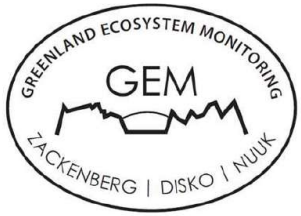
Systematized in-situ monitoring of peripheral glaciers in Greenland

- and the relevance for global glacier mass change assessments

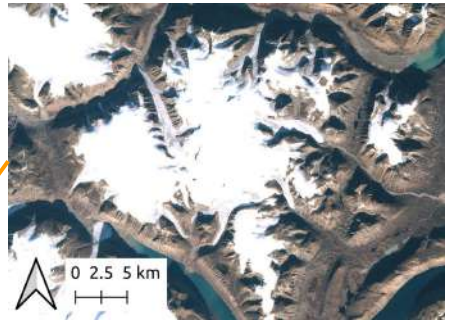
Signe Hillerup Larsen (Researcher at GEUS)
Alexandra Messerli (Asiaq), Kirsty Langley (Asiaq), Michele Citterio (GEUS),
Bernhard Hynek (GeoSphere), Simon de Villiers (HVL), Jacob Clement Yde (HVL), Anders Bjørk (KU) and Robert Fausto (GEUS)



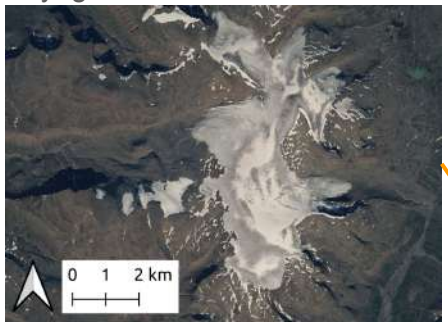
~20.300 peripheral glaciers in Greenland

Map source: QGreenland

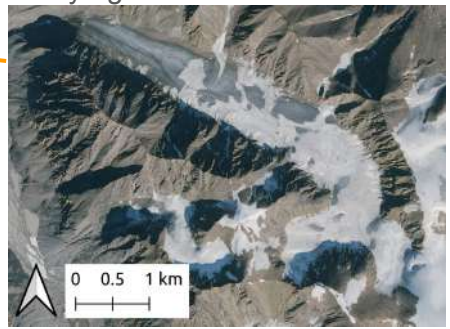
A.P. Olsen Ice Cap



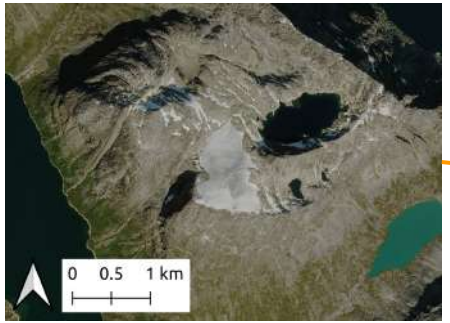
Lyngmarksbræen



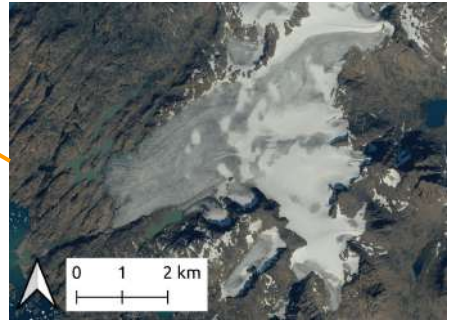
Freya glacier



Qassinnguit sermiat



Mitivakkat Glacier



Map source: QGreenland

Zackenberg Ecological Research Station

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austrian polar research institute

GeoSphere Austria

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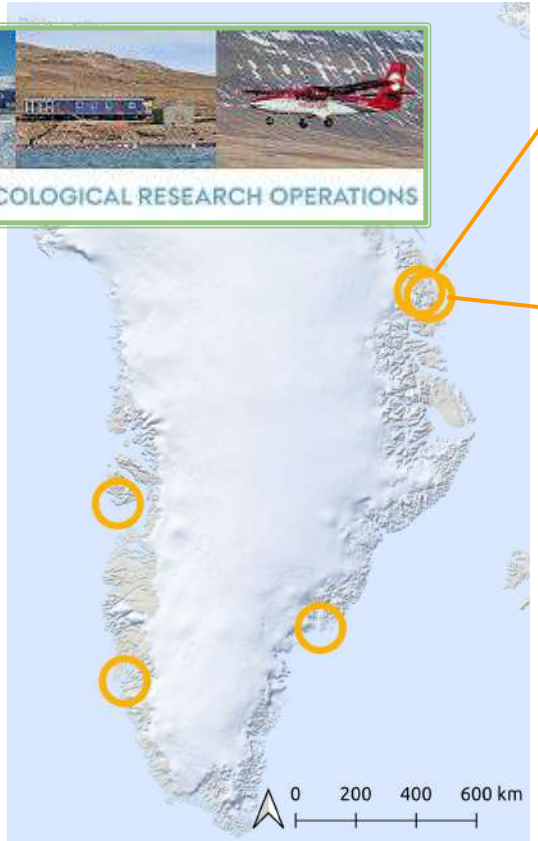

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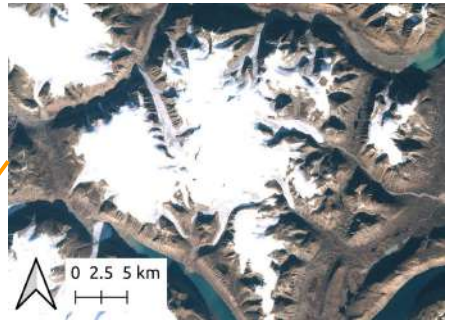

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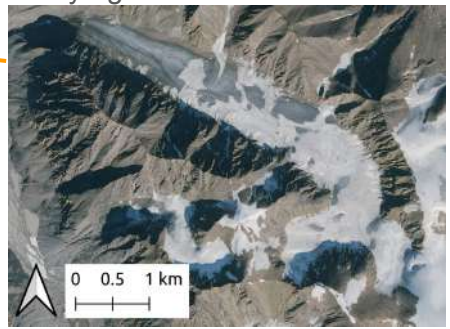


Glaciological monitoring from 2008 to present

Contact:

