



DestinE Sea Ice Decision Enhancement (DESIDE)

Photo: Andreas Cziferszky



Norwegian
Meteorological
Institute



The Danish
Meteorological
Institute



ILMATIETEEN LAITOS
METEOROLOGISKA INSTITUTET
FINNISH METEOROLOGICAL INSTITUTE



Funded by the
European Union



The Problem

WORLD

Cruise ship goes down off Antarctica

A Canadian cruise ship struck submerged ice off Antarctica, but all 154 passengers and crew, Americans and Britons among them, took to lifeboats and were plucked to safety by a passing cruise ship before the ship sank.



The MS Explorer heels to starboard Friday after hitting submerged ice. AFP - Getty Images



Illustration photo by Rosatom

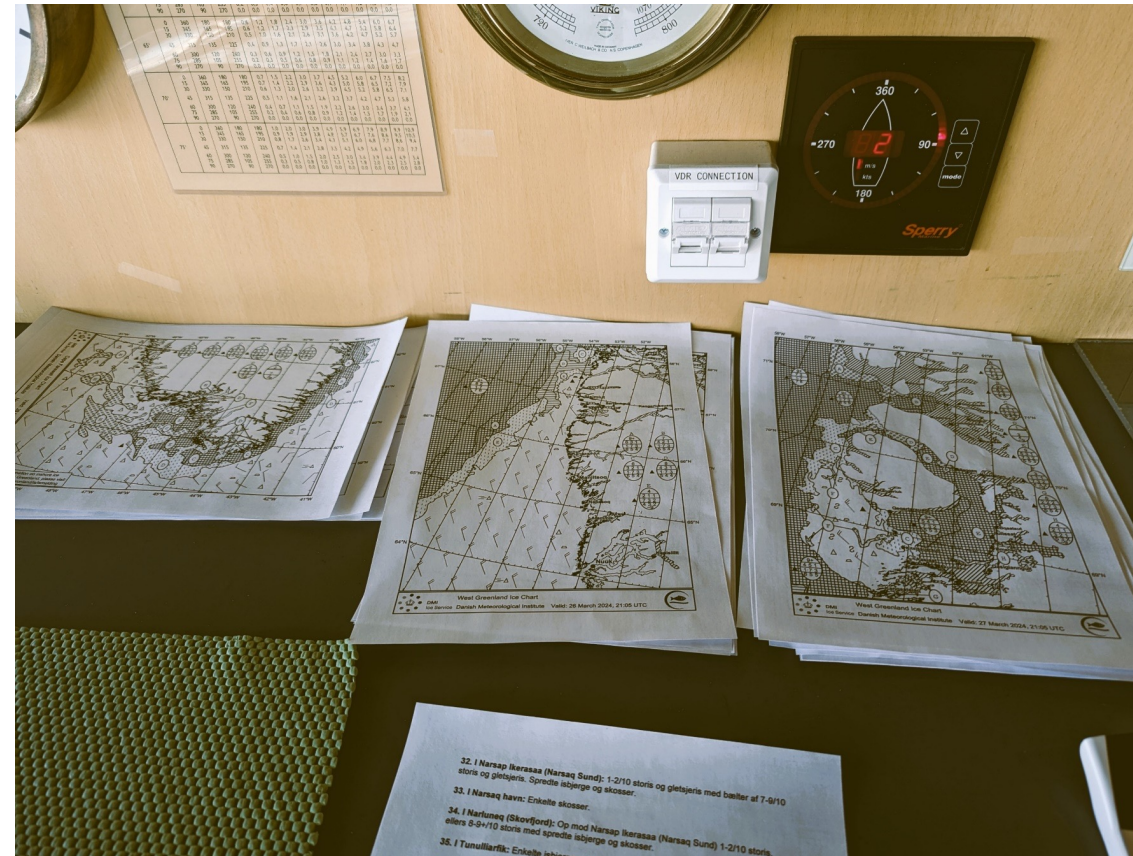
Two icebreakers are on the way to rescue ice-locked ships on Northern Sea Route





Current Solution

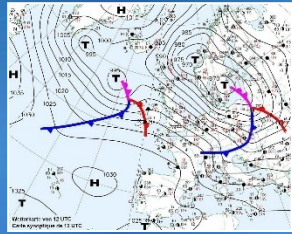
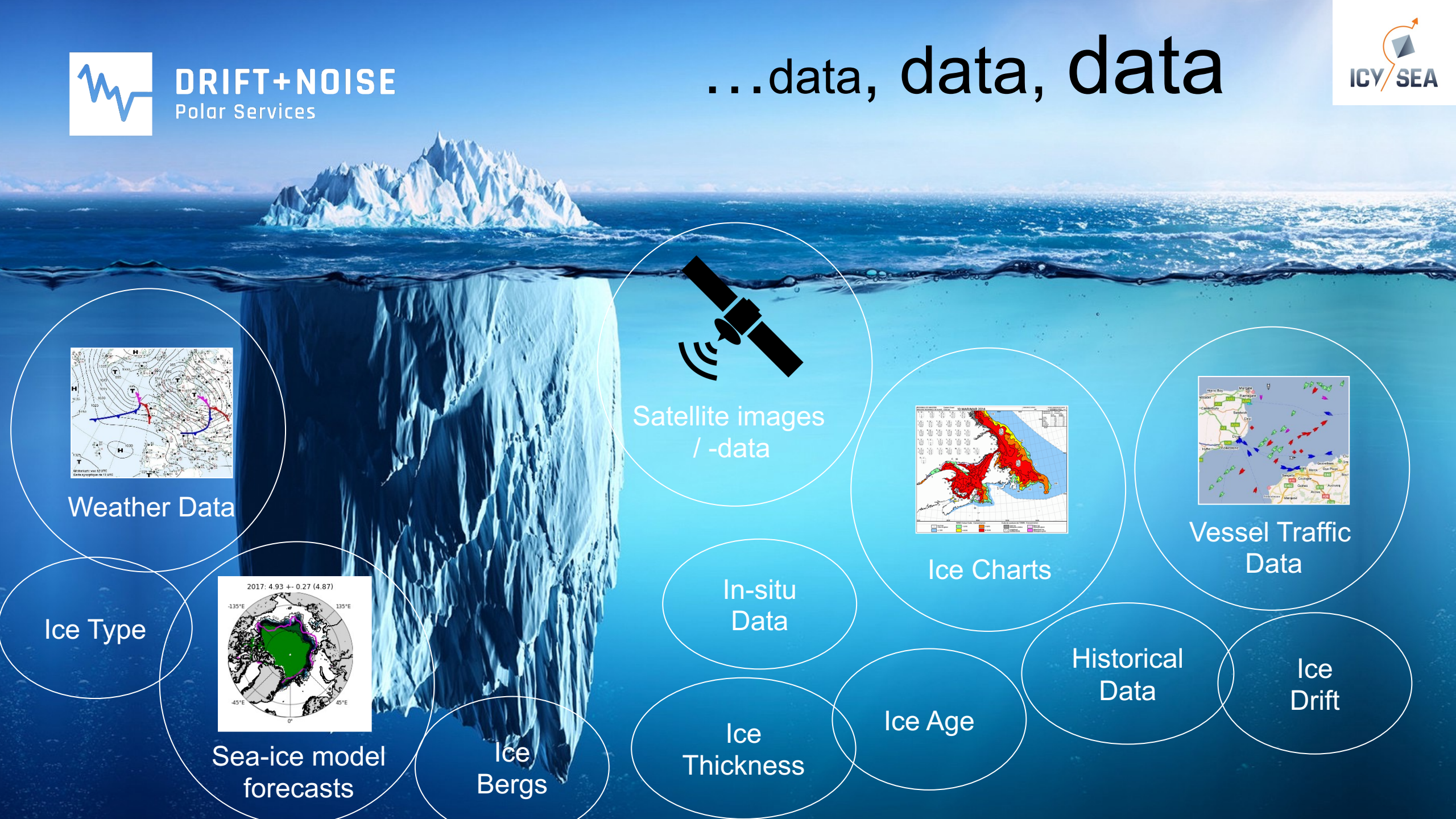
Level of Digitization
on many vessels
2024





