The Iceland-Greenland Seas Project (IGP)

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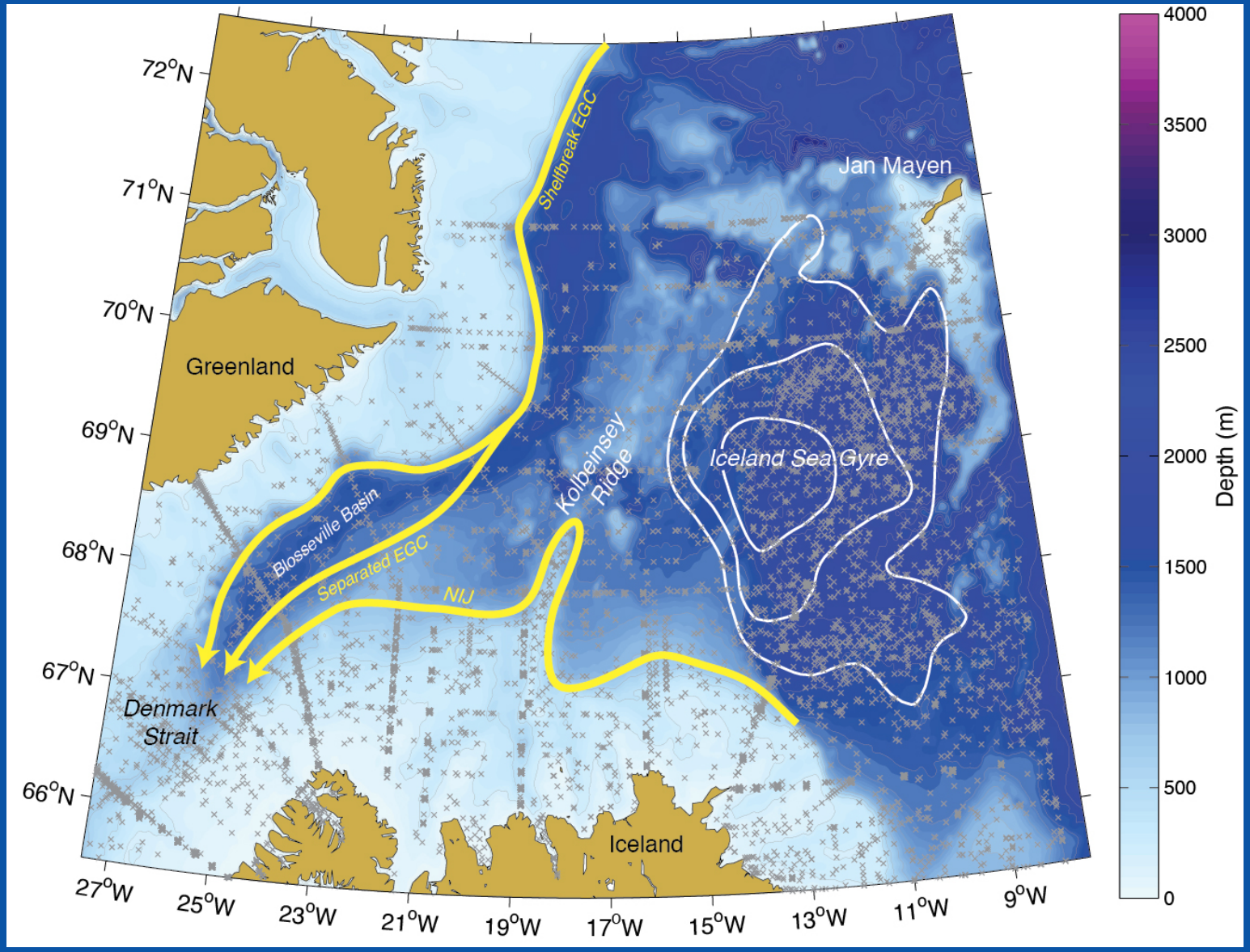
East coast of Greenland, summer 2014
Photo by Carolina Nobre

Motivation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17°W
15°W
13°W
11°W
9°W
Greenland
Jan Mayen
Iceland
Shelfbreak EGC
Kolbeinsey Ridge
Iceland Sea Gyre
Blosseville Basin
Separated EGC
NIJ
Denmark Strait
4000
3500
3000
2500
2000
1500
1000
500
0
Depth (m)