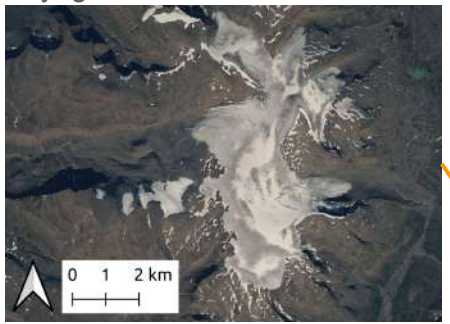
Signe Hillerup Larsen (GEUS)

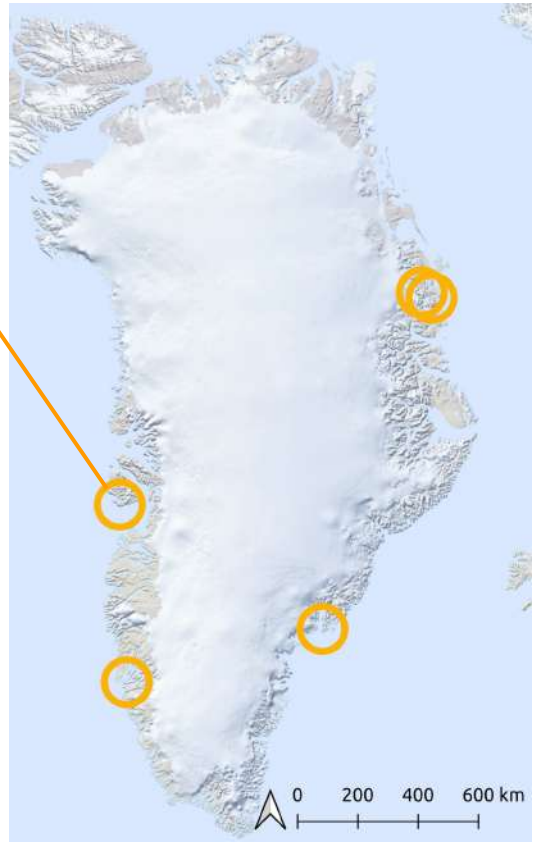
Bernhard Hynek (GeoSphere Austria)

Arctic Station

Glaciological monitoring
from 2017 to present
Contact:
Michele Citterio (GEUS)

Lyngmarksbræen





Arctic Station

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Map source: QGreenland

Nuuk Ecological Research Station

Glaciological monitoring
from 2017 to present
Contact:
Alexandra Messerli (Asiaq)

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NUUK ECOLOGICAL RESEARCH OPERATIONS

GREENLAND ECOSYSTEM MONITORING
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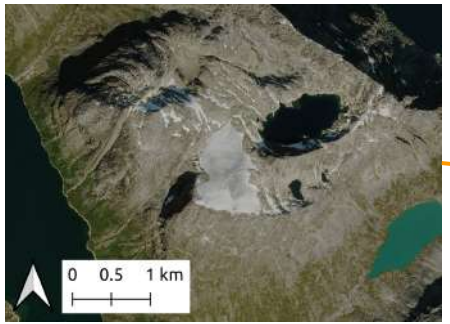
Qassinnguit sermiat



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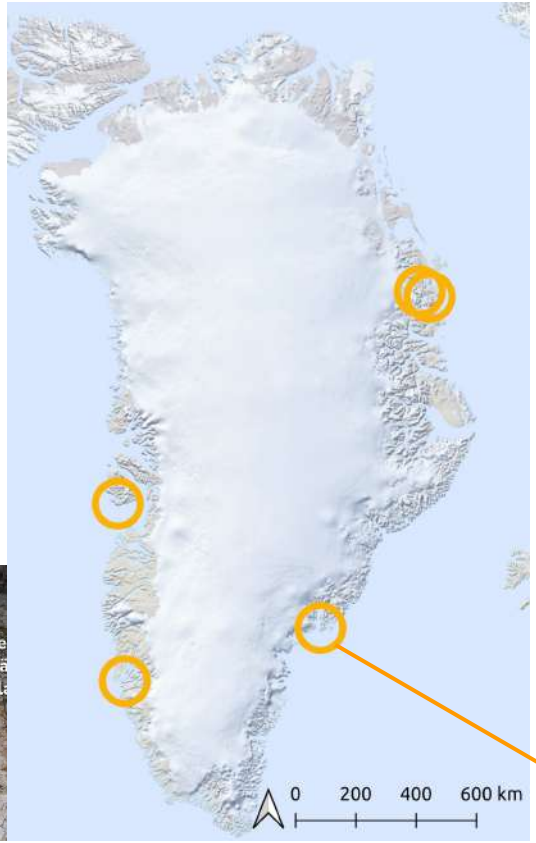
Map source: QGreenland

Sermilik Scientific Research Station

Glaciological monitoring
from 1996 to present
Contact:
Simon de Villiers (HVL)
Jacob Clement Yde (HVL)



Map source: QGreenland

Western Norway University of Applied Sciences

SDU University of Southern Denmark

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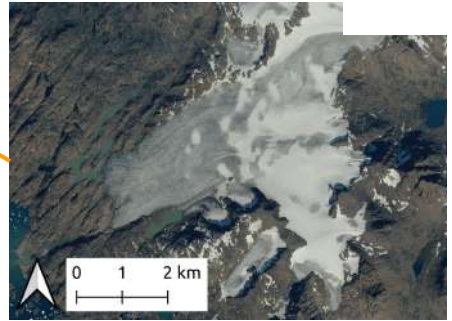
AARHUS UNIVERSITY

Mittivakkat Glacier



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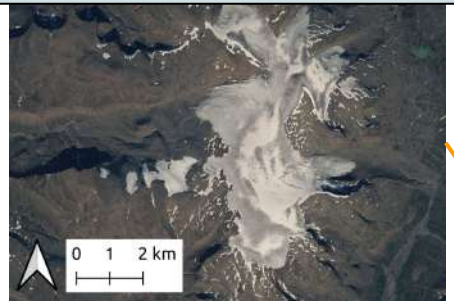
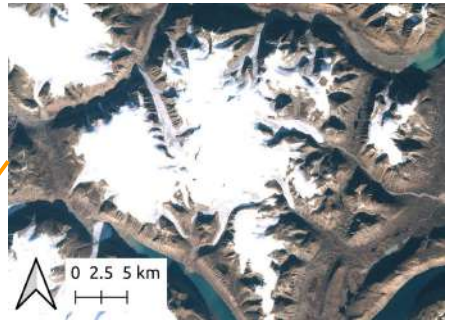
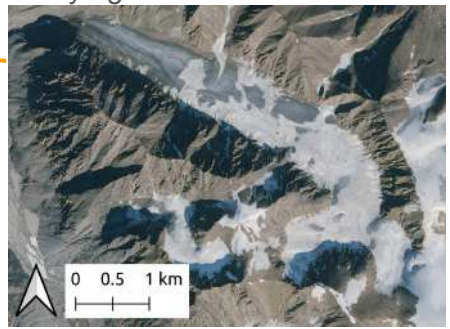