DRIFT+NOISE
Polar Services

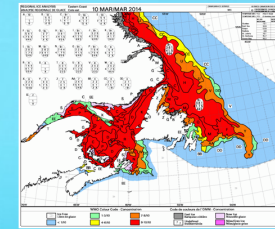
...data, data, data



Weather Data



Satellite images
/ -data

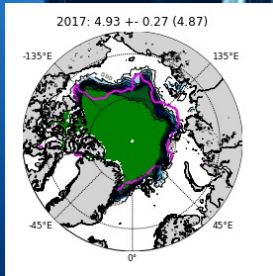


Ice Charts



Vessel Traffic
Data

Ice Type



Sea-ice model
forecasts

Ice
Bergs

In-situ
Data

Ice
Thickness

Ice Age

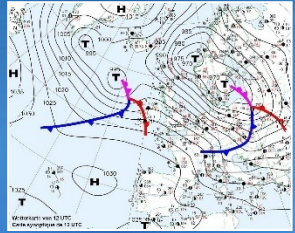
Historical
Data

Ice
Drift



DRIFT+NOISE
Polar Services

...data, data, data



Weather Data



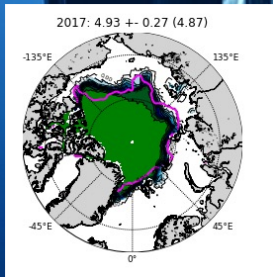
Satellite images
/ -data



Vessel Traffic
Data

!
Actionable
Information

Ice Type



Sea-ice model
forecasts

Ice
Bergs

In-situ
Data

Ice
Thickness

Ice Age

Historical
Data

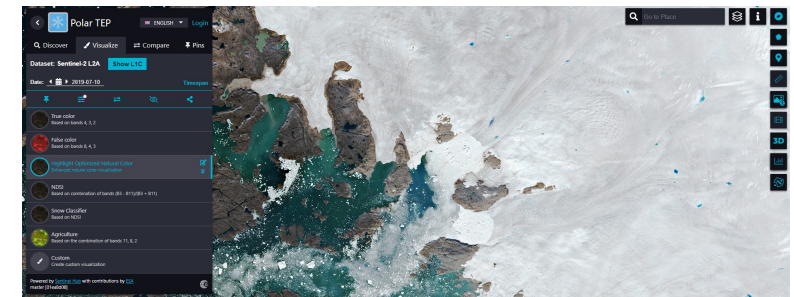
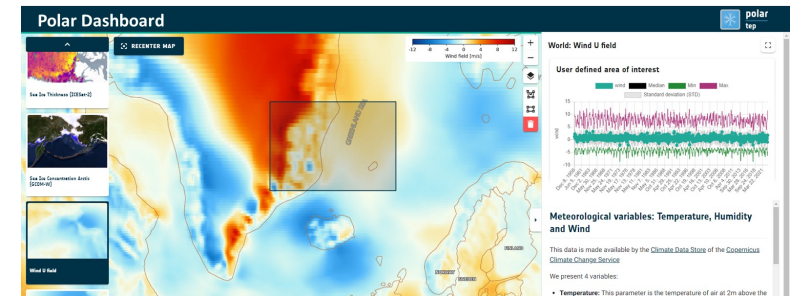
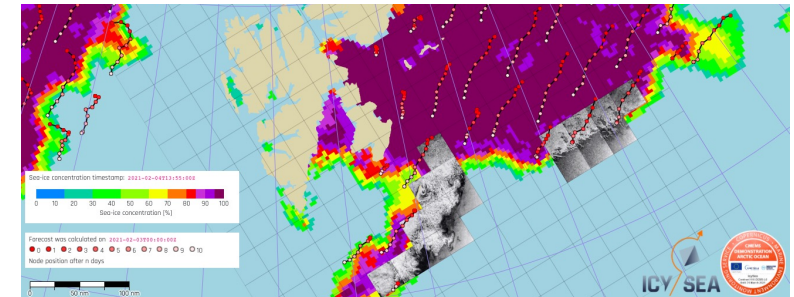
Ice
Drift



Decision Support Platforms

Decision support will be provided in three ways to meet the different needs and levels of sophistication of user groups:

- **IcySea:** Tactical decision support for ships operating in polar regions.
- **Polar Dashboard:** Strategic decision support for policy analysts and residents.
- **Polar TEP:** Research collaboration platform for private, academic, and public sectors.





