Geophysical Research Abstracts
Vol. 21, EGU2019-14949-1, 2019
EGU General Assembly 2019

Merged operational satellite ice thickness retrievals to inform about the present state of Arctic sea ice

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Sea-ice thickness on a global scale is derived from different satellite sensors using independent retrieval methods. Due to the sensor and orbit characteristics, such satellite retrievals differ in spatial and temporal resolution as well as in the sensitivity to certain sea-ice types and thickness ranges. Satellite altimeters, such as CryoSat-2 (CS2), sense the height of the ice surface above the sea level, which can be converted into sea-ice thickness. But relative uncertainties associated with this method are large over thin ice regimes. Another retrieval method is based on the evaluation of surface brightness temperature in L-band microwave frequencies with a thickness-dependent emission model, as measured by the Soil Moisture and Ocean Salinity (SMOS) satellite. While the radiometer-based method loses sensitivity for thick sea ice (> 1m), relative uncertainties over thin ice are significantly smaller than for the altimetry-based retrievals. In addition, the SMOS product provides global sea-ice coverage on a daily basis unlike the altimeter data.

In the framework of the ESA project "SMOS & CryoSat-2 Sea Ice Data Product Processing and Dissemination Service", we present the first operational merged product of complementary weekly Arctic sea-ice thickness data records from the CS2 altimeter and SMOS radiometer. We use an optimal interpolation scheme to produce weekly Arctic-wide sea-ice thickness fields. The data product is publicly available (https://spaces.awi.de/confluence/display/CS2SMOS) and has been already used in several scientific studies that investigate the sea-ice cover in the context of climate change. Moreover, it supports operational use of remotely sensed sea-ice thickness information for international sea-ice monitoring programs and climate forecasting systems. Here, we present sea-ice thickness and volume changes from this winter 2018/2019, informing about the present state of the Arctic sea ice.