

EGU21-12860

<https://doi.org/10.5194/egusphere-egu21-12860>

EGU General Assembly 2021

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Comparison of complementary methods of melt pond depth retrieval on different spatial scales

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Pond bathymetry and average pond depth on Arctic sea ice are important for characterizing and quantifying the distribution of surface melt water volume. Melt pond models that take depth into account used to be based on manual in situ measurements; however, the capability of measuring pond depth through other means have increased substantially in recent years .

We take advantage of the extensive sampling and data recorded during the 2019-2020 MOSAiC campaign to compare different melt pond depth retrievals from a unique case study involving a melt pond in the center of the MOSAiC floe. Thus, we are able to present the most recent upscaling cascade of pond depth measurement methods.

The methods we examine in our contribution include in-situ echo sounder and hyperspectral measurements, airborne hyperspectral and photogrammetry-based measurements, as well as spaceborne multispectral measurements. Each method is assessed regarding its spatial resolution, retrieval accuracy, technical prerequisites and limitations.