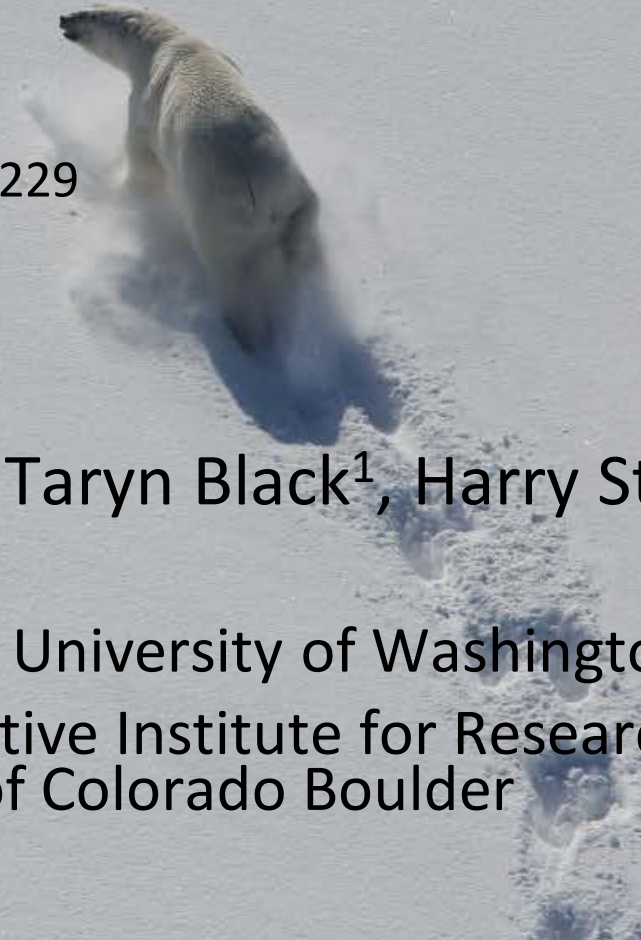


Bears on Ice: Understanding Southeast Greenland polar bear habitat

NASA grant 80NSSC18K1229



Kristin Laidre¹, Twila Moon², Ben Cohen¹, Taryn Black¹, Harry Stern¹

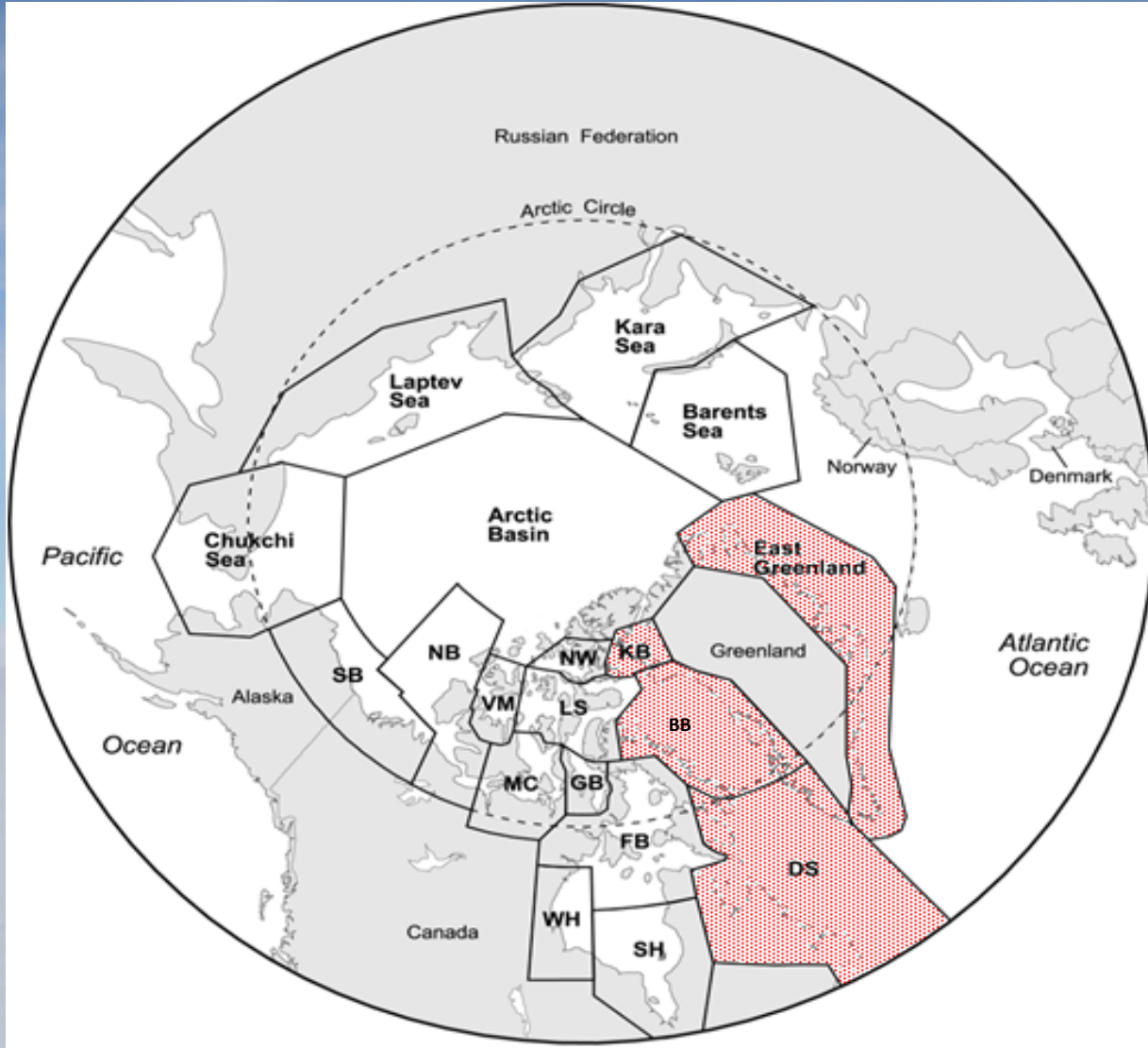
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² National Snow and Ice Data Center, Cooperative Institute for Research in Environmental Sciences, University of Colorado Boulder

Project goals

- 1) quantify properties of Southeast Greenland's glacier/fjord systems
- 2) understand the drivers of seasonal ice dynamics, in particular connections among glaciers, ice mélange, and sea ice
- 3) investigate habitat of polar bears living year-round at glacier fronts

