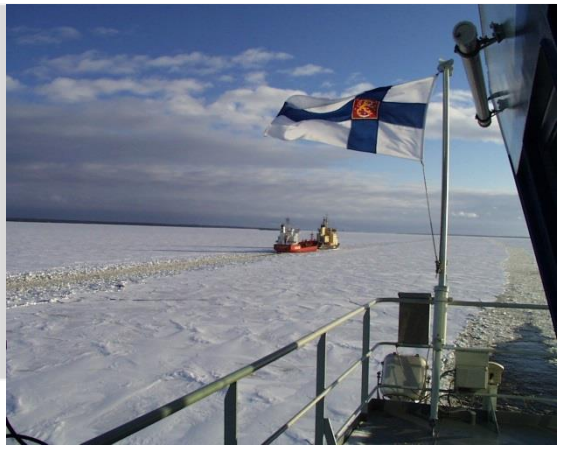

Photo: Tapio Nyman

http://www.polarice.eu/

# POLAR ICE – Integrated Arctic and Antarctic Sea Ice monitoring Services

**Robin Berglund, Lauri Seitsonen, Teppo Veijonen**
**VTT Technical Research Centre of Finland Ltd**
**Marko Mäkynen, Finnish Meteorological Institute**

***Finnish Remote Sensing Days, November 23, 2015***

# The POLAR ICE Project Consortium

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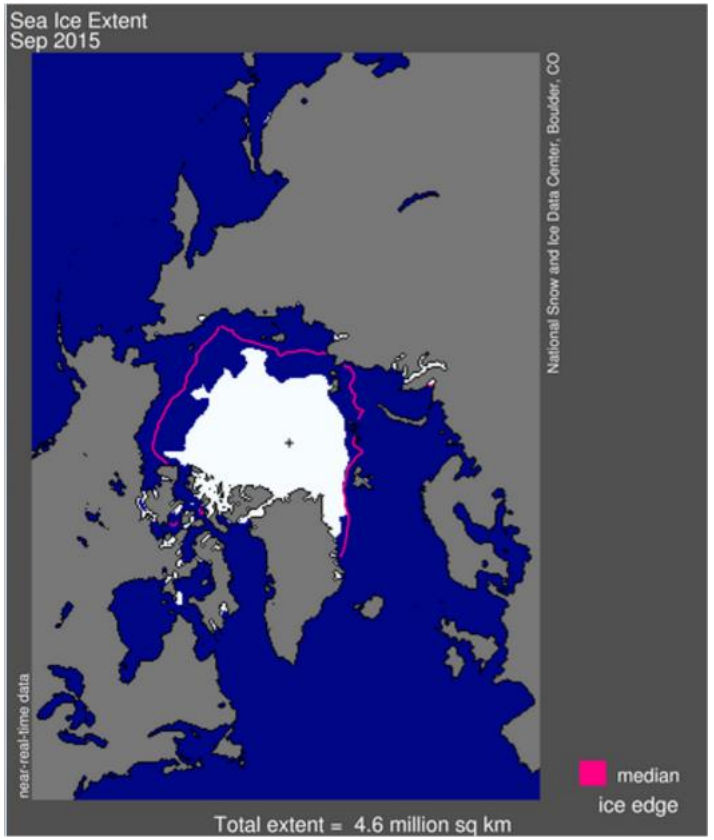
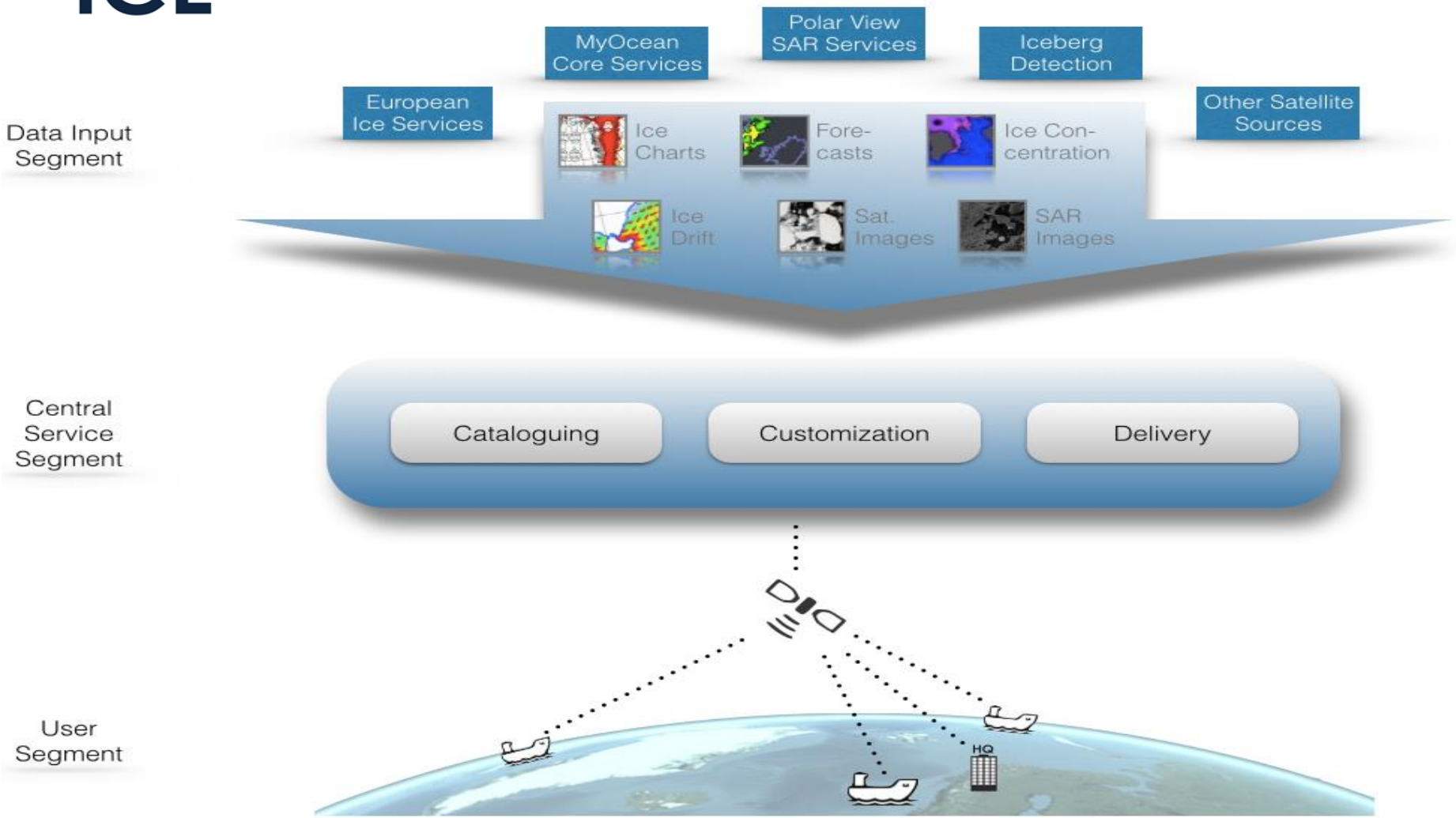
- POLAR ICE is focused on Arctic and Antarctic
- Economically and environmentally important
- Arctic retreat of the sea ice during the last two decades facilitating increase in natural resource development
- Accompanied by increased shipping activity.
- The Antarctic also seeing increased ship traffic driven by fisheries, cruise ships and scientific research
- POLAR ICE project scheduled to finish in June 2016




Arctic Sea Ice extent, Sept. 2015 Source: National Snow and Ice Data Center, Boulder, CO

POLAR ICE

VTT



# Integrated Arctic & Antarctic sea-ice monitoring services

**1. Advanced sea ice information products**

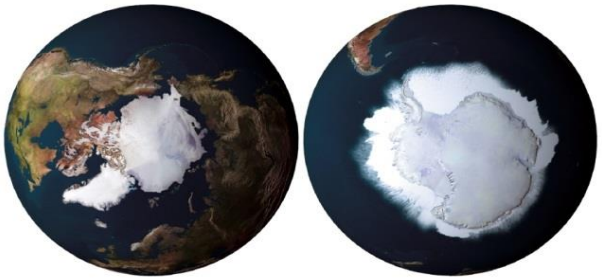
- Sea-ice thickness
- Sea-ice pressure
- Sea-ice forecasts

**2. Focus on Integration & visualisation:**
**Bringing together our products**
**AND many more**

- Operational service integration
- Onboard integration and visualisation

**3. End User Demonstrations**

**4. Business analysis**



Shipping, Oil and Gas, Fishing, Coast Guard, Ice service, Oil Spill, Tourism, Icebergs, Science, Engineering

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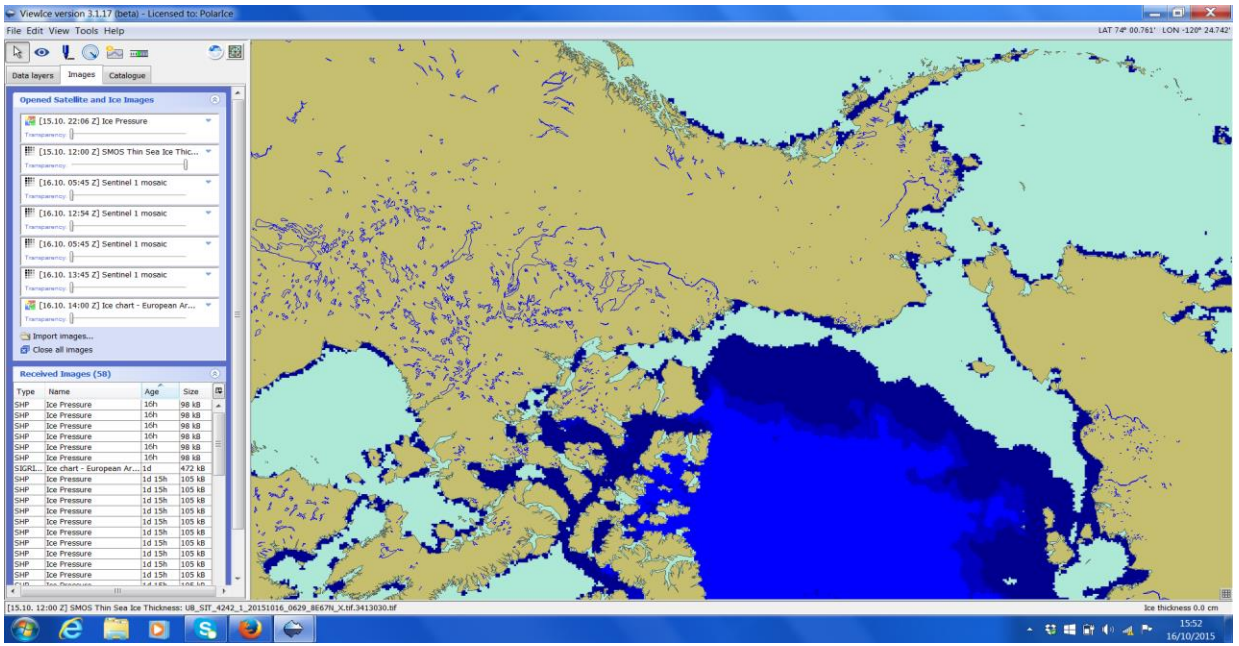
POLAR ICE

**Advanced sea ice information products**

Sea-ice thickness | Sea-ice pressure | Sea-ice forecasts

- Ice thickness very important for transport
- Hard to obtain with satellites
- 3 products:
  - FMI, Bremen, NR

