F2022-042
Autonomous Observations in the Nordic Seas

Luc Rainville
Applied Physics Laboratory, University of Washington
1013 NE 40th St, Seattle, WA 98105-6698
206-685-4058, lucrain@uw.edu (Rainville)

Long-term Goals

The objective of this application was to conduct scientific oceanographic research from autonomous platforms in the Nordic Seas. Gliders, wave gliders, floats, and drifters will be deployed and recovered from primarily Norwegian and Icelandic research vessels. Instruments will measure environmental parameters (temperature, salinity, velocity, passive acoustics, turbulence, wind, atmospheric pressure).

Data collected by the autonomous instruments are related to previous NISKINe (2018, 2019; south of Iceland) and NORSE (2021, Fall 2022; near Jan Mayen, Norway) ship-based studies, although broader in scope and with a more direct involvement of International partners from Iceland and Norway.

Accomplished

Permissions were granted to sample within Norwegian, Icelandic, and Faroese waters for the duration of the NORSE DRI (2022-06-15 to 2025-06-14). Below we describe sampling by autonomous instruments that occurred under this project.

Seaglider operations (APL-UW, PI: Rainville)

During the 2022 NORSE cruise, a Seaglider was deployed near Jan Mayen with the objective to sample between the moorings for a year, but unfortunately had to be recovered after a few days because of a malfunction.

A replacement glider was launched north of Iceland in January 2023 from an Icelandic vessel, Árni Friðriksson, during a Fisheries cruise (HAFRO), thank to our collaborators Angel Ruiz Angulo, Andreas Macrander, and Anna Kristín Árnadóttir. This glider had immediate issues with electronics, and was safely recovered after one dive. A trip to Iceland by our senior engineer didn't solve the problem.

A third attempt to send a glider to sample near Jan Mayen was made in June 2023. A glider (SG248) was safely deployed from Vestmannaeyjar (south of Iceland) by Angel Ruiz Angulo and his student. A few weeks into its mission (before crossing the Iceland-Faroe Ridge), the pressure sensor on the glider failed. The glider was recovered by the vessel Árni Friðriksson.

Finally, a fourth glider (SG237) was sent in August 2023 to be deployed north of Iceland again, but shipping delays made such that the glider arrived the day after the ship departed. Since time was running short to transit to Jan Mayen, we made the decision to

not deploy on another cruise opportunity in October, instead aiming for a mission in the winter and spring 2024 south of Iceland on the Faroe-Iceland Ridge (Fig 1). This glider was deployed from Árni Friðriksson in February 2024. At the end of its first dive, engineering data indicated a failed pressure sensor (likely digitalization of the signal, as opposed to a failed sensor itself). Despite advancing darkness and deteriorating weather, we made the decision to attempt a recovery. Unfortunately, the glider was likely hit by the boat and couldn't be recovered.

Slocum glider operations (APL-UW, PI: Simmons)

Several short deployments occurred during the NORSE cruises in 2021, 2022, and 2023. These were covered under the ship-centric NORSE MSR. Two other deployments are reported here.

Slocum Freya was deployed near Jan Mayen in October 2022 and traveled to Norway across the Norwegian Sea. It was recovered from a Norwegian vessels in December 2022 (Fig 2).

The same glider was deployed north of Iceland from R/V Bjarni Sæmundsson (Icelandic research vessel) in August 2023 and was recovered near Jan Mayen during the NORSE cruise in November 2023 (Fig 3).

Wave Glider operations (SIO-UCSD, PI: Merrifield)

Wave Glider SV3-253 "Ole" (SIO) was deployed near Greenland from R/V Árni Friðriksson (Icelandic research vessel) in September 2023 and was recovered near Jan Mayen during the NORSE cruise in November 2023 (Fig 3).

Data Sharing

Data collected from all these platforms have been made available to our colleagues from Norway and Iceland. We are collaborating with Ilker Fer and Ailin Brakstad from University of Bergen, and with Angel Ruiz-Angulo from University of Iceland in analyzing and publishing these results.