Polar bears across the Arctic

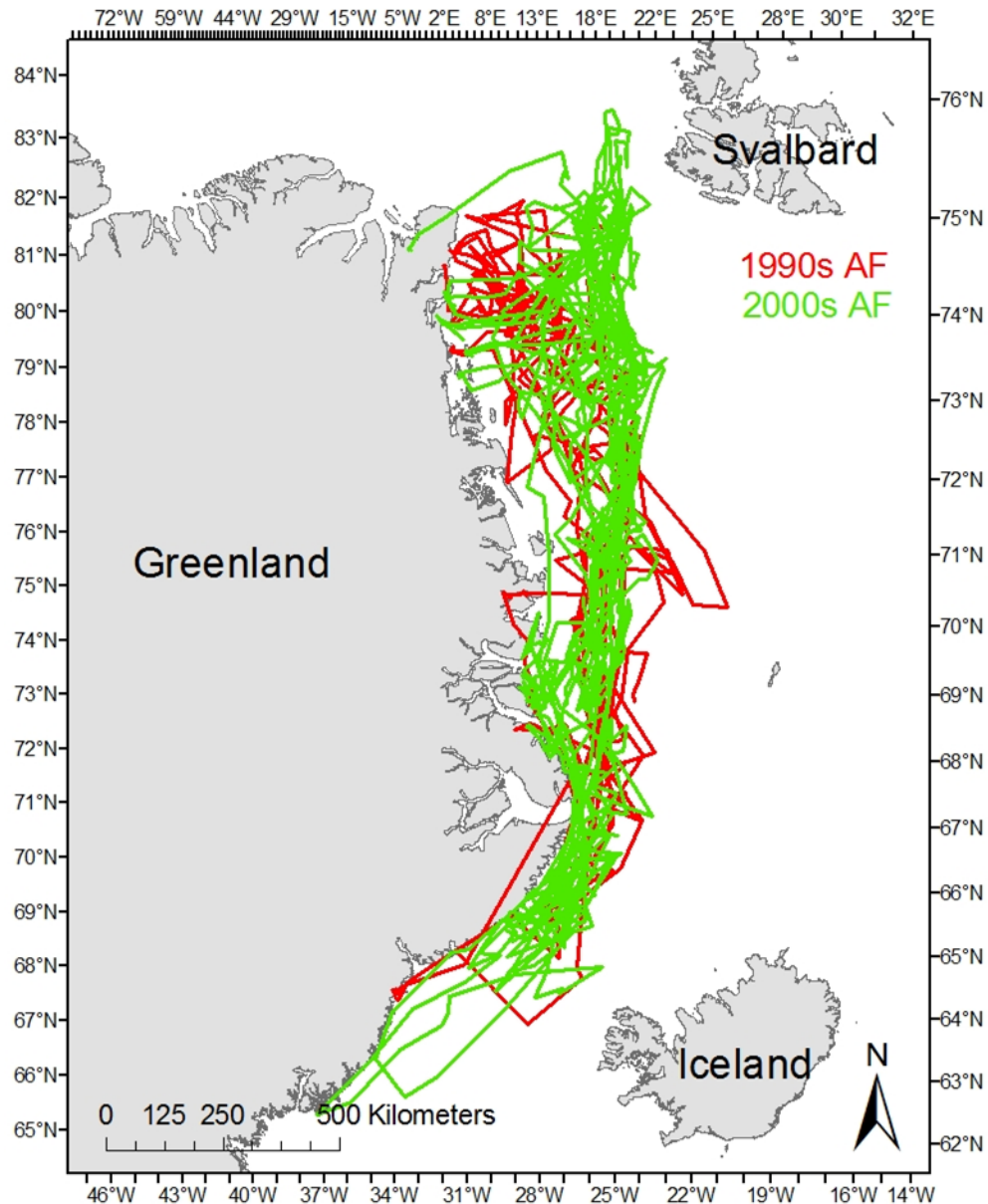


- Kane Basin
- Baffin Bay
- Davis Strait
- East Greenland
- Arctic Basin

Shared with
Canada

Important in
the future

Earlier research focused on NE Greenland



Historical data from 1990s and 2000s show bears use the offshore sea ice as habitat.



Sea ice is the primary habitat for polar bears



Travel



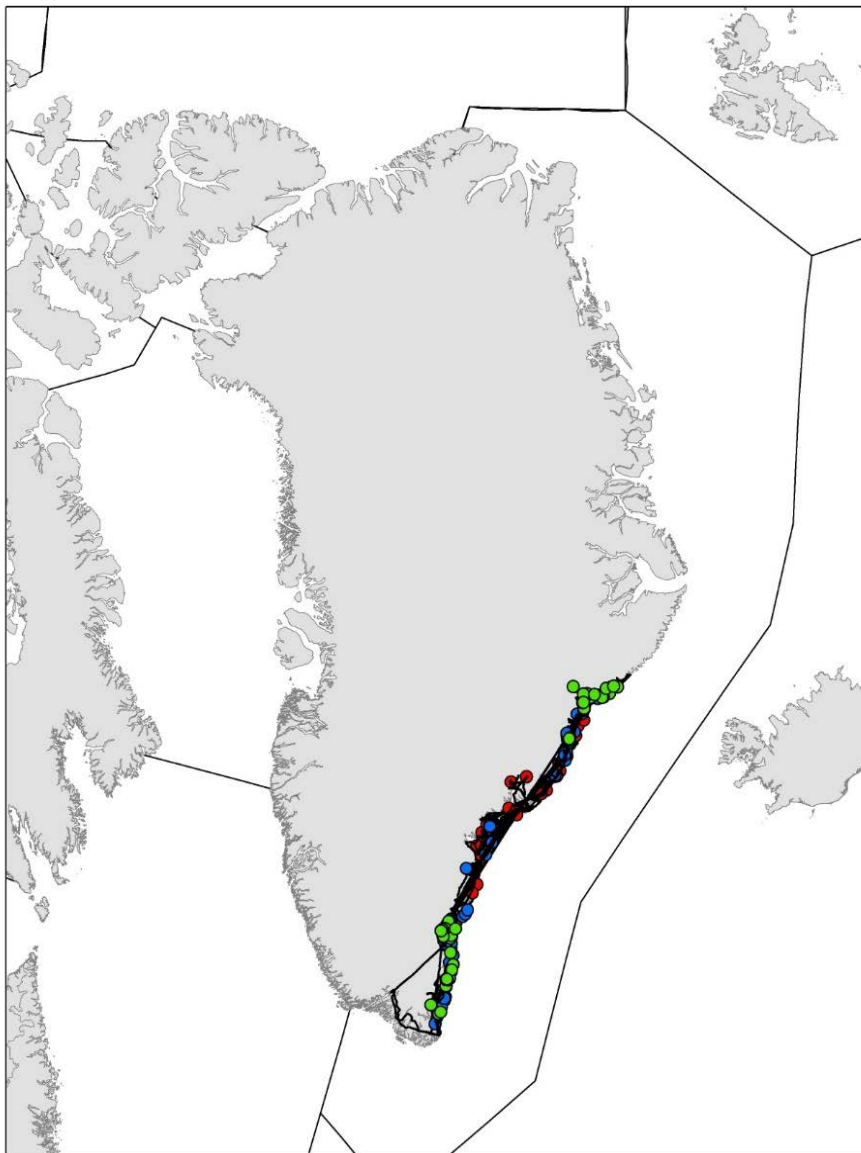
Hunt



Mate



Some maternity denning



Field campaign in SE
Greenland

2015-2017

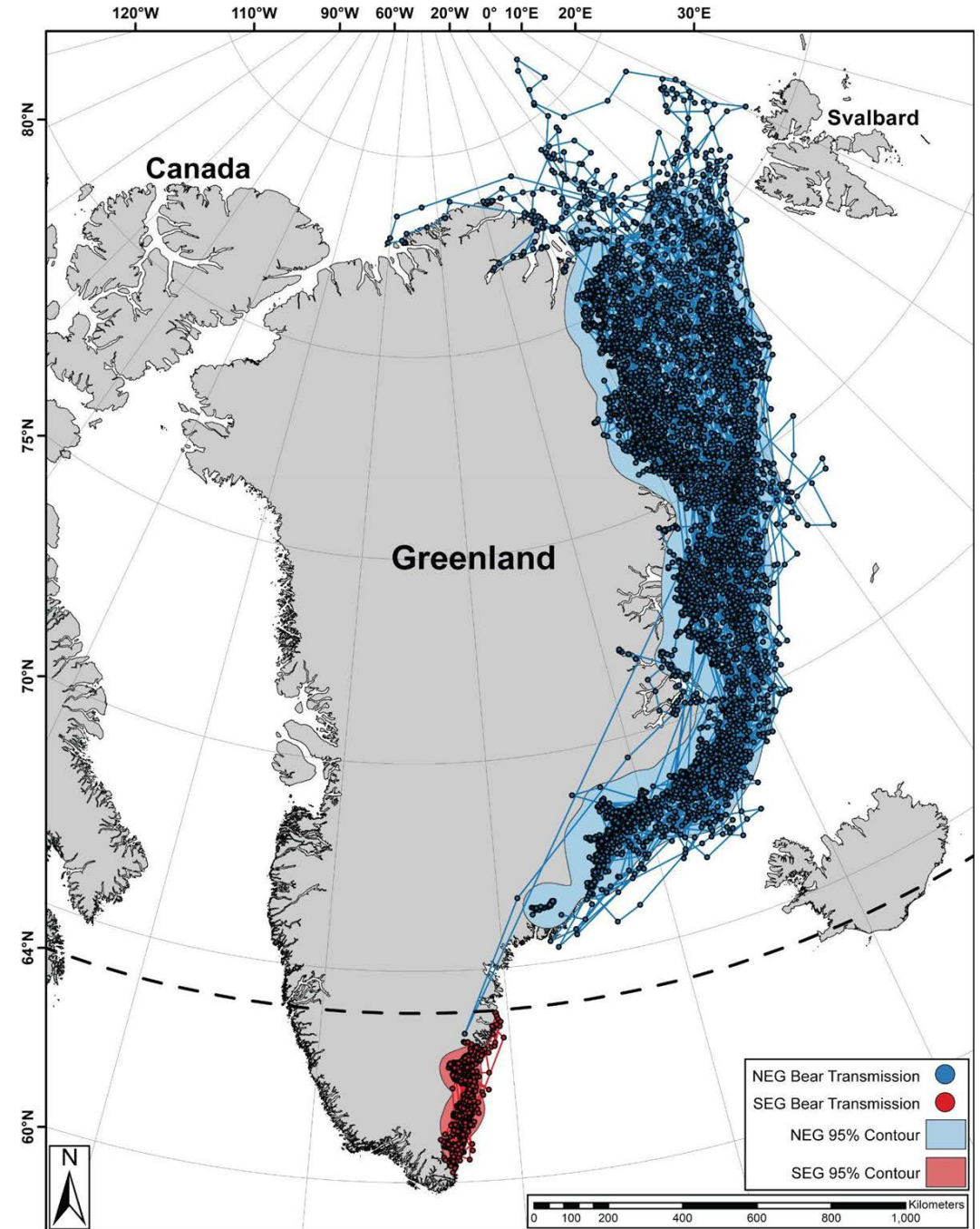
Funded by Greenland
and Denmark

N=126 bears captured

Assessed for condition,
genetics, and females
tracked with telemetry
for 3+ years