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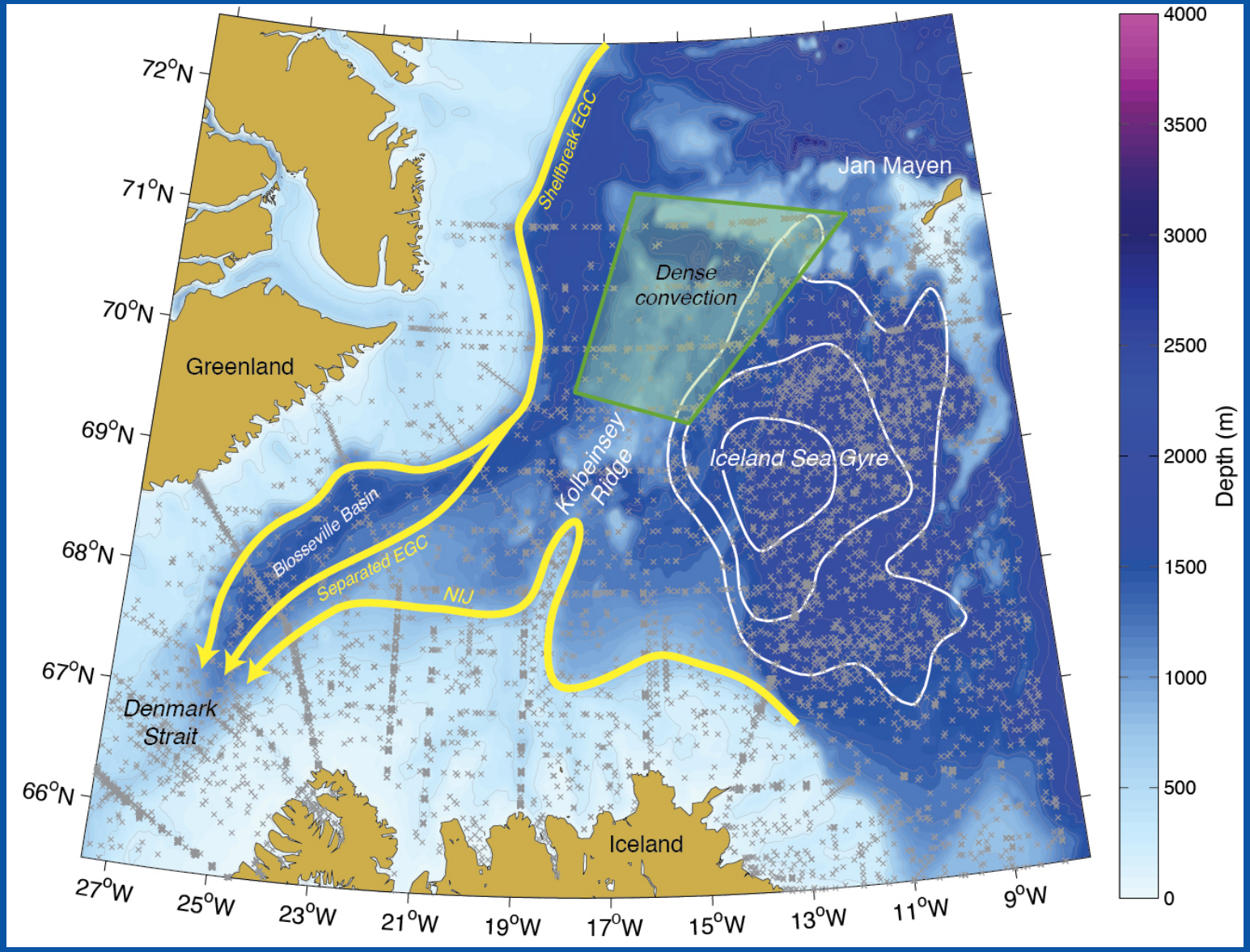
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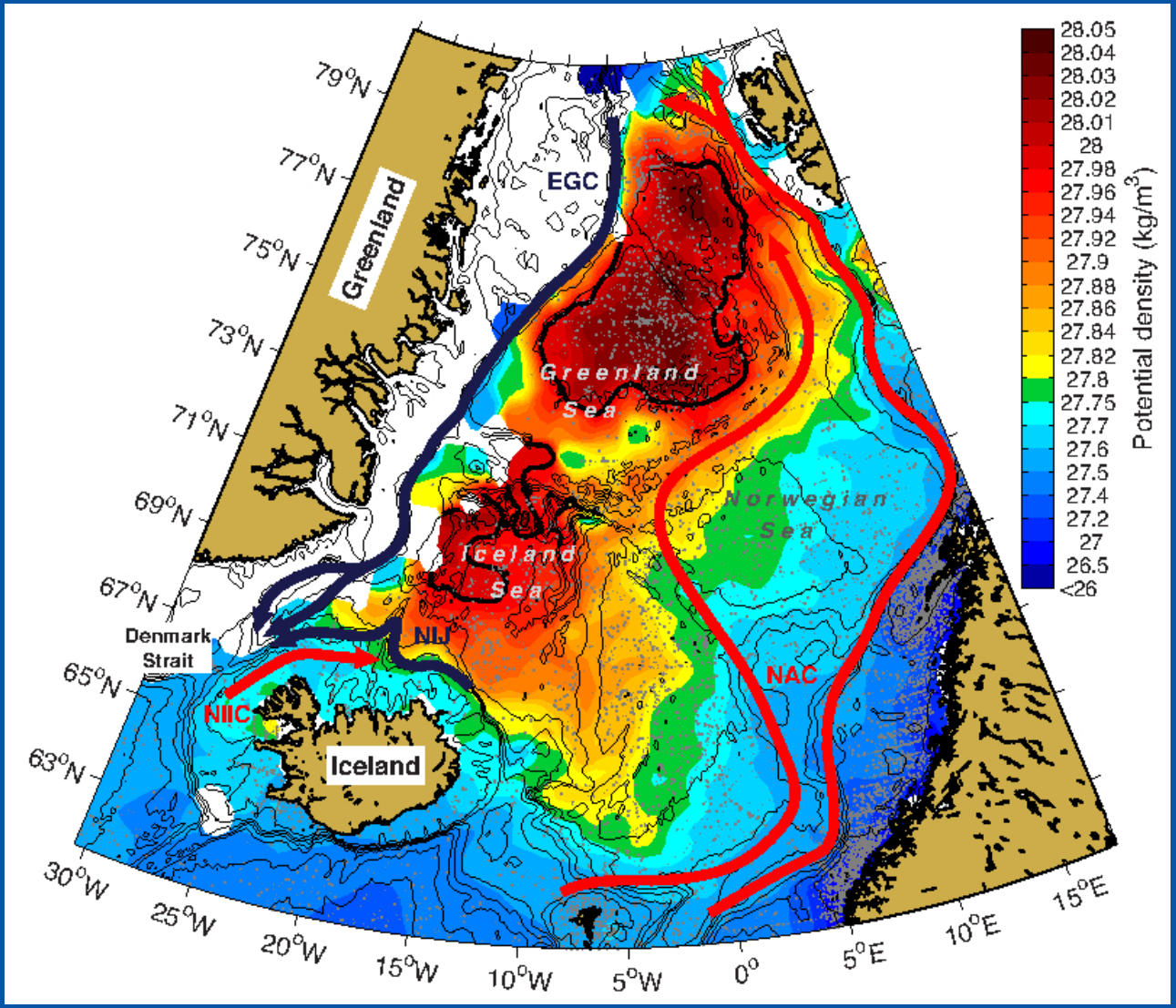
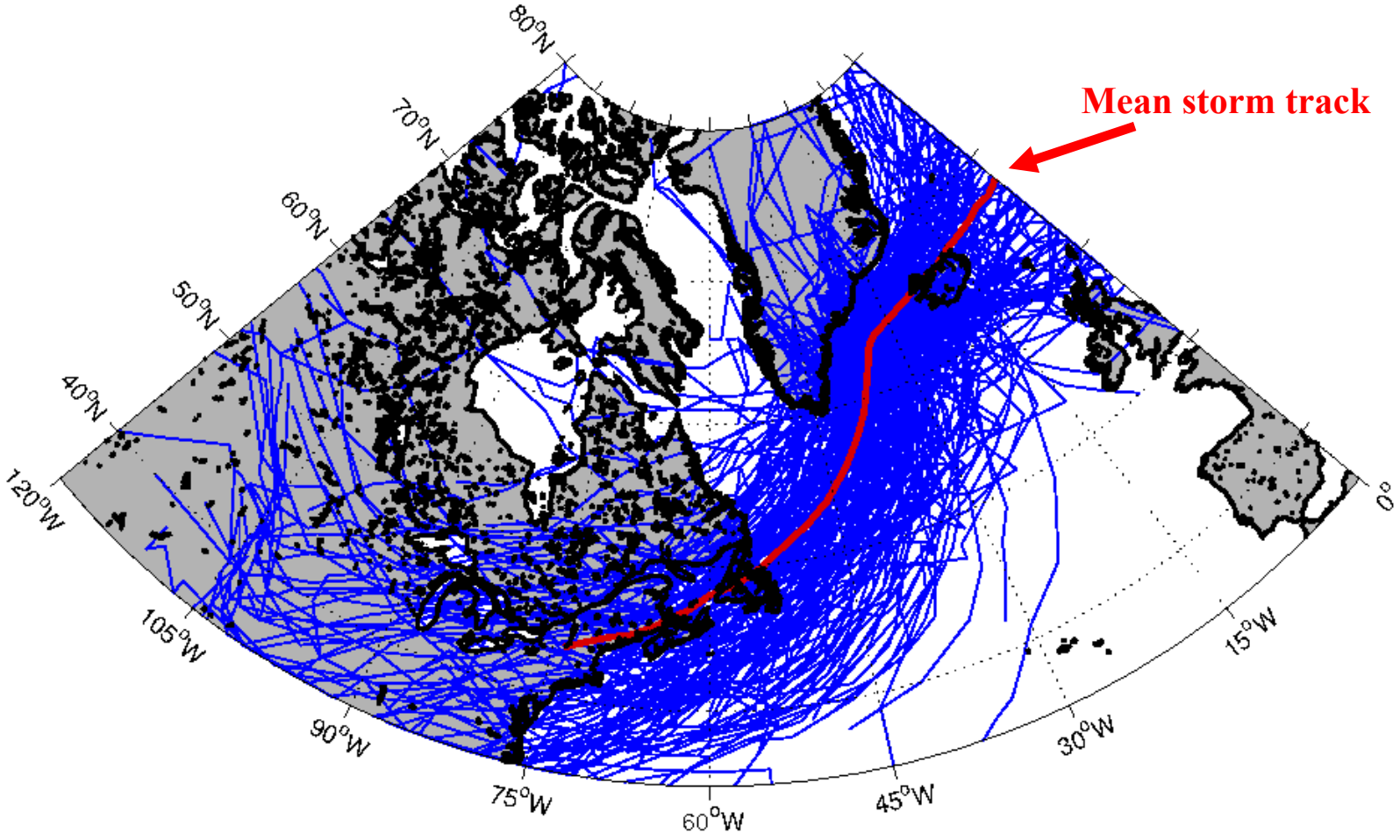


