GO-MARIE Addresses GrIS Glacial Fjord Hydrographic Mapping Needs 2022-2030

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The Ocean Research Project (ORP), a US-based NGO mobilizes for the international hydrographic mapping needs around the GrIS through the decadal campaign, GO-MARIE (Glacier-Ocean Mapping & Research Interdisciplinary Effort)

ORP contributed hydrographic data to NASA OMG in 2015-16, and 2018.

GO-MARIE **Observations** Include:

- glacial fjord bathymetry

During Peak GrIS melt period:

- ocean temperature
- current velocity
- Suspended sediment concentration

Intended to support ….

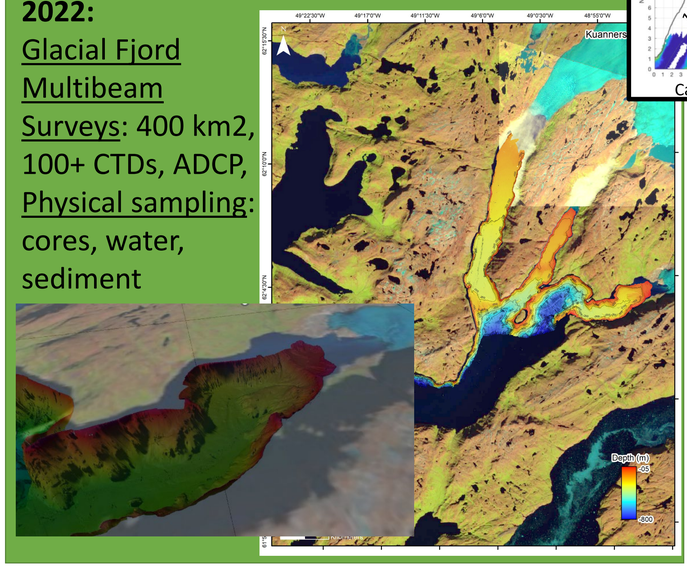
- Categorizing fjord/ice geometry
- Identifying the Presence/Absence of Atlantic Water

Observations are made:
< 1km from a
Marine Terminating Glacier defined as 1. non-categorized (Wood, 2021) 2. or associated with a poor bathymetry fjord (Choi, 2021). 3. underestimated or underinvestigaited sites like West Greenland's .

38% of Greenland's Marine Terminating Glaciers (MTG) are Non-Categorized (relative to fjord/ice geometry and Atlantic Water presence) but this knowledge gap is responsible for nearly 20% of recent GrIS ice loss and 15% of annual discharge (1992-2017) therefore GO-MARIE launched in 2022 to map those gaps.

Note: Whereas MTG is n=226 glacier associated with Wood et al. 2021

2022:
Glacial Fjord Multibeam Surveys: 400 km2, 100+ CTDs, ADCP, Physical sampling: cores, water, sediment



Instruments

- **Workhorse Sentinel ADCP 600 khz (70 m range)**
- **Reson 7125 (200-400 khz) to 500m**
- **RBR CTD with multiple sensors**