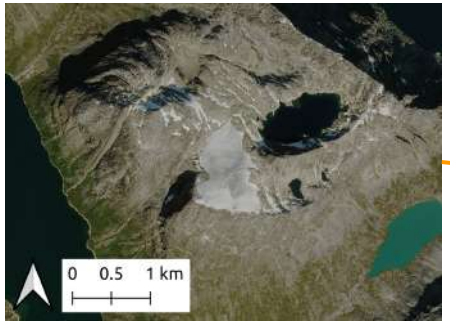
A.P. Olsen Ice Cap



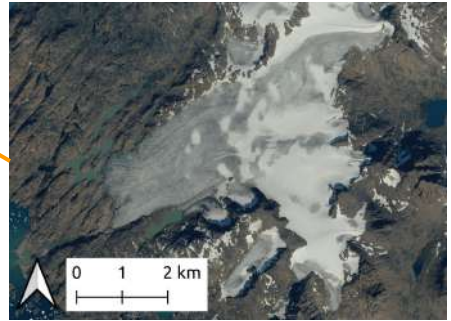
Freya glacier



Qassinnguit sermiat



Mittivakkat Glacier



Map source: QGreenland

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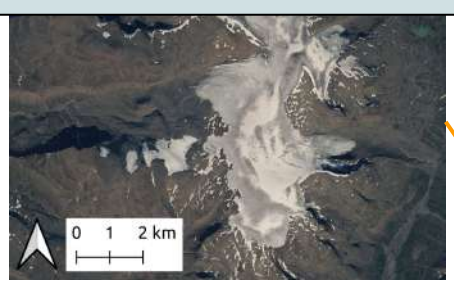

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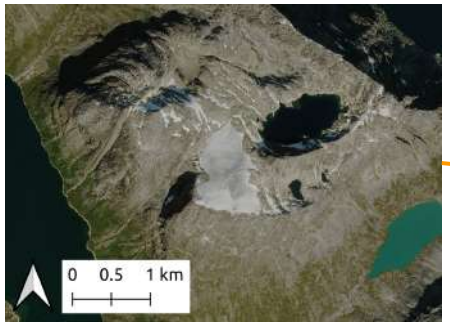

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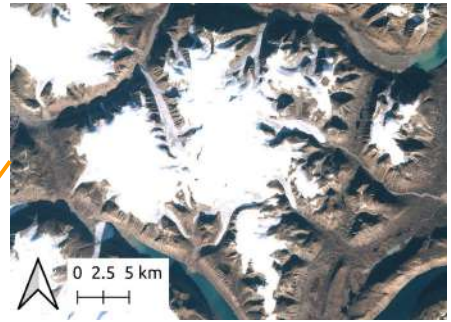

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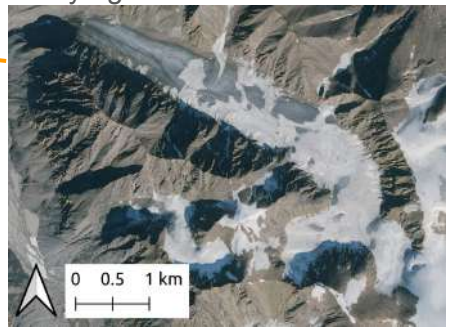

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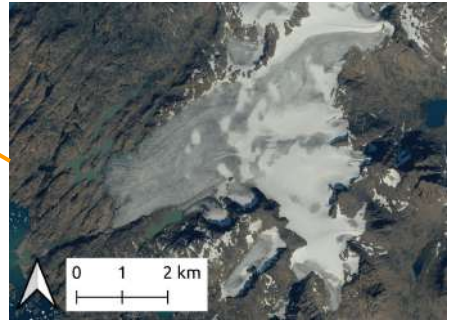

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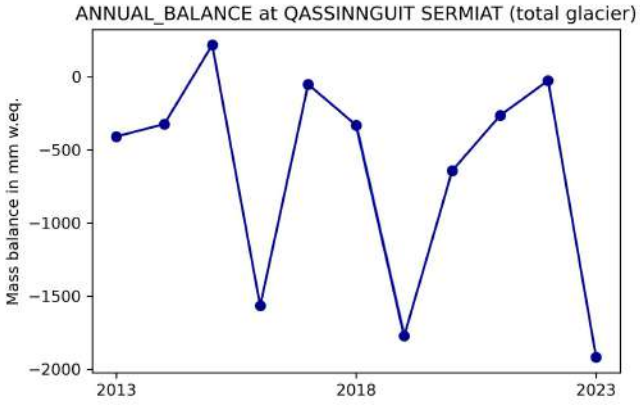
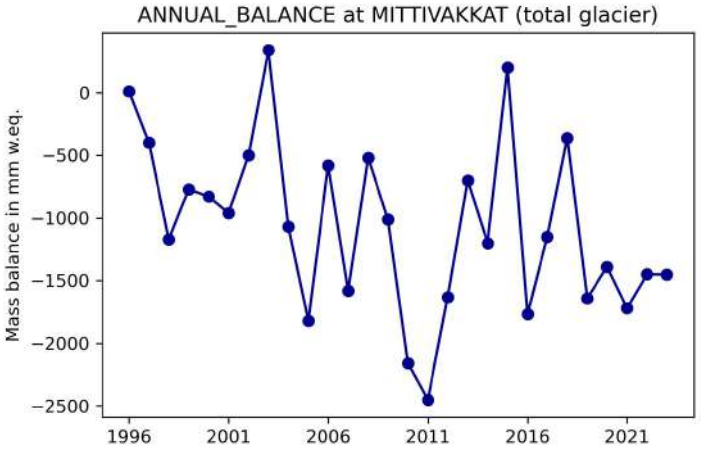
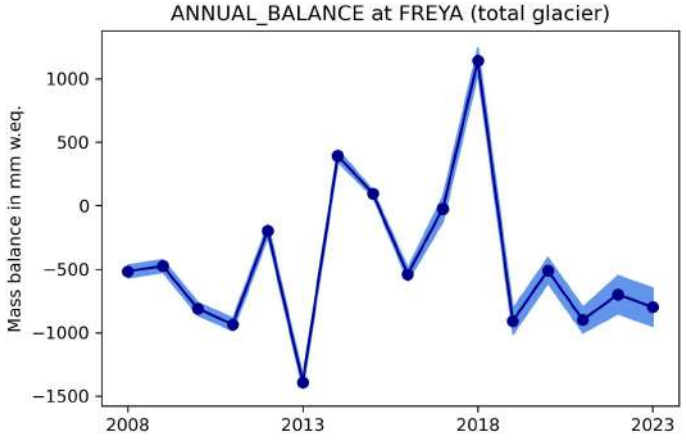
~~Systematized~~ Systematic in-situ monitoring of peripheral glaciers in Greenland