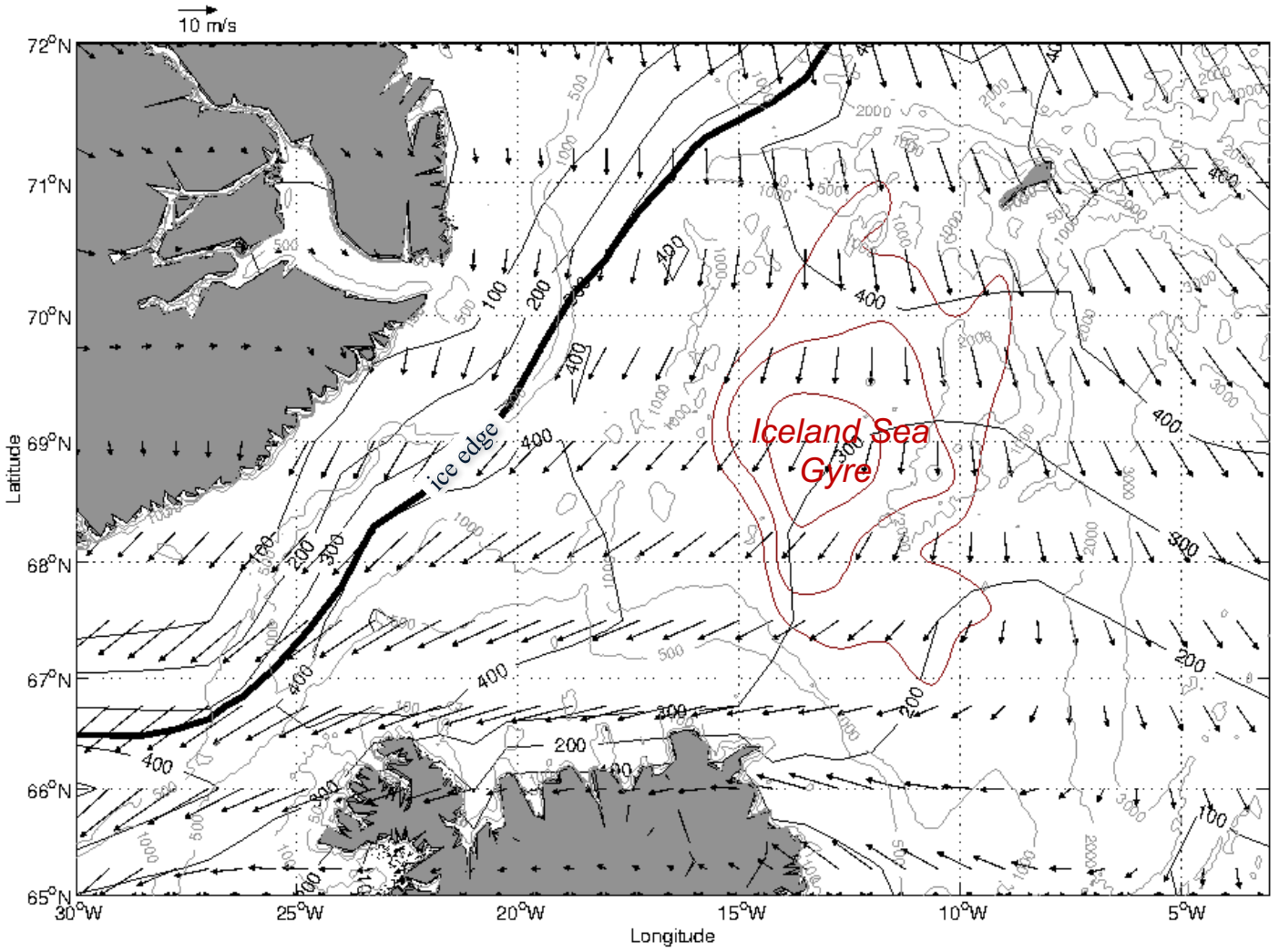
Average density at 50 m from Jan-Apr (from Våge et al. (2015)

Atmospheric forcing



Våge et al., 2009

Atmospheric forcing



Cold air outbreak event in Feb 2009

Hypothesis of the IGP

Wintertime convection in the northwest Iceland Sea and southeast Greenland Sea, forced by intermittent cold-air outbreaks, forms the densest component of the AMOC.