IcySea on *Le Commandant Charcot*



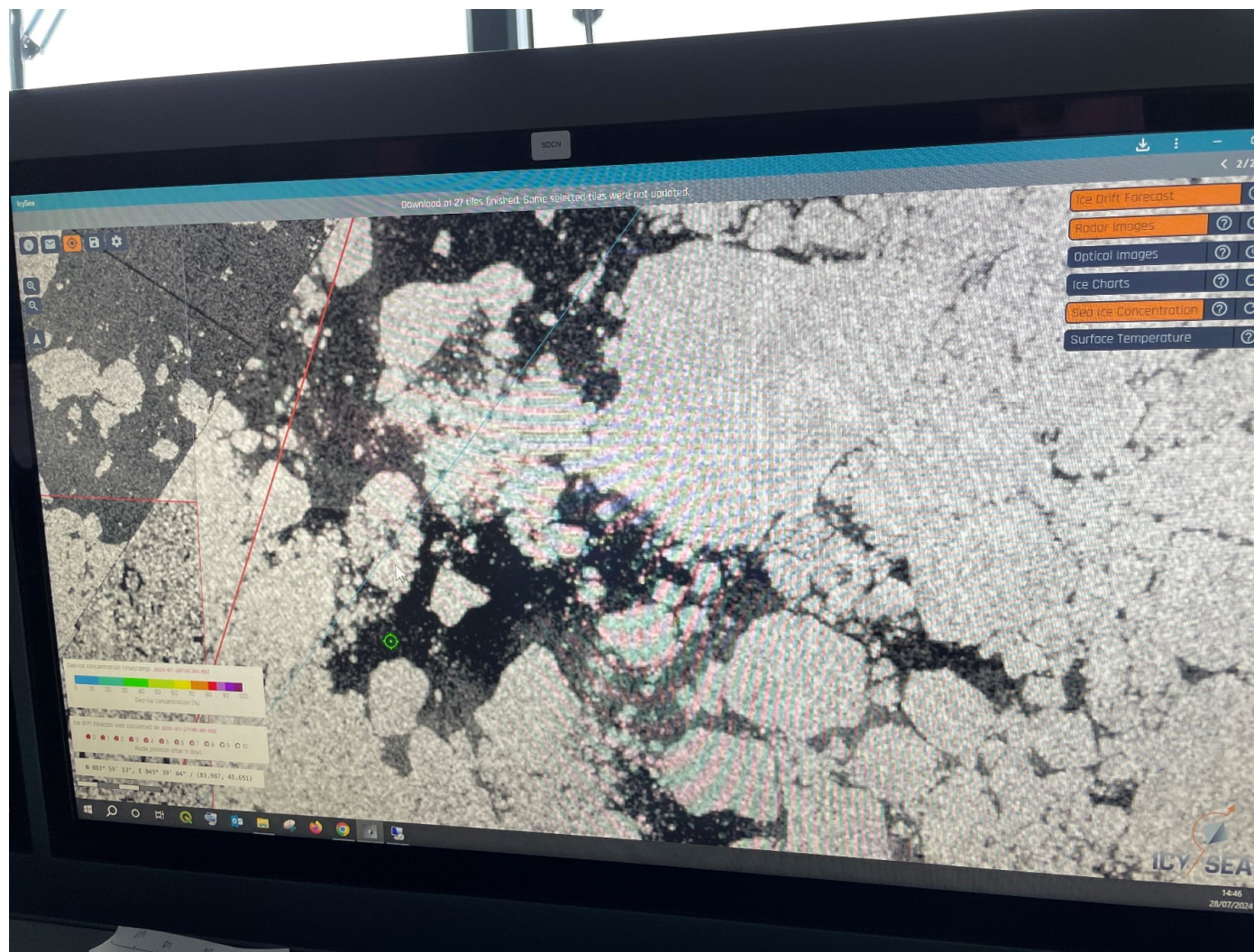


IcySea on *Le Commandant Charcot*



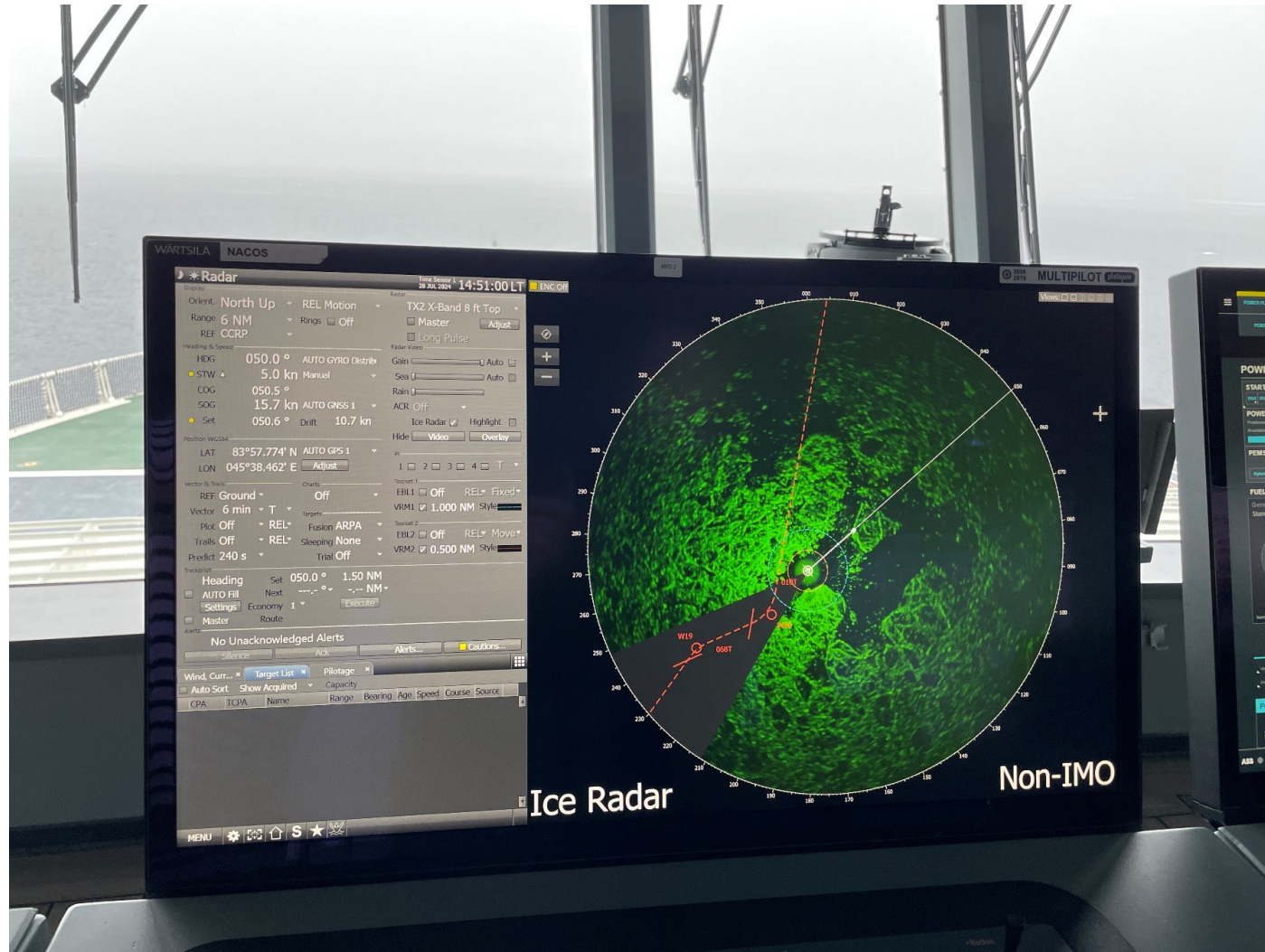


IcySea on *Le Commandant Charcot*





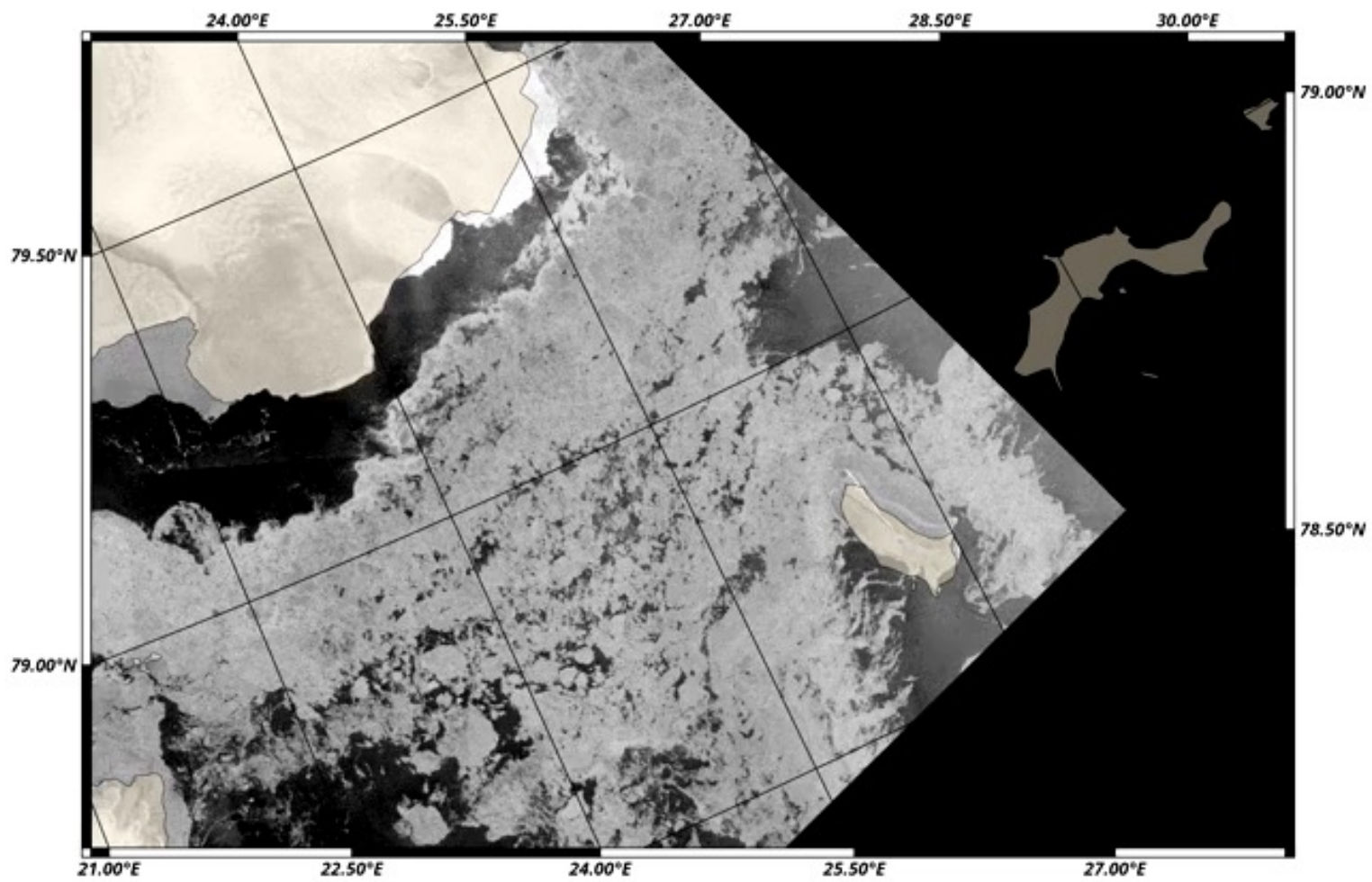
IcySea on *Le Commandant Charcot*