New information

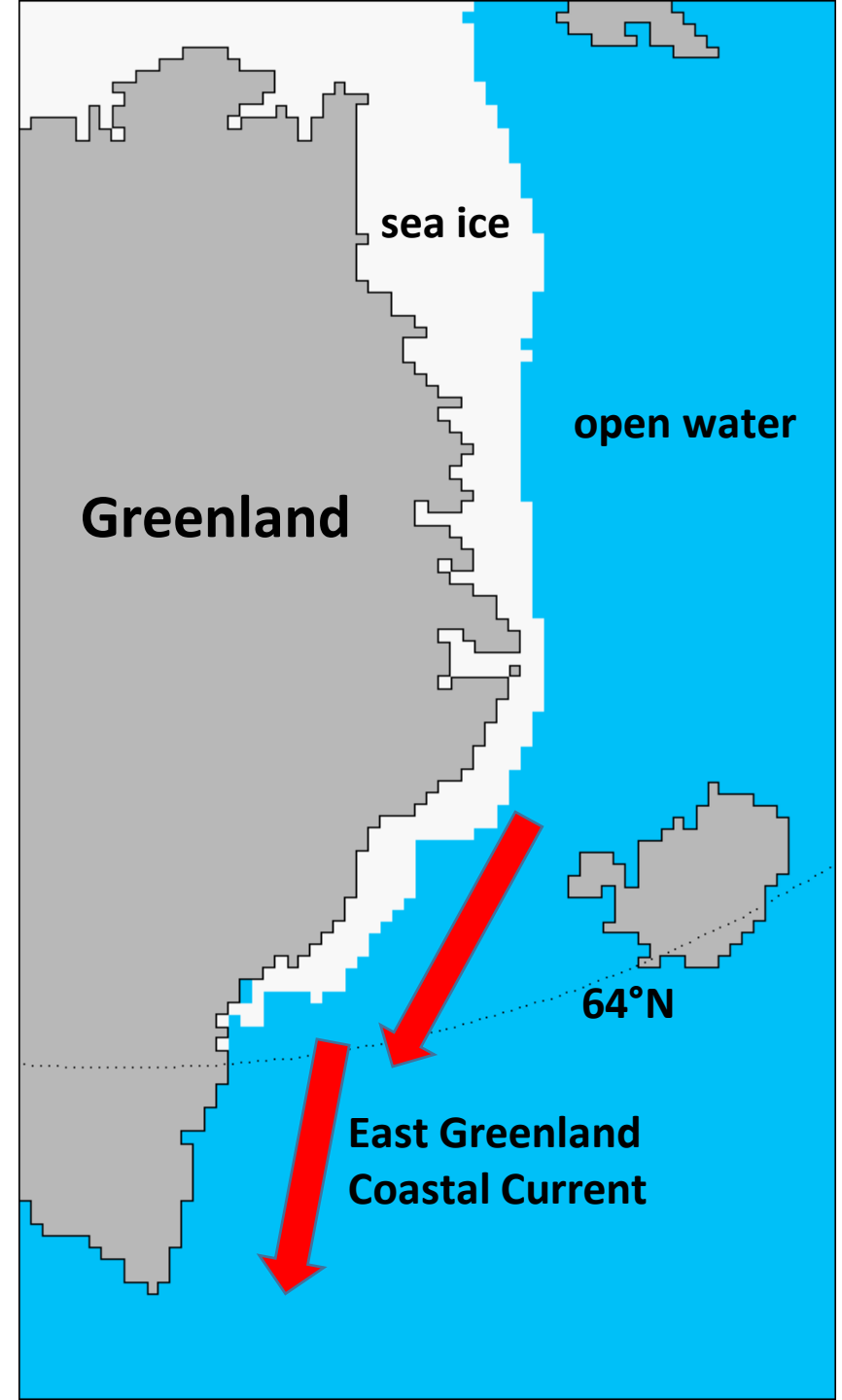
- Movement data suggest sub-structuring along coast
- Genetic and demographic analyses
- What makes SE Greenland habitat unique?



Offshore sea ice

- Sea ice diminishes southward along the coast
- Absent for much of the year south of 64°N
- The East Greenland Coastal Current rapidly carries any sea ice further south
- Offshore sea ice is not suitable habitat for polar bears in SE Greenland

Sea ice on 2/12/2018 from NSIDC passive microwave satellite data. White is >50% sea-ice concentration.