Partners

THE NIPPON FOUNDATION-GEBCO SEABED 2030

University of Maryland Center for Environmental Science

UNIVERSITY OF HULL

MAP the GAPS

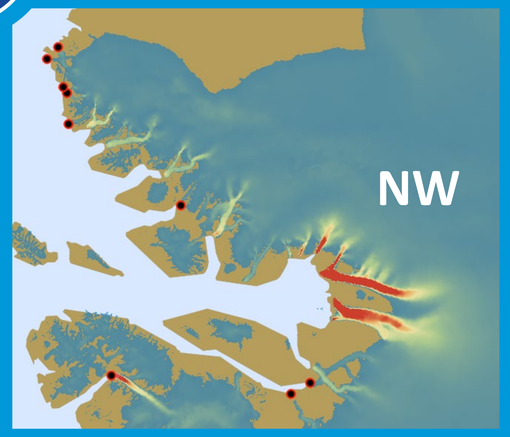
Archives

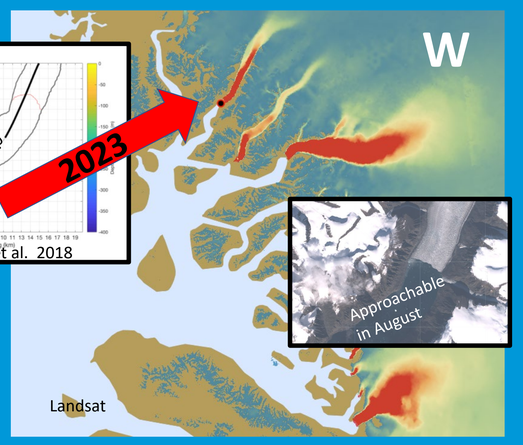
NCEI DCDB

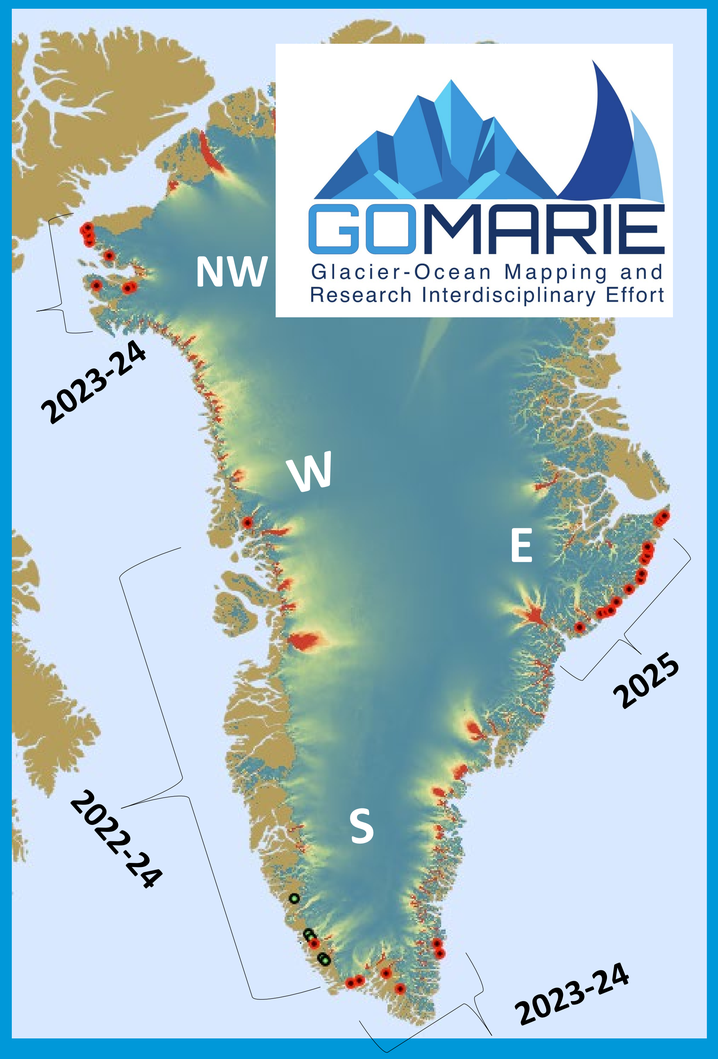
Models

IBCAO – GEBCO - BedMachine

Near Bed Topography Multibeam Survey Plan 2022+

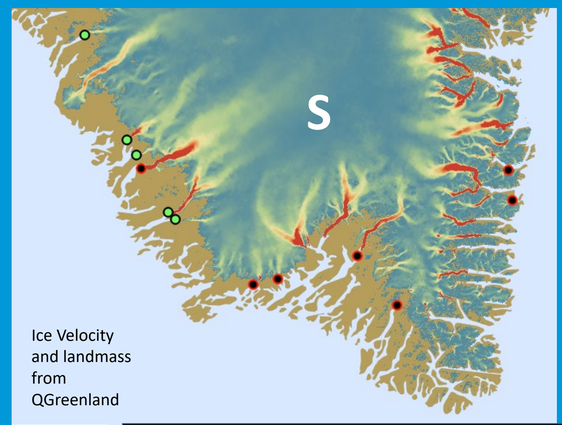




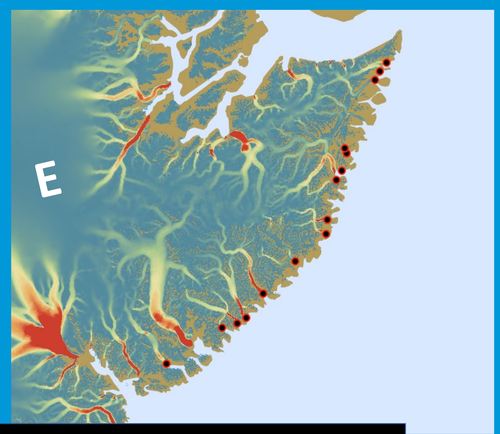


Planned

Mapped (2022)



Ice Velocity and landmass from QGreenland



GO-MARIE Requires:

- Survey & Observation Type Review at FOGSS
- Survey Funding
- Securing deeper ranging acoustics: > 400-600 m sonar and > 70 m ranging ADCP
- Committed Collabs
- Strategy for an inclusive & decolonized campaign

SRV Marie Tharp moves from pole mounted multibeam sonar (2022) to hull mounted in 2023. 22m and crew compliment up to 9 including a 4 science party of 4.

References

Wood, Michael & Rignot, E. & Fenty, Ian & An, Lu & Bjørk, Anders & Van den Broeke, Michiel & Cai, Cilan & Kane, Emily & Menemenlis, Dimitris & Millan, Romain & Morlighem, Mathieu & Mouginot, Jeremie & Noël, Brice & Scheuchl, Bernd & Velicogna, Isabella & Willis, Josh & Zhang, Hong. (2021). Ocean forcing drives glacier retreat in Greenland. Science Advances. 7. eaba7282. 10.1126/sciadv.aba7282.

Choi, Y., Morlighem, M., Rignot, E. *et al.* Ice dynamics will remain a primary driver of Greenland ice sheet mass loss over the next century. *Commun Earth Environ* **2**, 26 (2021). https://doi.org/10.1038/s43247-021-00092-z

Catania, Ginny & Stearns, L. & Sutherland, D. & Fried, Mason & Bartholomaus, Timothy & Morlighem, Mathieu & Shroyer, E. & Nash, J.. (2018). Geometric Controls on Tidewater Glacier Retreat in Central Western Greenland. Journal of Geophysical Research: Earth Surface. 123. 10.1029/2017JF004499.

Version 2.0: Moon, T., Fisher, M., Harden, L., Simonoko, H., and T. Stafford (2022). QGreenland (v2.0.0) [software], National Snow and Ice Data Center.

Dedicated campaigns for improved GrIS modeling during the Ocean Decade

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