

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

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The Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAiC) is an international initiative under the International Arctic Science Committee (IASC) umbrella that aims to improve numerical model representations of sea ice, weather, and climate processes through coupled system observations and modeling activities that link the central Arctic atmosphere, sea ice, ocean, and the ecosystem.

Observations of many critical parameters such as cloud properties, surface energy fluxes, atmospheric aerosols, small-scale sea-ice and oceanic processes, biological feedbacks with the sea-ice ice and ocean, and others have never been made in the central Arctic in all seasons, and certainly not in a coupled system fashion.

The primary objective of MOSAiC is to develop a better understanding of these important coupled-system processes so they can be more accurately represented in regional- and global-scale weather- and climate models. Such enhancements will contribute to improved modeling of global climate and weather, and Arctic sea-ice predictive capabilities.

The MOSAiC observations are an important opportunity to gather the high quality and comprehensive observations needed to improve numerical modeling of critical, scale-dependent processes impacting Arctic predictability given diminished sea ice coverage and increased model complexity. Model improvements are needed to understand the effects of a changing Arctic on mid-latitude weather and climate. MOSAiC is specifically designed to provide the multi-parameter, coordinated observations needed to improve sub-grid scale model parameterizations especially with respect to thinner ice conditions.

To facilitate, evaluate, and develop the needed model improvements, MOSAiC will employ a hierarchy of modeling approaches ranging from process model studies, to regional climate model intercomparisons, to operational forecasts and assimilation of real-time observations. Model evaluations prior to the field program will be used to identify specific gaps and parameterization needs. Preliminary modeling and operational forecasting will also be necessary to directly guide field planning and optimal implementation of field resources, and to support the safety of the project.

The MOSAiC Observatory will be deployed in, and drift with, the Arctic sea-ice pack for at least a full annual cycle, starting in fall 2019 and ending in autumn 2020. Initial plans are for the drift to start in the newly forming autumn sea-ice in, or near, the East Siberian Sea. The specific location will be selected to allow for the observatory to follow the Transpolar Drift towards the North Pole and on to the Fram Strait.

IASC has adopted MOSAiC as a key international activity, the German Alfred Wegener Institute has made the huge contribution of the icebreaker Polarstern to serve as the central drifting observatory for this year long endeavor, and the US Department of Energy has committed a comprehensive atmospheric measurement suite.

Many other nations and agencies have expressed interest in participation and in gaining access to this unprecedented observational dataset. International coordination is needed to support this groundbreaking endeavor.