Contributing institutions

Woods Hole Oceanographic Institution

University of East Anglia

University of Bergen

Marine Research Institute, Reykjavik

University of Akureyri

University of Toronto

Uni Research, Bergen

University Centre, Svalbard

University of British Columbia

Icelandic Met Office

British Antarctic Survey

Approach

Measurements of the ocean and atmosphere

- wintertime shipboard survey
- wintertime aircraft campaign
- year-long moorings and met buoy
- 9-month gliders
- short-term microstructure glider
- Argo floats
- Drones

Ocean modeling

- high resolution GCM
- idealized models

Atmospheric/climate modeling

- weather prediction case studies
- testing of atmospheric climate models

Research vessel

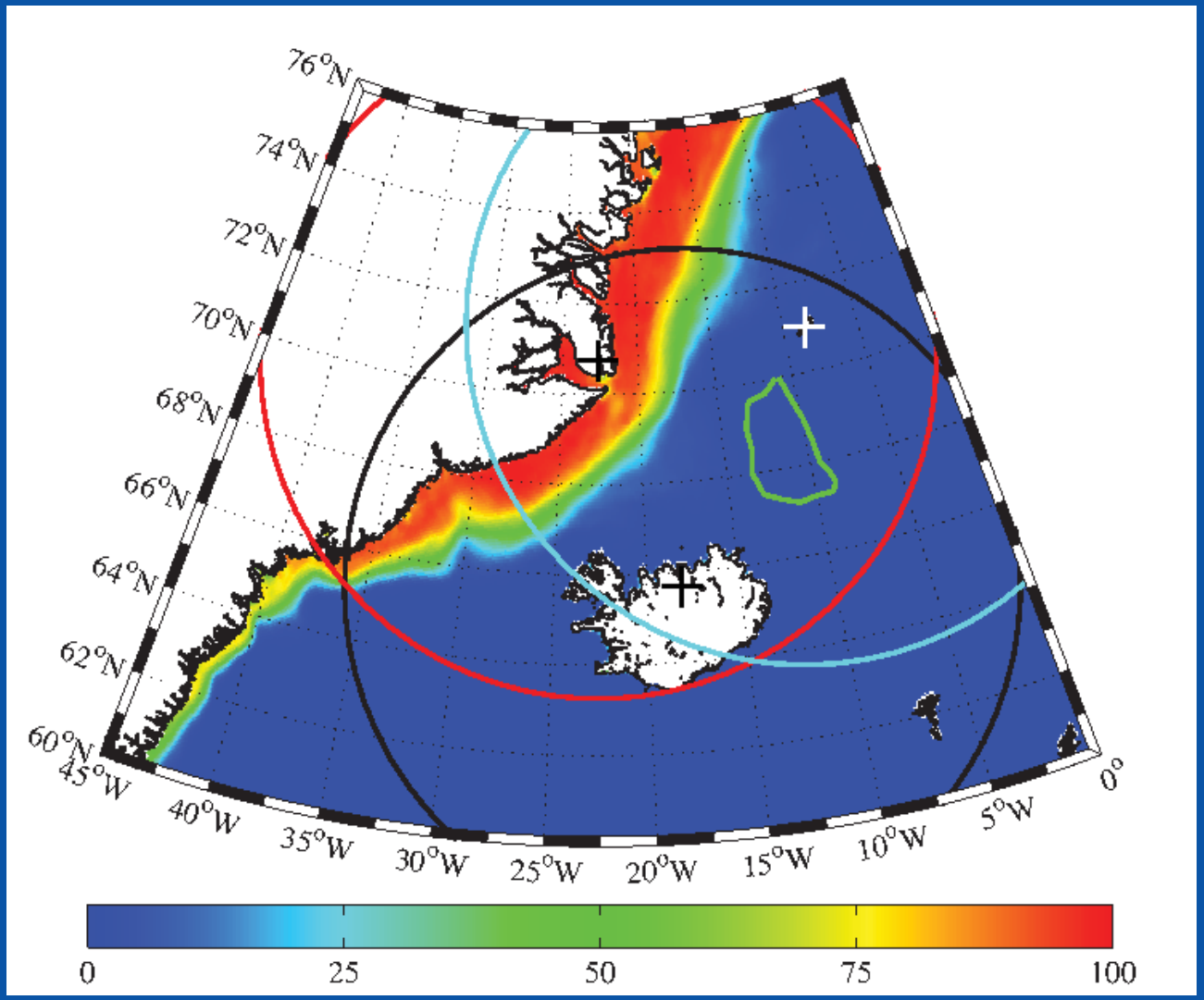
