

Investigation of the recent dynamics of the active subglacial lake under the Flade Isblink ice cap.

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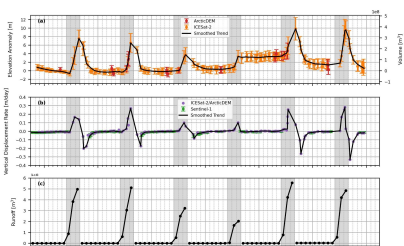
Introduction

- Subglacial lakes are bodies of water stored beneath ice sheets, ice caps, or glaciers. They act as temporary meltwater reservoirs and play an integral role in subglacial hydrological systems.
- Drainage of these reservoirs can influence ice dynamics, but the exact impacts are poorly constrained.
- We document a new lake under Flade Isblink in NE Greenland and quantify its role in the regional hydrological system.

Methods

We monitor elevation change anomalies in the ice surface above the lake using satellite altimetry and digital elevation models. We use these anomaly estimates to quantify the volume of meltwater stored in the lake. Additionally, we use synthetic aperture radar interferometry to track small-scale changes in the ice surface above and near the lake.

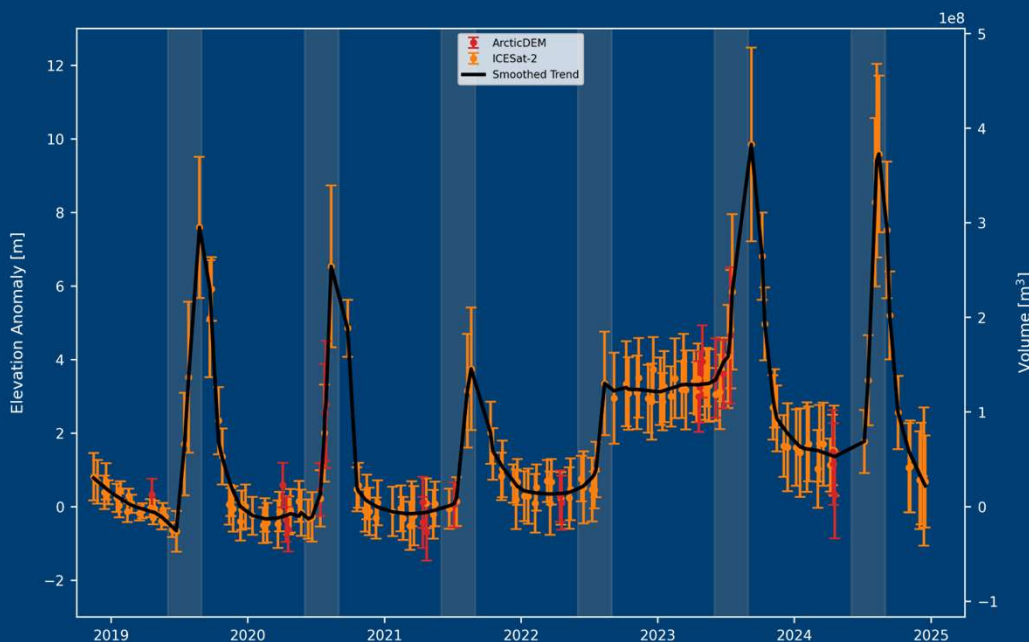
Results



Conclusions

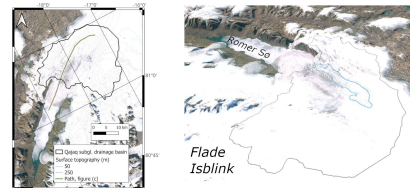
The lake captures 50% - 70% of the yearly meltwater runoff in its catchment and releases it over several months.

Previously undocumented subglacial lake beneath Flade Isblink stores half of catchment runoff and delays its release



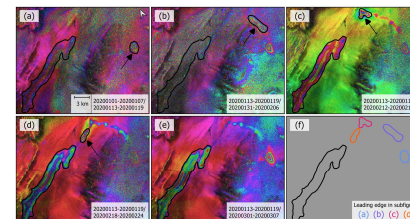
The scene of interest

Left: overview of the southern dome of the Flade Isblink ice cap and the hydrological catchment surrounding the lake outlined in black. Right: 3D image of the scene with the ice surface above the subglacial lake basin outlined in blue.



Subglacial water transport

Images depicting the local phase changes between pairs of radar images. The circular fringe patterns indicate that the ice surface rises and falls as subglacial meltwater moves beneath it on its way towards the lake.



Summary statistics for anomalies

A table with the summary statistics for the elevation anomaly data plotted to the left.

Dataset	Obs. Dates	Mean	Std. Dev.	Min	Max
ArcticDEM	22	1.37m	0.93m	-0.69m	4.65m
ICESat-2	153	1.70m	0.87m	-0.67m	9.85m

Key references

Andersen, J. K., Kusk, A., Merryman Boncori, J. P., Hyldberg, C. S. & Grinsted, A. Improved ice velocity measurements with Sentinel-1 tops interferometry. Remote. Sens. 12(12), 2014, DOI: <https://doi.org/10.3390/rs12122014> (2020).

Kusk, A., Andersen, J. K. & Merryman Boncori, J. P. Burst overlap coregistration for Sentinel-1 tops dinstar ice velocity measurements. IEEE Geosci. Remote. Sens. Lett. 19, 1–5, DOI: <https://doi.org/10.1109/LGRS.2021.3062905> (2022).

Acknowledgments

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