SE Greenland offshore sea ice



Photo by Kristin Laidre

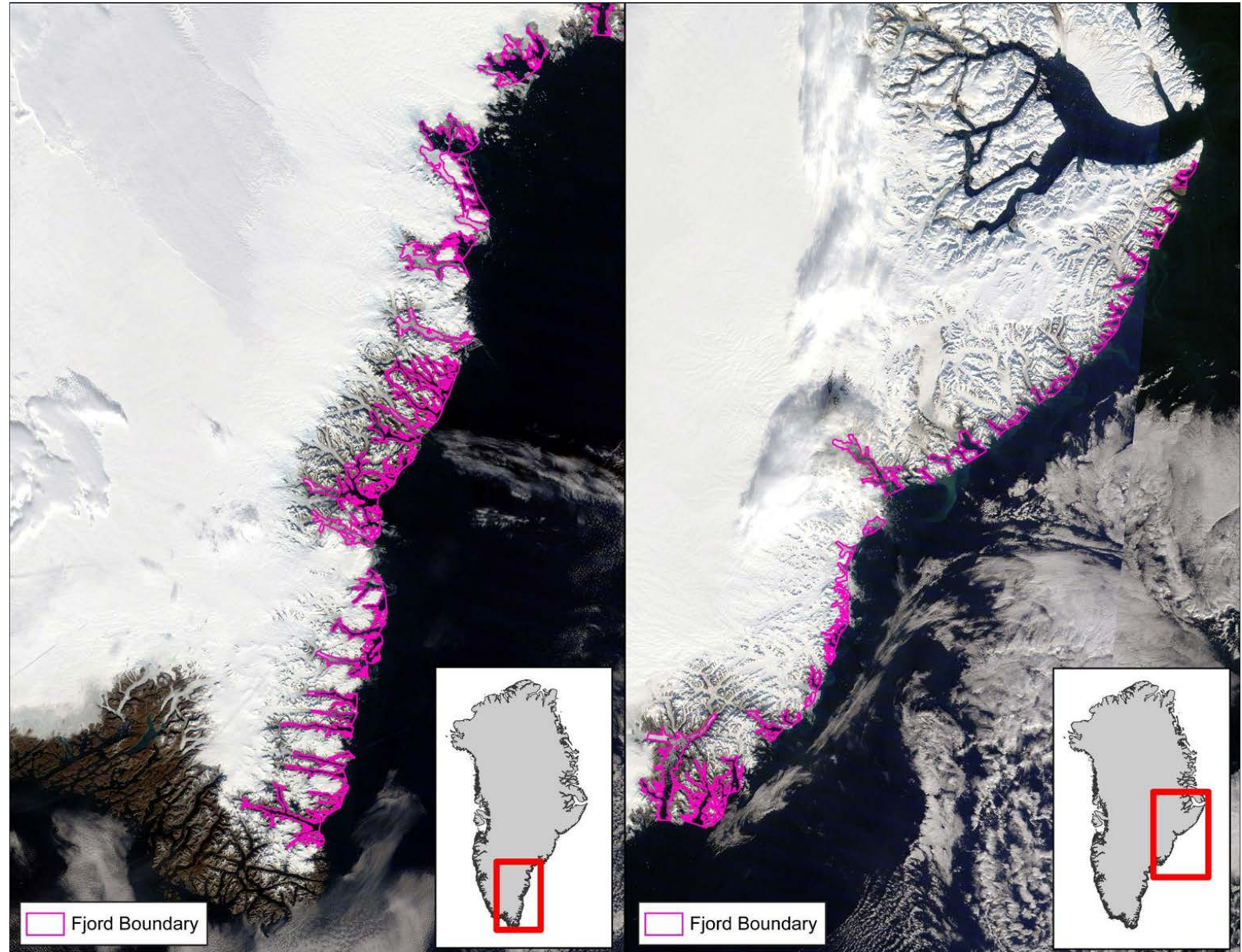
Bears reside in the SE Greenland fjords



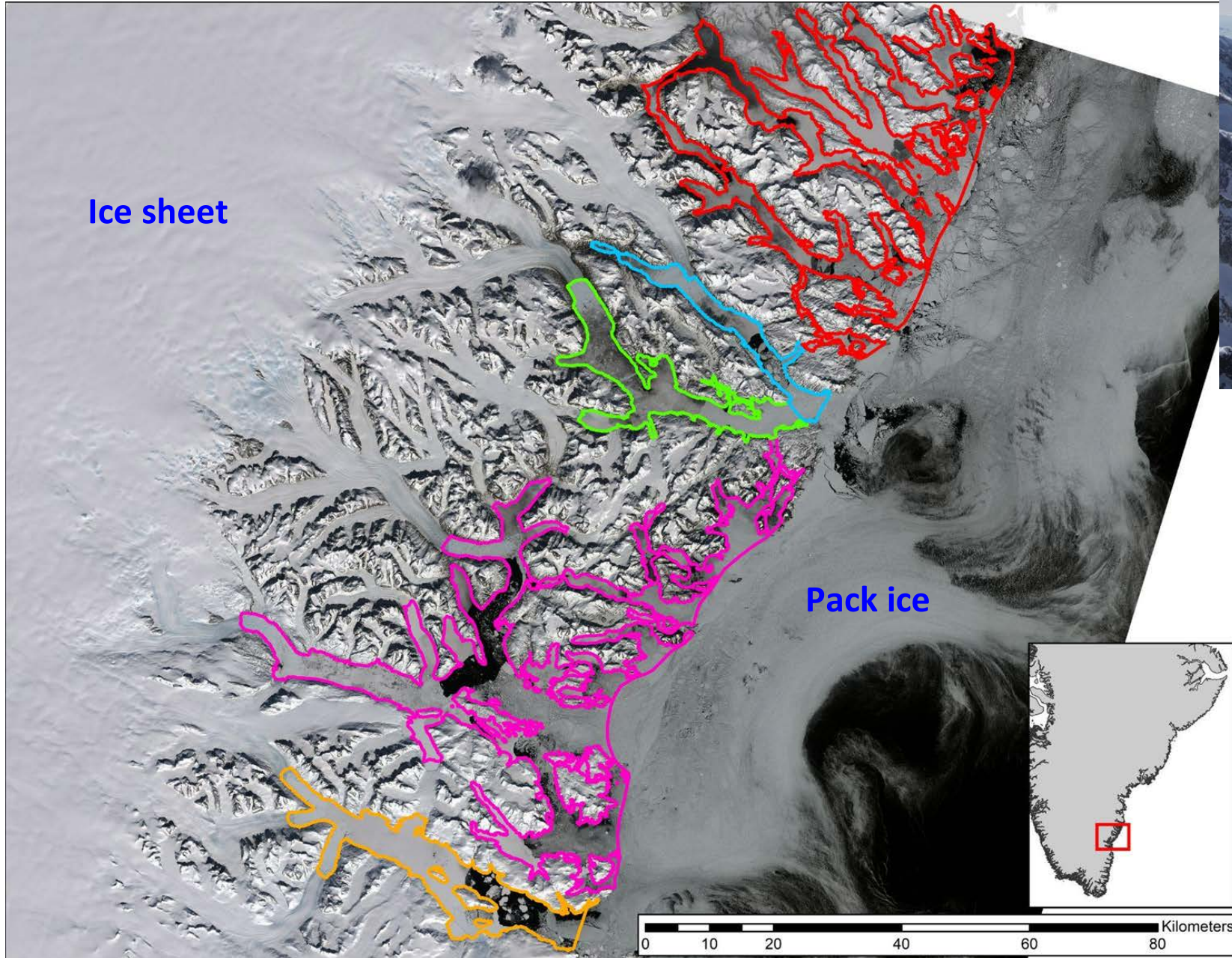
Photo by Kristin Laidre

Geography of SE Greenland

MODIS Corrected Reflectance imagery captured on 10/10/21.

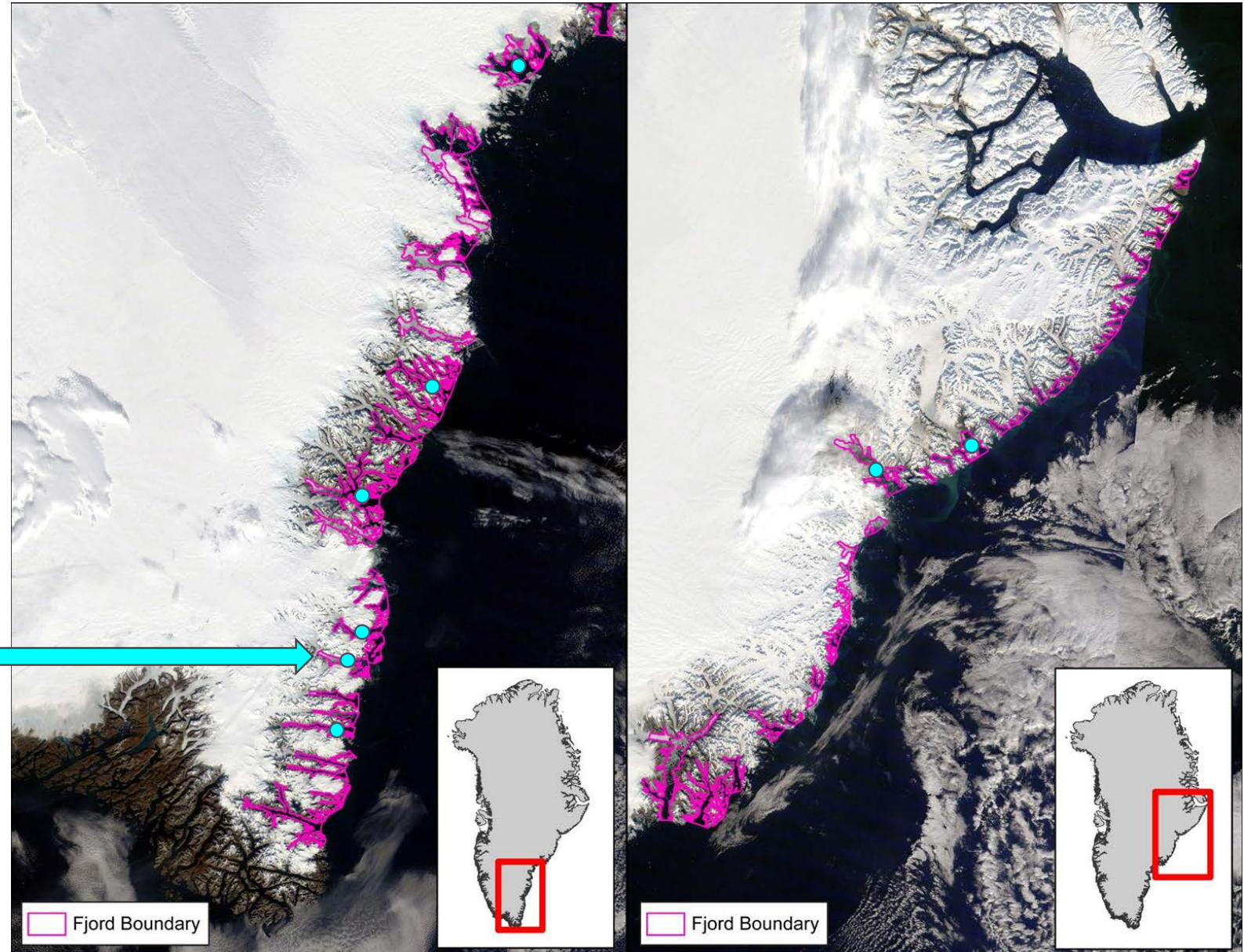


Complex fjord systems



Landsat-8 imagery captured on 4/26/18

Selected a subsample of fjords across the range



MODIS Corrected Reflectance
imagery captured on 10/10/21.



