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ASR Final Report (DOE-CU-23521)

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Sponsoring Program Office: *DOE Atmospheric System Research Program*

Project Title: *Support for the Second MOSAiC Science Conference support*

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Abstract: This is a final report for a conference support project. The US Department of Energy's Atmospheric System Research Program provided funding support for the Second MOSAiC Science Conference. MOSAiC is the Multidisciplinary drifting Observatory for the Study of Arctic Climate, a yearlong, international expedition into the rapidly changing Arctic sea ice. The expedition collected measurements of the atmosphere, sea ice, and ocean to study coupled physical, chemical, and biological processes. The Second MOSAiC Science Conference provided an important opportunity to bring the MOSAiC-interested community together to discuss MOSAiC data, scientific analyses, synthesis, modeling activities, and more. Overall, the conference was a significant success and has motivated and facilitated a great deal of ongoing research. The support provide by this project was used along with support from other agencies to implement a participant support program that enabled participation in the conference by a diverse collection of researchers from many different countries and disciplines, 60% of whom were female. Most of these participants were Early Career Researchers. Participation by these researchers was vital to the overall success of the conference and has helped to build leadership and research skills for the participants that will serve both themselves and the broader scientific community in the future.

Full Report

This one-year project involved support for the Second MOSAiC Science Conference, which took place from 13-17 February 2023 at the University of Colorado. MOSAiC is the Multidisciplinary drifting Observatory for the Study of Arctic Climate, an international year-long expedition that was conducted in the central Arctic sea ice from September 2019 to October 2020. MOSAiC was designed to collect extensive observations of the atmosphere, sea ice, and ocean to study coupled physical, chemical, and biological processes related to the rapid changes occurring in the region. The US Department of Energy (DOE) played a substantial role in the expedition by operating one of its Atmospheric Radiation Measurement (ARM) Mobile Facilities, which included extensive observations of atmospheric properties, clouds, aerosols, precipitation, and radiation. In addition to this contribution, the DOE Atmospheric System Research (ASR) program has provided funding support for a variety of related research activities to capitalize on the unique observations made during the expedition.

To support the advancement of MOSAiC science, and enable the broad use of data from DOE and other international partners towards improved understanding and modeling of the Arctic system, the MOSAiC community convenes annual science conferences. The First MOSAiC Science Conference was held in Potsdam, Germany in April 2022. In acknowledgement of the significant role played by the United States in the expedition, the Second MOSAiC Science Conference was held in Boulder, Colorado with the broad heading of "Cross-cutting science to advance modeling capabilities." It had about 230 participants from a

wide variety of international countries, institutions, and scientific disciplines. Most participants attended in person while some joined virtually. Importantly, the conference included many "new" participants who had not previously been engaged in the MOSAiC community, particularly those representing model centers. The conference included a collection of plenary sessions, a Knowledge Transfer discussion panel, focused scientific sessions, a poster session, targeted discussions, flexible meeting time, and evening activities. There was an extensive array of activities to support and advance Early Career Researchers (ECR), including a dedicated ECR future planning session, an ECR discussion with journalists, an ECR social event, a student presentation award competition, a plenary session that highlighted impactful cross-cutting research led by ECR scientists, ECR involvement in chairing sessions, and more.

Scientifically, there were many key outcomes of the conference. From a data perspective, this conference occurred just after the agreed upon date for ensuring that all MOSAiC data is publicly archived. While the vast majority of MOSAiC data has already been archived publicly, the conference provided the opportunity to identify the additional data that needs to be made public. Moreover, it was an important time to communicate with the MOSAiC community about the variety of available data sets and how they can be used to advance scientific research in many directions. Additionally, multiple collaborative efforts were outlined to develop value added products from the MOSAiC data, including combined data sets that are designed for model evaluation and model forcing using key measurements from DOE and other sources. These data sets will serve to support numerous ongoing synthesis and modeling efforts. Many key areas of scientific emphasis also emerged from the conference. For example, there is wide interest in better understanding the role of summer freshwater on coupled processes at the surface-atmosphere interface. Additionally, there was significant coordination on research aimed at this surface-atmosphere interface in terms of energy and momentum budgets, linking atmospheric drivers to sea ice melt and movement. There was broad discussion on thematic topics related to Arctic cloud and aerosol properties, helping to draw important links across multiple individual research efforts in these areas and to leverage various data sources towards a more comprehensive understanding of central Arctic atmospheric processes. Arctic cyclones, storms, and synoptic-scale variability were repeated themes, helping to link the localized MOSAiC process observations to the broader Arctic and global climate systems. Multiple synthesis topics were identified, including the freshwater budget theme, with ECR leaders identified to coordinate interested participants towards developing cross-cutting publications.

The primary role of this "conference-support" project, in combination with a partner project funded by the US National Science Foundation and some internal funding provided by the University of Colorado, was to enable participation in the conference, particularly for ECR participants from a variety of backgrounds. ECRs in need of travel support to attend the conference submitted applications to the program that included their institutional information, a statement on the need for assistance, a statement regarding their past contributions to MOSAiC science, and a statement on their intended contributions to the science conference. Based on this information, a small committee evaluated the relevant information to select a diverse collection of recipients for travel support ranging from full travel support to a travel stipend to offset some travel costs. Overall, 40 participants received some support, with recipients coming from 8 different countries, representing all of the MOSAiC research areas (atmosphere, sea ice, ocean, biogeochemistry, ecosystem), and 60% of recipients were female. The recipients made many key contributions to the conference, in addition to their scientific research contributions. These included plenary presentations, panel participation, session convening, coordinating the student award program, coordinating the ECR session, and many others. The

participants that were supported by this program helped to amplify the conference's success and many will play important roles in directing and promoting MOSAiC science going forward. Moreover, the active participation of the supported ECRs gained them valuable experience, exposure, and connections that will serve them in their future research and careers. Five of these participants are now part of the planning committee for the Third MOSAiC Science Conference, planned for February 2024.