- **and the relevance for global glacier mass change assessments**

WGMS FoG database: A route to global glacier mass change assessments







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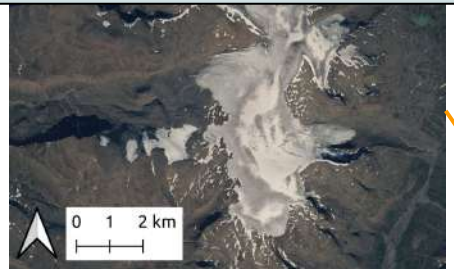

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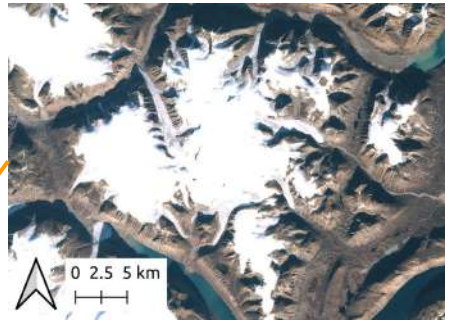

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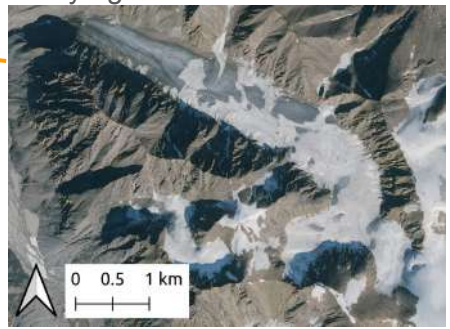
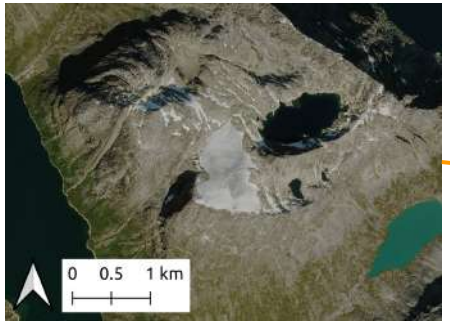
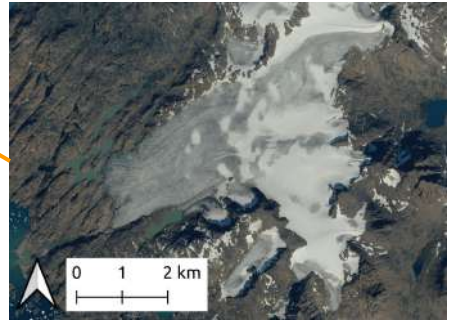


Qassinnguit sermiat



Close to research stations but still very far away

Mittivakkat Glacier



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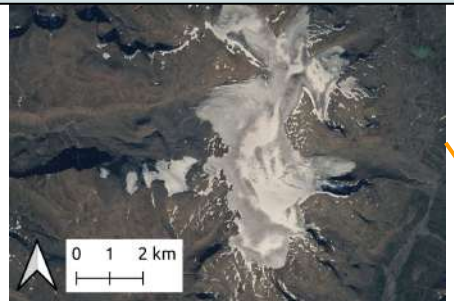

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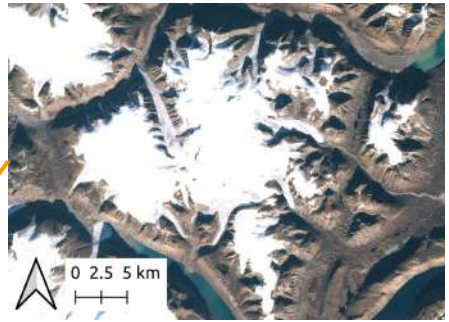

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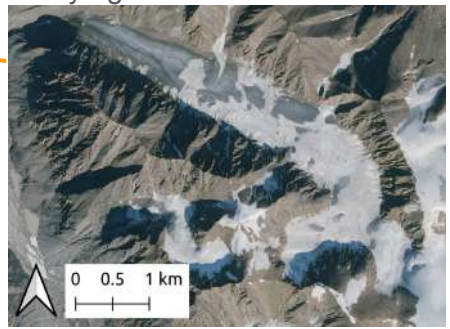

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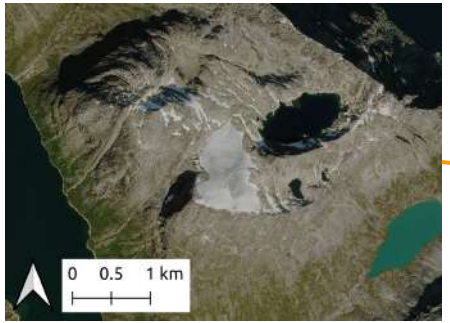

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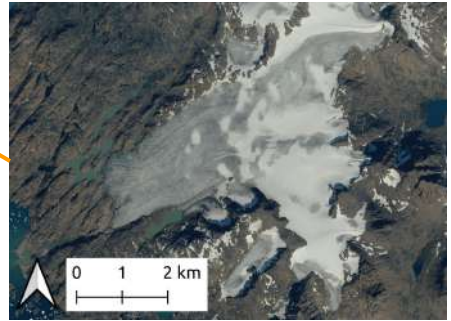


Map source: QGreenland

Systematized in-situ monitoring of peripheral glaciers in Greenland

- and the relevance for global glacier mass change assessments

All five glaciers have one thing in common: **Standardized Automatic Ablation and Weather Stations**

Transmitting hourly:

- Snow height
- Precipitation
- Ice surface lowering (ice ablation)
- Ice/firn temperature up to 10 m depth
- Various climate variables

