Using 0.5-2 GHz Microwave Radiometry for Arctic Sea-Ice Thickness and Salinity Retrieval

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Sea ice is an important element of the cryospheric system, and has significant impacts on Earth's climate and on global water circulation. Sea ice thickness regulates the heat flow between oceans and the atmosphere. The salt content of sea ice also impacts ocean salinity and contributes to driving deep sea currents. Therefore, understanding and estimating sea ice and its properties is important to improve the prediction of cryospheric and oceanic processes.

Remote sensing of sea ice is clearly motivated by the cost and difficulties of in-situ measurements. Microwave radiometry has been shown to be useful for monitoring sea ice thickness and coverage, with L-band satellites such as SMAP and SMOS used for thickness sensing and higher frequency systems for monitoring sea ice extent. Results from past measurements have also shown the potential benefit of observations at frequencies lower than L-band in order to extend the range of sea ice thicknesses that can be retrieved.

The Ultra-Wideband Software-Defined Microwave Radiometer (UWBRAD) developed at The Ohio State University measures microwave thermal emissions from 0.5-2 GHz, and was deployed in an airborne observation in Greenland in 2017 for observations of various terrain types. UWBRAD also acquired sea-ice emission data over the Lincoln Sea in this campaign. This presentation will review the dataset acquired and present initial analyses of the relationship between measured brightness temperatures and sea ice properties.

The analyses to be discussed include comparisons with the onboard infrared FLIR camera recordings and with Sentinel C-band SAR measurements. An emission model is also applied for the retrieval of ice characteristics such as ice thickness and salinity. Results for these parameters will be presented and discussed. The presentation will conclude by presenting the status of a Dec 2018 Antarctic campaign and related opportunities for additional sea ice measurements, as well as a summary of the potential utility of the method for sea ice remote sensing.