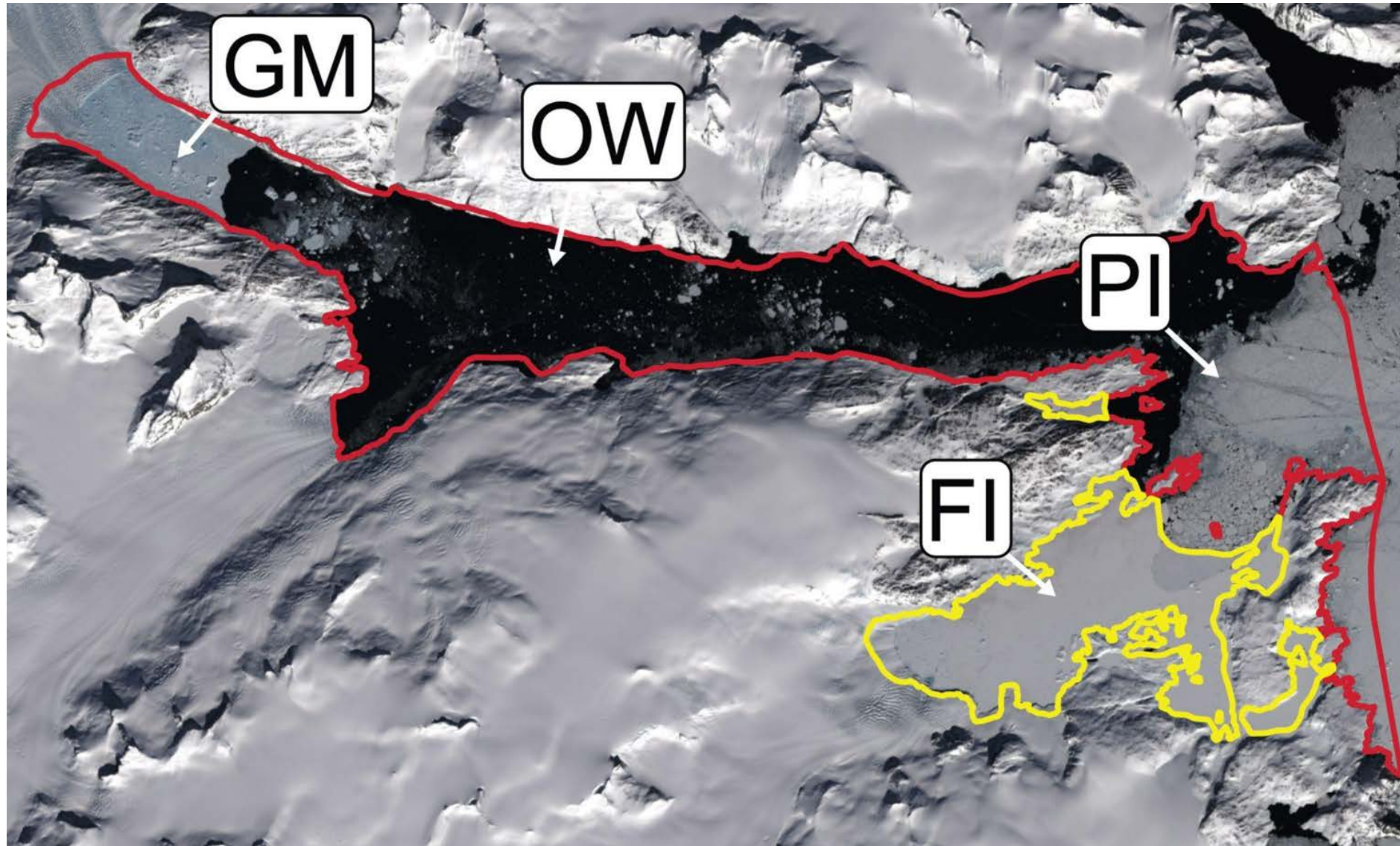
Photo by Kristin Laidre

Convergence zones of sea ice, glacial ice, and land



Photo by Kristin Laidre

Unique ice environments: fast ice

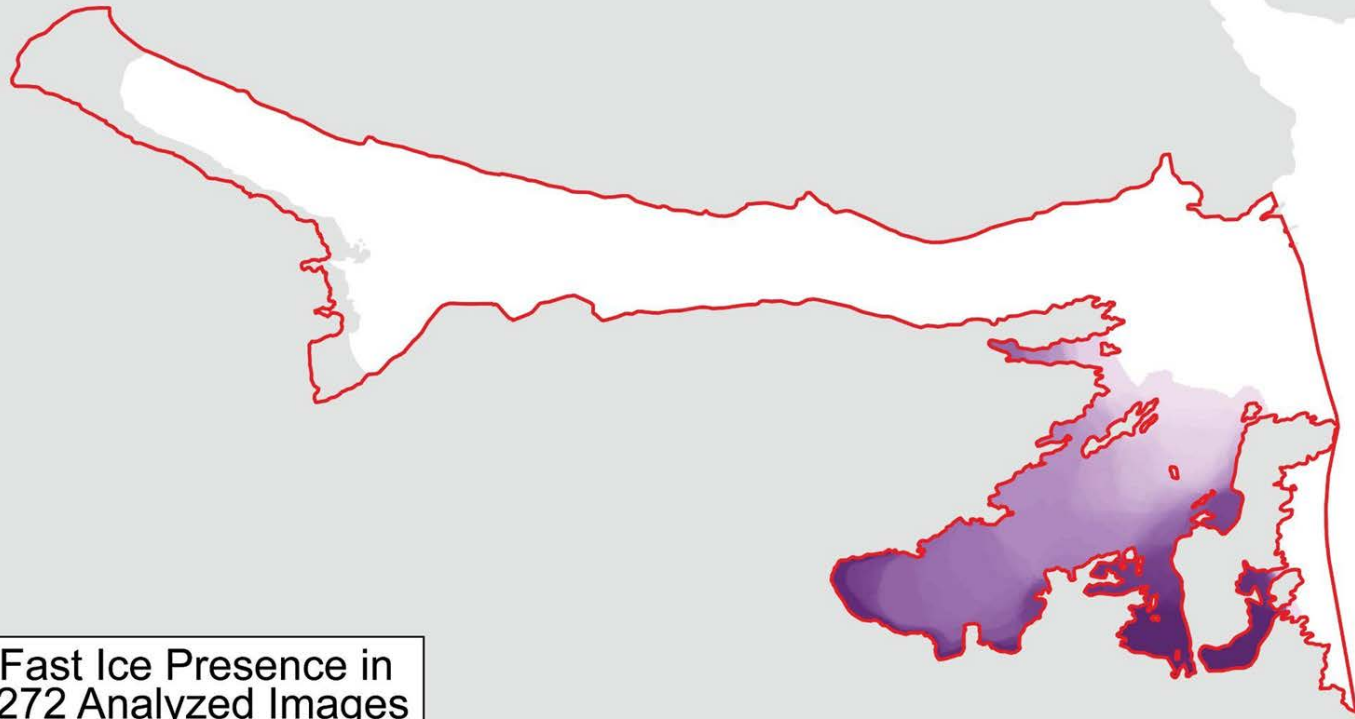


<u>ID</u>	<u>Description</u>
GM	Glacial Melange
OW	Open Water
PI	Pack Ice
FI	Fast Ice

Landsat-8 imagery in map above captured on 4/7/17.