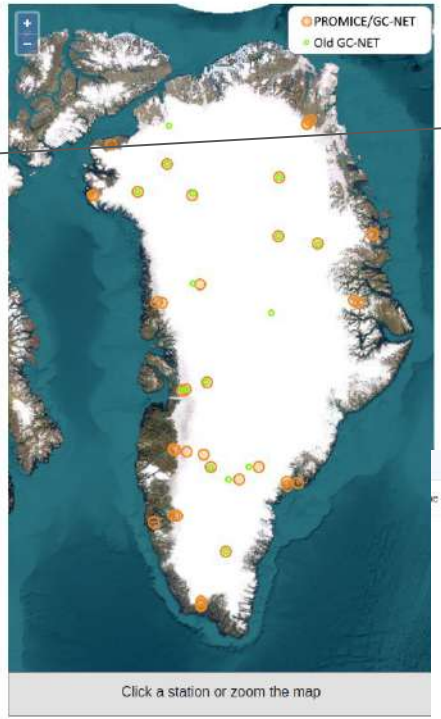
Into PROMICE | GC-NET workflow

Standardized, consistent,

Anchored at GEUS: large-scale production benefits

PROMICE GC-NET

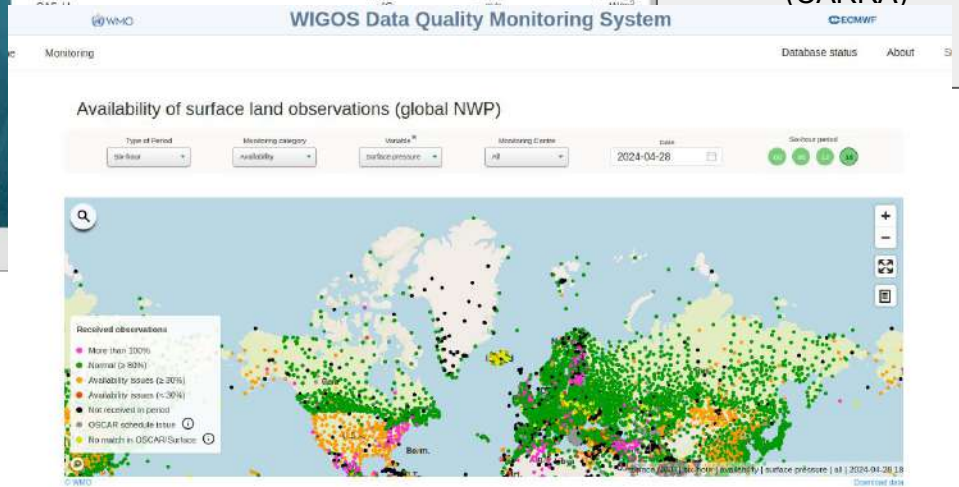
Get data | Weather stations | The Greenland ice sheet | Mass balance | Fieldwork | News | About



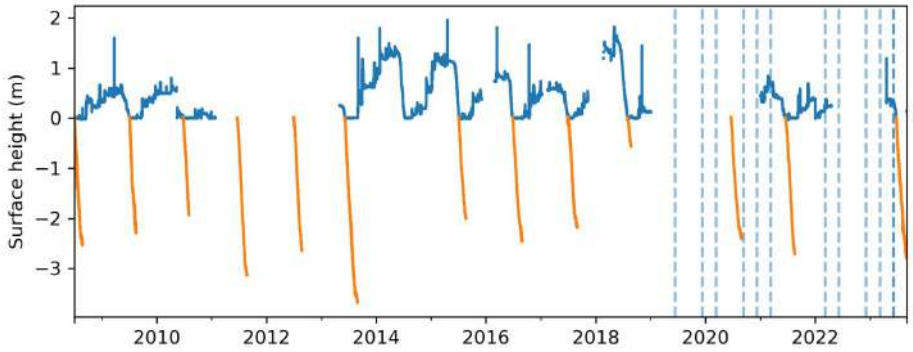
Name	Timestamp (GMT)	Temperature	Wind speed	Solar radiation
KAN_L	23-08-2024 11:00	3.0 °C	3.9 m/s	127.2 W/m²
UPE_U	23-08-2024 11:00	1.0 °C	1.5 m/s	174.3 W/m²
CP1	23-08-2024 11:00	-6.5 °C	7.7 m/s	207.8 W/m²
UPE_L	23-08-2024 11:00	3.8 °C	4.5 m/s	87.7 W/m²
THU_U	23-08-2024 11:00	0.6 °C	3.0 m/s	65.1 W/m²
ING_1	30-12-2024 23:00	-37.2 °C	0.0 m/s	-1.2 W/m²
DY2	23-08-2024 11:00	-3.2 °C	8.2 m/s	195.9 W/m²
KPC_UV3	23-11-2056 23:00	-30.1 °C	0.0 m/s	-0.5 W/m²
NUK_L	23-08-2024 11:00	5.3 °C	2.8 m/s	27.7 W/m²
KPC_U	23-08-2024 10:00	-4.0 °C	2.6 m/s	-380.3 W/m²
KPC_L	23-08-2024 11:00	0.5 °C	2.3 m/s	661.8 W/m²
THU_L	23-08-2024 10:00	0.9 °C	2.2 m/s	70.2 W/m²
KAN_B	23-08-2024 11:00	6.6 °C	1.0 m/s	48.9 W/m²
TAS_L	23-08-2024 11:00	4.6 °C	4.1 m/s	322.3 W/m²
QAS_L	23-08-2024 11:00	4.5 °C	0.6 m/s	42.5 W/m²
THU_L2	23-08-2024 11:00	1.2 °C	4.3 m/s	80.5 W/m²
ZAC_L	23-08-2024 11:00	3.8 °C	5.9 m/s	575.5 W/m²
SDL	23-08-2024 13:00	10.6 °C	5.7 m/s	388.4 W/m²

Another route to global surface mass balance assessments

- WMO: Weather forecast,
- Reanalysis: ERA6, Copernicus Arctic Regional Reanalysis (CARRA)



Continuous, in-situ, automatic ablation observations



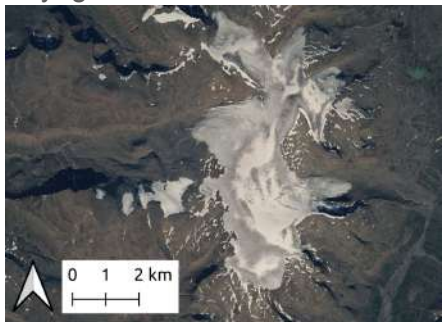
Freely available at
https://dataverse.geus.dk/

And for GEM sites
https://data.g-e-m.dk/

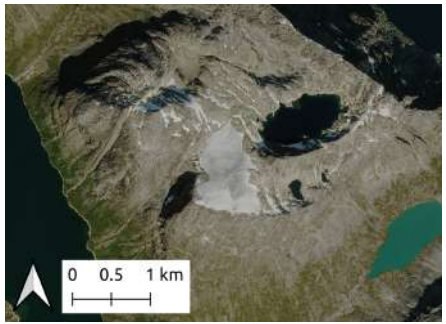
Underused dataset for global mass balance assessments?

