Sea Ice Observations with 0.5-2 GHz Microwave Radiometry as part of the MOSAiC Campaign

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Abstract

The remote sensing of sea ice thickness is an important tool for monitoring sea ice dynamics and evolution. Current technologies can provide accurate thickness estimates for thicknesses in the ~ 0-50 cm range (through L-band microwave radiometry) or for ~ 200 cm and greater (through spaceborne lidar). The increased errors in thickness currently occurring for the 50-200 cm thickness range represent a significant challenge, as the gradual weakening of Arctic sea ice cover will result in an increased presence of sea ice in this thickness range.

The use of microwave radiometry at frequencies less than 1.4 GHz has been proposed to address this challenge, since lower frequencies should be more sensitive to emissions from sea ice of greater thickness. To investigate this concept, a four channel microwave radiometer operating at 540, 900, 1380, and 1740 MHz was developed at deployed as part of the Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAIC) campaign. In this experiment, the ground-based microwave radiometer is located in the “remote sensing camp” on an arctic sea ice floe, and continuously observes Arctic sea ice emission during its evolution. Measurements are also supported by numerous in-situ samples characterizing sea ice properties, and occur in conjunction with the observations of multiple other remote sensing systems.

This presentation will review the design and development of the microwave radiometer deployed, as well as the conditions encountered during the first portion of the campaign (which continues until Fall 2020). Initial analyses of the measurement data acquired will also be presented, along with a description of the physical models used for interpretation of the results. Recommendations for continued use of these frequencies for the sensing of sea ice thickness will also be provided.