NRV *Alliance*

Aircraft

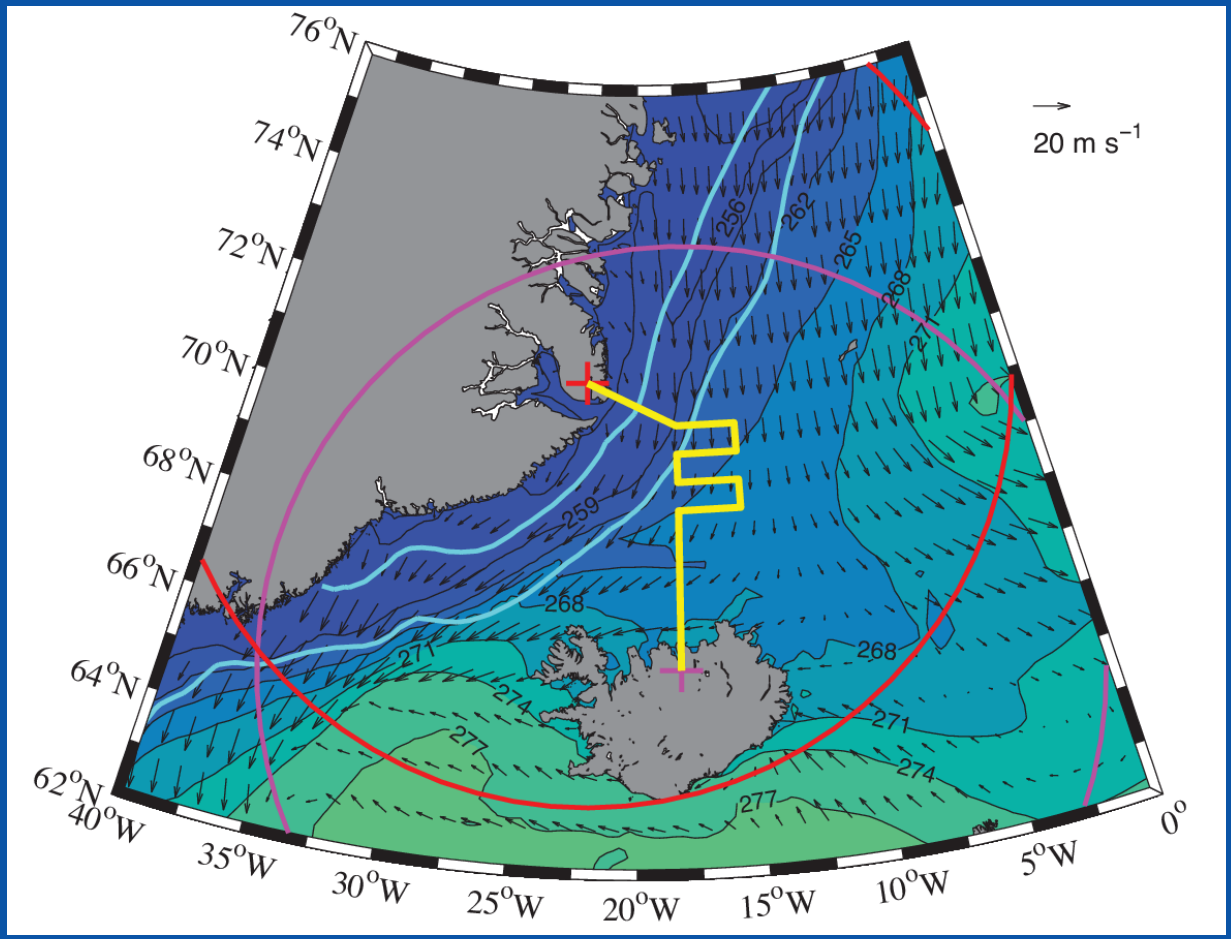
The MARIN twin otter, operated by the British Antarctic Survey

Approximately 12 five-hour flights targeting various weather conditions

Range of aircraft coverage



Example of a flight



From Akureyri to Scorsby Sound

Scientific Objectives for the ocean component

Objective 1: *Document the broad-scale ventilation of dense water in the northwest Iceland Sea and southeast Greenland Sea.*

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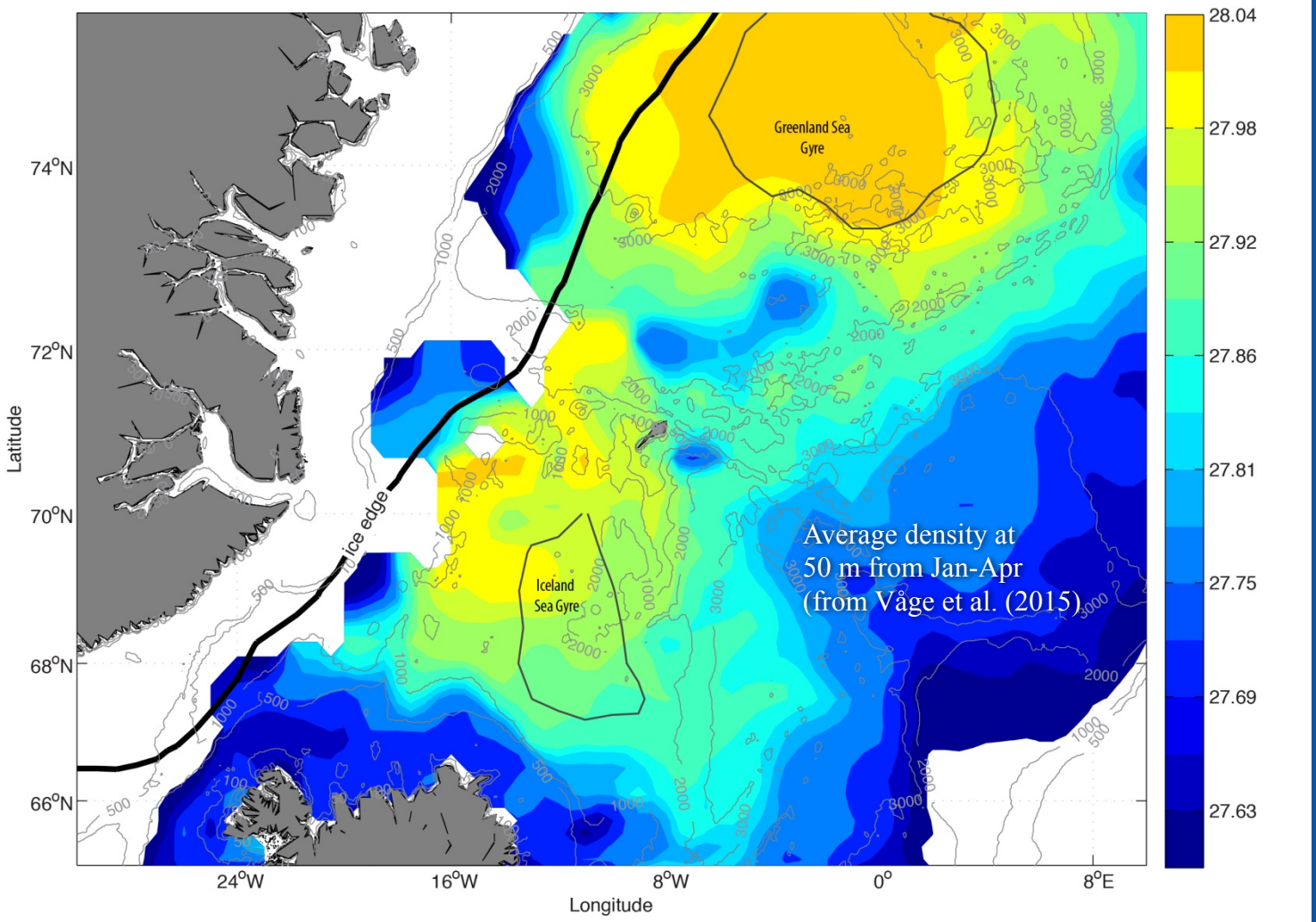
Objective 4: *Elucidate the dynamics and timescales that link the ventilation process, the circulation and mixing of the newly-formed water, and the manner in which the dense water feeds the North Icelandic Jet.*