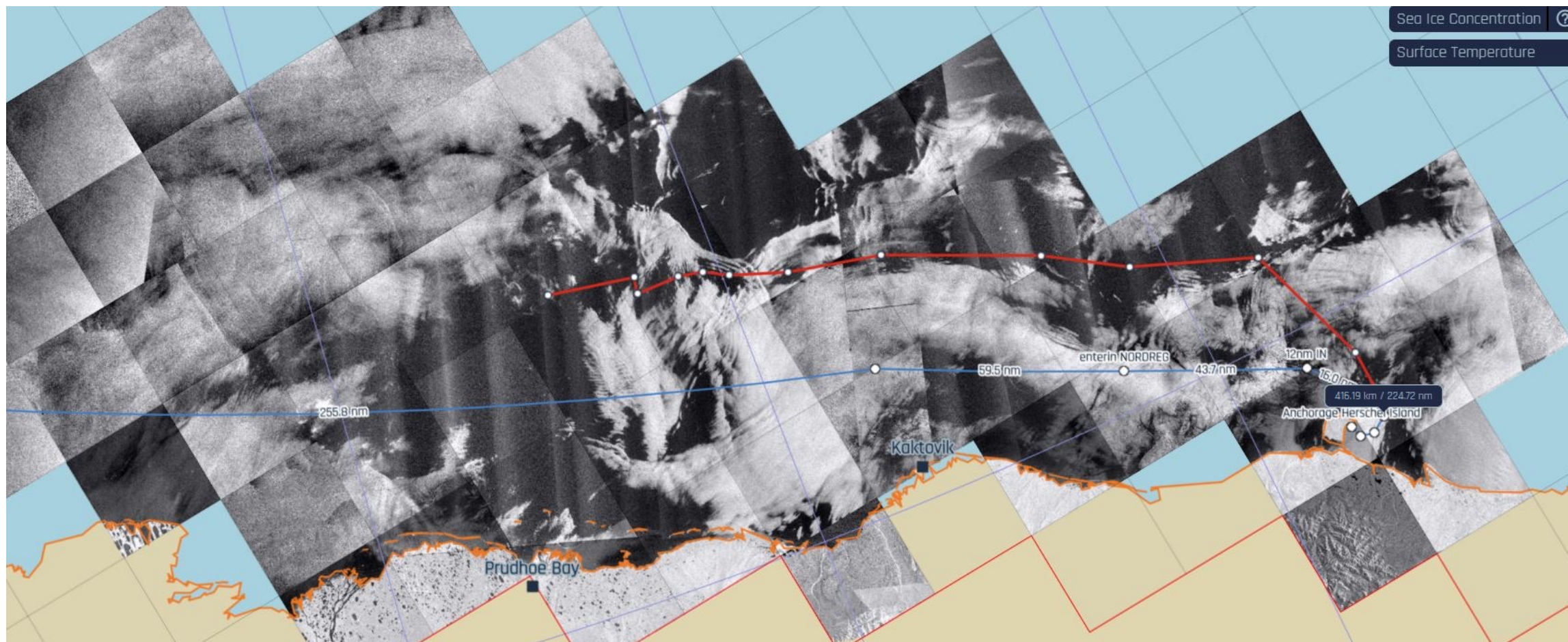
Sea-ice forecasts

2018-05-27 05:33:37 + 0 h



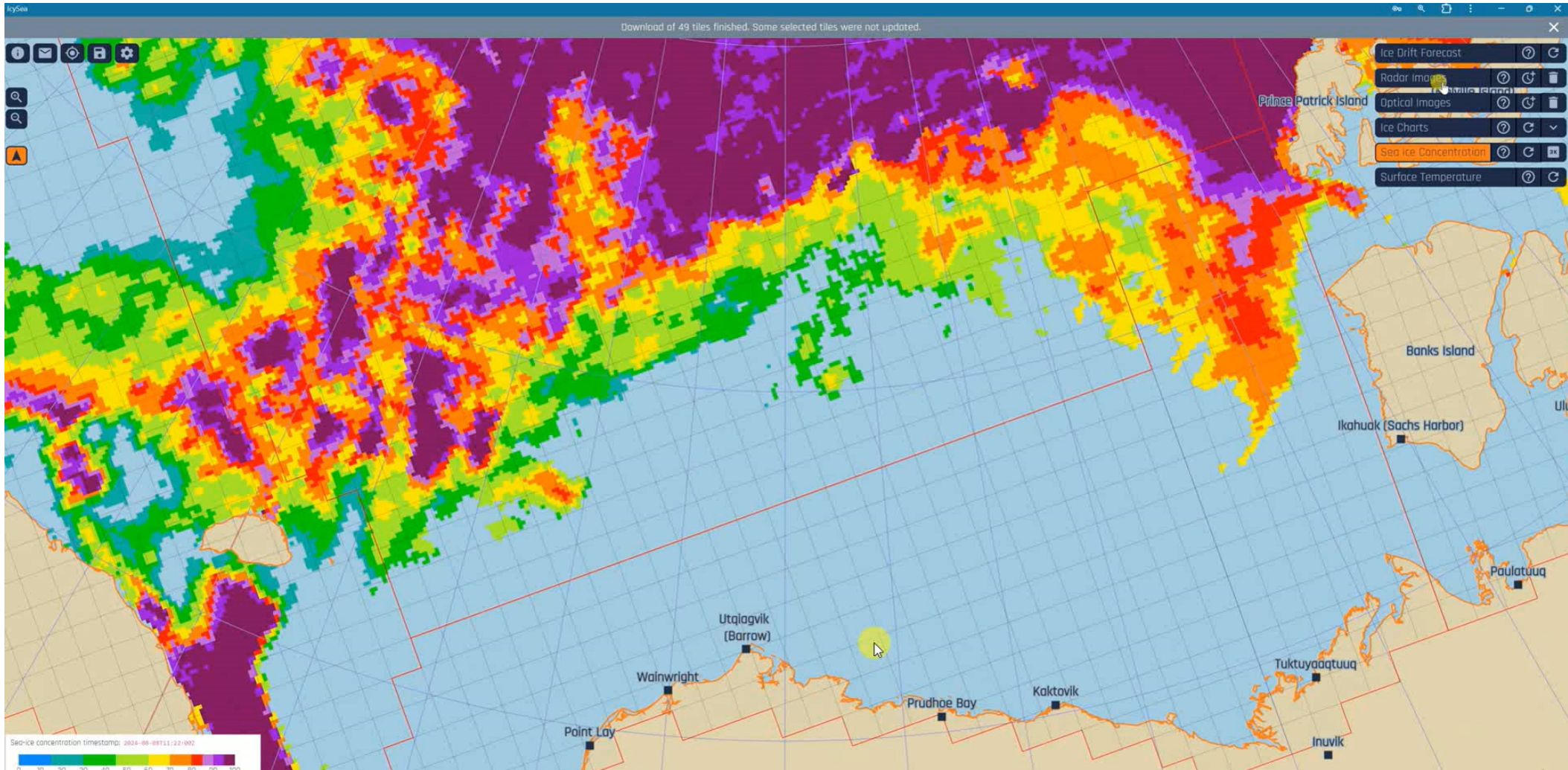


Misinterpretation of Satellite images





Misinterpretation of Satellite images



📍
✉️
📍
📄
⚙️

laujaat



Ampton Island)

Qikiqtaaluk (Baffin Island)

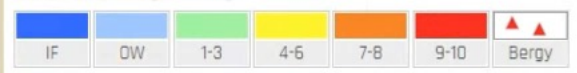
(GRØNLAND)

ISLA

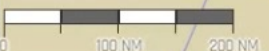
Ungava Peninsula

Ice Charts timestamp: 2024-04-25T00:00:00Z

Ice concentration (In tenths)



N 067° 56' 31", W 034° 37' 37" / (67.942, -34.627)



