Copernicus Marine Service

Danish Meteorological Institute

EU Coastal Use Cases Workshop

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Disko Bay ocean and sea ice forecast

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Danish Meteorological Institute

PROGRAMME OF THE EUROPEAN UNION

Copernicus Europe's eyes on Earth

implemented by MERCATOR OCEAN INTERNATIONAL

Consortium – introduction to DMI

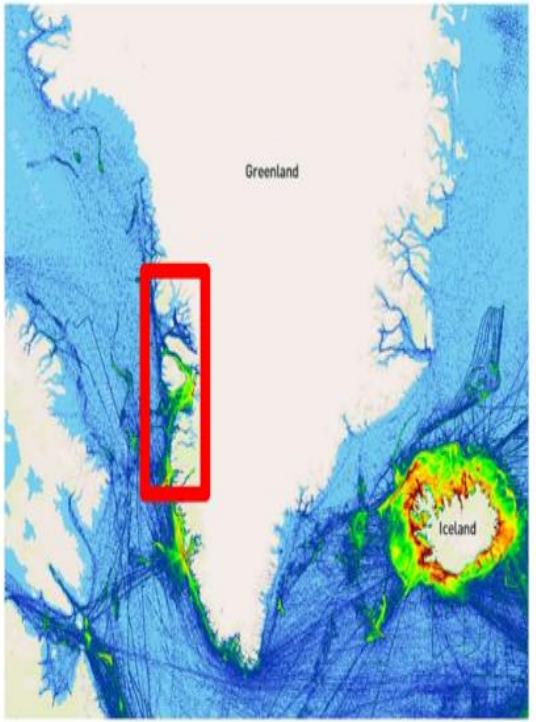
- The Danish Meteorological Institute (DMI) is responsible for the Greenlandic ice service and oceanographic+meteorological weather bulletin's around Greenland.
- Produces sea ice, ocean and weather information for the Greenlandic waters
- Primary goals:
  - Safety at sea
  - Support security around Greenland
- DMI contributes to the Copernicus marine services (relevant to the Arctic):
  - Sea ice (ice charts – manual and automated)
  - Iceberg detections
  - Sea/sea ice surface temperatures
  - Arctic Marine forecast

Motivation

- Waters around Greenland are important infrastructure
- Maritime users often work near the coast
- There are large variations in ice conditions around Greenland
- Ice is an important hazard and opportunity
- Most users work near the coast
- Support to the blue economy
  - It is expected that the number of cruise ships will increase
  - Fisheries is an important income, thus the environmental conditions are important

The DIO service

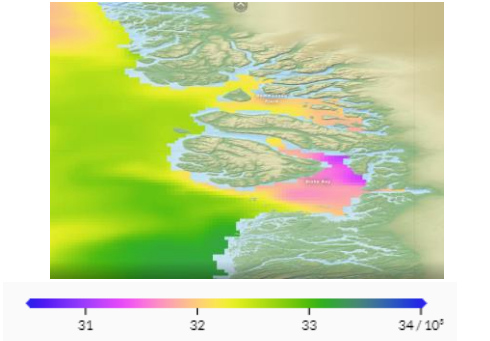
- DIO aim at producing high resolution (~750m) short term forecast for the Disko Bay ocean and sea ice
- Active area for fishing, shipping and tourism
- Sea ice free in summer
- Partly ice covered in winter
- Forecast for 2 ½ days of physical ocean and sea ice parameters
- Includes 6 month hindcast/reanalysis (extended in support of use case 2)
- Based on a coupled ocean and sea model system
- Forced by DMI Harmonie atmospheric model
- Output is used directly and as input to other systems