Observational components



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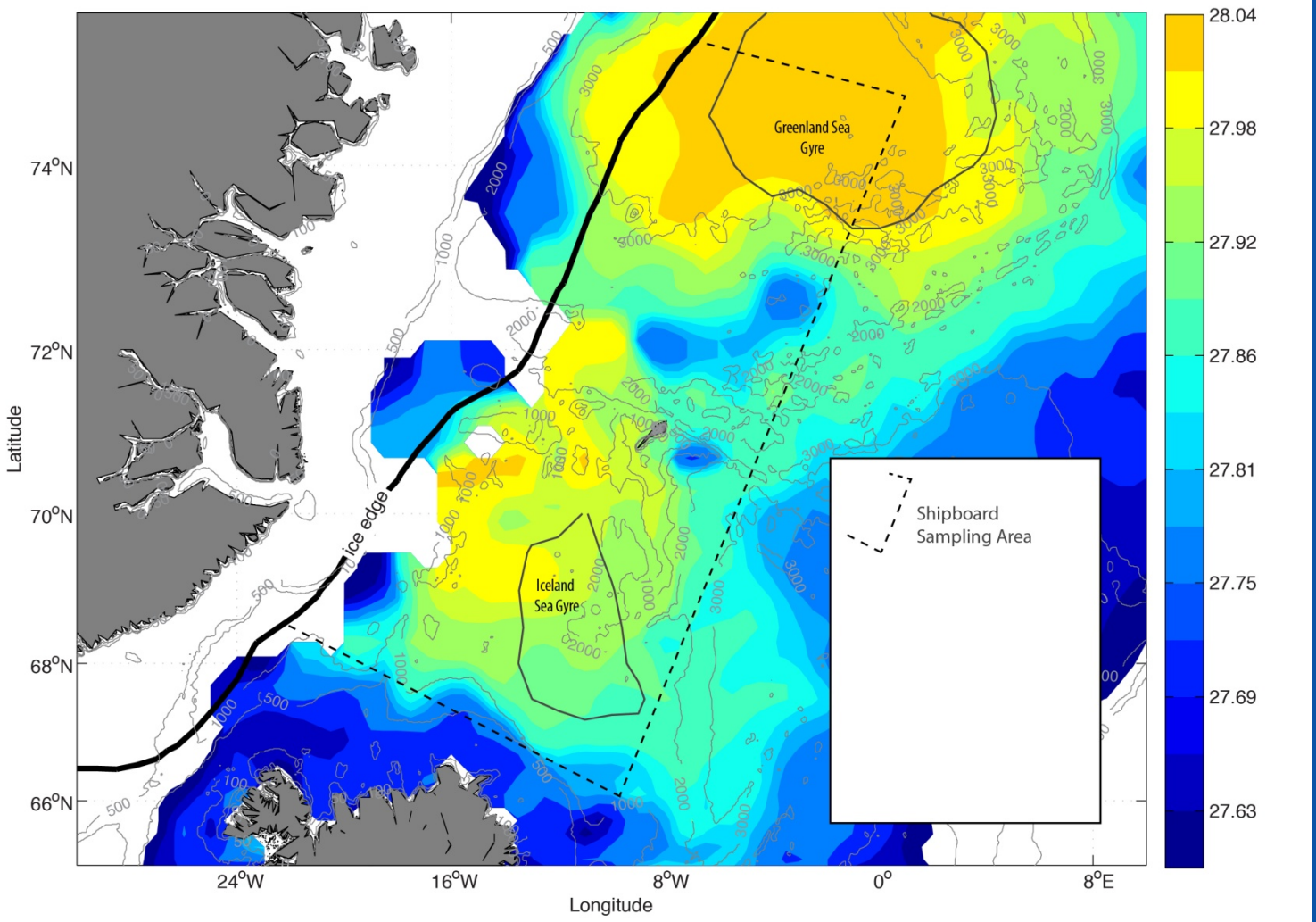

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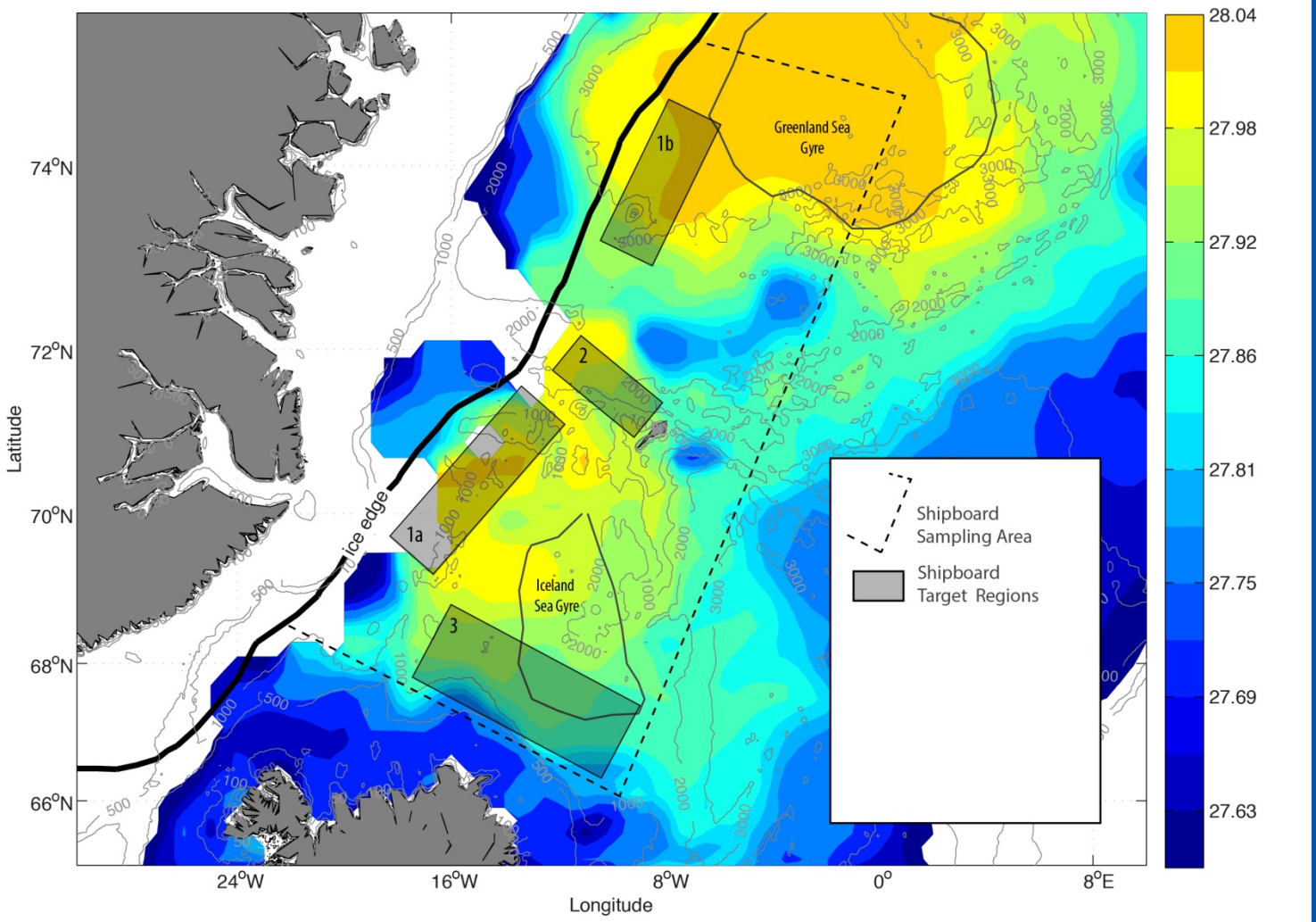

