Breakout session reports serve as a record of discussion results from breakout and working group presentations. These reports serve as a resource for program managers when asked to provide highlights of programmatic results with short notice. They also provide information to the ARM Facility management about science needs of ARM users. In addition, they can help the program managers evaluate the progress of self-organized groups within the ARM and ASR communities.

Please provide a concise narrative discussing key findings, decisions, issues, needs, and/or future plans and action items. Not all session narratives will necessitate touching on all topics, but session report authors should aim to provide as much information as possible to address relevant points. Session reports are not expected to exceed two pages of text. It is not necessary to include a detailed list of presentations. Send completed reports by July 30, 2021 to Sally McFarlane, Shaima Nasiri, and Jeff Stehr.

Session Title: Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAiC)
Session Conveners: Matthew Shupe, Laura Riihimaki, Jessie Creamean
Session Date: 6/22/21
Session Time: 11 am – 1 pm EDT
Number of Attendees: ~100
Summary Authors: Matthew Shupe, Laura Riihimaki, Jessie Creamean

Main Discussion

The general flow of the session started with a general overview of the field campaign part of MOSAiC. Following this presentation there was some brief discussion about the spatial context for MOSAiC and the coupled nature of the Arctic system and how atmosphere and possibly ocean heat fluxes could trigger thermodynamic change within the sea ice.   The second presentation was a summary of ARM data processing and products, which provided an overview of operational successes and challenges over the year in the field. Numerous questions were asked about radar data and derived products, and about the possibilities for developing some sort of pollution flagging for the aerosol measurements. There was also a question about data availability for other MOSAiC data. To this last point, Shupe clarified that much of the MOSAiC data will be archived at the PANGAEA archive in Germany, which will also include some cross-referencing to ARM data, and that only ARM data will be stored at the ARM archive. ARM is a role model here for having very open data policies and making their data publicly available as soon as possible.

These broader summaries were followed by a collection of ten 4-min presentations given by various scientists that are currently, or will soon be, conducting research related to MOSAiC. The presentations really demonstrated the breadth of the potential research that can result from MOSAiC, covering aerosol properties, ice nucleation and particle composition, pollution identification, cloud properties, cloud-surface interactions, precipitation characterization, atmosphere-surface dynamical coupling, uncrewed aircraft measurements in the boundary layer, process-based model assessments, and the derivation of model assessment data products. Throughout the presentations there were a few questions and comments, such as: discussions on the coupled nature of the Arctic system and how atmosphere and possibly ocean heat fluxes could trigger thermodynamic change within the sea ice. One of the presentations was from a Germany colleague from the TROPOS institute, serving as a great

example of international collaboration and how MOSAiC is helping to draw in, and build connections with, a broad international community. There were a few questions asked of some of the presenters.

Following the presentations was time for discussion and the primary topic of the discussion focused on modeling activities and how this unprecedented coupled-system data set in the central Arctic can be best utilized to support modeling. It was suggested that a model intercomparison activity could be organized, similar to intercomparisons of the past. Some key points included:

- That the intercomparison should really evaluate the models against observations, not just compare models.
- That the focus could be on dynamics
- That focus could be on coupled modeling of fast processes through the atmosphere and sea ice.
- That there are already some ongoing modeling activities as part of the Year of Polar Prediction and that we might benefit from these. In particular, there is already a modeling activity that will focus on an important warm air intrusion event that occurred in mid-April 2020. This event could be an opportunity to study a significant process (warm air advection) plus the many coupled processes that are involved such as cloud formation, precipitation, impacts on surface energy budgets, dynamic impacts on the surface, and changes in the sea ice. This suggested focus drew the interest of the HiLAT modeling community.
- Since the observational data is not all ready yet, it will probably be good timing to consider starting discussions of a model intercomparison at next year's ARM-ASR meeting.
- It was also mentioned that the LASSO activity could possibly take up a focus on MOSAiC in the future when the observational data is in appropriate shape.

There were additional discussions on surface energy fluxes and how to appropriately represent spatial heterogeneity and if it will be possible to find closure in the surface energy budget. The answer to this great question is that it will be challenging in large part due to the heterogeneity of the Arctic surface and the variety of spatial scales that are relevant for different terms in the surface energy budget. But, that an attempt at closure of the surface energy budget should and will be attempted. Additionally, there was some interest in the topic of aerosol interactions with precipitation and wet deposition. These discussions could lead to collaboration among multiple groups that bring different areas of expertise including aerosol properties and precipitation/storm dynamics.

Overall the session was a great success. It successfully highlighted the great data that was obtained and a variety of ways it can be used. It exposed a broad audience of attendees to the data set, and hopefully peaked further interest in the data set. The modeling discussion appeared to have resonated with quite a number of people and will hopefully lead to future actions.

Key Findings
If applicable

Decisions

If applicable

Issues

A few issues were briefly discussed about radar calibration and processing issues. These are currently being considered by the translator team and will hopefully be resolved in the coming time.

Needs

If applicable

Future Plans

Next year's ASR-ARM meeting would be a great time to ramp up further discussion about coordinated modeling activities. This would give a year for observational data sets to be processes, quality controlled, and analyzed at a level that would then provide the observational constraints that must be a foundation for a broader modeling activity.

Action Items

N/A