Integration

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nick.walker@eosphere.co.uk

Polar View

FINNISH METEOROLOGICAL INSTITUTE

# POLAR ICE - FMI sea ice thickness chart

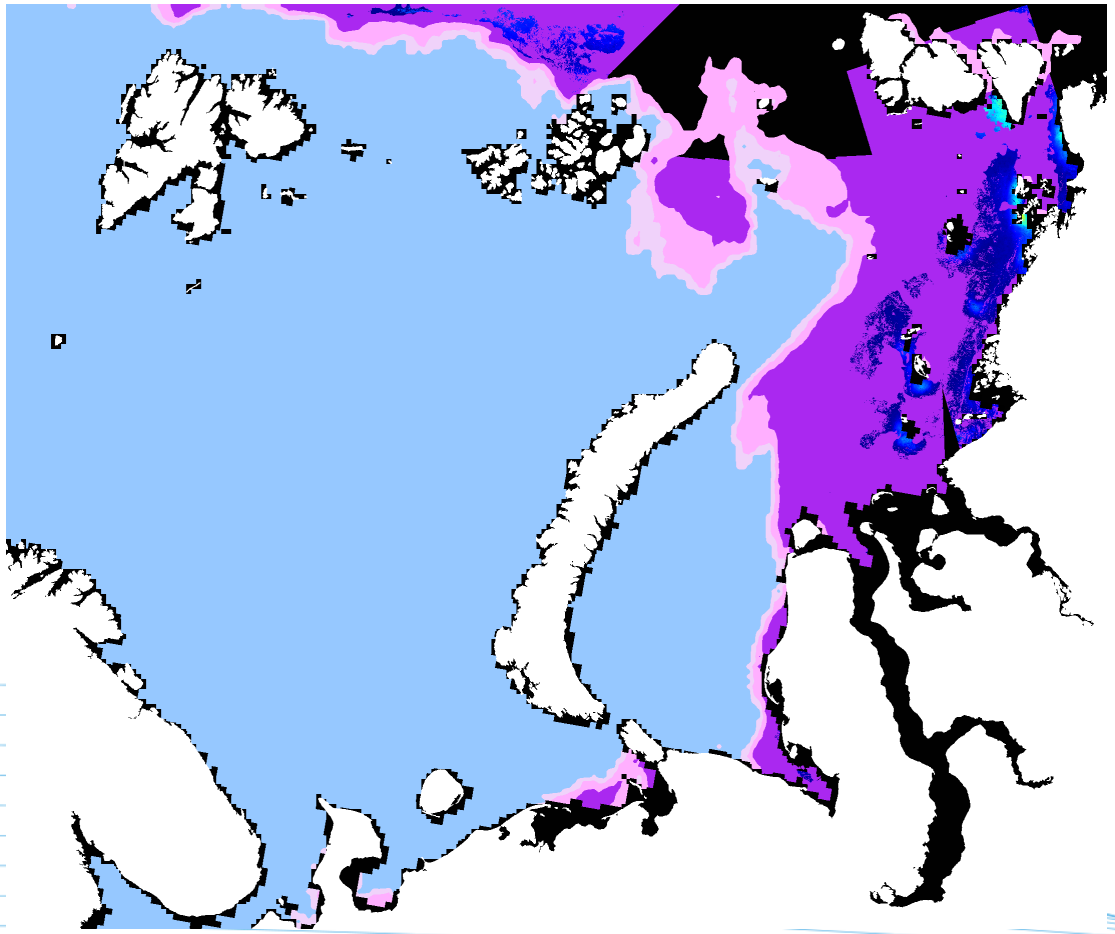


Chart on 19 Nov 2015

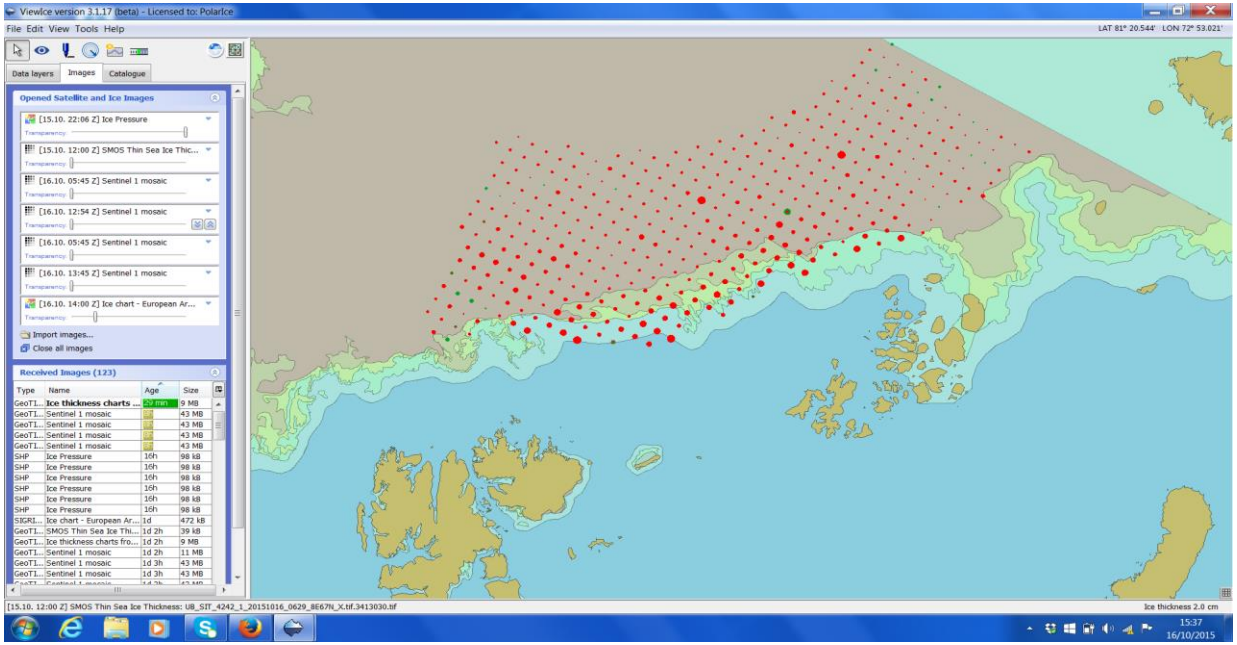
- Satellite data used: AMSR2 radiometer and Sentinel-1 EW SAR. (EW= Extra Wide)
- Radiometer data gives thin ice areas, thickness up to 30 cm.
- Copernicus CMEMS TOPAZ model gives background ice thickness field which is locally modulated by SAR backscatter statistics.
- FYI thickness up to 2.5 m.
- Pixel size 1 km.
- Coverage: Barents and Kara Seas.
- Issued now from Nov 2015 to April 2016 (cold conditions needed).
- Submitted to POLAR ICE daily.
- Further development on-going.

POLAR ICE

**Advanced sea ice information products**

Sea-ice thickness | **Sea-ice pressure** | Sea-ice forecasts

- Ice pressure very important
- Derived from ice drift information
- Ice drift derived from subsequent satellite data acquisitions by DTU

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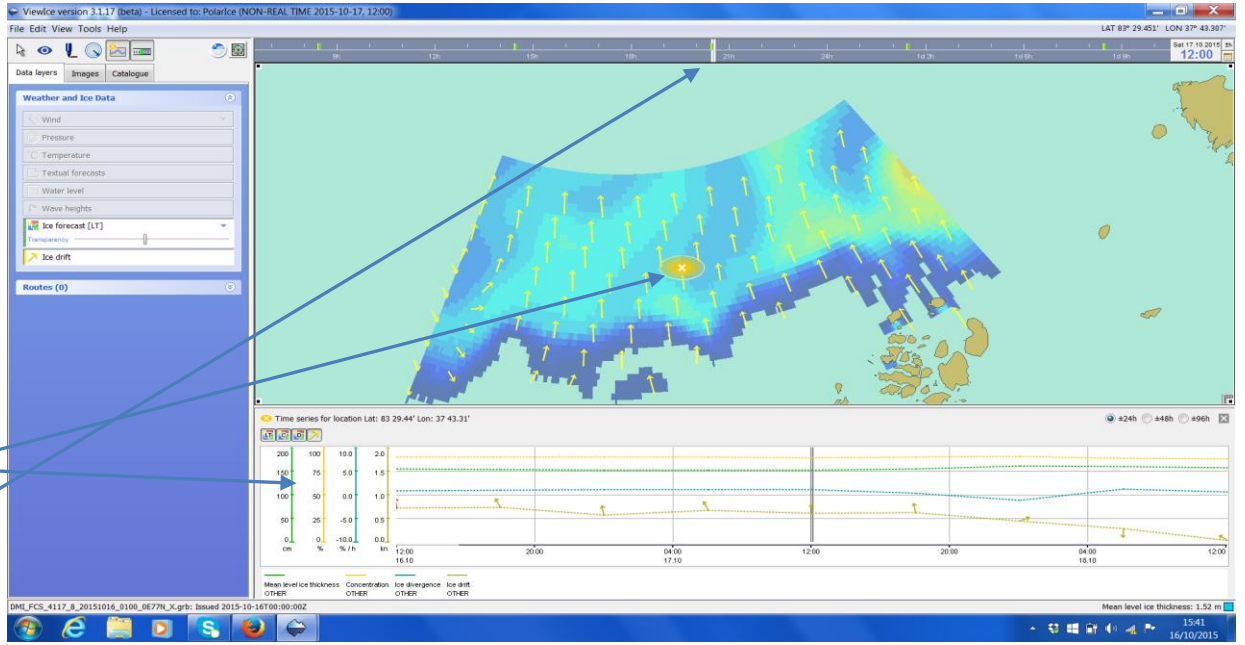
**Advanced sea ice information products**

Sea-ice thickness | Sea-ice pressure | Sea-ice forecasts

- Ice forecasts very important for route planning
- Derived from a model with several inputs
- Can examine parameters at a point
- Can step forward in time