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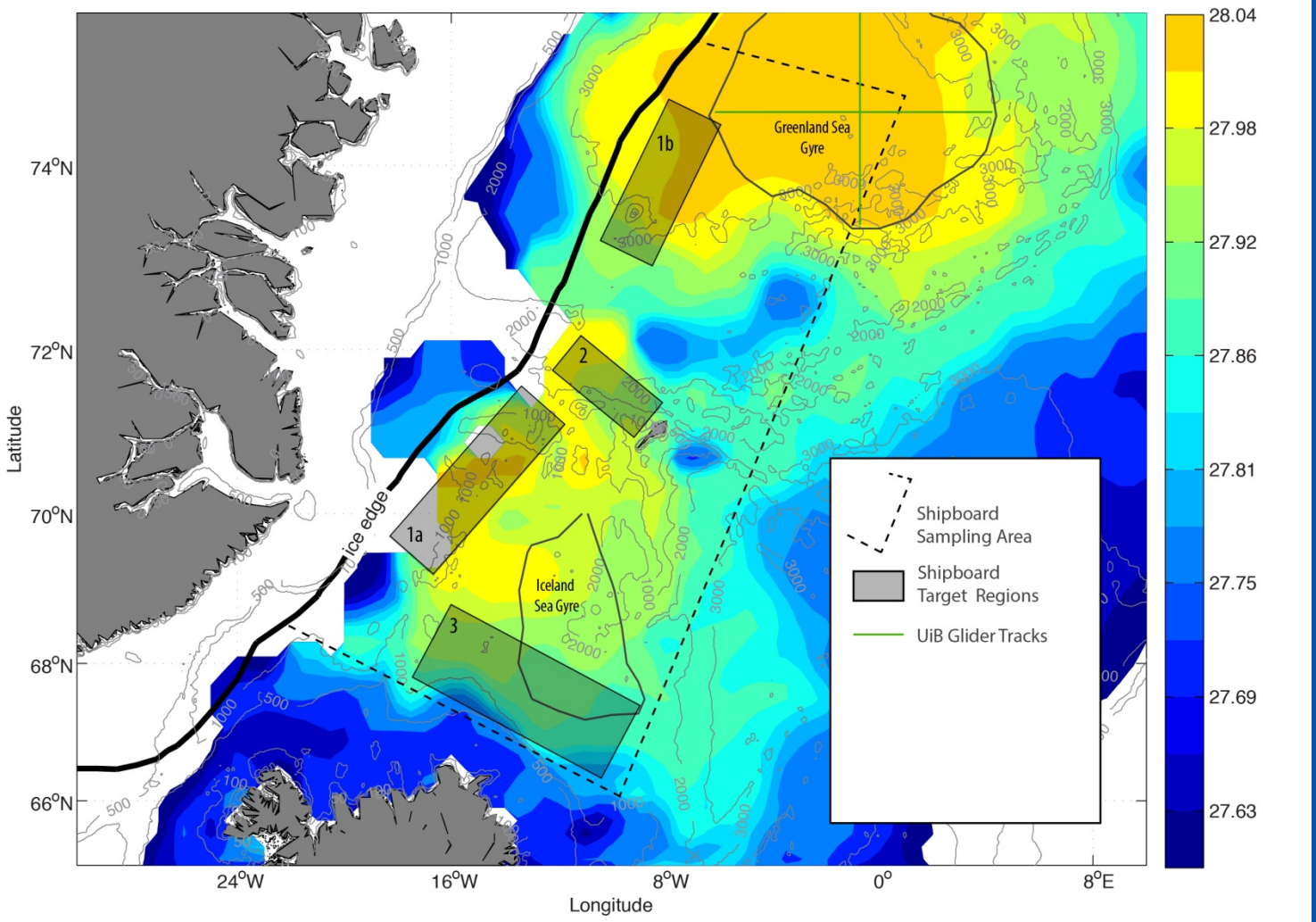