Ice Drift Forecast ? ↺

Classified Radar Images ? ↺ 🗑️

RCM Radar Images ? ↺ 🗑️

Radar Images ? ↺ 🗑️

Optical Images ? ↺ 🗑️

Ice Charts ? ↺ ⬆️

Source
U.S. National Ice Center ▼

Presentation

- Ice Concentration
- Stage of Development
- POLARIS

Sea Ice Concentration ? ↺ ⌨️

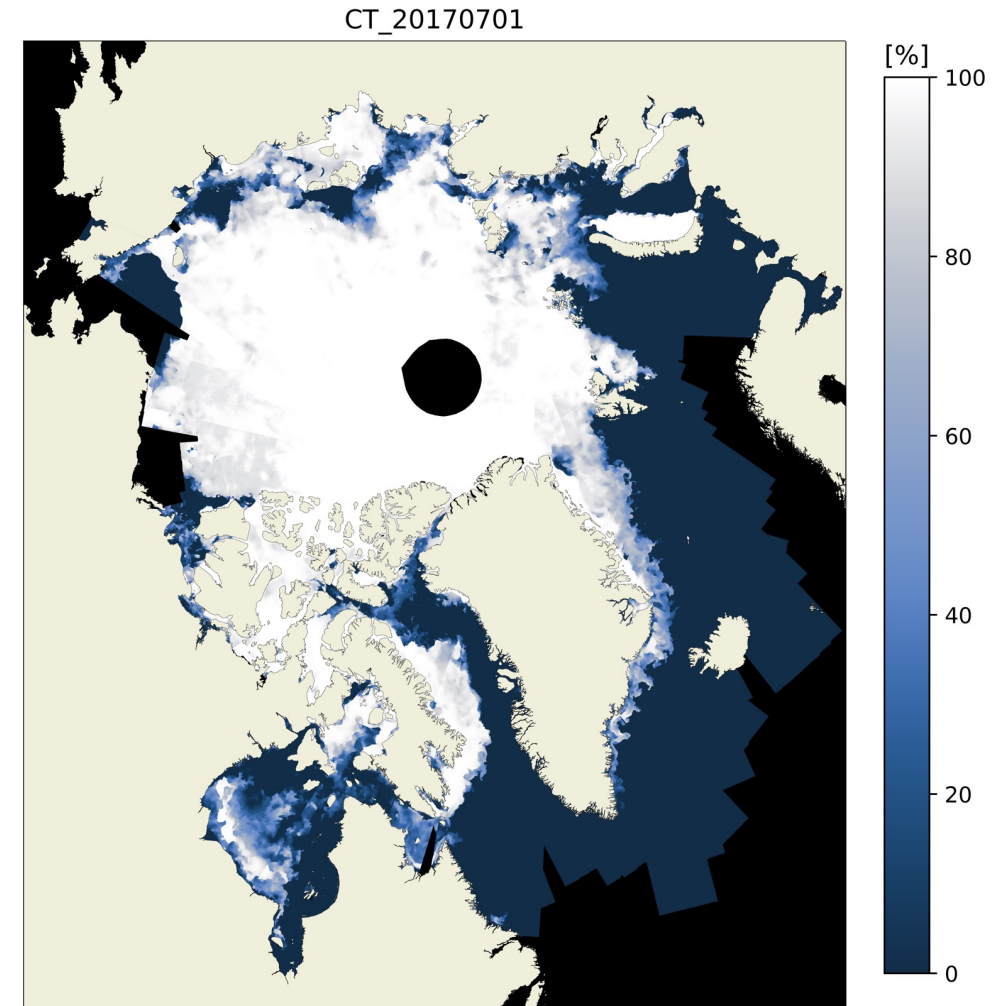
Surface Temperature ? ↺





Automated Image Interpretation

- Automated SAR image interpretation using the DMI ASIP ML algorithm:
 - Concentration
 - Stage of Development
 - Floe Size
- Includes uncertainties
- Can use S1 and RCM data
- **See:** Wulf, Tore, et al. "Pan-Arctic Sea Ice Concentration from SAR and Passive Microwave." *Cryosphere Discussions* (2024).



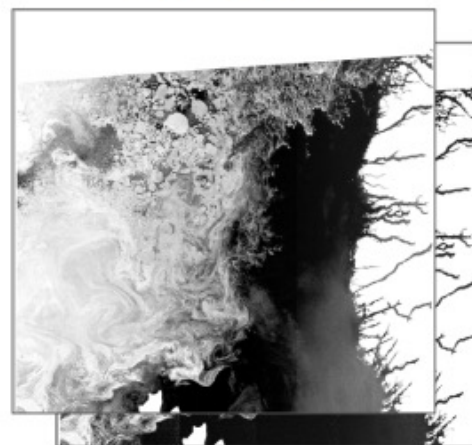


Automated Image Interpretation

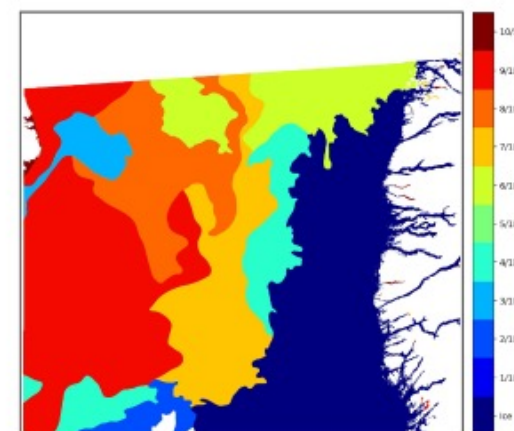
Training Data

- 5382 Sentinel-1 scenes
 - 5292 training
 - 40 validation
 - 50 test
- Corresponding manual ice charts
- Corresponding Passive Microwave AMSR2 scenes

