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What can spaceborne low frequency microwave observations tell us about sea ice?

Georg Heygster*[(1)], Catalin Patilea[(1)], Marcus Huntemann [(1,2)], Gunnar Spreen [(1)], Leif Toudal Pedersen[(3)], Filipe Aires[(4)]
(1) University of Bremen, Germany, www.iup.uni-bremen.de
(2) Alfred-Wegener-Institute, Bremerhaven, Germany, www.awi.de
(3) Danish Meteorological Institute, Copenhagen, Denmark, www.dmi.de
(4) Observatoire de Paris, Paris, France, www.lmd.jussieu.fr

1. Extended Abstract

For many years, the main use of passive microwave observations of sea ice was retrieving sea ice concentration, i.e. sea ice area, at 19 and 37 GHz. Recently, new sensors and research initiatives have opened the opportunity to retrieve new sea ice quantities. Among them are thickness of thin sea ice from L band observation (1.4 GHz) and sea ice concentration from C band (6.9) GHz observations.

Data of L band (1.4 GHz) sensors like SMOS and SMAP, primarily intended for soil moisture and ocean salinity, have shown to also carry information on thickness of thin sea ice up to about 0.5 m [1,2] and snow depth on thicker sea ice [5]. The approach [2] exploiting SMOS intensity and polarization data in the range of 40° to 50° incidence angle is currently being transferred to the conically scanning radiometer SMAP with 40° incidence angle. This makes the data less vulnerable to radio frequency interference (RFI) and increases the frequency of ice thickness observations.

The sea ice concentration retrievals based on C band observations (6.9 GHz) of AMSR-E and AMSR2 have shown the best performance in a comparative study of 30 retrieval algorithms in terms of bias and standard deviation [3]. With current sensors, the advantage of low atmospheric contribution to the C band signal has to be paid by low spatial resolution of about 35km x 62km km^2. This flaw may be overcome by new sensors with large antenna reflector as suggested as proposal for the next ESA Earth Explorer mission [4].

This contribution will present the recent progress in the two fields, including the transfer of the SMOS-based ice thickness retrieval [2] to SMAP data and a method compensating the influence of SST and wind speed on the C band based retrieval of sea ice concentration.

2. References

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