

Seminar “Ocean, Ice and Atmosphere”,
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Measuring Melt Ponds on Arctic Sea Ice from Space

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Melt ponds significantly lower the albedo of sea ice, causing an increase in absorption of solar radiation within the sea ice-ocean system and therefore changes in the Arctic energy budget as well as sea ice mass balance. Therefore, melt ponds are key components of the positive sea ice-albedo feedback and contribute to the accelerated warming of the Arctic. Understanding their seasonal and regional variability is crucial for assessing their impact on Arctic amplification and improving climate models.

In this talk, the Melt Pond Detection Algorithm (MPD, Zege et al. 2015) will be presented as a fully physical retrieval method for estimating melt pond fraction and sea ice albedo. MPD was originally developed for use with the optical instruments MERIS (aboard ENVISAT) and OLCI (aboard Sentinel-3).

Based on results from a new version of MPD applied to OLCI observations from 2017 to 2023, the seasonal and regional variability of pan-Arctic melt pond fractions will be discussed. This time series reveals significant variability across different Arctic subregions. Air temperature and sea ice surface topography emerge as key factors influencing the formation and evolution of melt ponds.

To investigate longer-term trends in pan-Arctic melt pond fractions, the updated MPD version is currently being adapted for MERIS data, aiming to extend the time series back to 2002–2011. The progress of this adaptation will also be presented and discussed.

Additionally, some related upcoming research projects will be introduced, including hyperspectral observations of melt ponds during a Polarstern cruise planned for this summer.