Fjord fast ice

“Heatmap” of fast ice presence in Anoritup, 2015-19

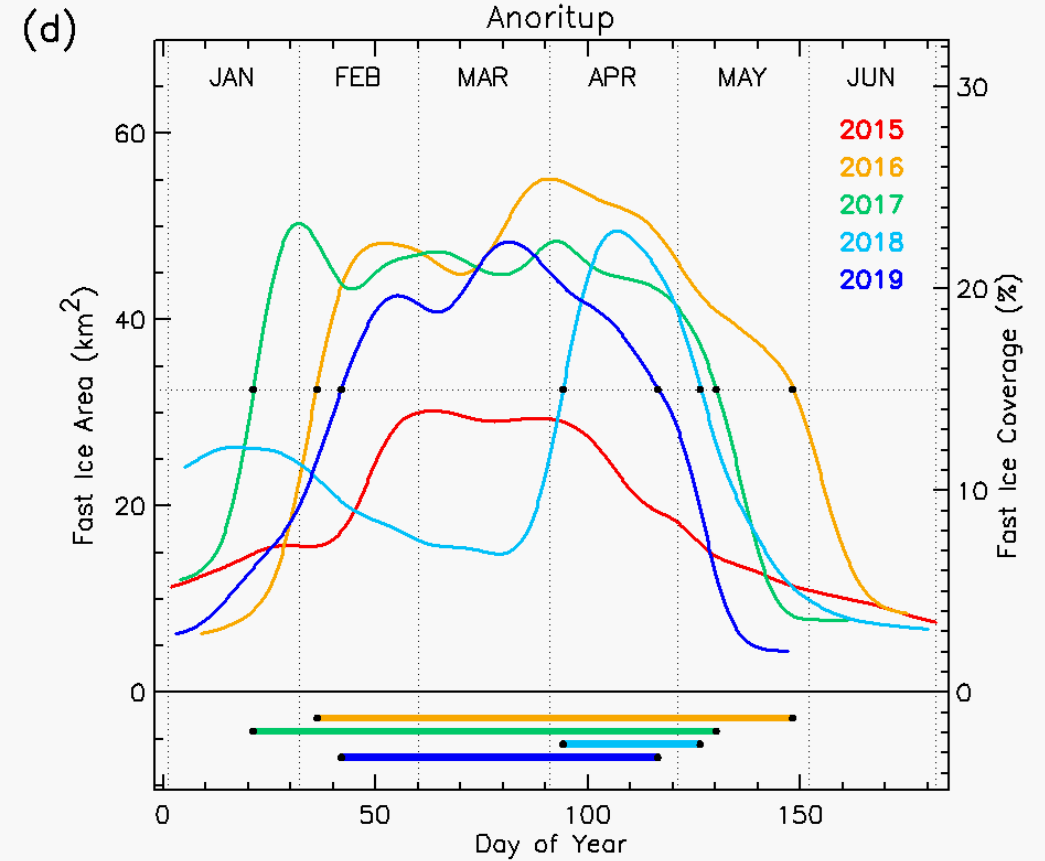


Fast Ice Presence in
272 Analyzed Images

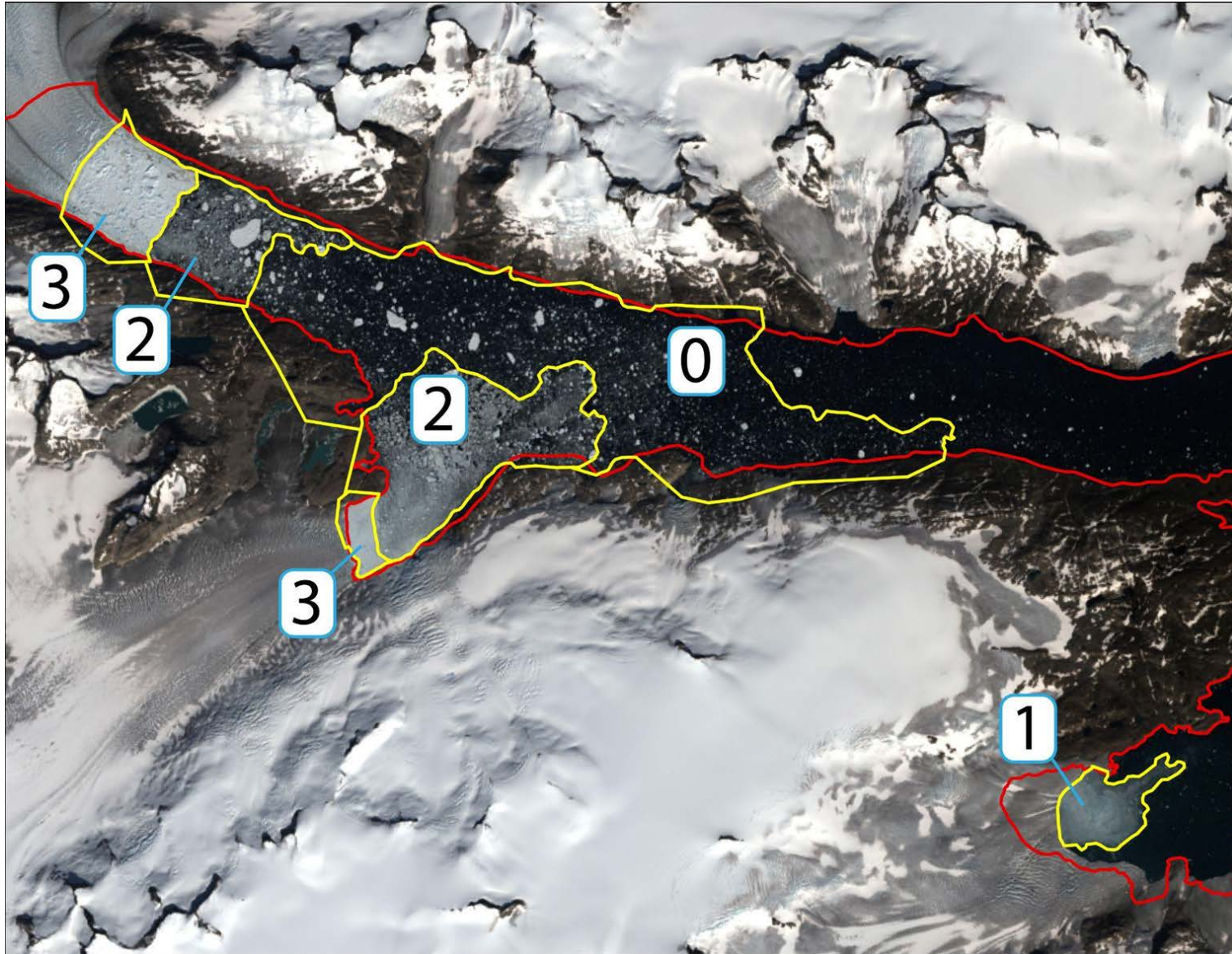


Data from Landsat 8 and MODIS

Fast ice area (km²) & Coverage (%)



Unique ice environments: **glacial ice**



<u>ID</u>	<u>Glacial Ice Type</u>
0	Dispersed icebergs <10% concentration by area
1	Somewhat consolidated glacial ice absent large icebergs
2	Unconsolidated glacial ice with larger icebergs
3	Consolidated dense glacial melange

Landsat-8 imagery captured on 8/1/15



Photo by Kristin Laidre

Solid ice discharge across SEG

- A year-round source of fjord surface ice
- Glacial output varies across the region and depends on ice sheet, glacier, and ice caps conditions
- High SE Greenland precipitation feeds glacial ice in the region

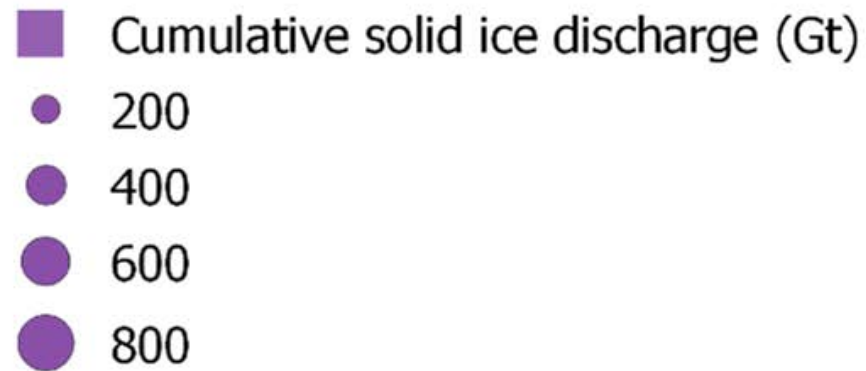
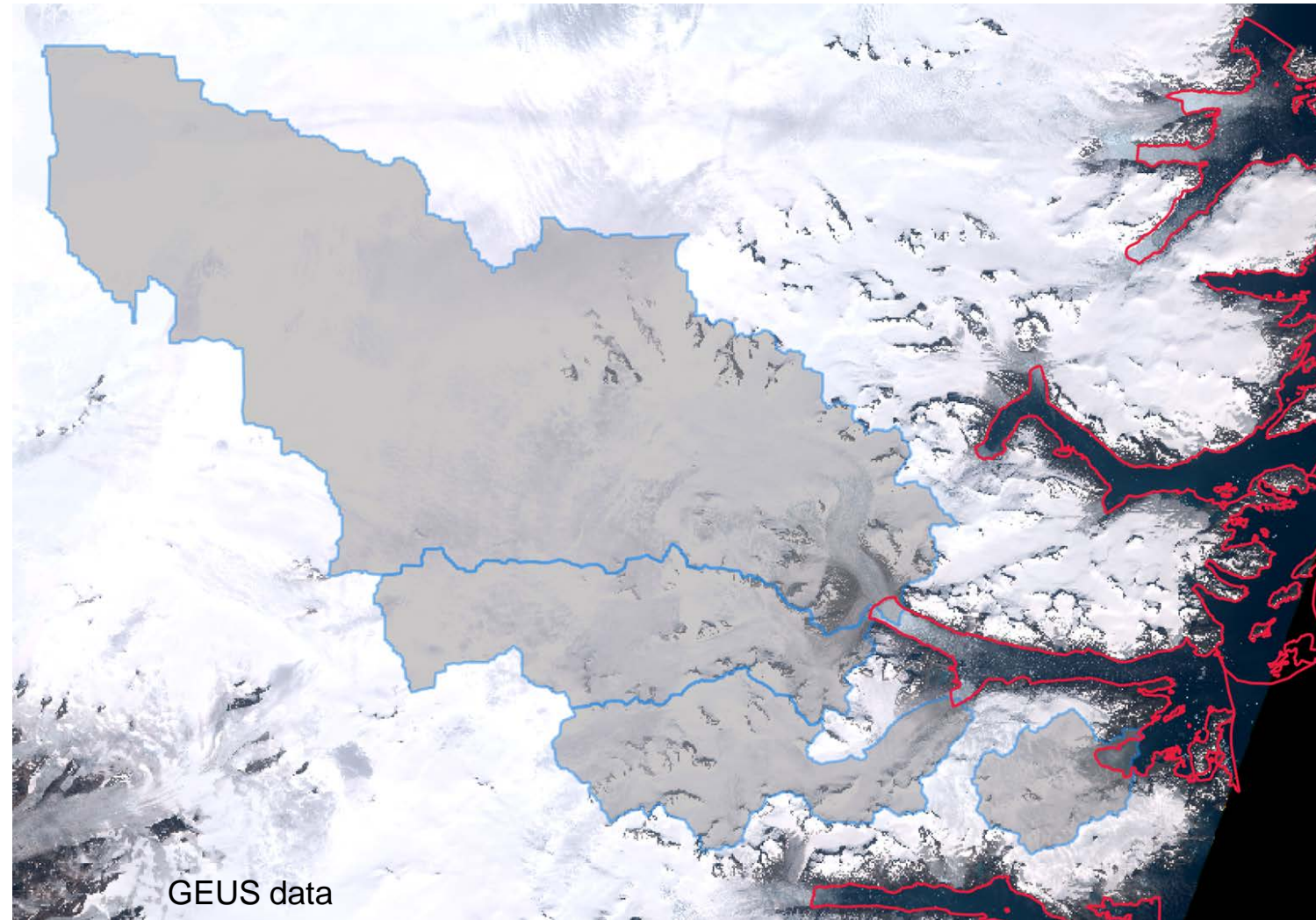
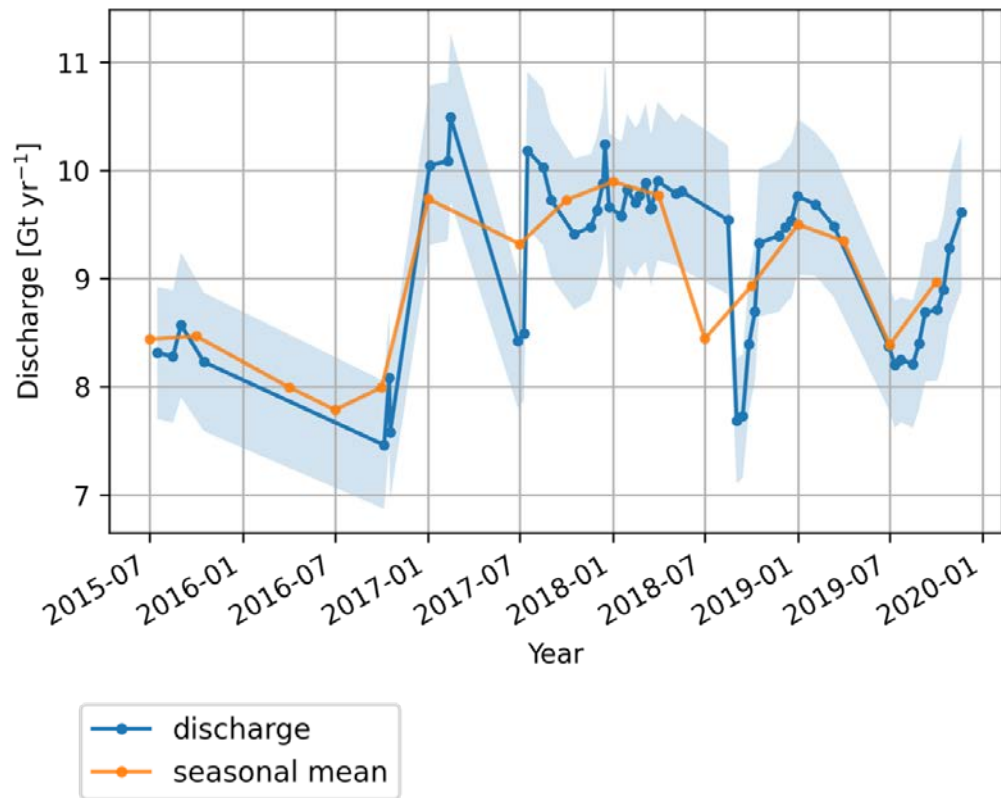