→ Ice thickness, concentration, divergence




Example: Ice concentration forecast in the Kara Sea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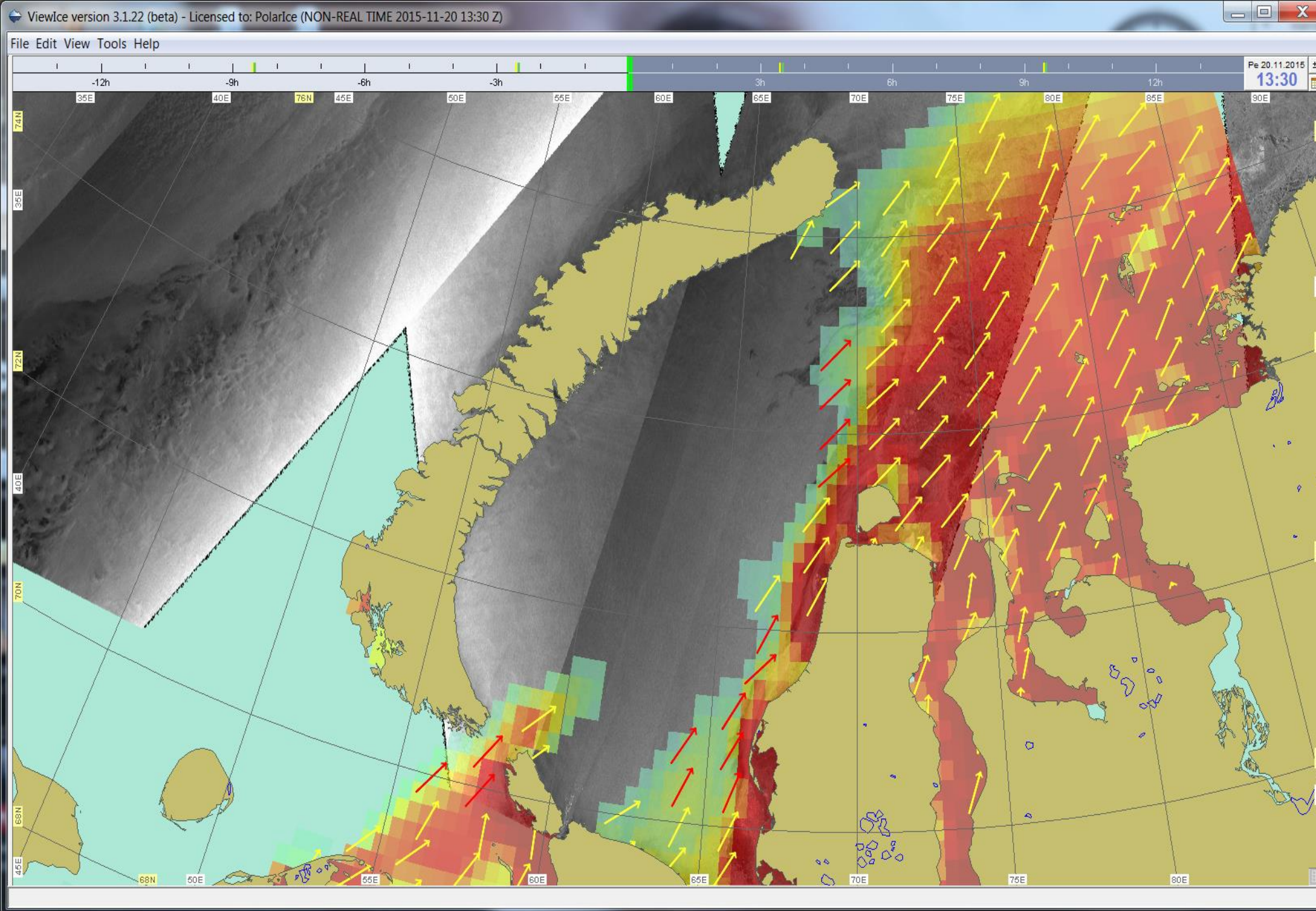
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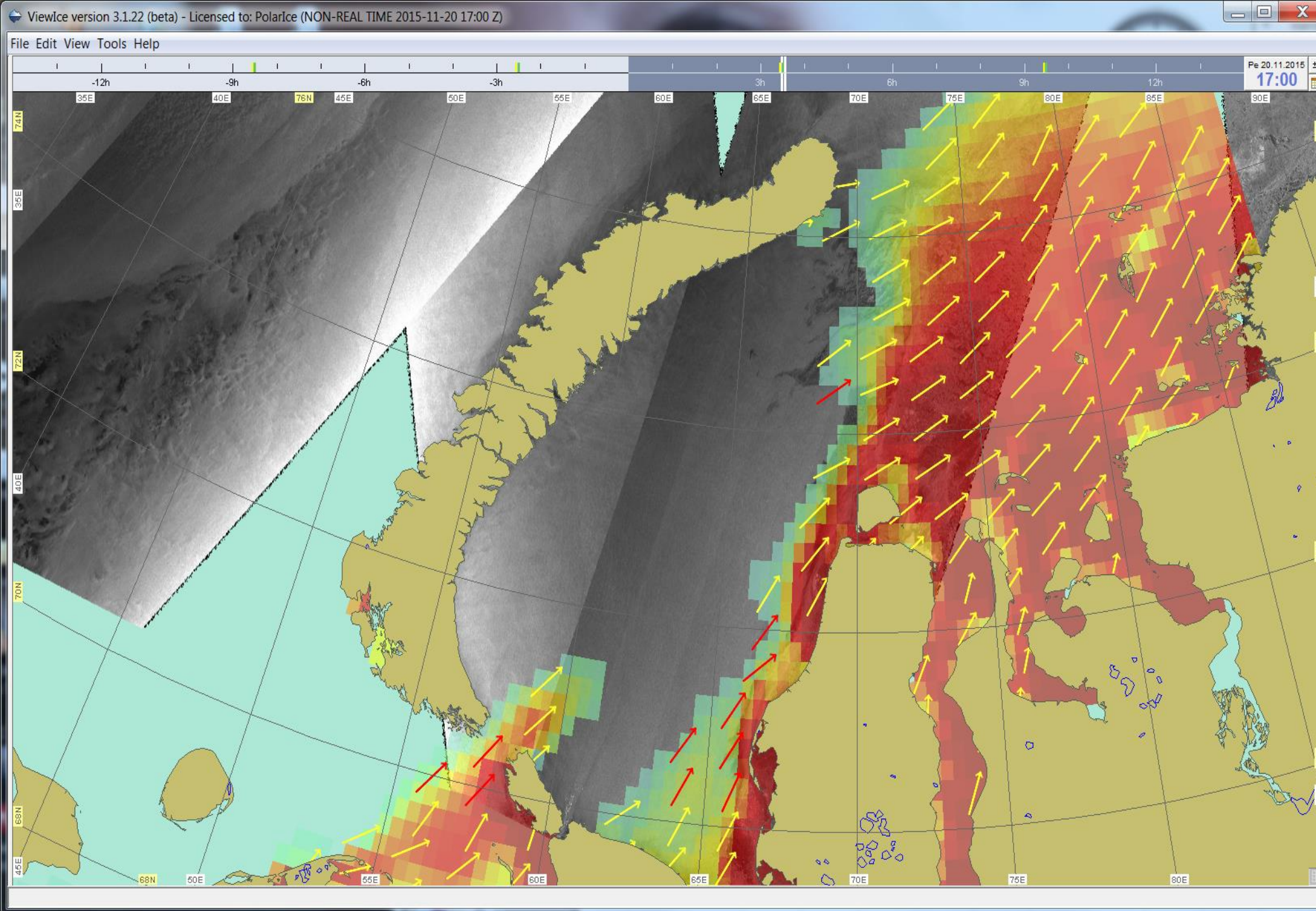
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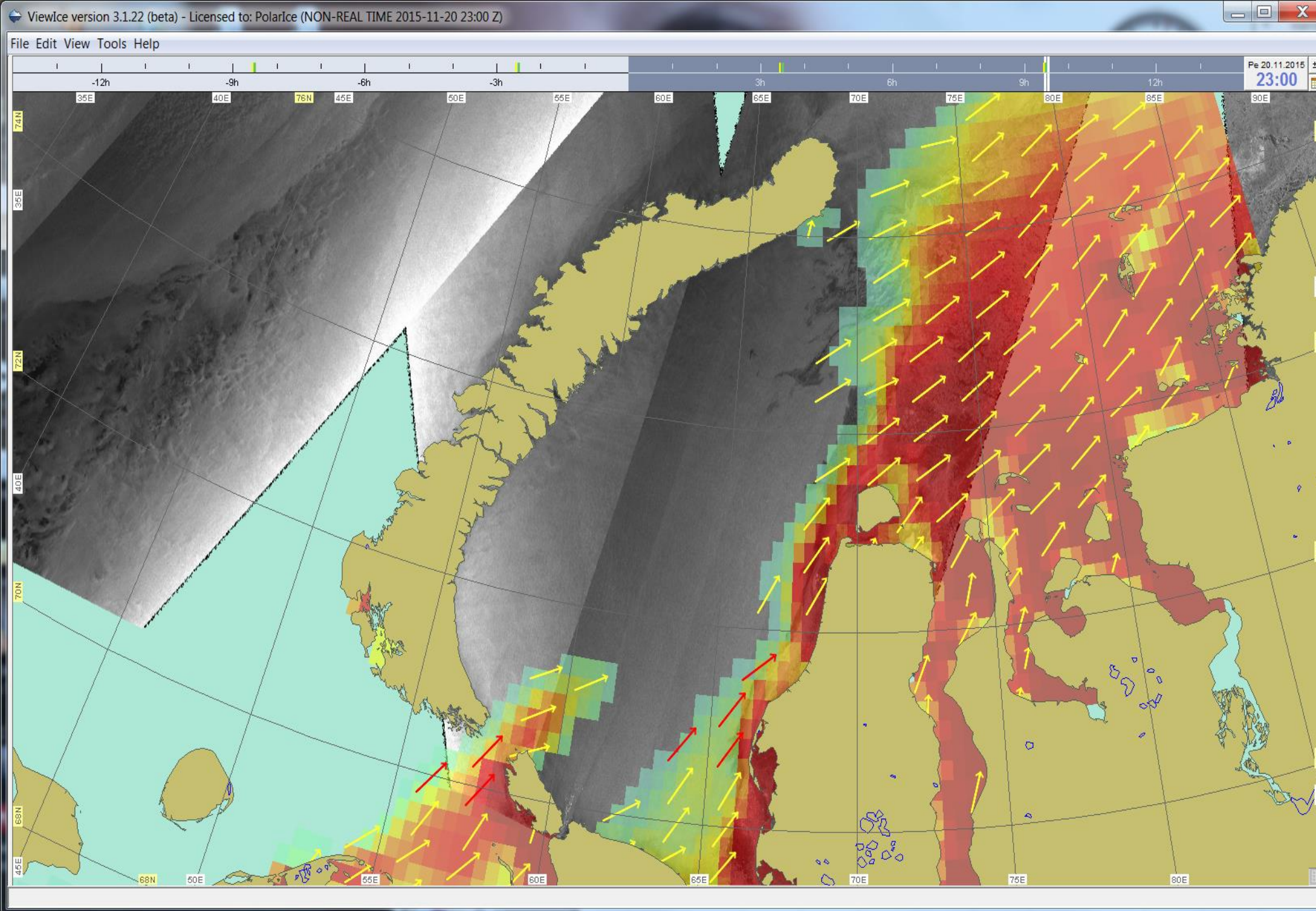
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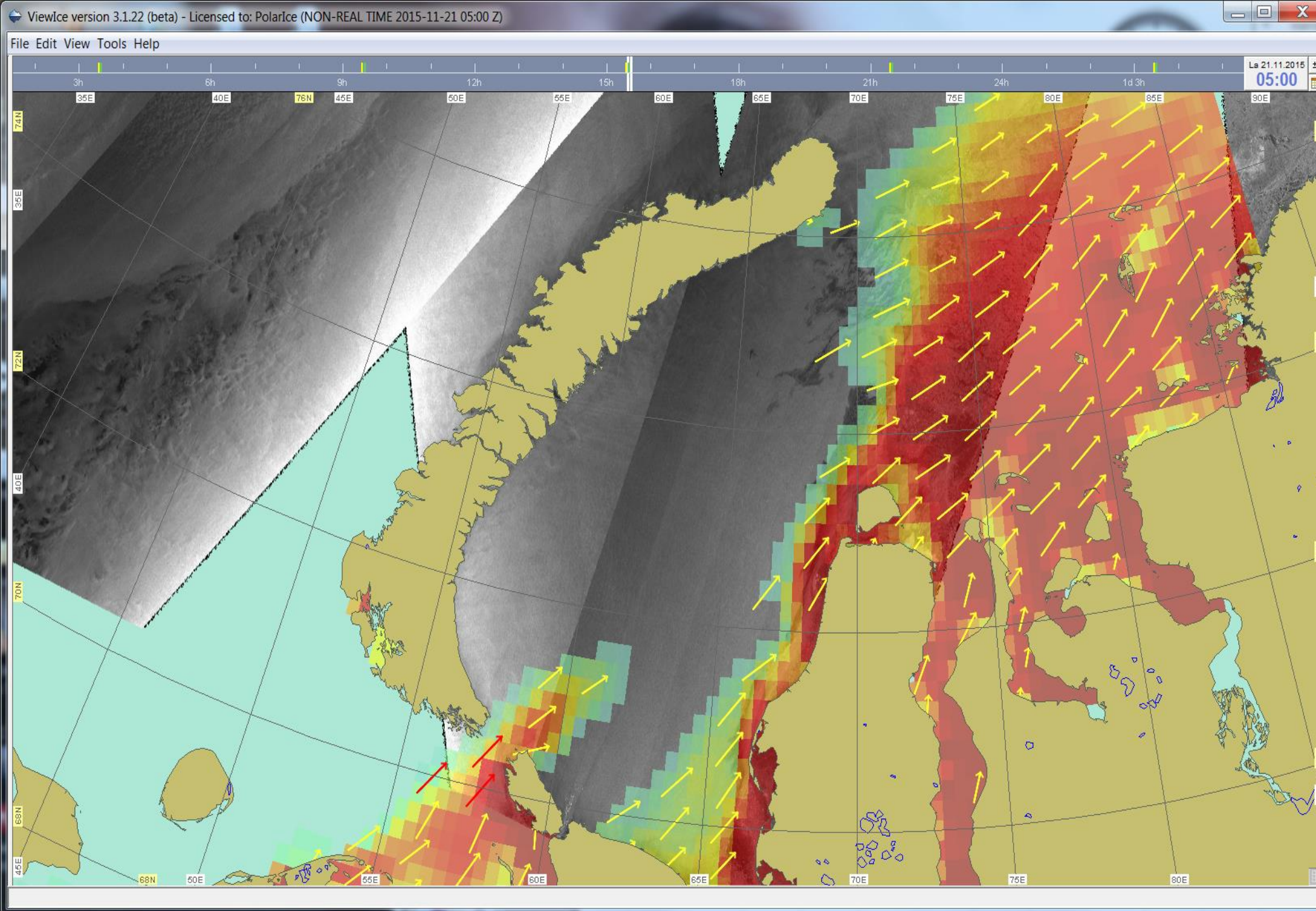
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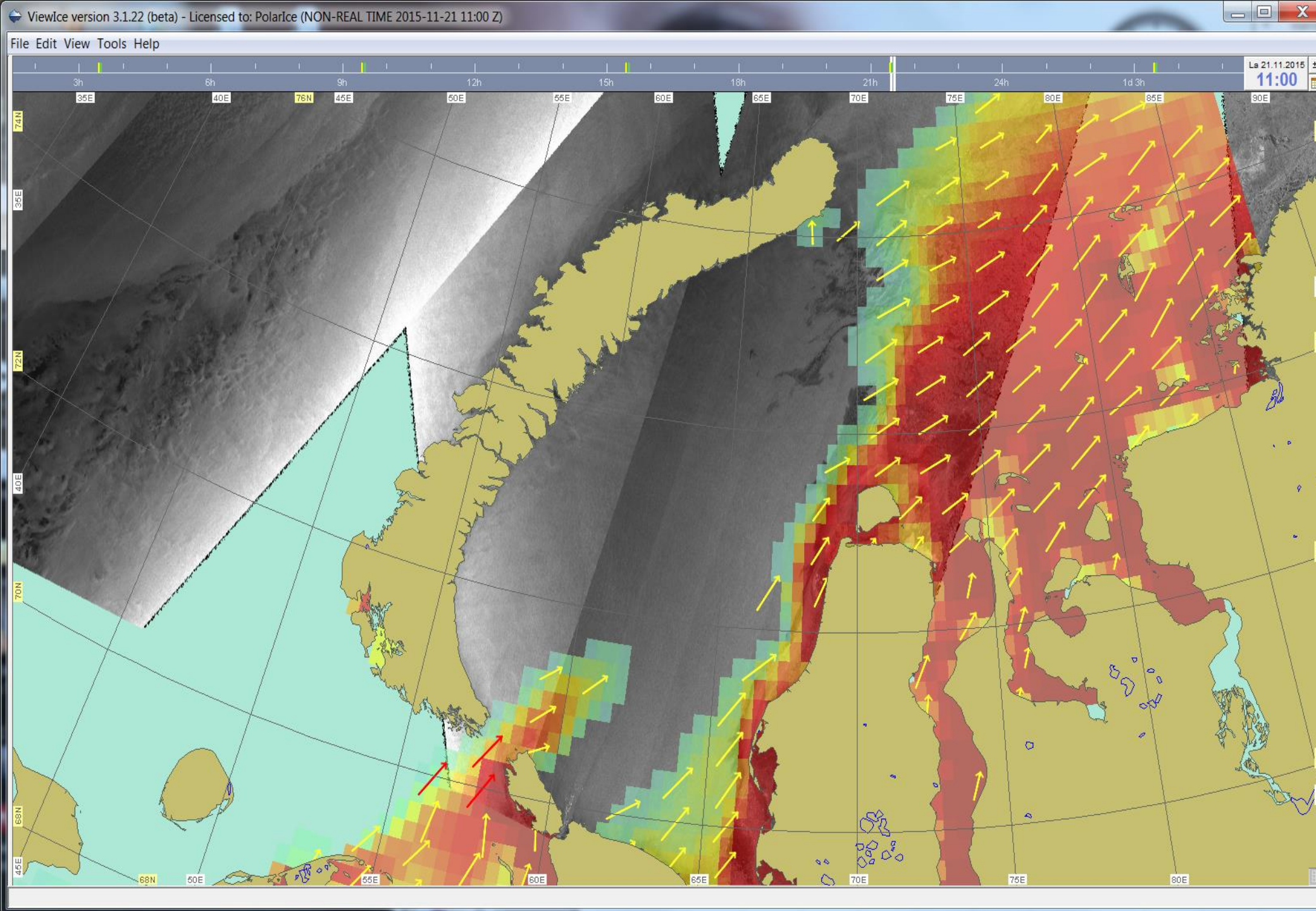