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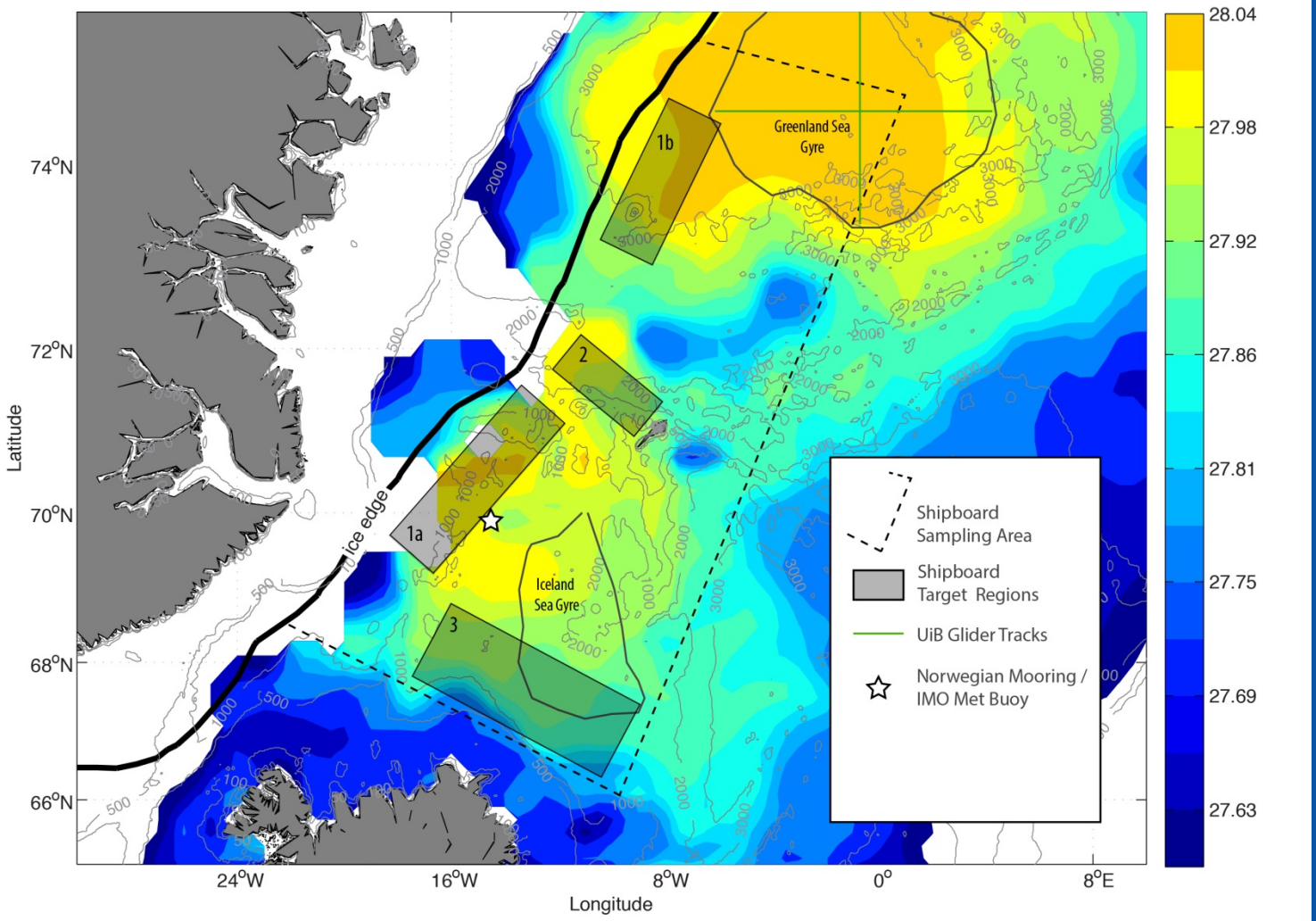

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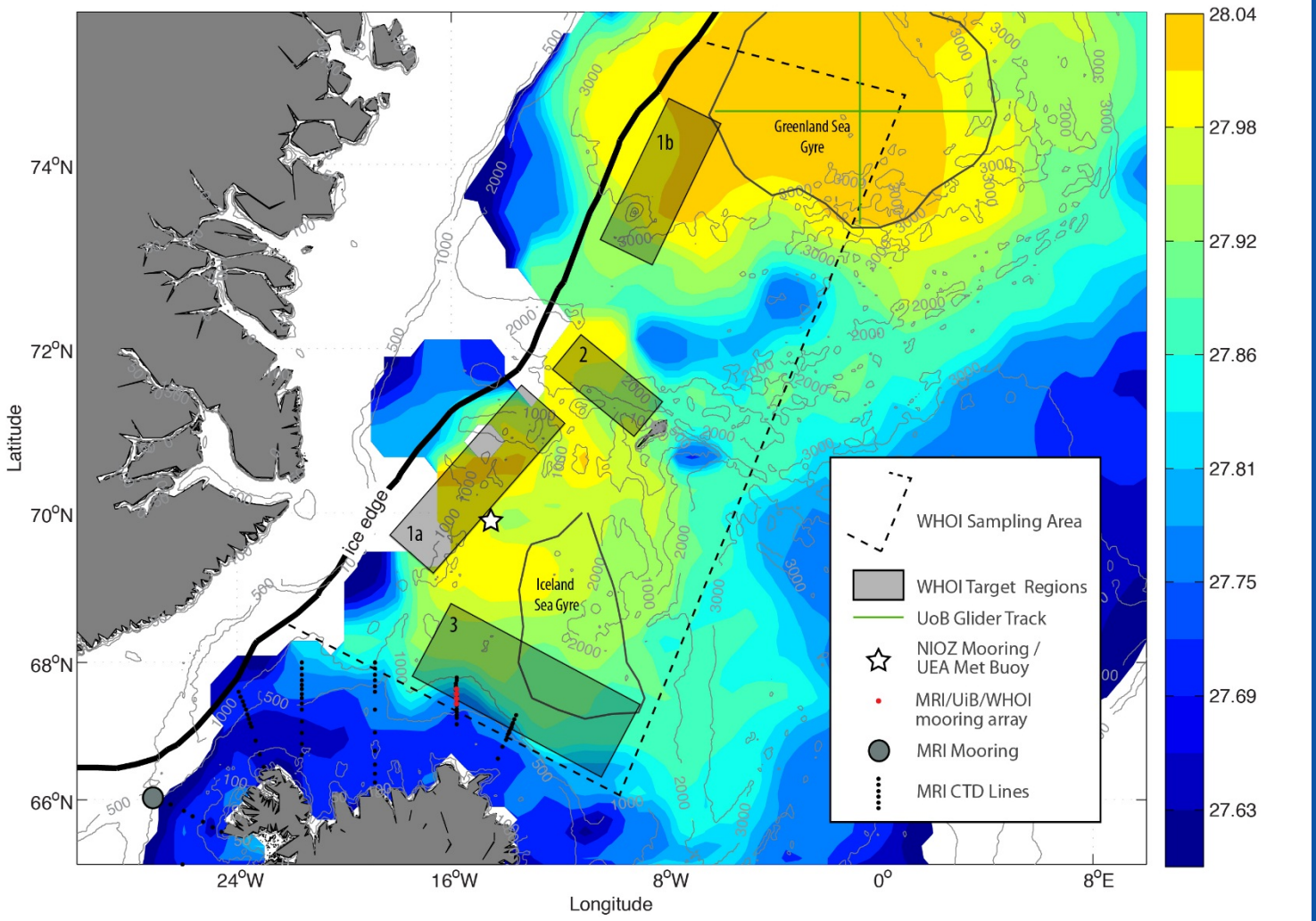

Shipboard components

- Hydrographic measurements using a CTD (T,S,O2,turbidity, etc.)
- Velocity (vessel-mounted ADCP)
- Expendable CTDs (100 XCTDs)
- Tracers (nutrients, dissolved oxygen, CFCs, SF6)
- Shipboard met (standard met package; specialized instrumentation)
- Radiosondes (one per day)
- Unmanned aircraft (Quad-copter)
- Microstructure Glider (short term deployments)
- Outreach

Timing of fieldwork

- **Aug 2017** deployment of moorings, met buoy, gliders
- **Mar 1-31, 2018** aircraft campaign
- **Feb 5 – Mar 31, 2018** winter cruise
- **May 2018** glider recovery
- **Aug 2018** moorings, met buoy recovery