Photo by Nick Cobbing

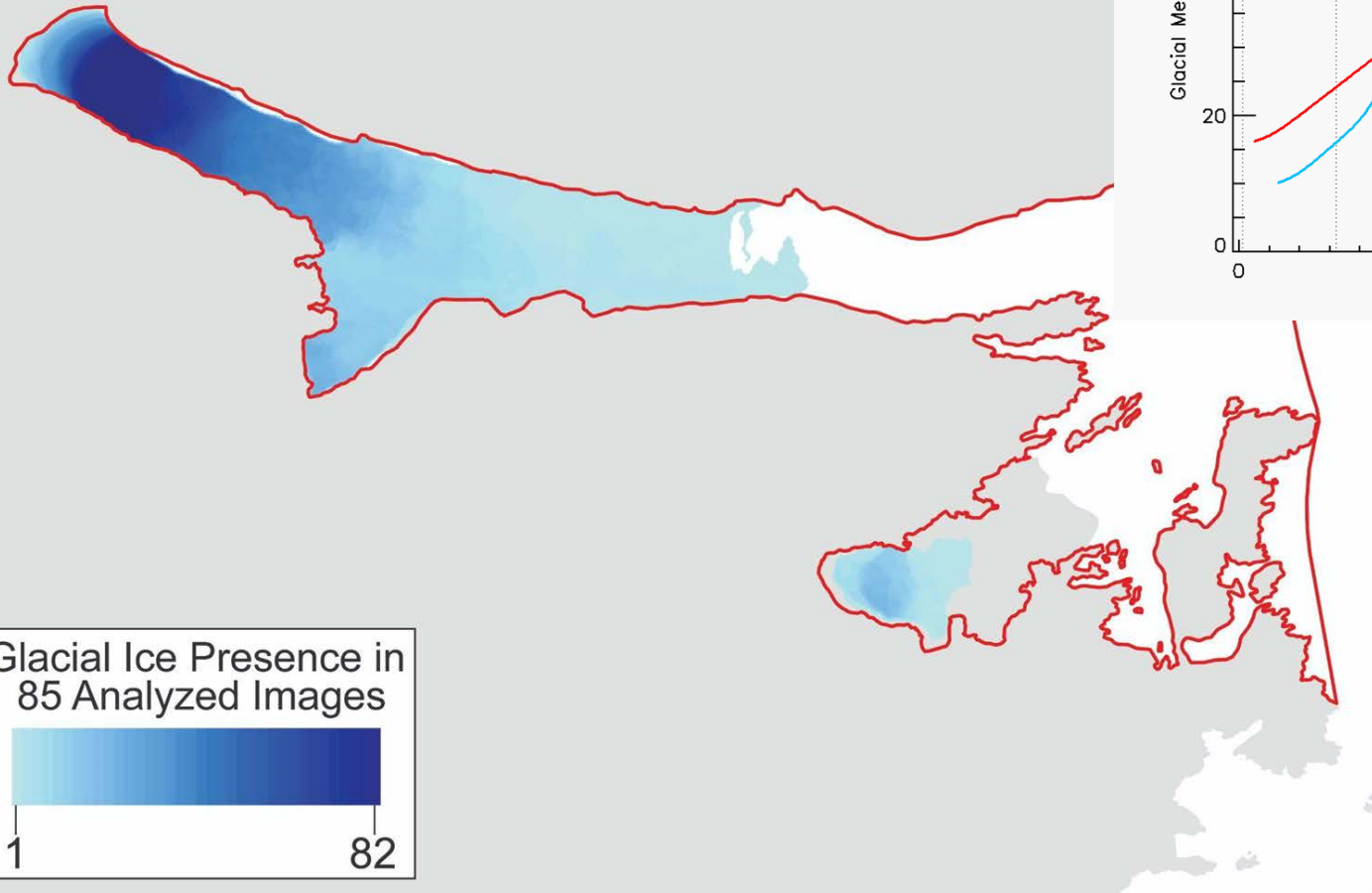
Solid ice discharge across SEG

Glacial ice discharge to fjord (Gt/yr)