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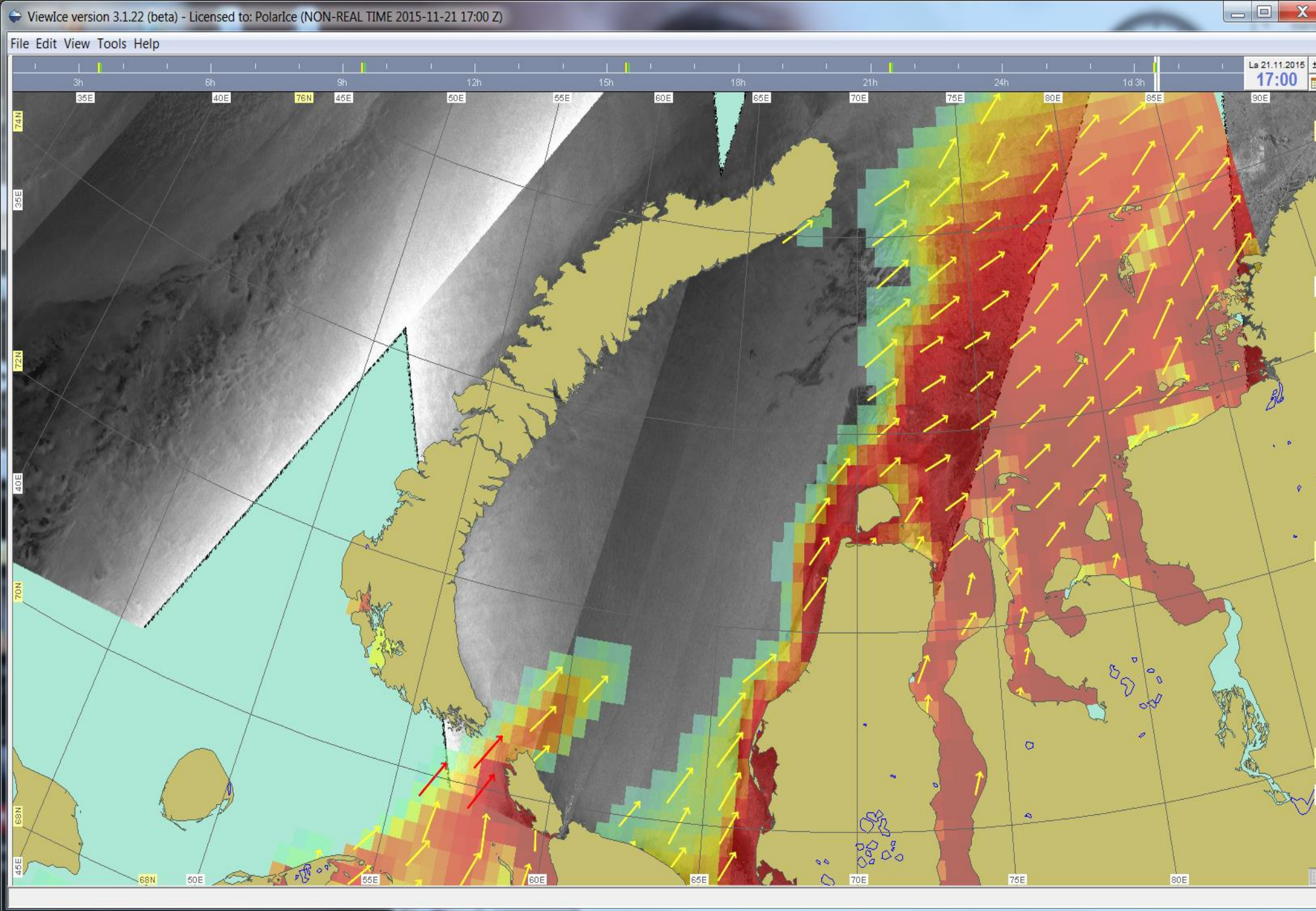
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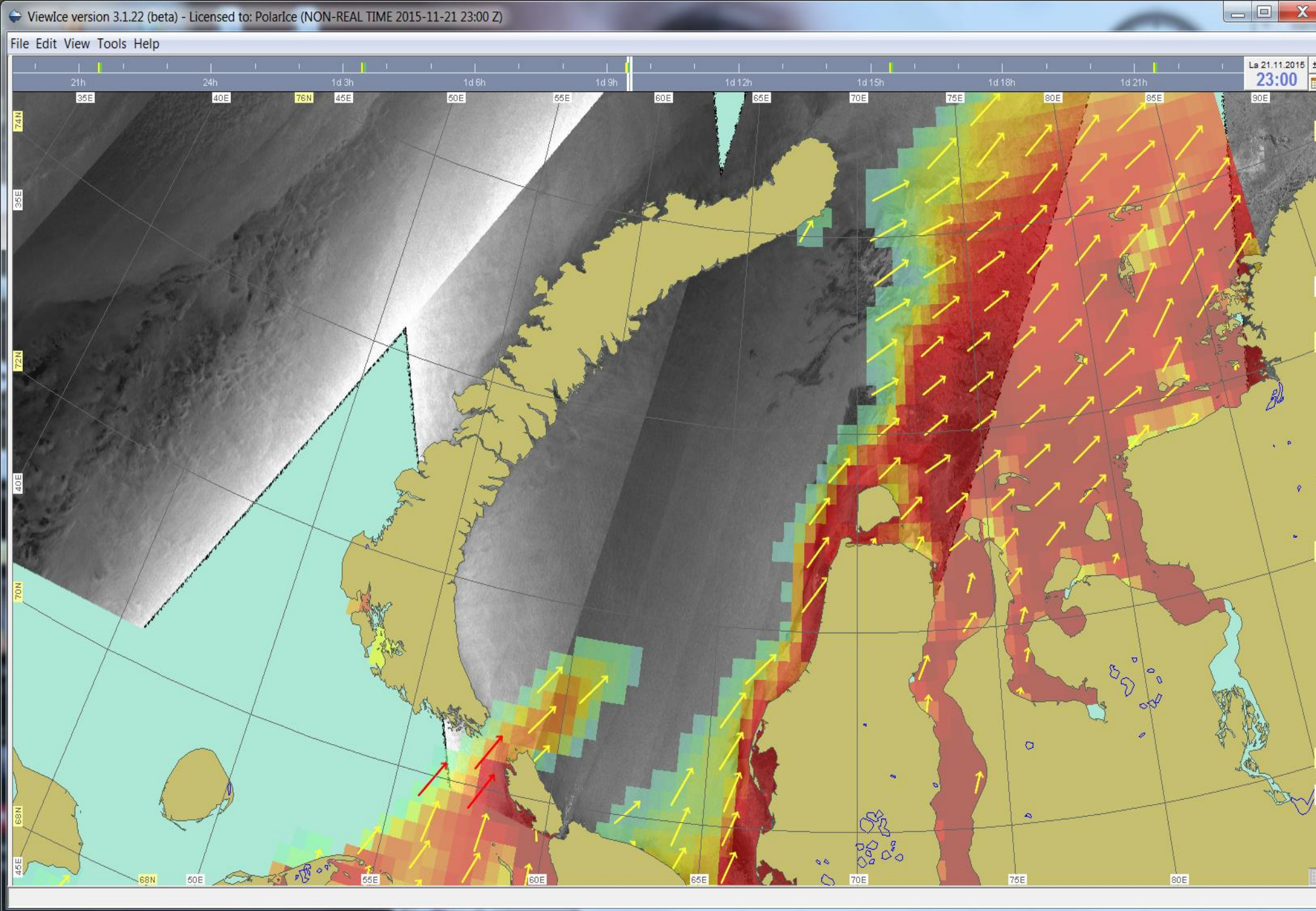
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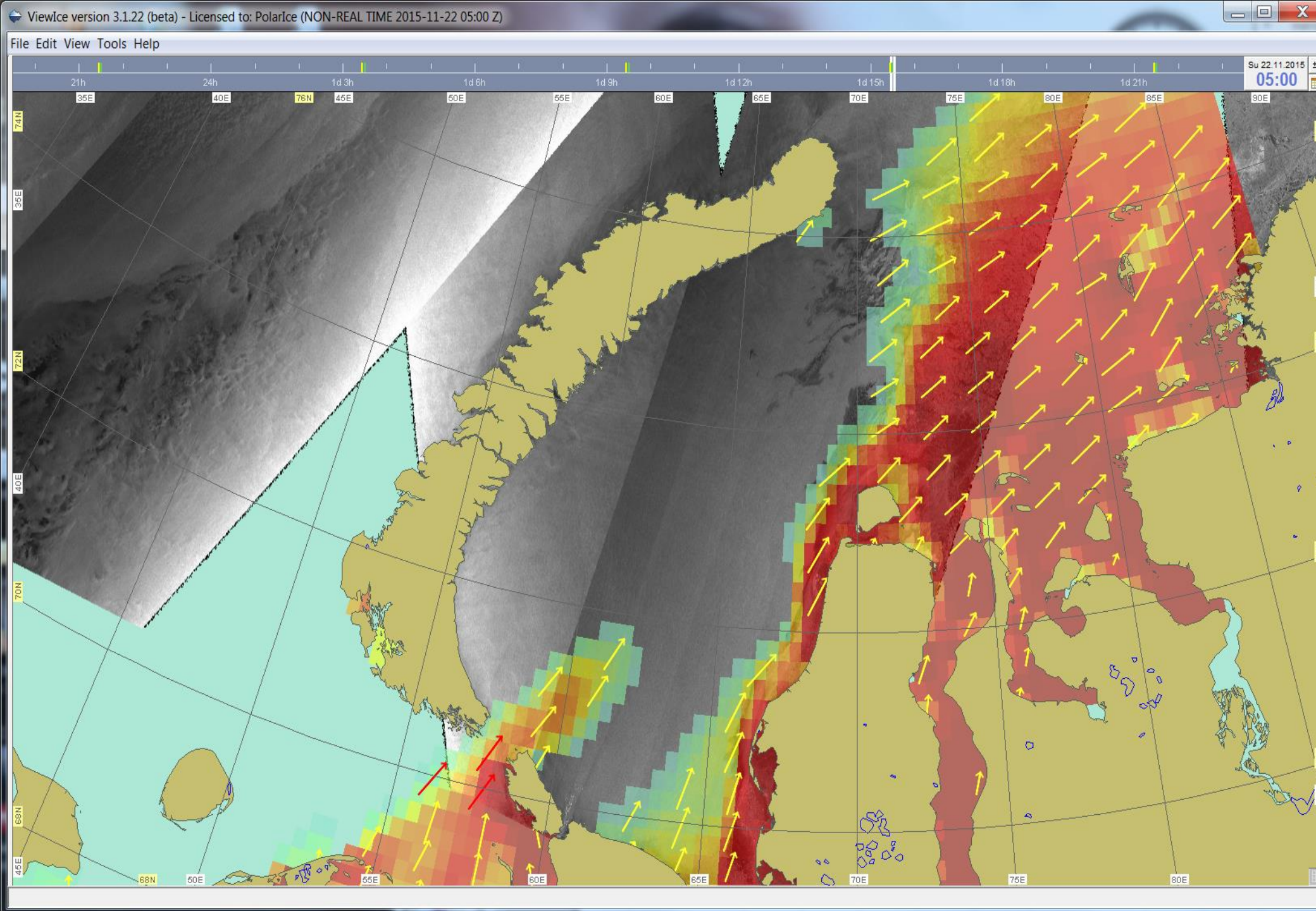
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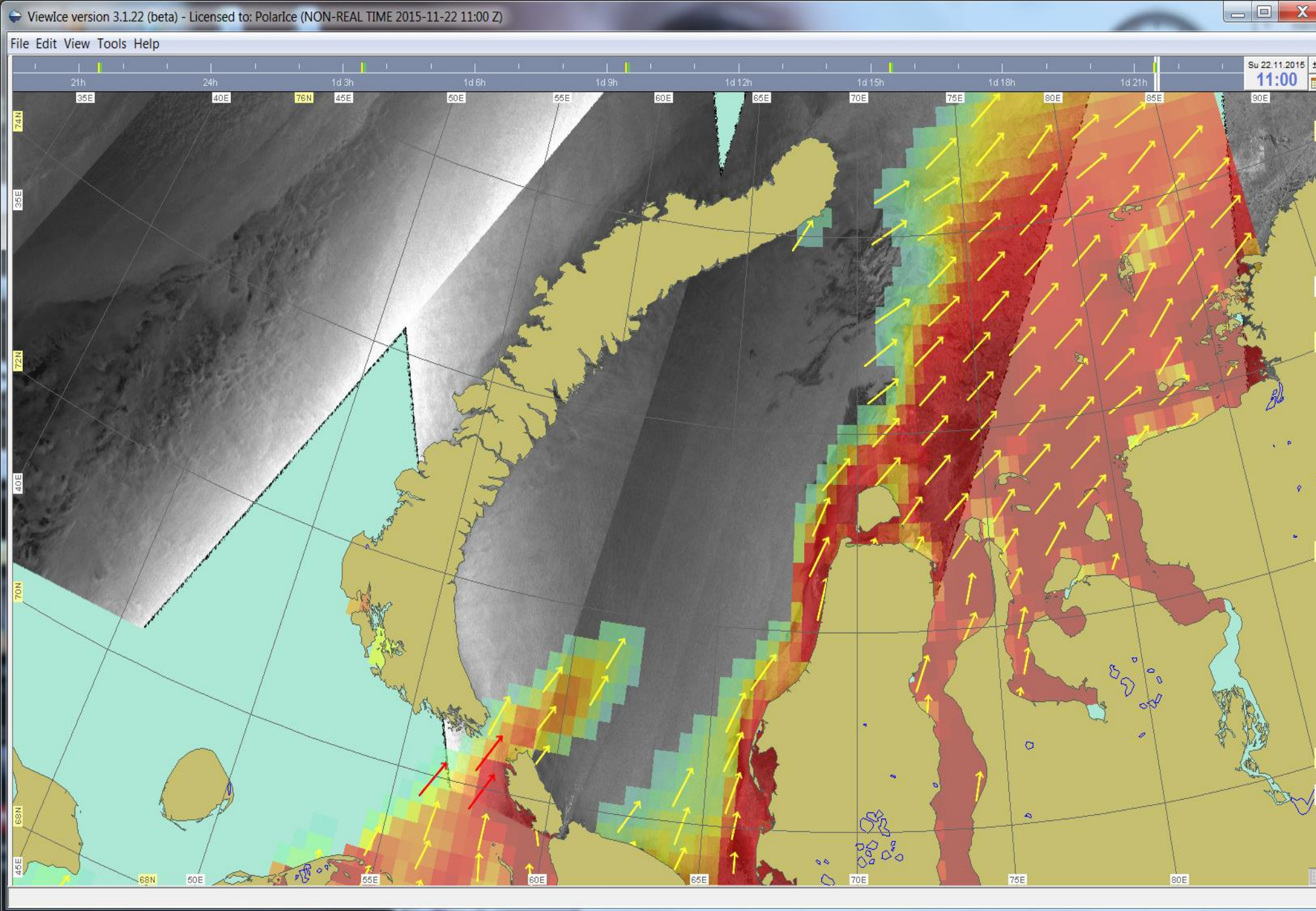
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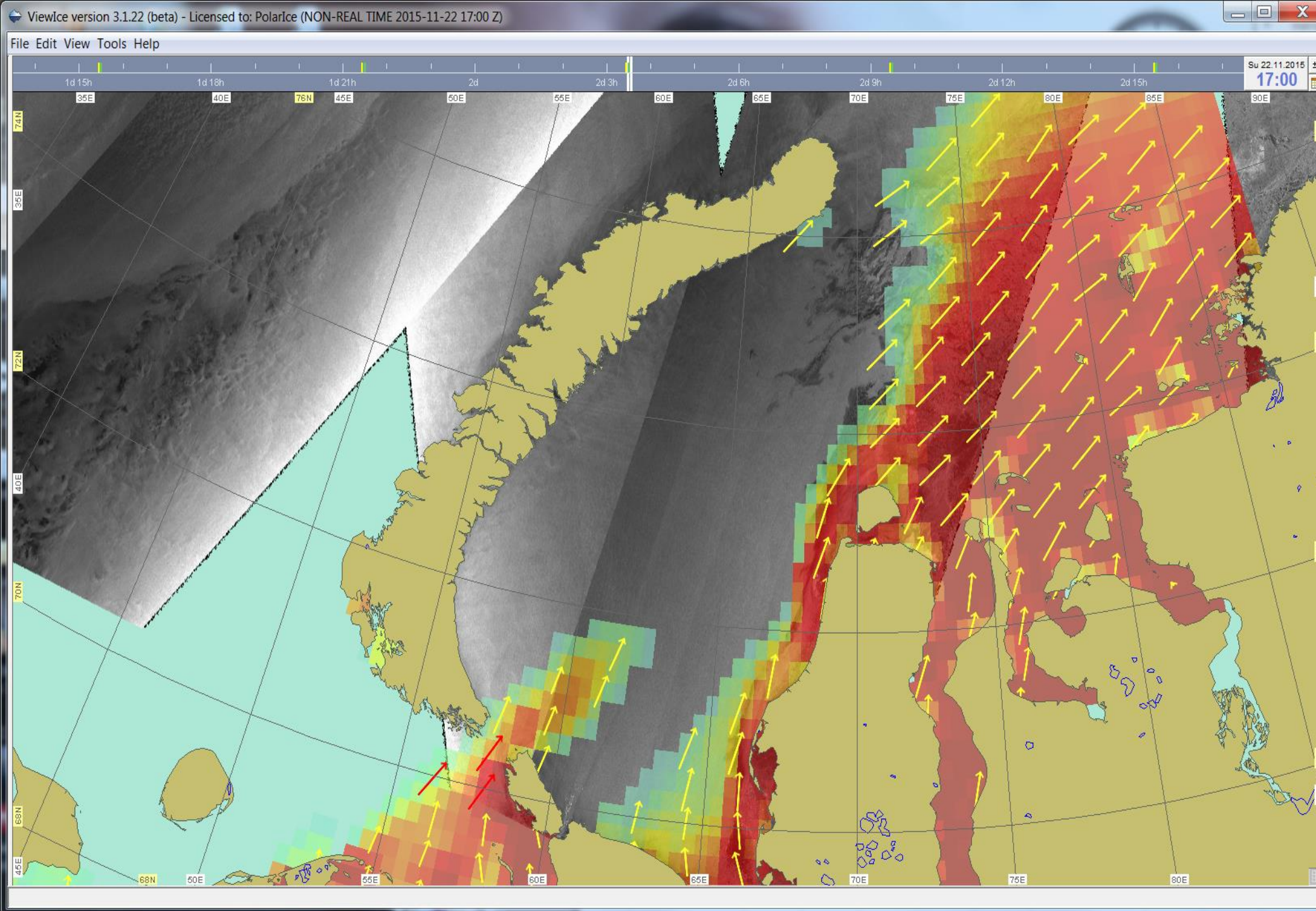
