Seminar on Physics and Chemistry
of the Atmosphere
07.06.2019, SoSe 2019, IUP Bremen

CIMR Support for Future Shipping and Off-Shore Industry Activities

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Abstract

The Copernicus Imaging Microwave Radiometer (CIMR) is a High Priority Candidate Mission for the Copernicus Space Component Expansion programme, which would fly on a Sentinel satellite at the horizon of 2025. It is planned that CIMR will provide observations in the microwave spectrum from L- to Ka-band (1.4 to 37 GHz), at much higher spatial resolution and accuracy than past or future missions. CIMR's focus is on retrieval of sea ice parameters and sea surface temperature (SST) in polar regions. As a Sentinel mission with a long-term operation period CIMR will provide observations of the predicted "New Arctic" by the mid-century and beyond.

The Arctic experienced an unpreceded warming and decrease of sea ice in recent decades. Climate models predict a continuation of the current retreat of sea ice cover and lengthening of the melting season for the next decades and beyond (Collins et al., 2013). This will make Arctic waters more attractive and accessible for shipping and off-shore activities (e.g., Melia et al., 2016). Predictions suggest that shipping from Europe to Asia via the Arctic becomes 10 days faster by mid-century, i.e., during the CIMR operational period. By late century, moderately ice-strengthened vessels likely can travel through the Arctic almost year-round (10–12 months). The retreating sea ice will allow the shipping routes to extend further north and further away from coastlines, which will increase the need in spatial coverage of satellite observation systems. The extended open ocean areas will also allow increased fishing activities in the Arctic Ocean and marginal seas. Larger all-year around open water areas might become attractive for offshore industries like oil industry.

For these activities timely information about the ice coverage and short-term forecast of ice situation for the complete Arctic will be needed. The demands for marine safety will increase to provide timely response to accidents like oil spills in ice covered waters.

With its relatively high spatial resolution of <4 km, sub-daily coverage of all polar regions without any unobserved areas around the pole (no pole hole), CIMR is ideally suited to address these needs in operational applications. CIMRS capabilities are especially applicable for model initialization for short to medium-range sea ice forecasts.

Here we will show how the shipping and off-shore industries will benefit from CIMR observations in a predicted future Arctic with reduced sea ice cover. Exemplary future sea ice scenarios from CMIP5 model simulations are analysed in combination with current AMSR2 sea ice concentration on a 3 km grid as a substitute for CIMR to demonstrate what benefit such an observing system would bring for Copernicus and the EU. The following questions are addressed:

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• What benefits will the higher resolution of CIMR bring in comparison to the 25 km sea ice concentrations expected from the MWI instrument on the MetOp-SG satellites?
• What future shipping routes and potential fishing grounds are predicted to open up and what will be the CIMR contribution to monitor these, especially close to the pole and within archipelagos?
• How will the CIMR high temporal resolution of sub-daily coverage help to better monitor the polar regions?
• How will CIMR help to address the EU Arctic Policy, CMEMS, Polar Code, and MSAR?