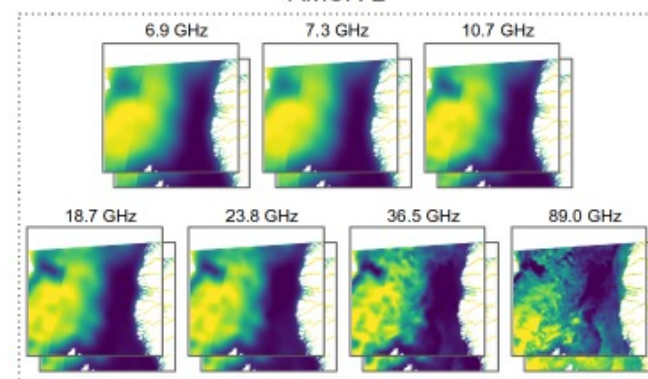
Sentinel-1 EW HH/HV



Ice Chart - Sea Ice Concentration



AMSR-2

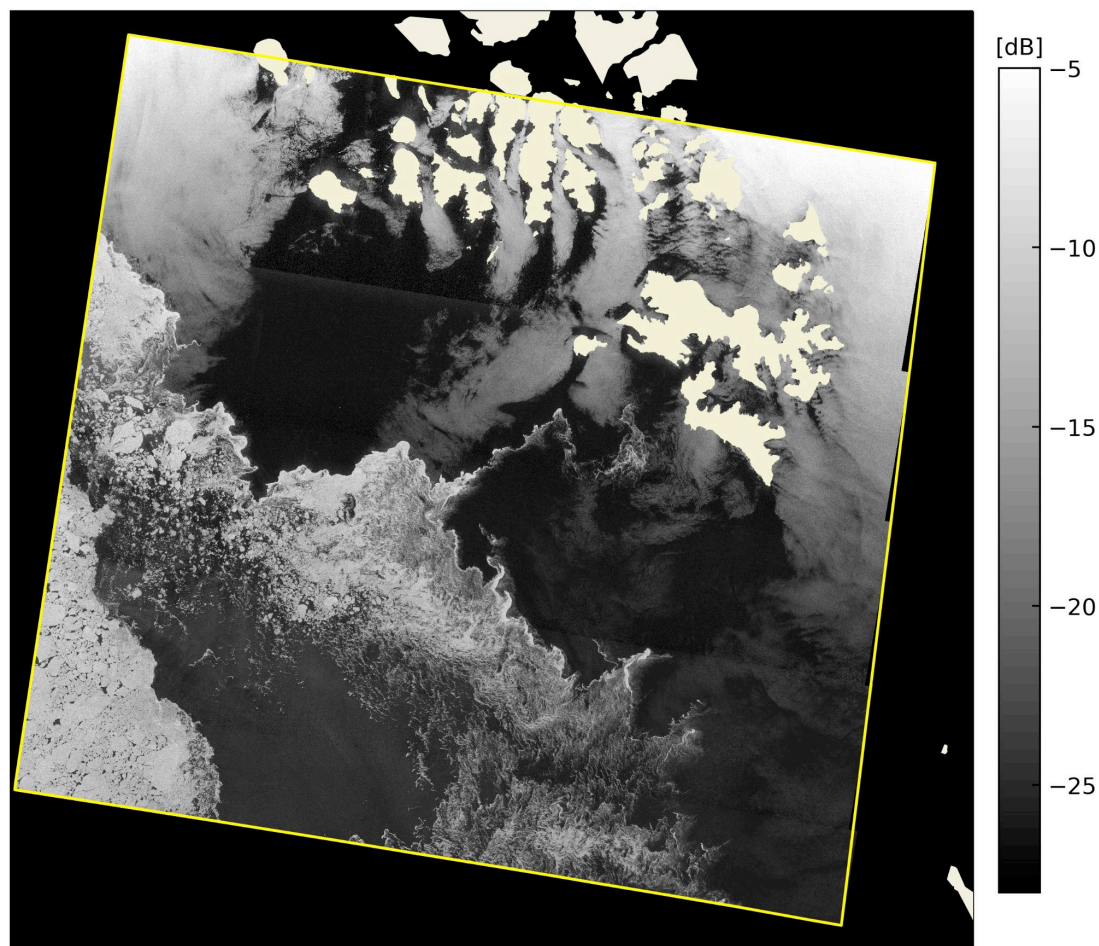


Wulf, Tore, et al. "Pan-Arctic Sea Ice Concentration from SAR and Passive Microwave." *Cryosphere Discussions* (2024).