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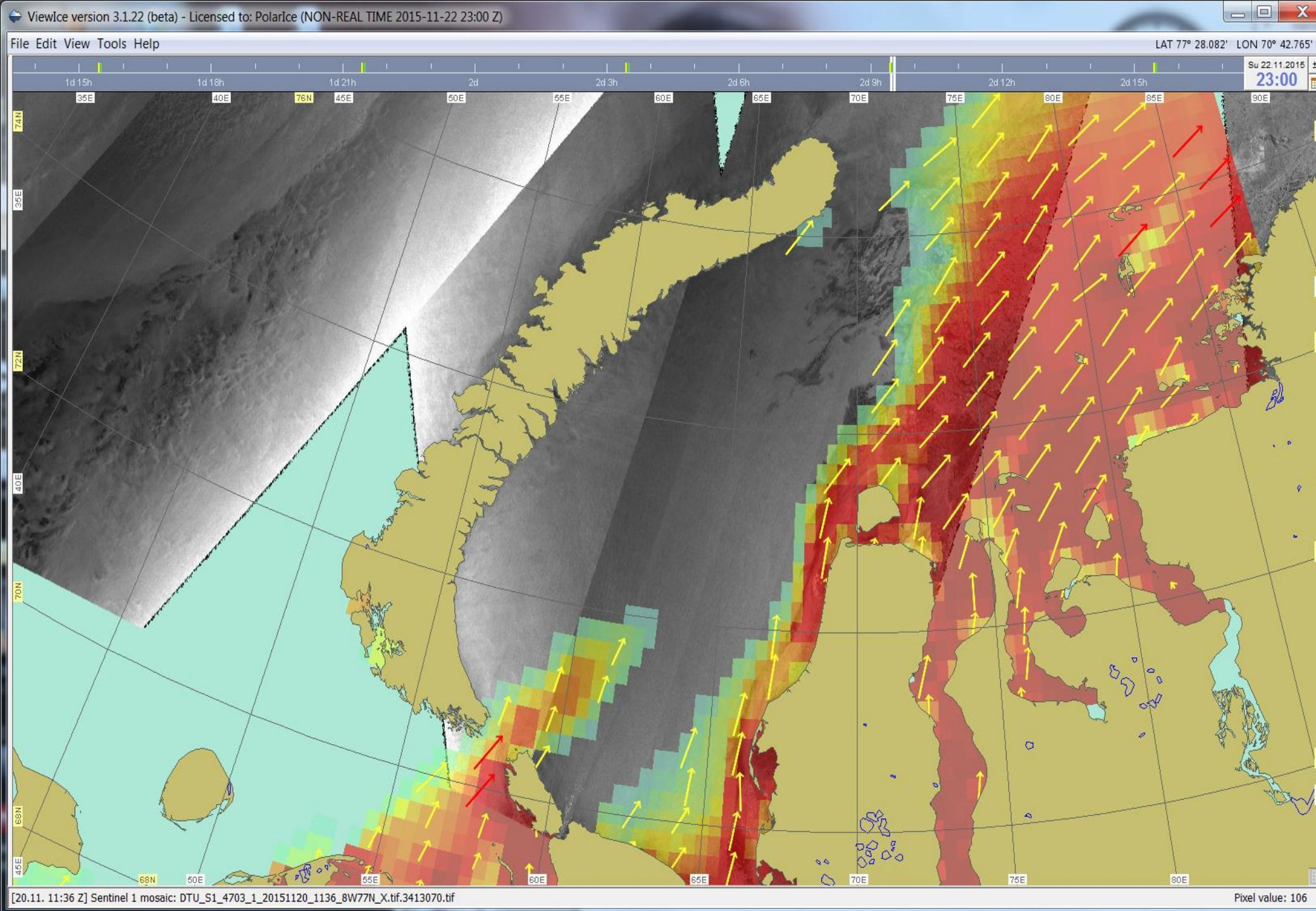
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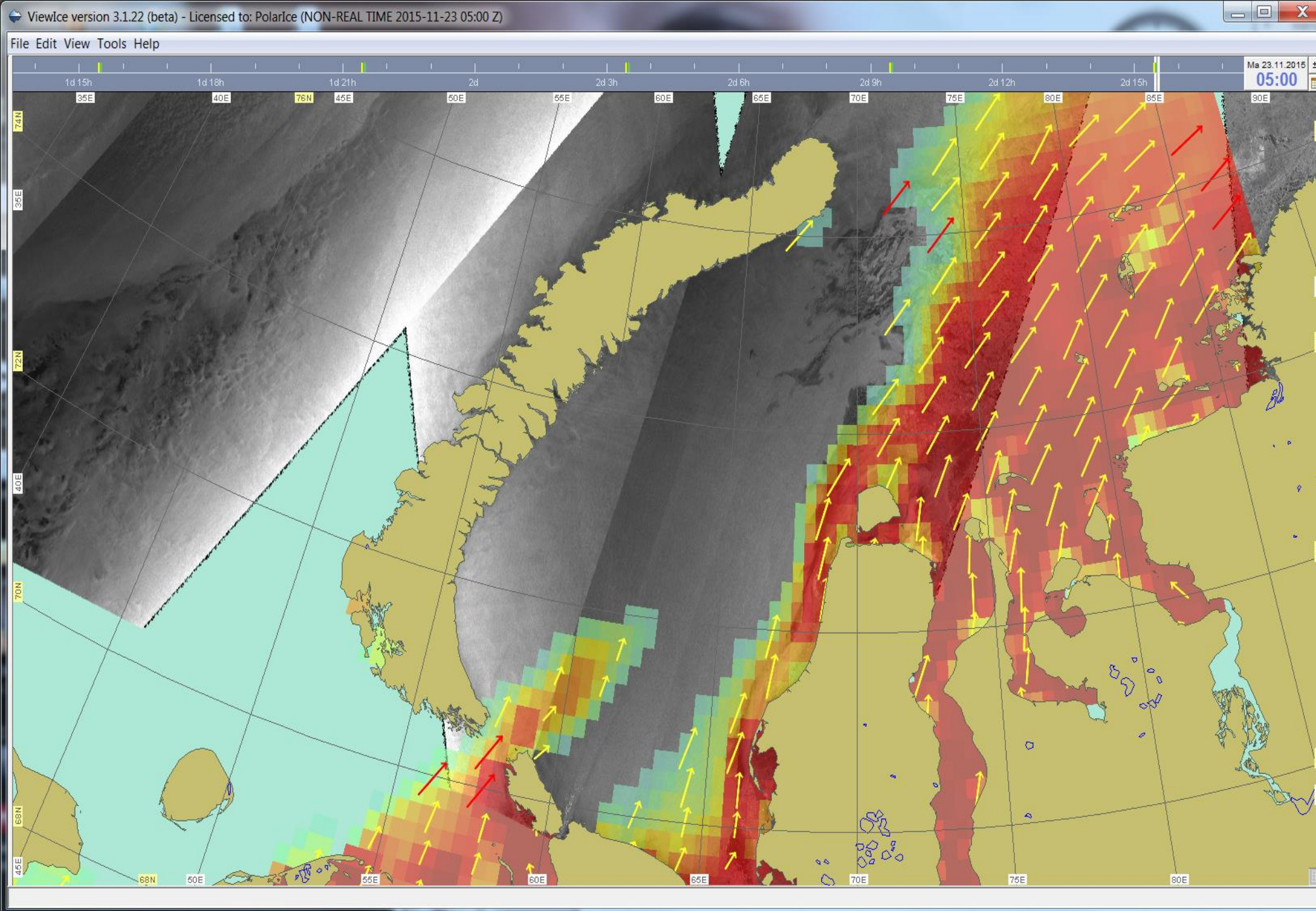
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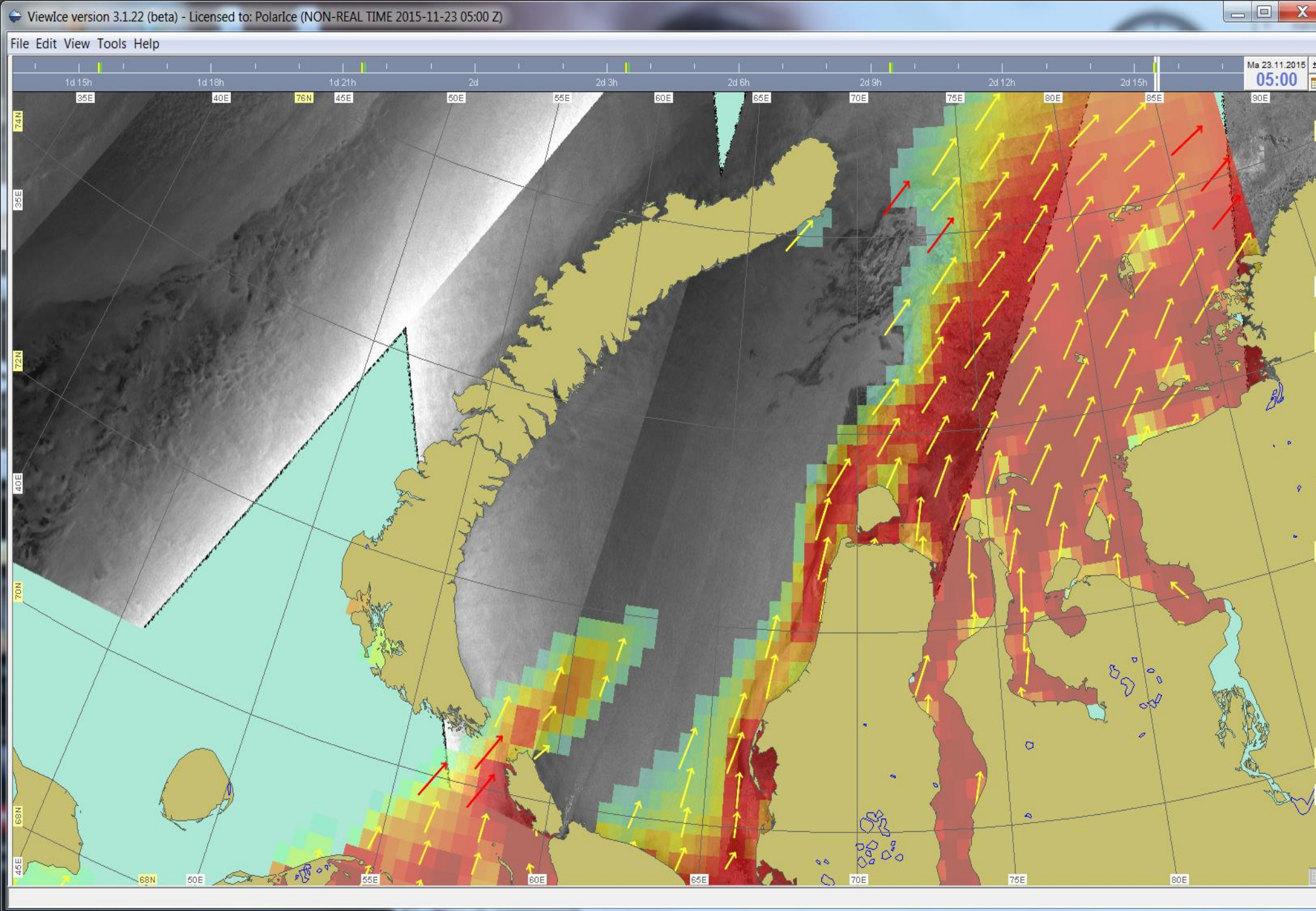
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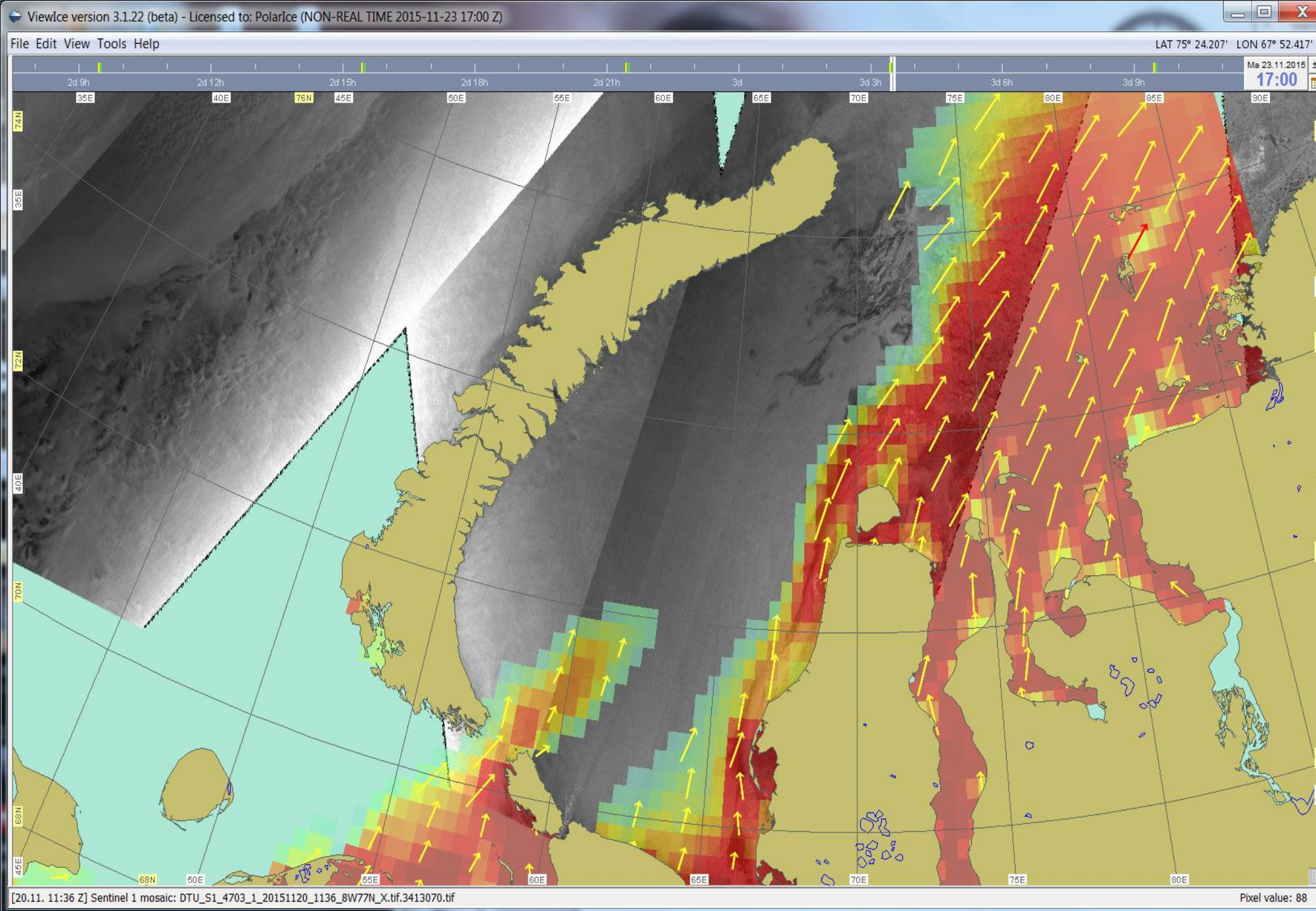
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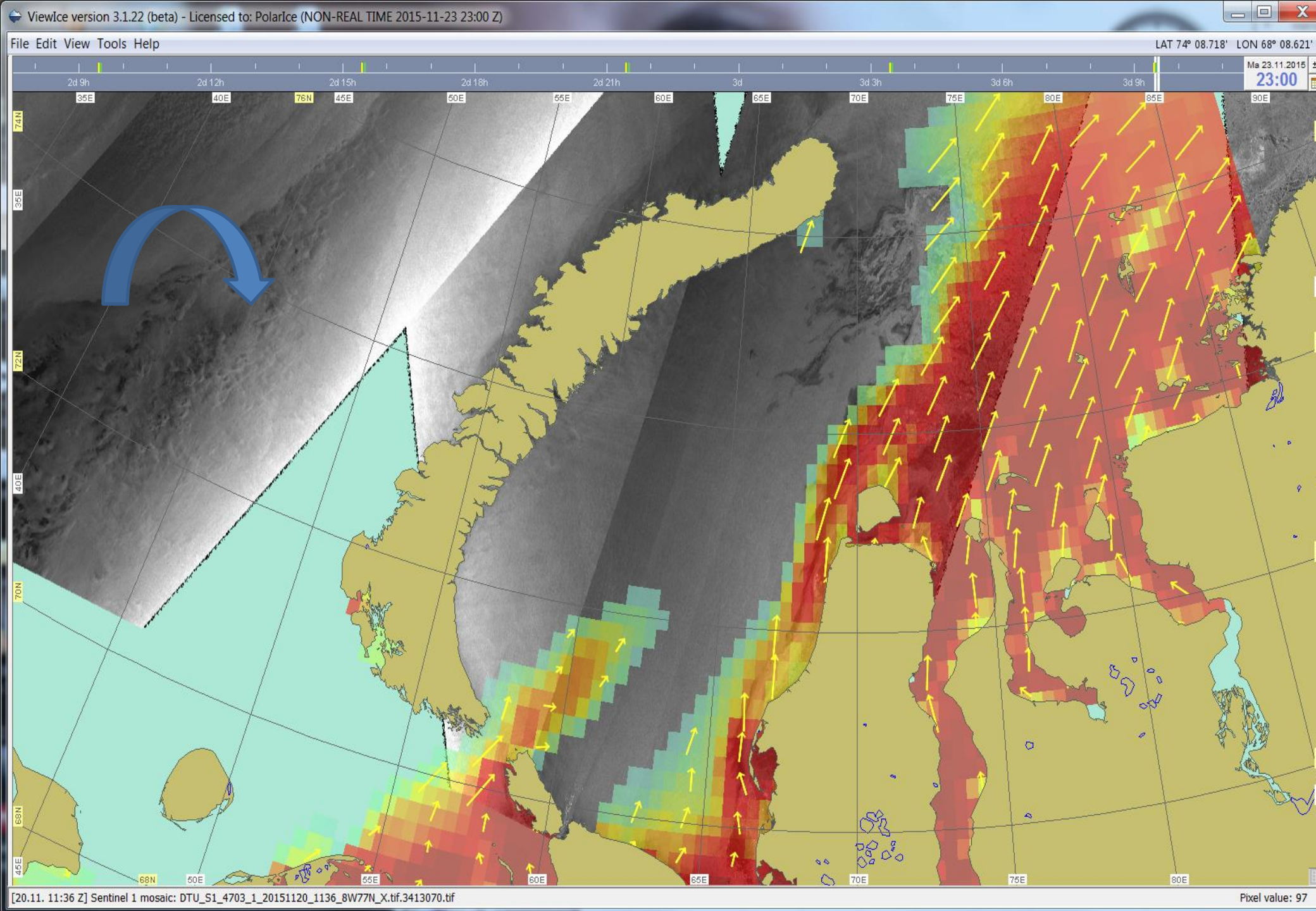
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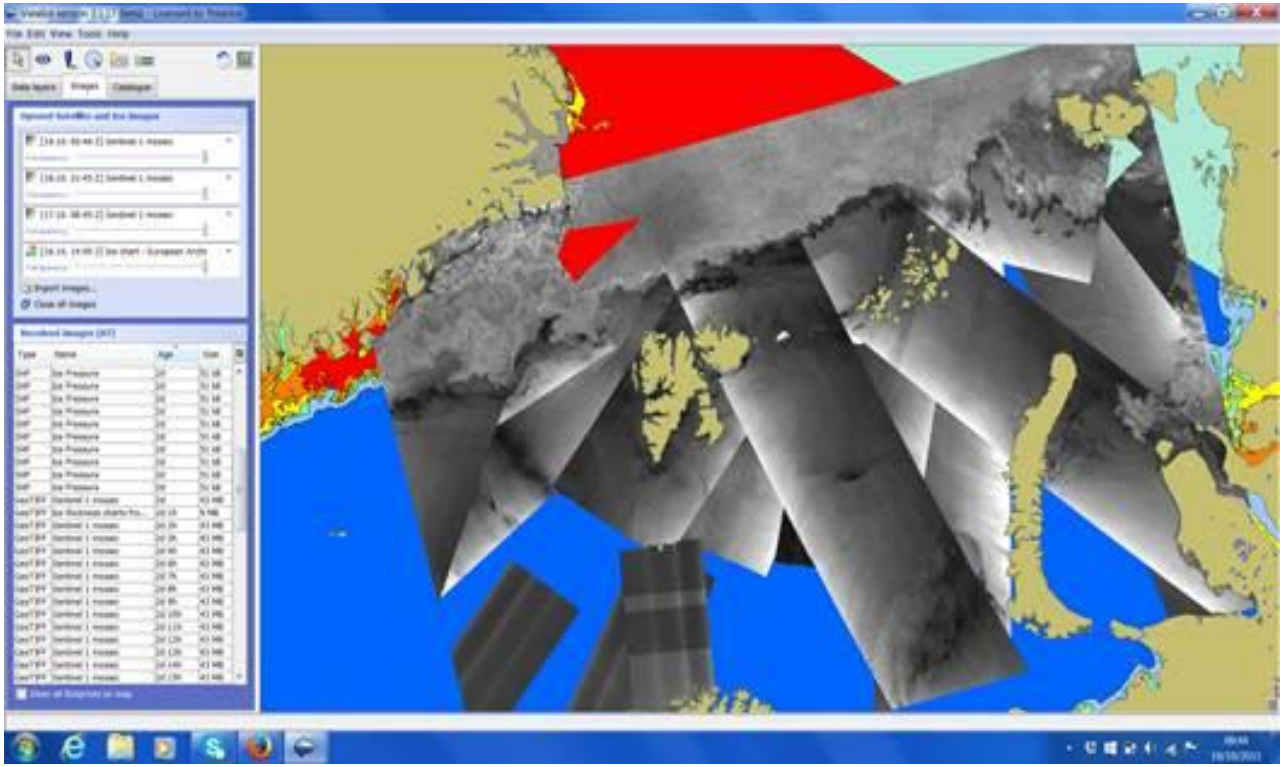
POLAR ICE

