and lead opening, were studied in detail to understand the implications of these processes for the Arctic system. MOSAiC observations are in addition contributing to the evaluation of satellite-based observations such as radiation fluxes or cloud properties, as well as to the evaluation and improvement of numerical simulations, ranging from simpler box to complex Earth System Models.

This presentation will provide an overview of the first atmospheric observational results during MOSAiC.

MOSAiC ATMOS Team: <https://mosaic-expedition.org/team/researchers/>