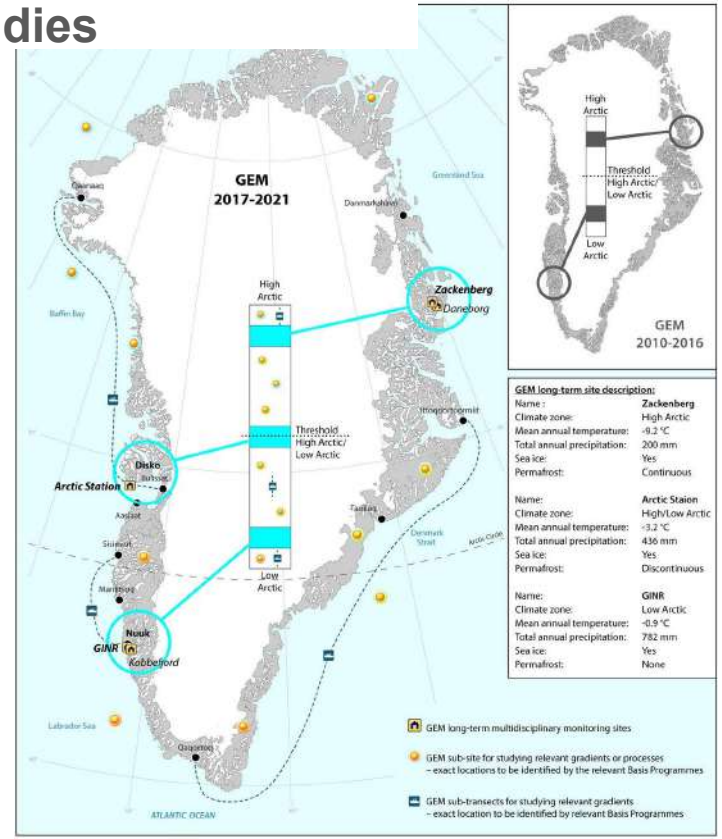
Alternative routes to global mass change assessments: **Process studies**

Lyngmarksbræen



Qasinguit





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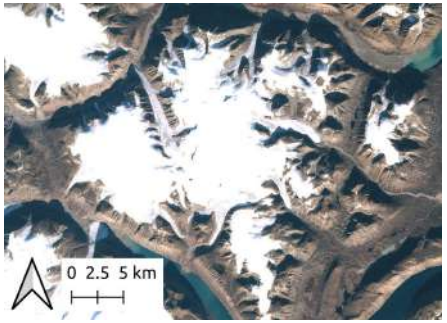