**Advanced sea ice information products**

Sentinel-1 data is very important within POLAR ICE

- SAR data is at the heart of many ice products and ice analysis



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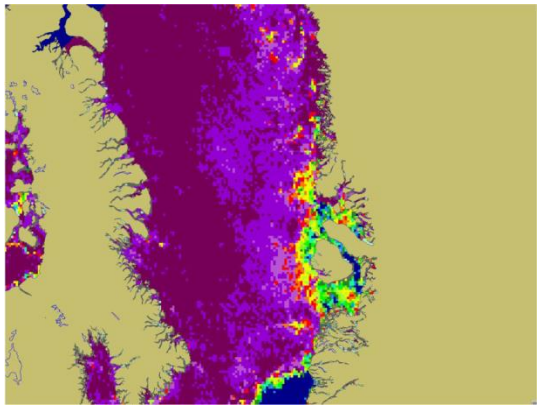
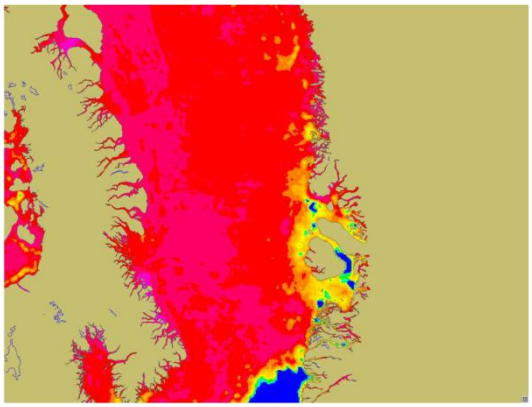
Polar View

# Harmonising colors

- Several providers of ice products -> can be confusing to the users UNLESS the color coding is harmonised
- Providers reluctant to change their production processes -> have to adapt to the coding conventions used by the providers
- A set of rules is defined per product type -> identifies Categories and Physical values