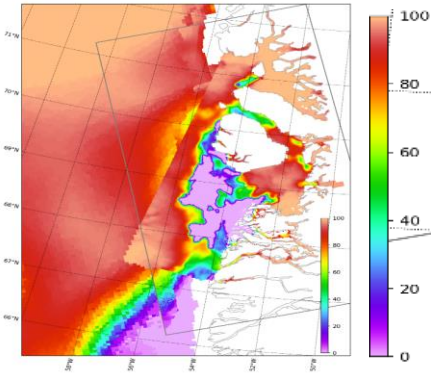
Copernicus Marine service products

- Boundary conditions
  - Arctic Marine forecast
- Assimilation of sea ice and SST
  - Ice charts Greenland
  - Remotely sensed SST products when available
  - Automated ice charts Greenland (ASIP)
    - Similar Pan Arctic are launched in November
- Validation
  - Primarily Copernicus remotely sensed data
- Wish from Copernicus
  - Higher frequent boundary conditions
  - Level 2 (none gridded) data from remotely sensed observations

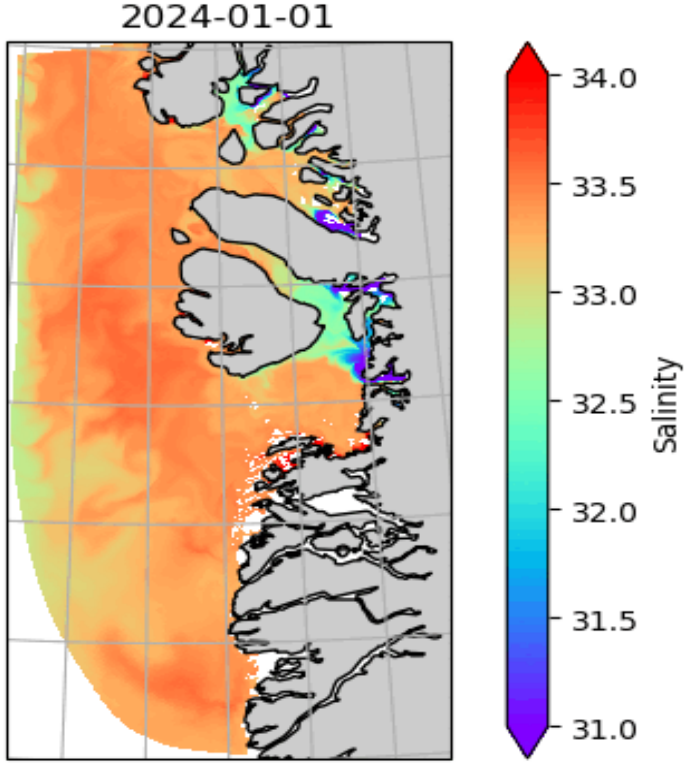
SSS ArcMFC from Copernicus viewer

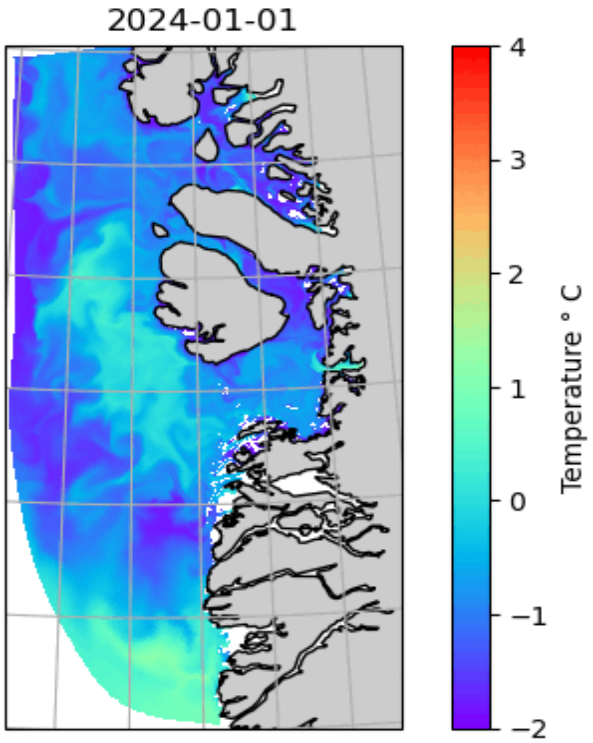


Ice cover from OSISAF and ASIP

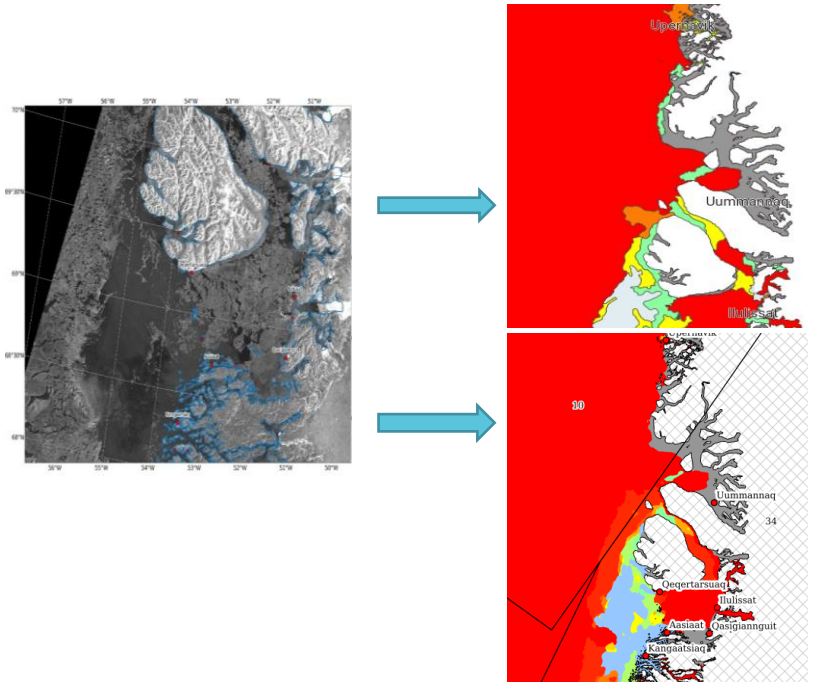


January 2024 surface temperatures and salinity





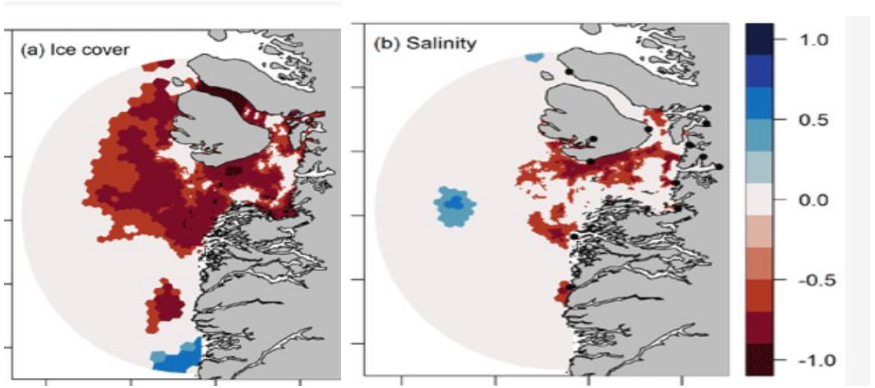
Use case 1 ice service



- Ice service has traditionally used remotely sensed products
- The ice service act as a connection to external users at DMI
- At the same time the ice service products serve as assimilation and verification
- Feeds into the e.g. Royal Arctic Line, the Navy and piloting services
- DIO aim at improving the near coastal forecast skill

Use case 2 – Aarhus University: Eco system modelling

- Aarhus University and other stakeholders are interested in the ice cover and the state of the ocean in order to monitor the state of the ocean
- Aarhus runs a ecosystem model (Flexem) that requires boundary conditions
- Large scale Copernicus Marine forecasting systems are too coarse
- DIO aim at improving this within the Disko Bay area



Correlation between ice cover/salinity and primary production

Møller, E. F. and Christensen, A. and Larsen, J. and Mankoff, K. D. and Ribergaard, M. cover;Ocean Science; 2023;403-420;10.5194/os-19-403-202H., Sejr, M. and Wallhead, P. and Maar, M.;