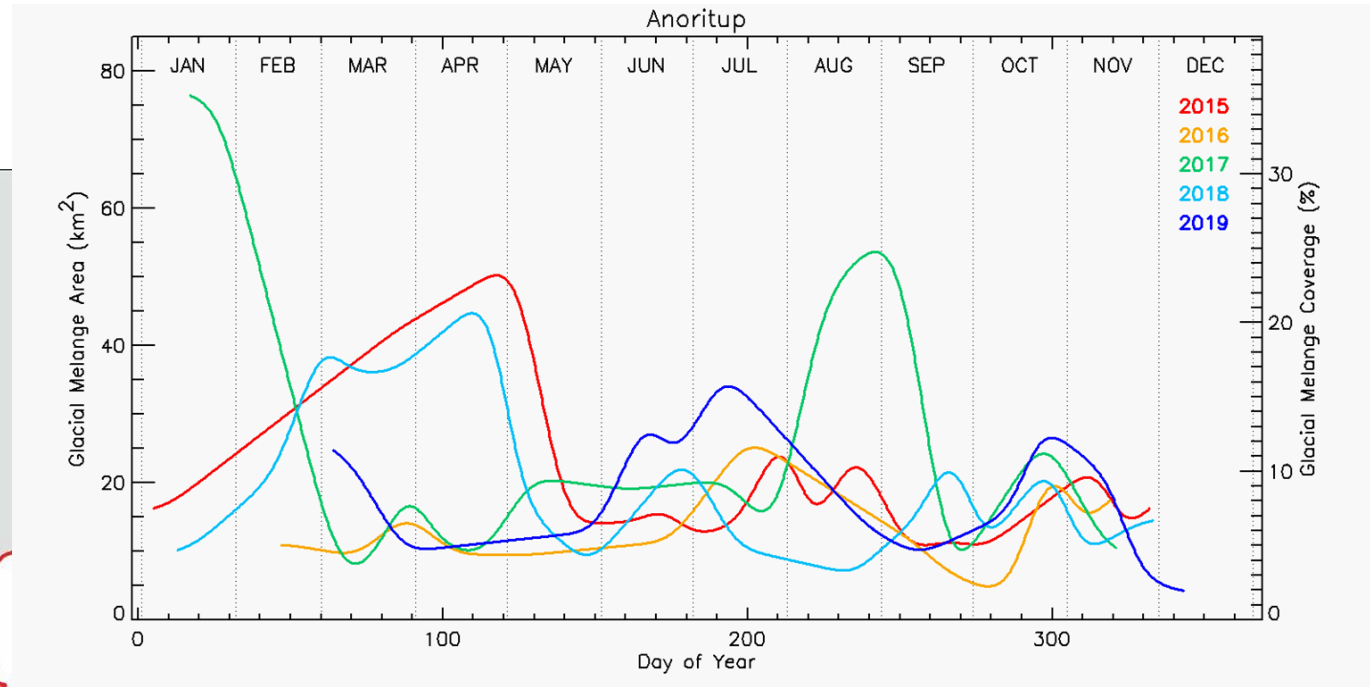


Fjord glacial ice

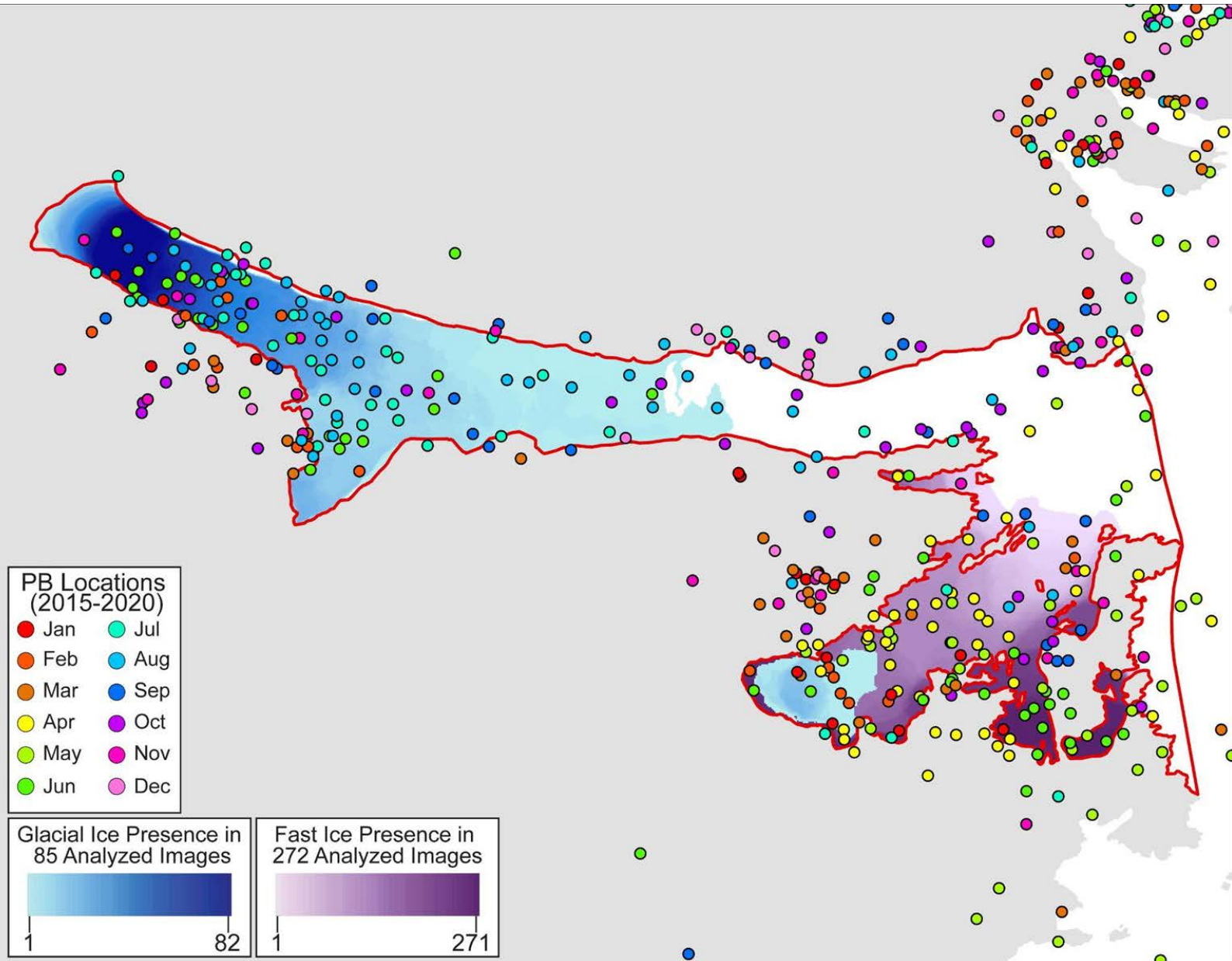
Heatmap of type 2 and 3 glacial ice presence in Anoritup, 2015-19



Glacial ice area (km²) & Coverage (%)



Polar bear use of fast ice & glacial ice varies seasonally



- Bears use fast ice while available in spring
- Transition to glacial ice during summer

Research feeds directly into sustainable harvest management

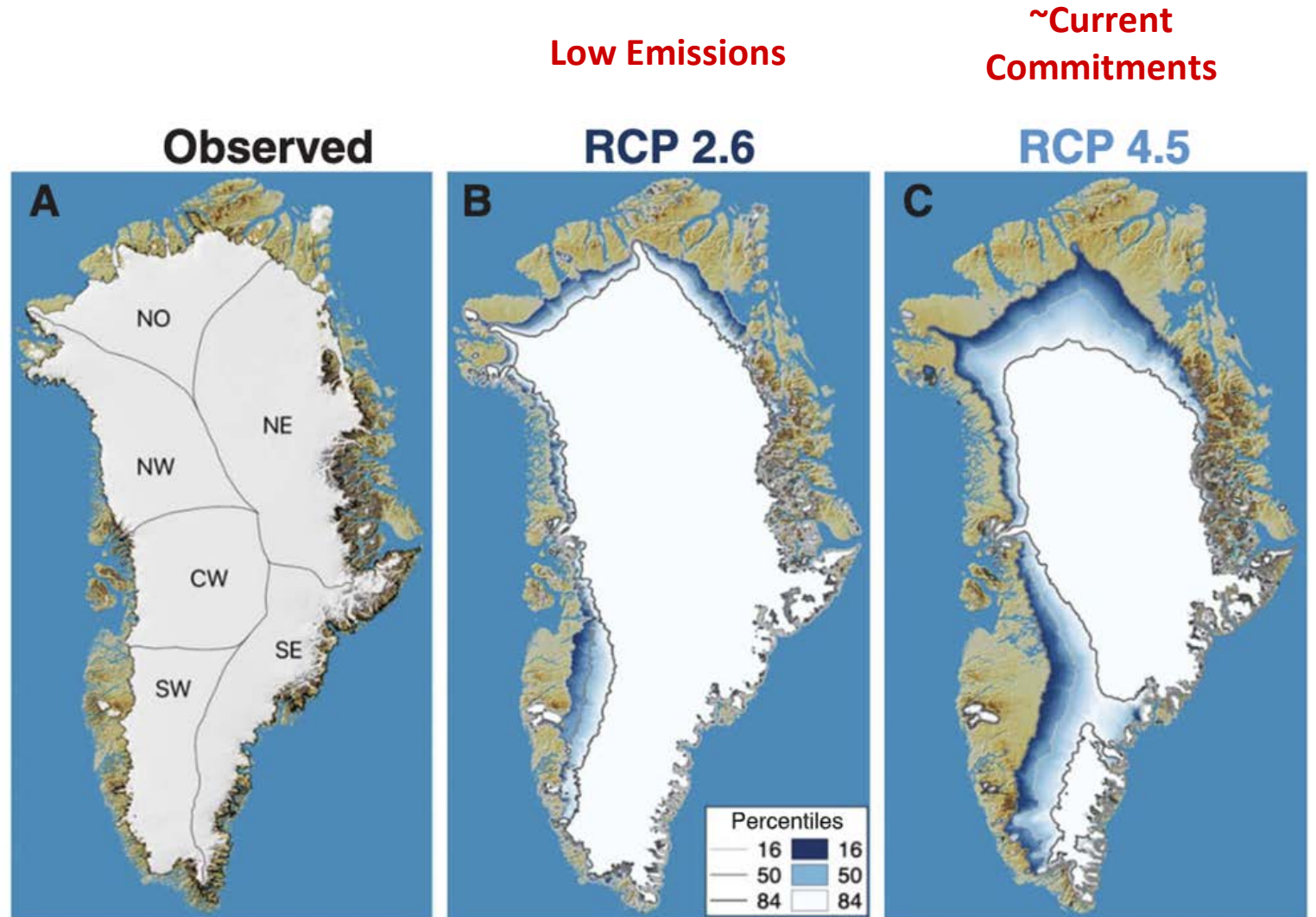


Photo by Tiina Itkonen

A habitat for the future?



Ice Presence Likelihood in Year 3000






Thank you!

Questions?

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