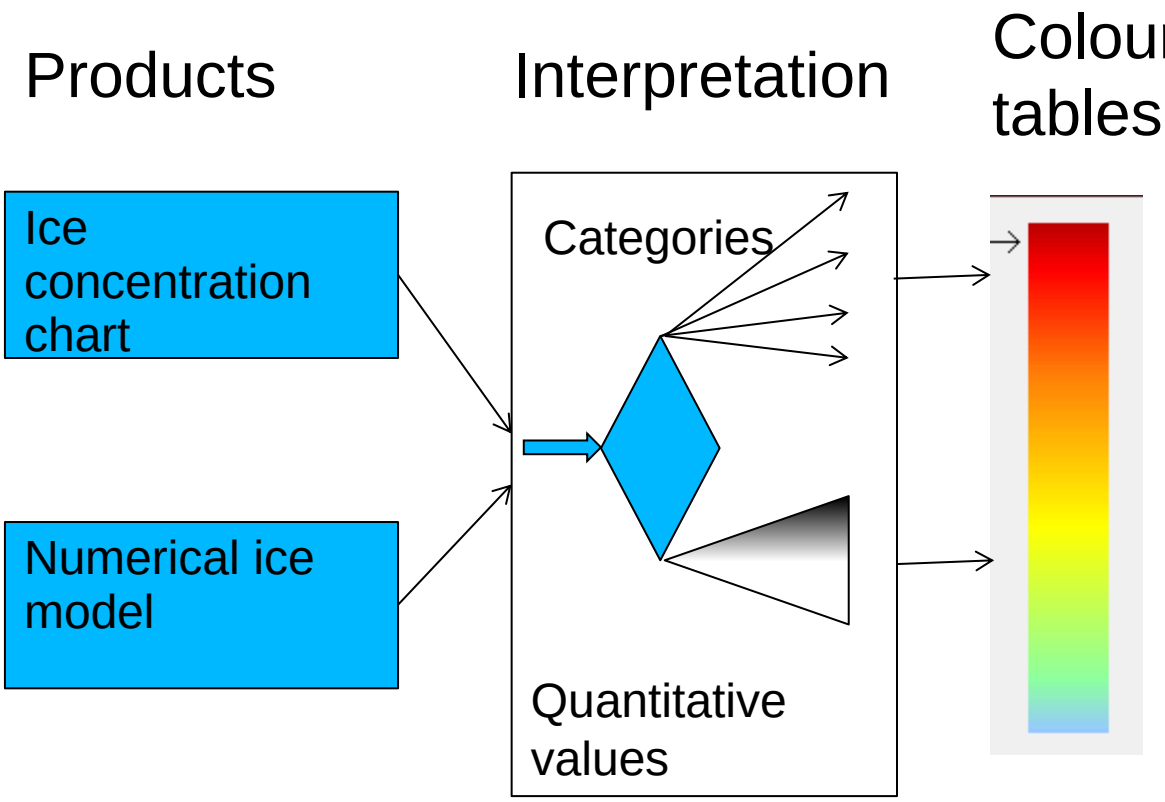


Bremen Sea ice conc. image

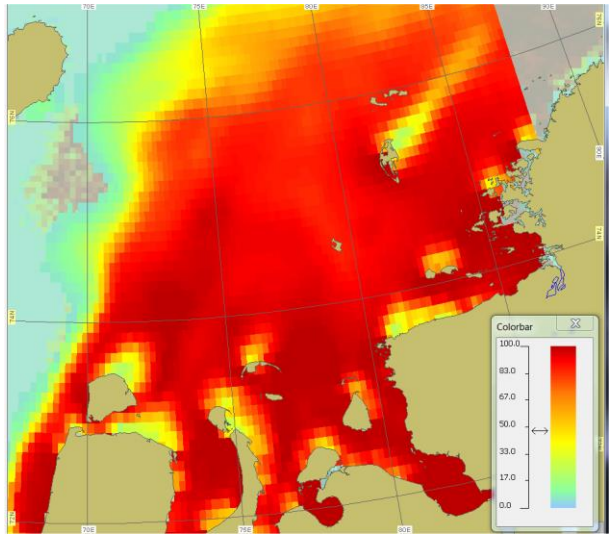


DTU AMSR2 ice conc. image

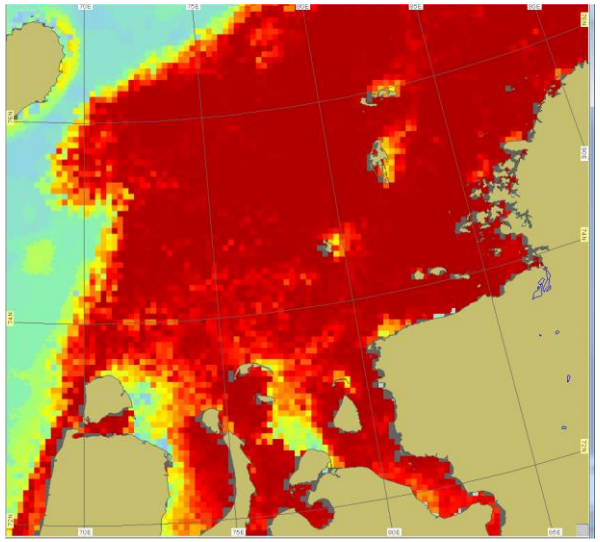
# Colouring


Products
Interpretation
Colour tables
Rendered layers
Ice concentration chart
Numerical ice model
Categories
Quantitative values

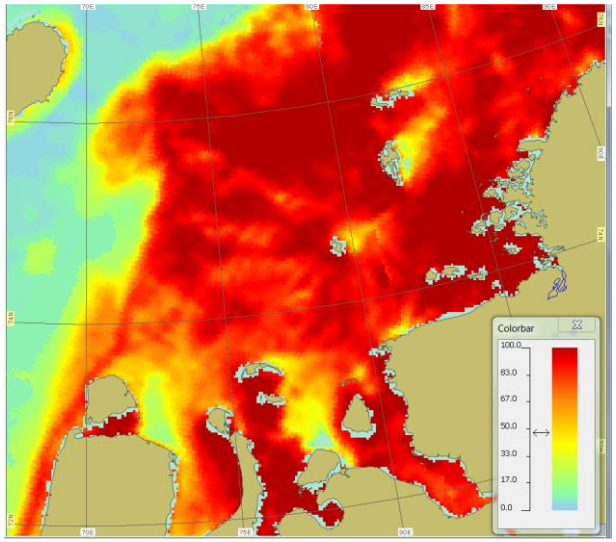
# Example: Ice concentration 20 November 2015




Ice concentration forecast (by DMI)

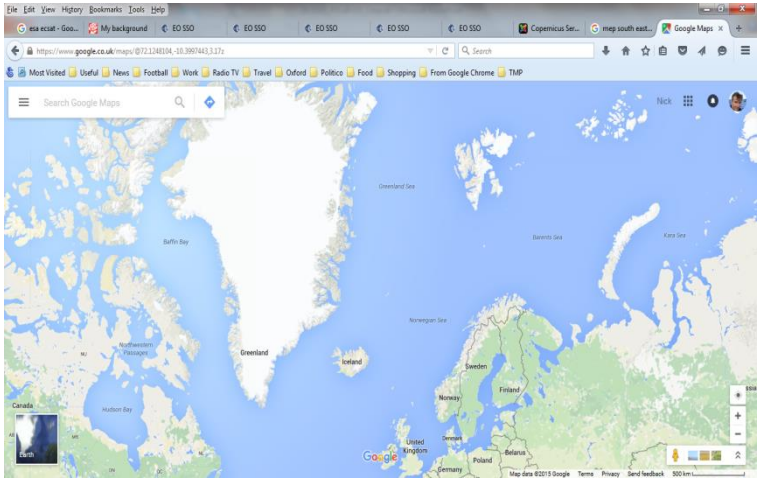


Ice concentration from AMSR 2 (by Bremen University)




Ice concentration from AMSR 2 (by DTU)

# Testing POLAR ICE during a seismic survey in the Greenland Sea 23 August to 20 September 2015





The Finnish icebreaker Otso was assisting

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Polar View

# Testing POLAR ICE during a seismic survey in the Greenland Sea 23 August to 20 September 2015

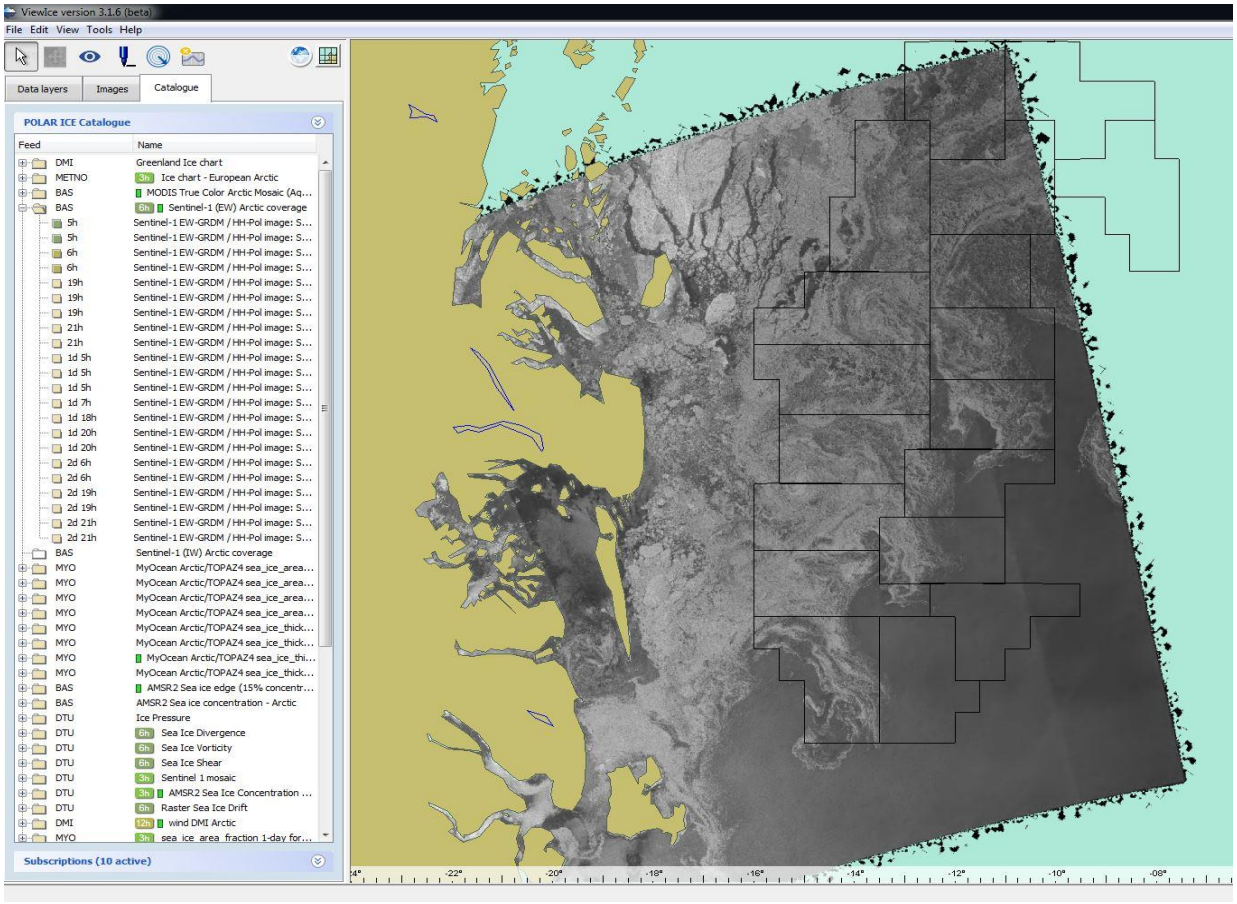
The DMI Ice Advisory Team: Jens Jakobsen, Anne Marie Findsen and Martin Nissen

POLAR ICE running on one of the workstations installed on the Otso bridge

nick.walker@eosphere.co.uk

# Testing POLAR ICE during a seismic survey in the Greenland Sea 23 August to 20 September 2015

- The ViewIce system showing Sentinel-1 SAR imagery.
- The NE Greenland license blocks are displayed on top of the Sentinel image from 15th September 2015.

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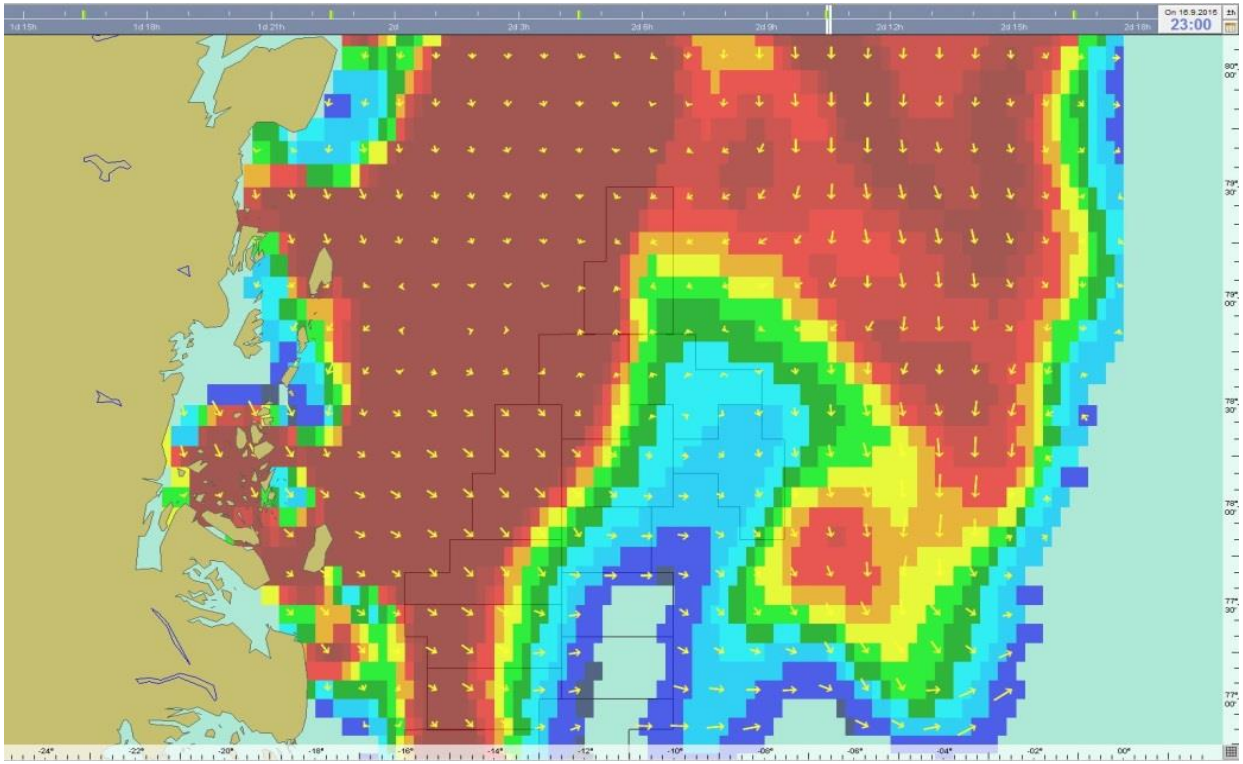
- The former land fast ice is expected to drift towards east.
- Especially in the northern part of the survey area, the ice regime is forecasted to be displaced towards east, from 15th Sep. to 16 Sep.
- The survey managed just to finish seismic acquisition in the northern part of the survey area before the former land fast ice actually encroached towards the area.