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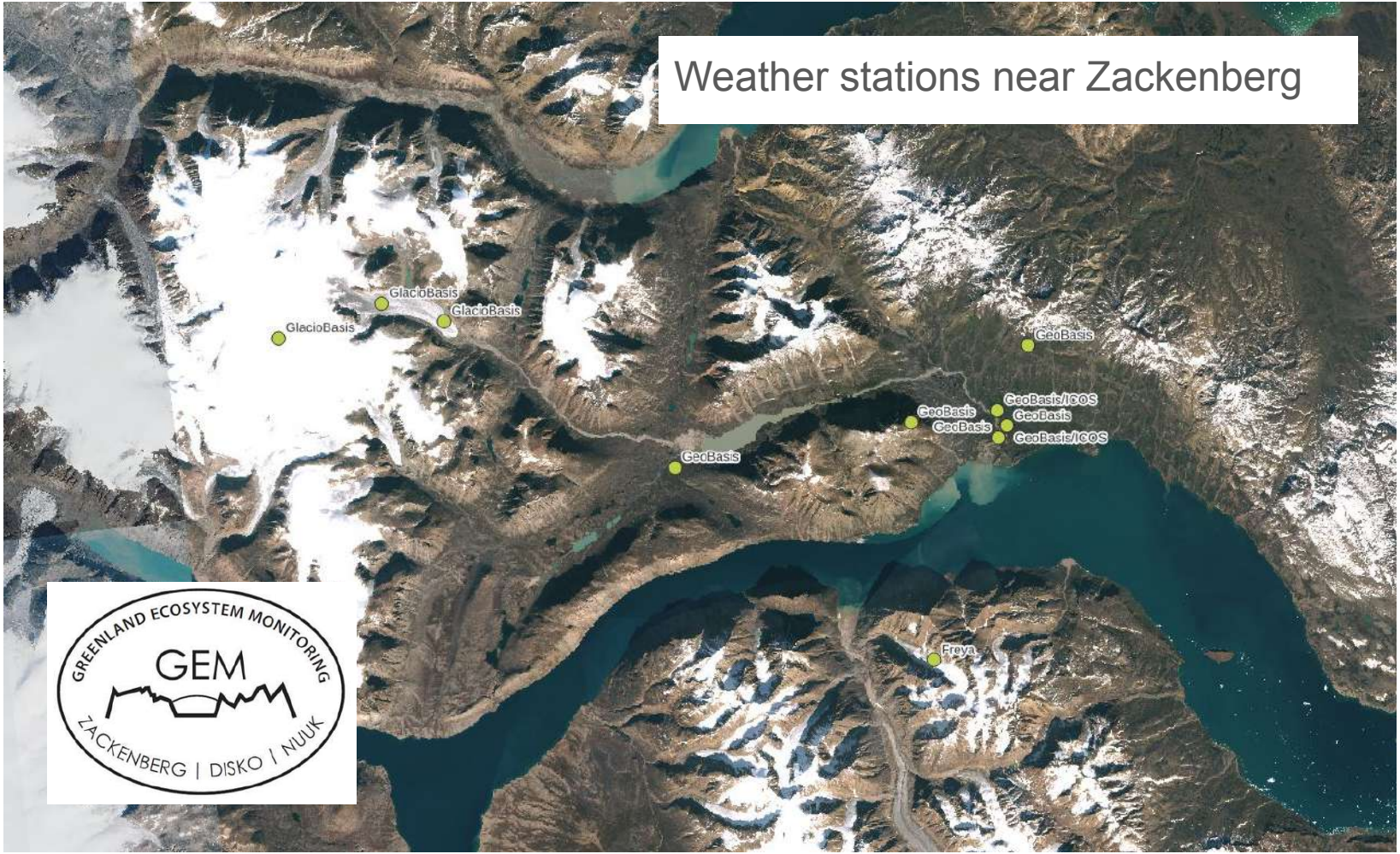
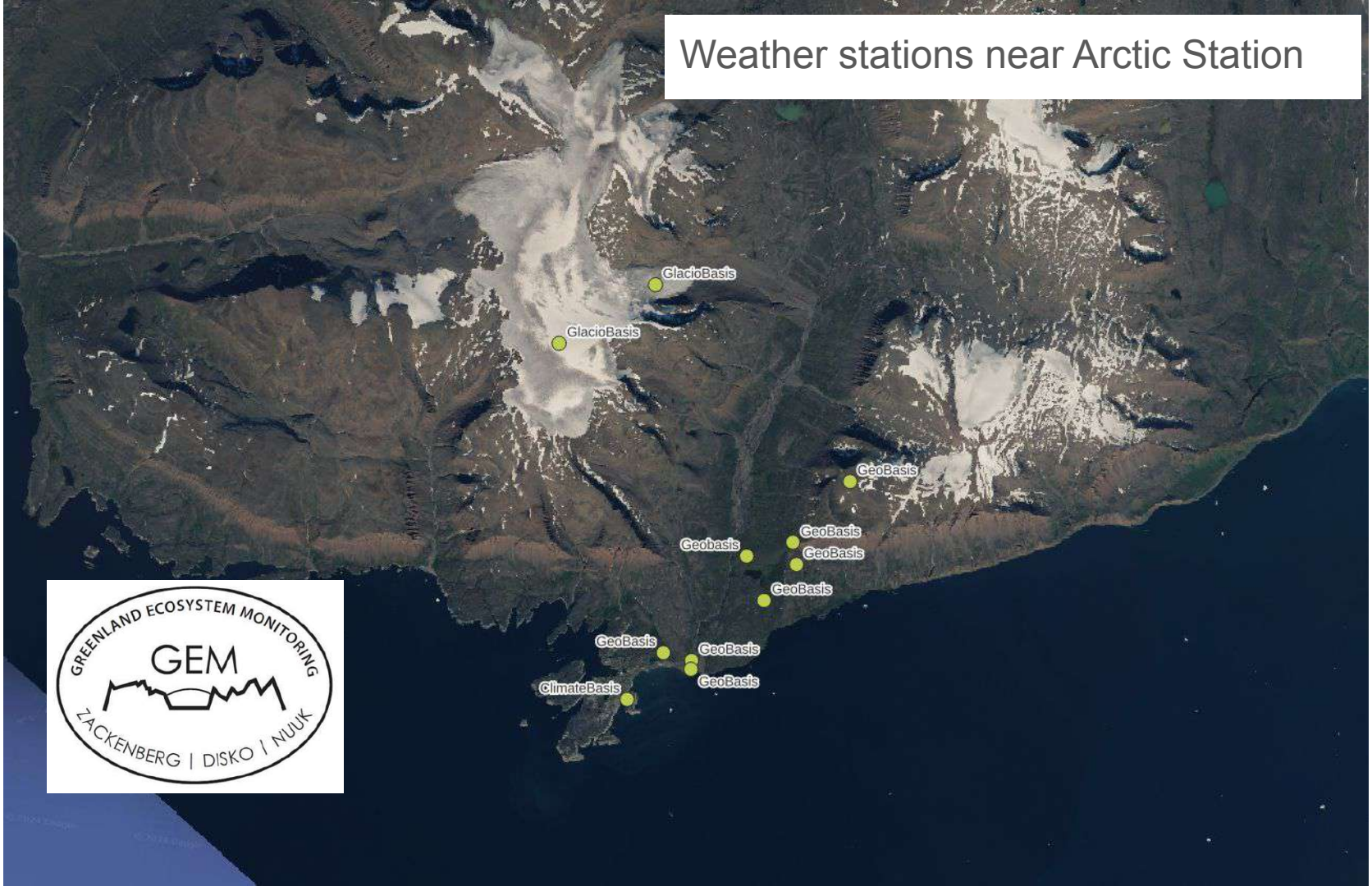
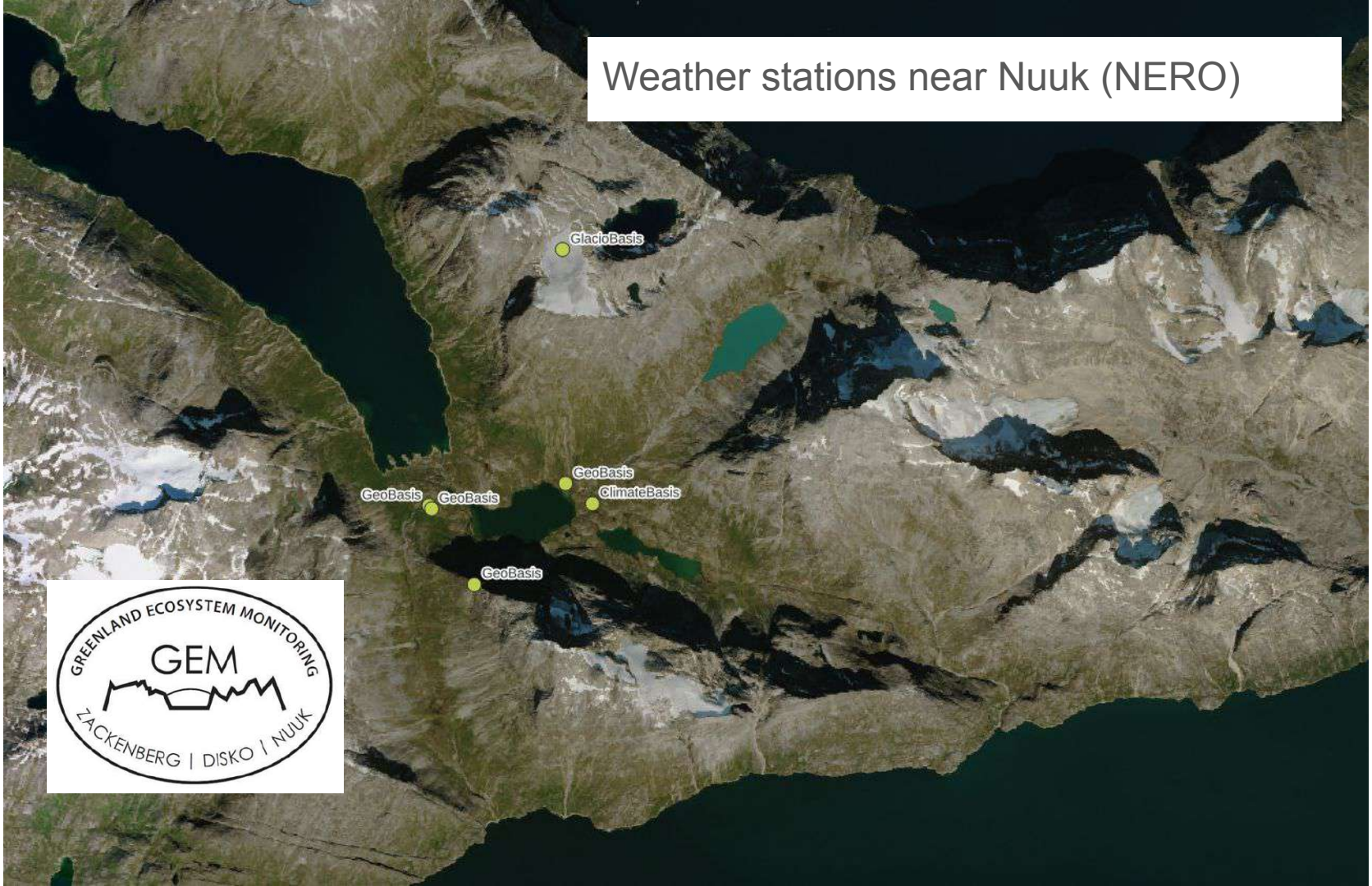
Weather stations near Zackenberg



