



# Hyperspectral Infrared Near Surface Observations of Arctic Snow, Sea Ice, and Non-Frozen Ocean from the RV PolarStern during the MOSAiC Expedition October 2019 to September 2020



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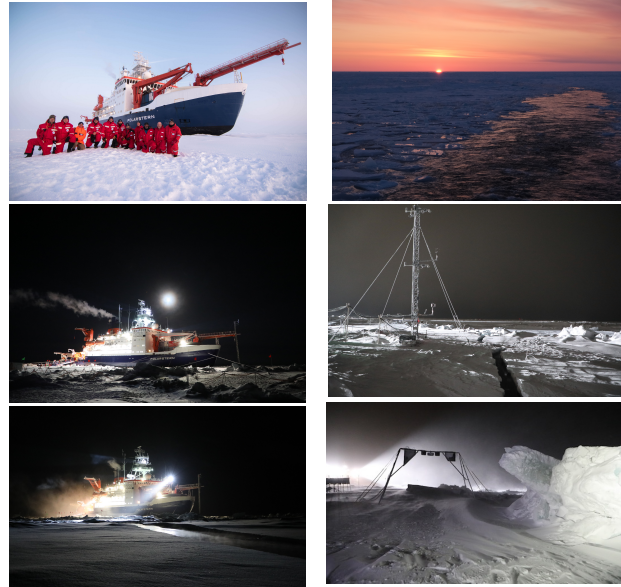
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## OVERVIEW & SUMMARY

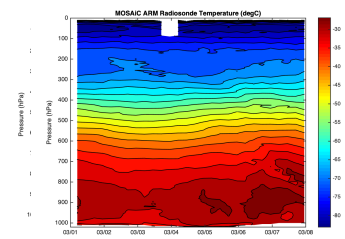
The use of IR channels in NWP data assimilation is often limited to non-frozen ocean due to uncertainties in surface emissivity of snow and sea ice. The University of Wisconsin Marine Atmospheric Emitted Radiance Interferometer (MAERI) is a ground based hyperspectral infrared instrument that measures a spectral range similar to the NOAA Crosstrack Infrared Sounder (CrIS). The MAERI was deployed on the icebreaker RV PolarStern during the MOSAiC (Multidisciplinary drifting Observatory for the Study of Arctic Climate) expedition as part of the US Department of Energy Atmospheric Radiation Measurement (ARM) mobile facility. Near surface air temperature and elevated air temperature have been derived from the MAERI observations for a variety of atmospheric conditions for a full year in the Arctic.

The MAERI made continuous measurements of the upwelling infrared emission from the surface (snow, sea ice, water) and of the downwelling emission from the atmosphere. Coincident observations were made with radiosondes at 6 hour intervals and from a surface met station. The MAERI infrared observations have been used to determine the change of air temperature with height in the lowest levels of the atmosphere. The upwelling observations of the MAERI provide validation spectra for the evaluation of satellite observations from NOAA-20 CrIS and METOP-IASI.

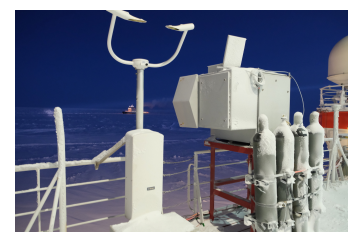


## Case Study #1: March 1st, 2020

Radioonde Cross-section



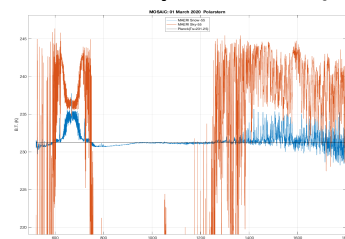
DOE ARM Marine-AERI



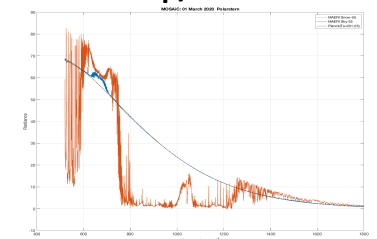
MosCam Video Surface



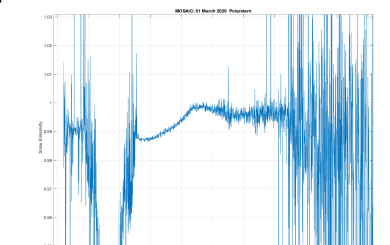
M-AERI Up/Down BT (K)



M-AERI Up/Down Radiance

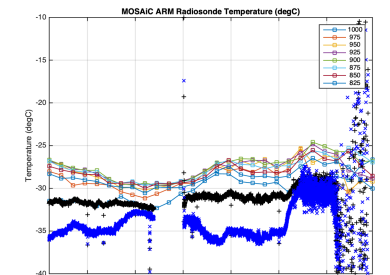
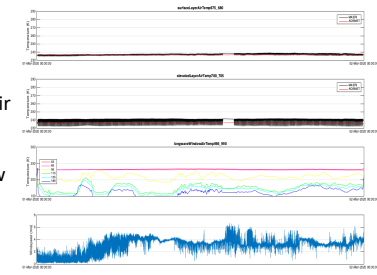


Derived Snow Emissivity

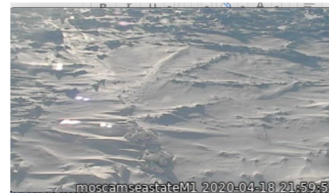


## Timeseries of Radiosonde and M-AERI Temperatures

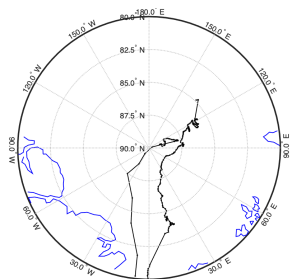
- M-AERI AIR TEMP
- M-AERI Elevated Air
- M-AERI LW Window
- Wind Speed



Case Study #2: April 18th, 2020  
Prior to ice breakup



Case Study #3: August 21st, 2020  
Water/Ice Slush after Breakup



## Acknowledgements:

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