Tore Wulf, twu@dmi.dk, Danish Meteorological Institute



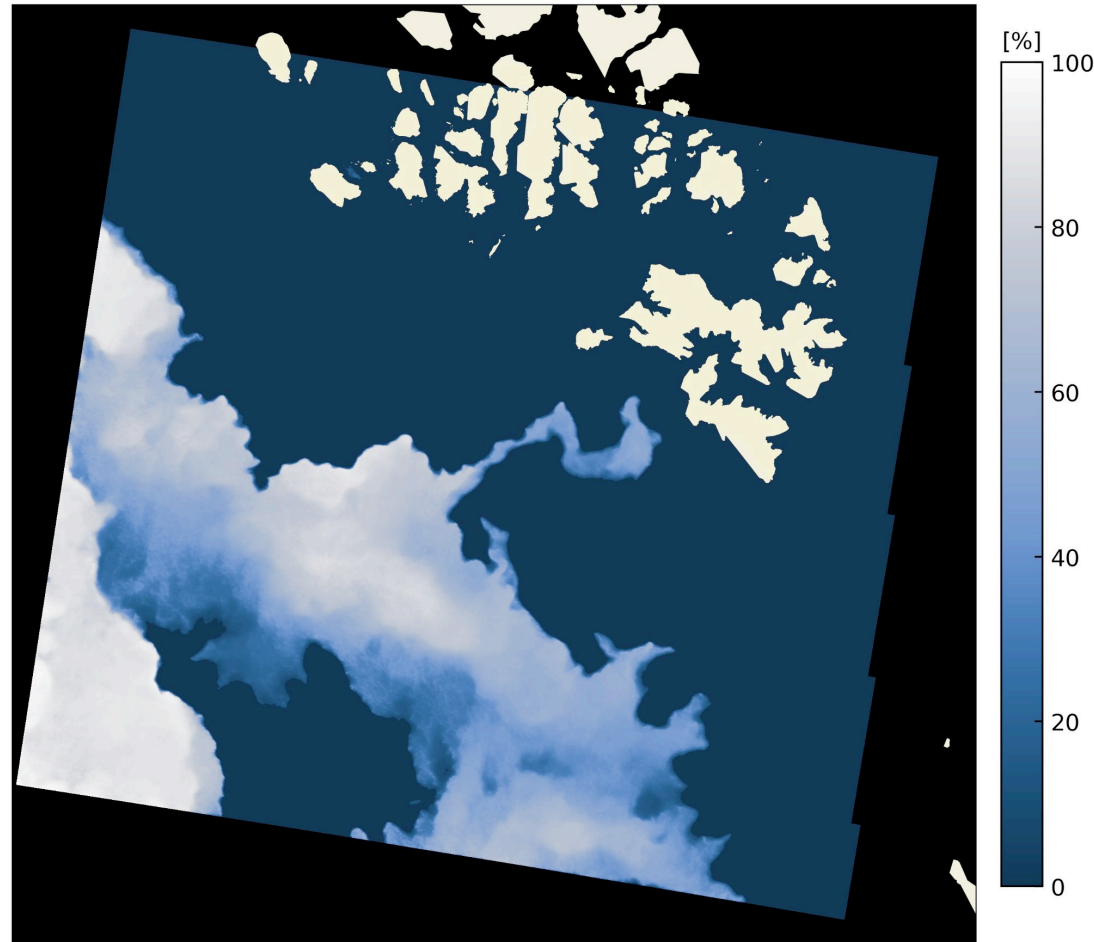
Automated Image Interpretation



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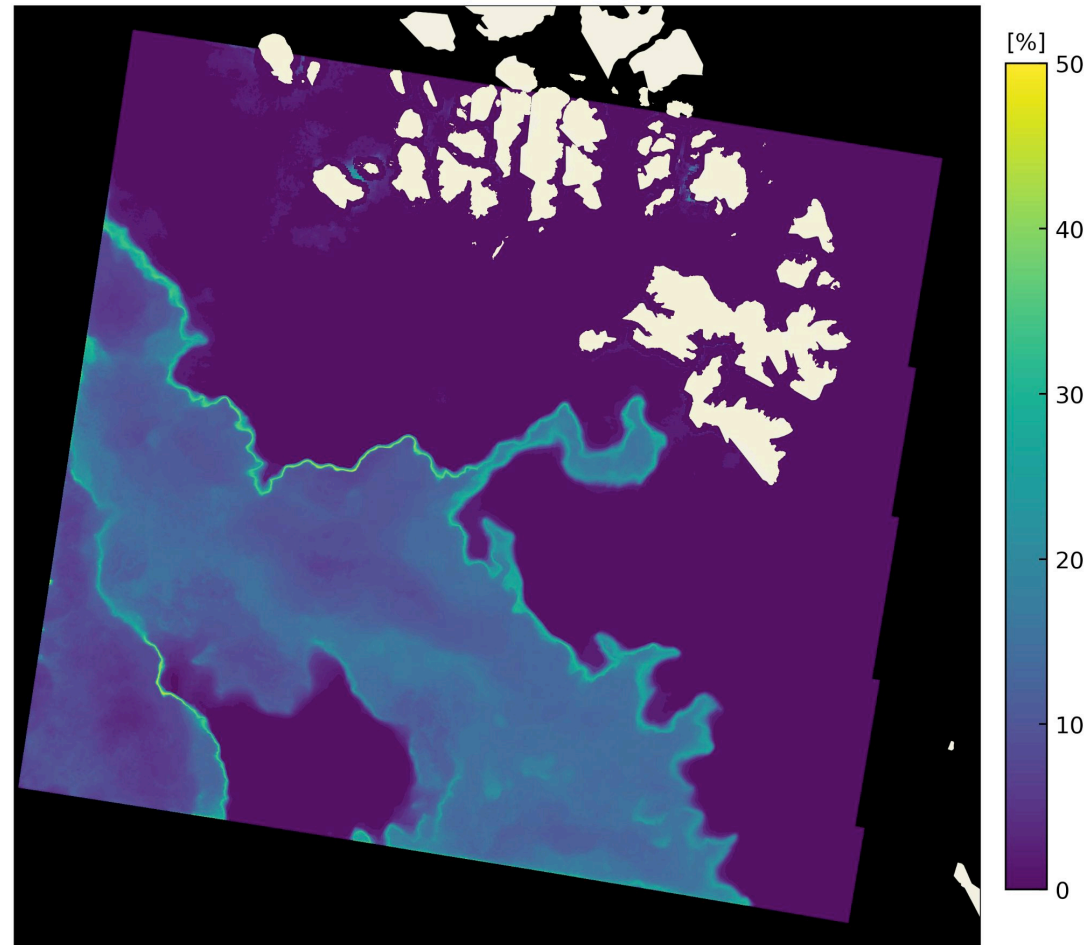
Automated Image Interpretation



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Automated Image Interpretation



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Route Optimization

14:12

Your location

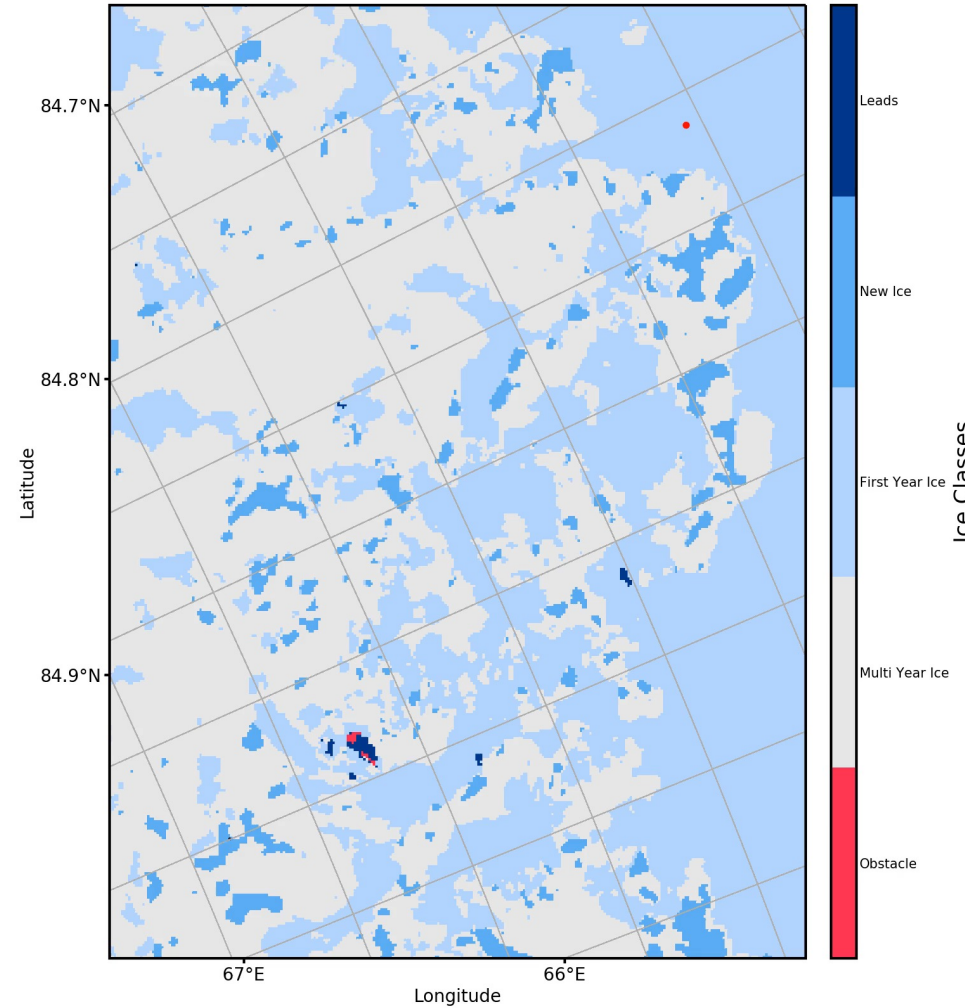
Murmansk

3 hr 46 3 hr 58 3 days 19 hr

76 hr 35 min (1003 nm)

Fastest route now due to ice conditions

Start Steps & more





For More Information

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