

The Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAiC)

Markus Rex (1), Matthew Shupe (2,3,4), Klaus Dethloff (1), Anja Sommerfeld (1), and Benjamin Rabe (1)

(1) Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, (2) Cooperative Institute for Research in Environmental Science (CIRES), (3) National Oceanic and Atmospheric Administration (NOAA), (4) University of Colorado

MOSAiC is an international initiative under the umbrella of the International Arctic Science Committee (IASC) designed by an international consortium of about 70 polar research institutes. MOSAiC will be the largest Arctic expedition ever covering 350 days in the ice from September 2019 to September 2020. Research Vessel (RV) Polarstern will drift 2500 km through the Arctic across the polar cap to collect urgently needed observation data to support a better understanding of the key Arctic climate processes.

Rapid changes in the Arctic lead to an urgent need for reliable information about the state and evolution of the Arctic climate system. This requires more observations over various spatial and temporal scales, and across a wide variety of disciplines. Observations of many critical parameters have not, yet, been made in the central Arctic for a full annual cycle.

MOSAiC will be the first year-around expedition into the central Arctic exploring the coupled climate system. RV Polarstern will drift with the sea ice across the central Arctic. The drift starts in the Siberian sector of the Arctic in late summer. A distributed regional network of observational sites will be established on the sea ice in an area of up to 50 km distance from RV Polarstern, representing a grid cell of climate models. The ship and the surrounding network will drift with the natural sea ice drift across the polar cap towards the Atlantic.

The focus of MOSAiC lies on in-situ observations of the climate processes that couple atmosphere, ocean, sea ice, biogeochemistry and ecosystem. These measurements will be supported by prediction of weather and sea ice, and remote sensing operations to make the expedition successful. The expedition includes aircraft operations and expeditions by icebreakers from MOSAiC partners. All these observations will be used for the main scientific goals of MOSAiC, enhancing the understanding of the regional and global consequences of Arctic climate change and sea ice loss, and improving weather and climate prediction. More precisely, the results are needed to advance the data assimilation for numerical weather prediction models, sea ice forecasts and climate models, and provide ground truth for satellite remote sensing. Additionally, the understanding of the energy budget and fluxes through interfaces, sources, sinks and cycles of chemical species, boundary layer processes, and primary productivity will be investigated during the expedition. MOSAiC will provide scientific knowledge to support safer Arctic maritime and offshore operations, including fisheries and transportation along northern sea routes.