FIGURES

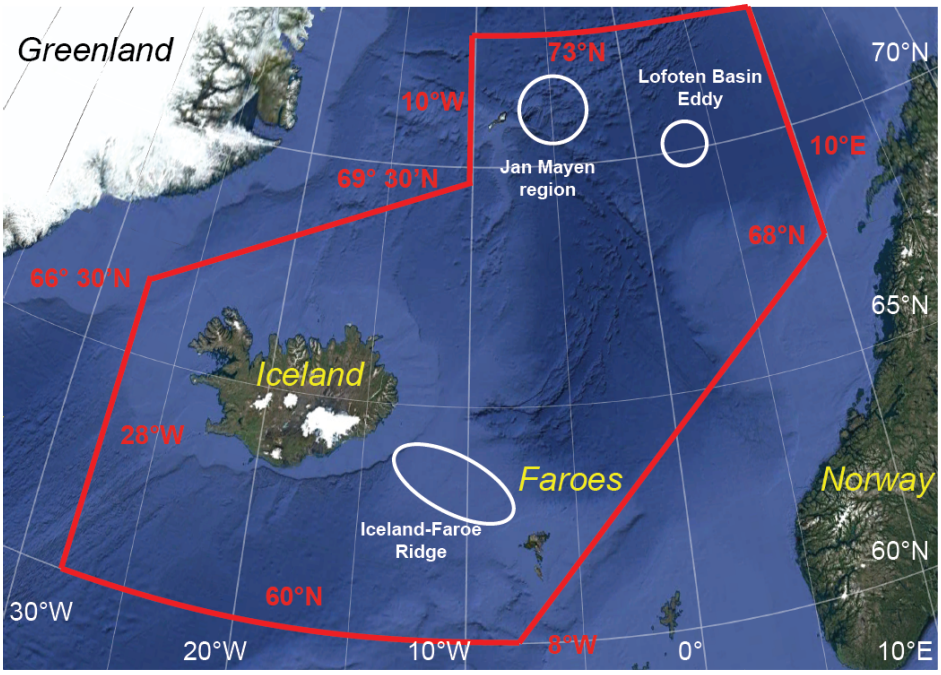

Figure 1. Map of Nordic Seas showing the main focus areas (Jan Mayen region, Lofoten Basin Eddy, and Iceland-Faroe Ridge).

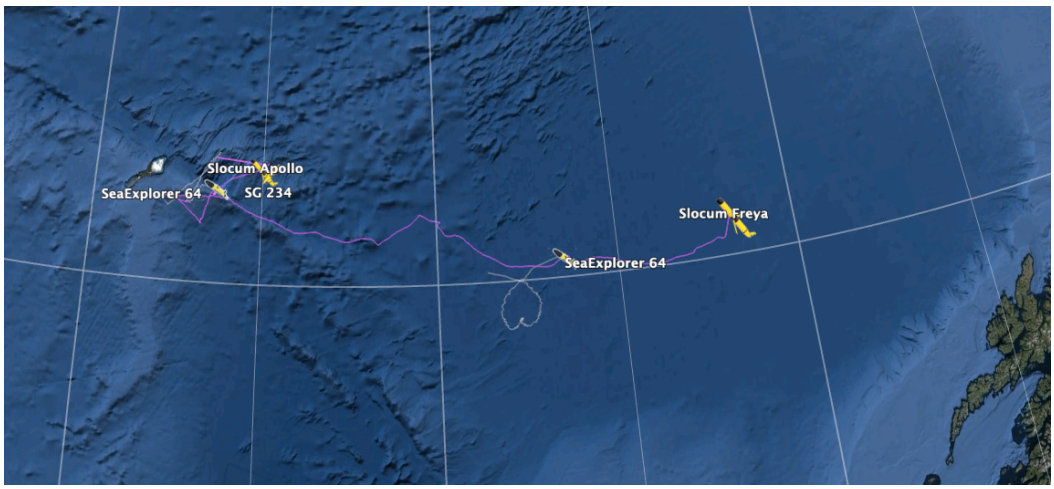

Figure 2: Map of the tracks of Slocum Freya, deployed near Jan Mayen and recovered near Norway, and of two other gliders deployed for the duration of the NORSE cruise only (SeaExplorer 64 near Jan Mayen and in the Lofoten Basin Eddy; and Slocum Apollo)

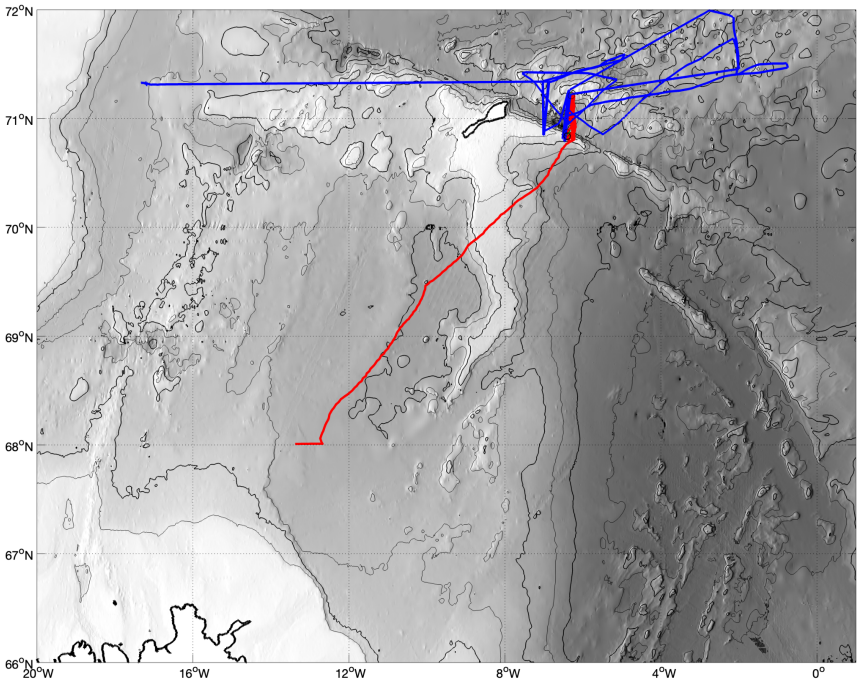

Figure 3: Map of the 2023 tracks of Slocum Freya (red), deployed north of Iceland recovered near Jan Mayen, and a Wave Glider (blue) deployed near Greenland and recovered near Jan Mayen. Both instruments were deployed from Icelandic Research vessels and recovered during the 2023 NORSE cruises.