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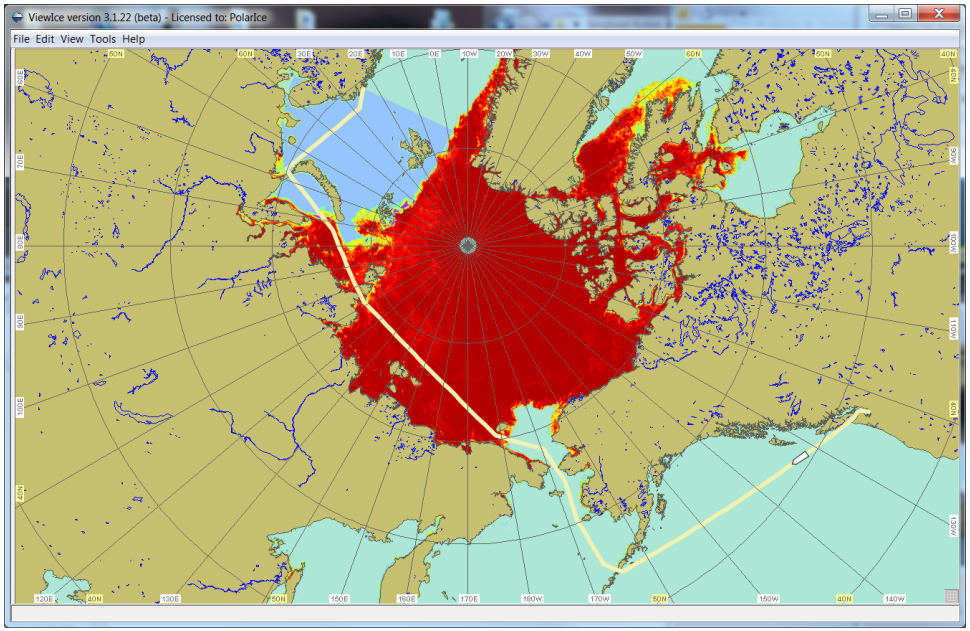
# Testing POLAR ICE:
# Vessel returning from US West coast (Seattle) to Hammerfest in Norway




Route and sea ice concentration
(19 Nov 2015)

POLAR ICE system is both onboard Tor Viking II and at the company office in Norway

http://www.maritime.no/nyheter/her-rigges-tor-viking-for-nordostpassasjen/

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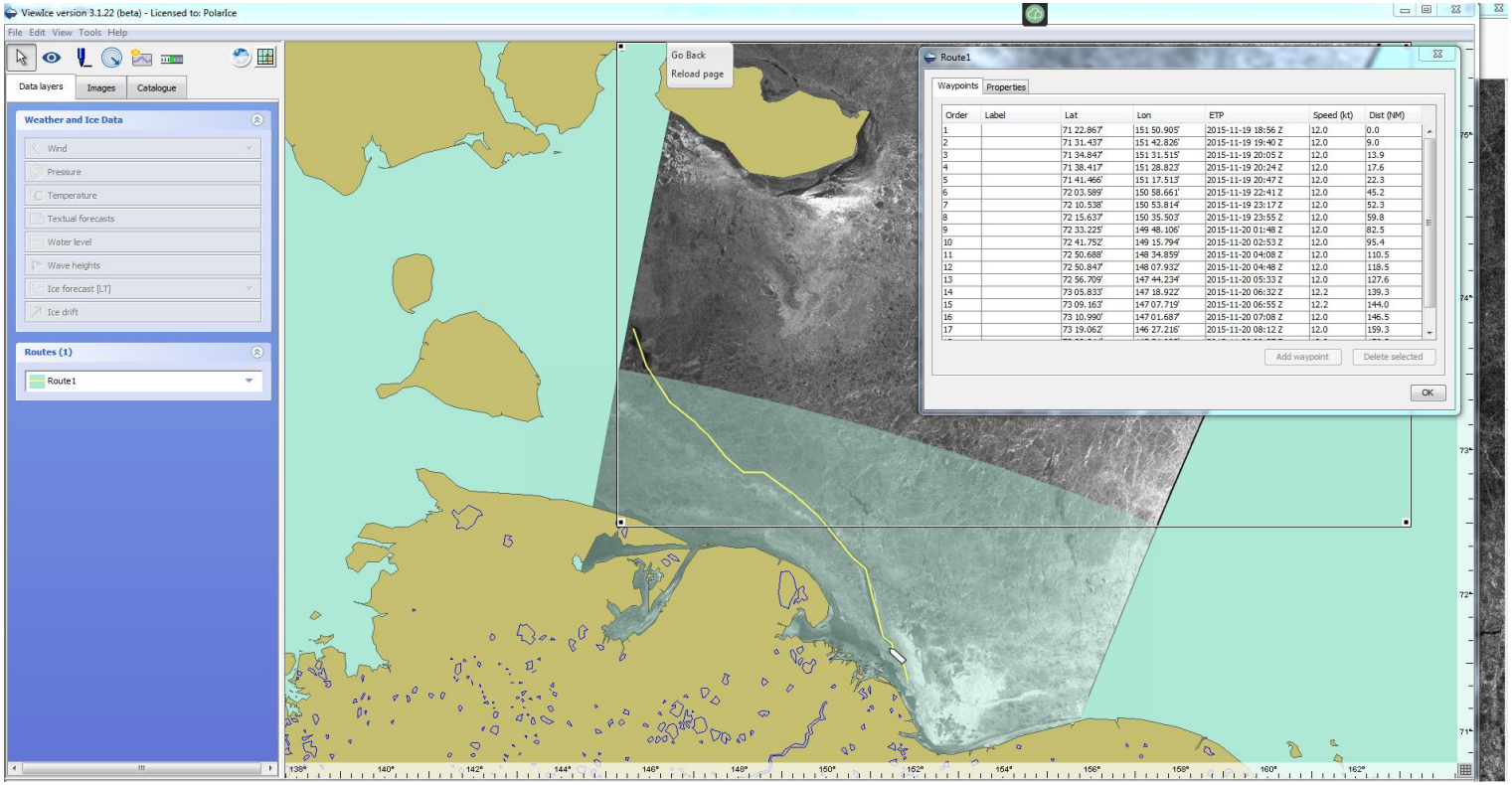


Route planning in ViewIce based on SENTINEL-1 image

# Testing POLAR ICE: Fishing in the Antarctic
December - January

- Patagonian tooth fish caught in Antarctic annually under license
- Small mobile vessels with strong requirement for tactical ice information
- Information for navigation:
  - Maximising the catch
  - When & where to enter the ice
  - Where to deploy lines
  - Where to go next
  - Safety & avoiding getting trapped

Ross Sea ice pack

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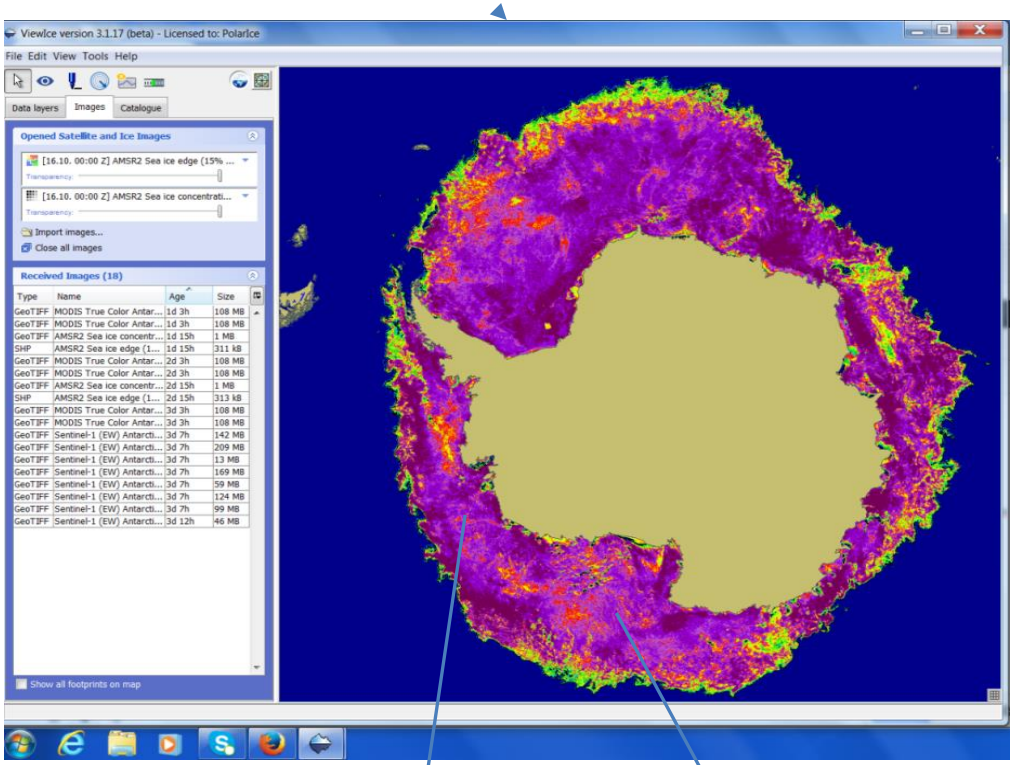
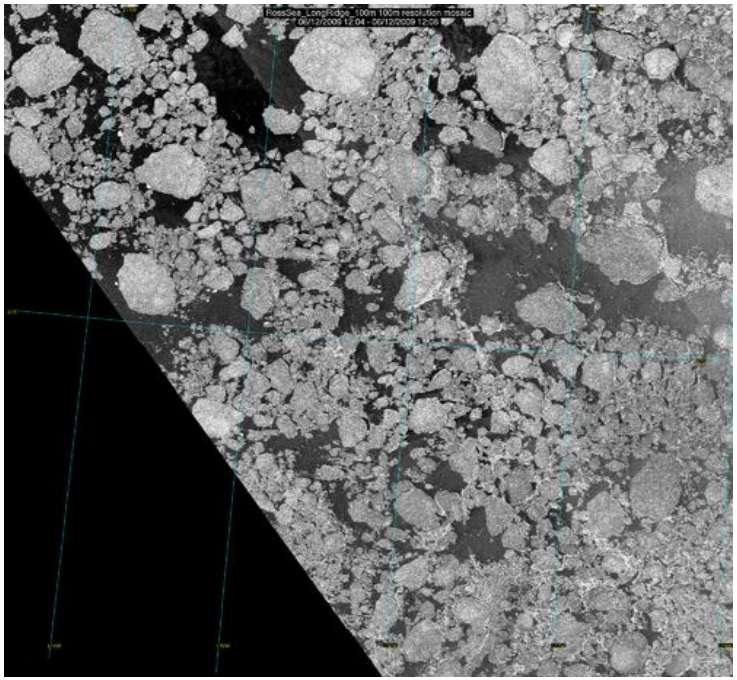
# Testing POLAR ICE: Fishing in the Antarctic
December - January



And may move here in the Amundsen Sea

Usually start here in the Ross Sea

SAR data very very useful

eOsphere

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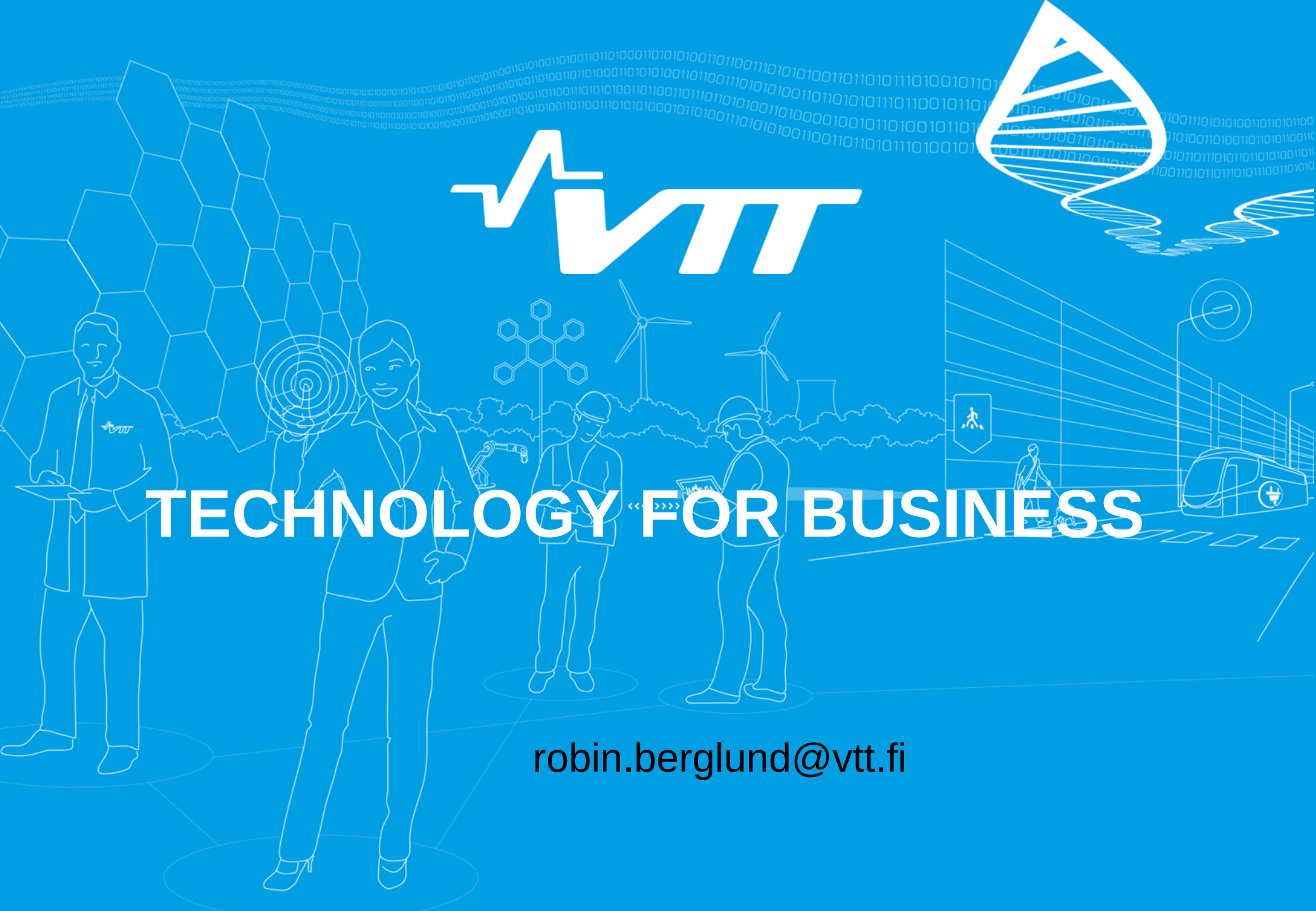
Polar View

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