Weather stations near Arctic Station

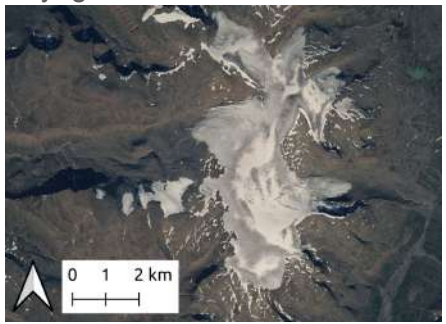


Weather stations near Nuuk (NERO)

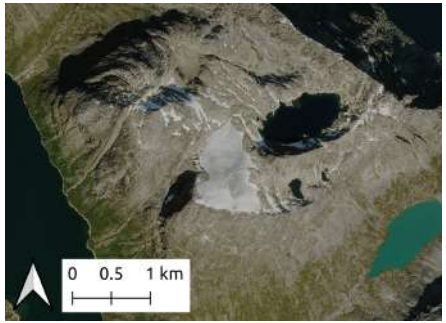


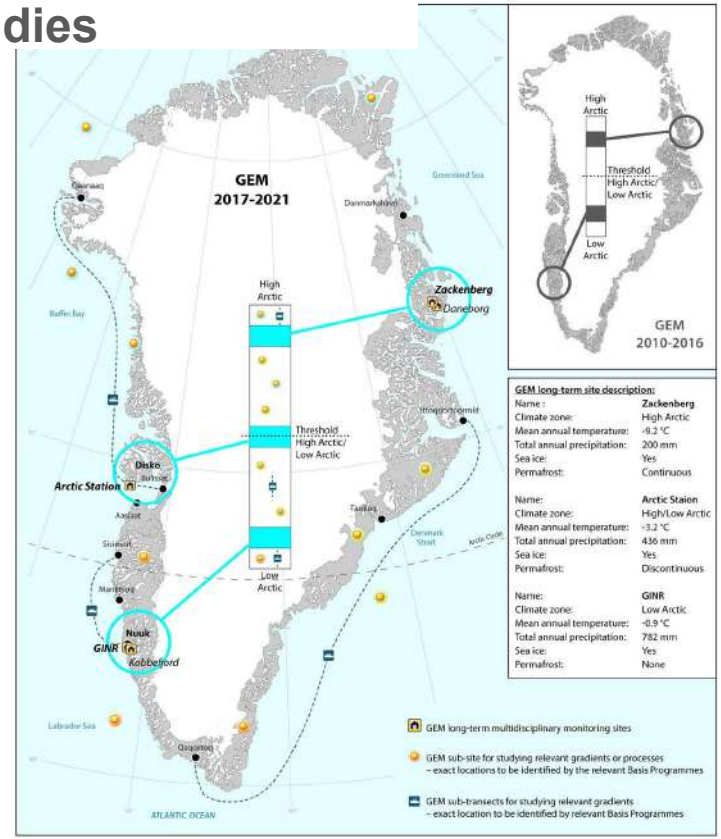
Alternative routes to global mass change assessments: **Process studies**

Lyngmarksbræen

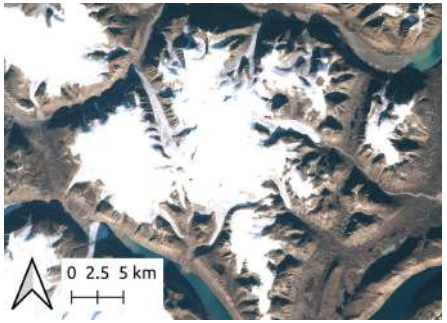


Qassinnguit sermiat





A.P. Olsen Ice Cap



- Meteorological observations
- Hydrometric stations
- Marine ecosystem
- …

Routes to global mass change assessments

- WGMS FoG database
- Sharing climate data with forecasters and re-analysis
- Possibility for process studies
- Freely available ice ablation observations

But is the data fully used?

Advances, highlights, challenges and gaps

We have systematic monitoring of the peripheral glaciers, but:

- is the data fully used?
- How do we ensure the continuation of these important time series?

Future efforts should focus on using the data we have, and ensuring the continued monitoring of the peripheral glaciers via more **coordinated efforts with long time funding**.

Thank you for your attention!

https://dataverse.geus.dk/

https://wgms.ch/products_fog/

https://data.g-e-m.dk/