

In the works...

Expedition 403: Eastern Fram Strait Paleo-Archive

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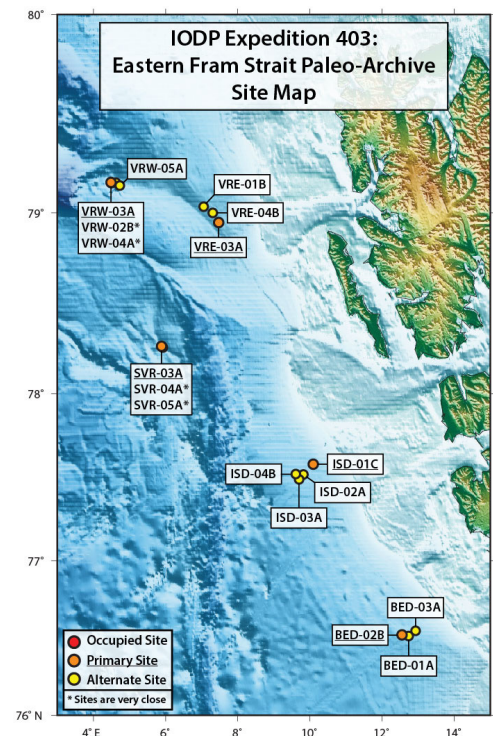
Sitting between Greenland and Svalbard is a deep-water passage that connects the Arctic Ocean with the Northern Atlantic to the south. Today this passage is best defined by the presence of a warm northward flowing current west of Spitsbergen (WSC) and the cool southward flowing East Greenland Current (EGC). By looking at the northward flowing current, which moves heat, salt, and moisture into the Arctic region, Expedition 403: “Eastern Fram Strait Paleo-Archive” will collect crucial data to ground-truth climate models of projected future CO₂, temperature, ocean circulation, sea ice, and present Earth ice sheet stability.

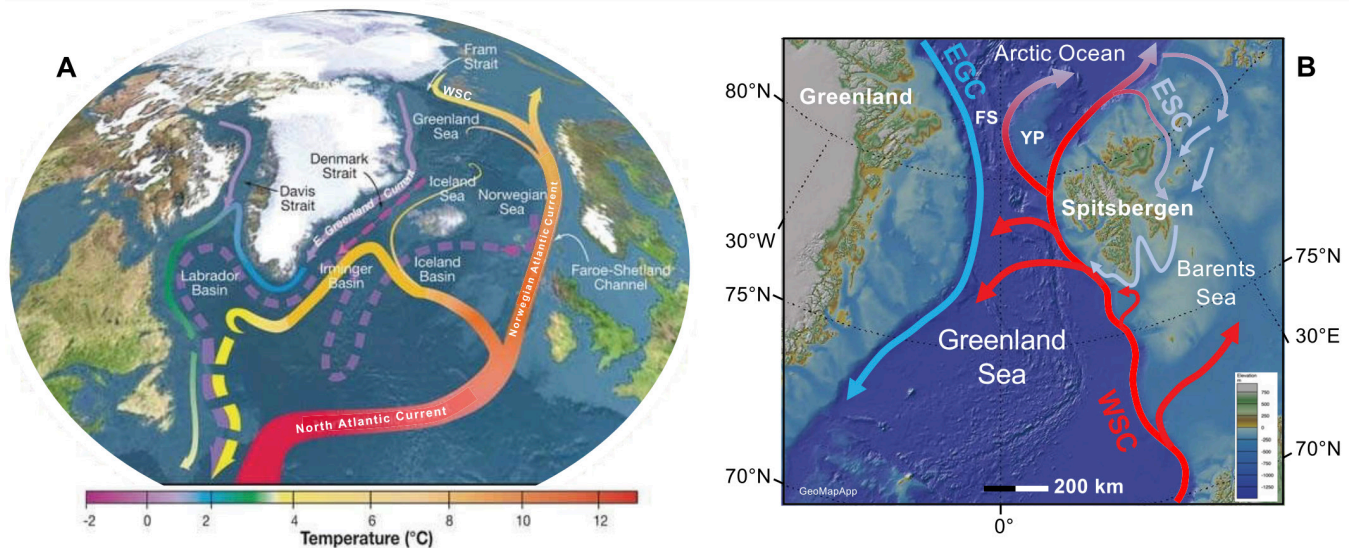
Led by Renata Giulia Lucchi (National Institute of Oceanography and Applied Geophysics-OGS) and Kristen St. John (James Madison University), Expedition 403 will depart from the port of Amsterdam in early June. Making the voyage northward, the researchers plan to drill at six primary sites along the western shore of Svalbard’s largest land mass. At the deepest point, the expedition aims to retrieve samples from 738 meters below the sea floor.

Cores collected over the course of two months will address the primary objectives of Expedition 403, which are:

- to reconstruct the West Spitsbergen Current variability transporting warm North Atlantic Water to the Arctic Ocean,
- to understand the influence oceanic water patterns have on climate changes particularly during key climate transitions (late Miocene–Pliocene transition, late Pliocene–Pleistocene transition, MPT, mid-Brunhes transition, and suborbital Heinrich-like events),
- and, to measure the impact this exchange has on the Arctic glaciations, ice shelves development and stability, and sea ice distribution.

Over millions of years, sediment has collected under the influence of marine sedimentological and biological activity, advanc-





Modern oceanographic configuration of North Atlantic Ocean. (A) Schematic circulation of surface currents (solid curves) and deep currents (dashed curves) that form portion of AMOC. Curve colors indicate approximate temperatures. Modified after Curry (2010). (B) Details of northernmost part of Atlantic Ocean currents' configuration. Modified after Jakobson et al. (2012). (Credit: Lucchi, R.G., St. John, K., and Ronge, T.A., 2023).

ing and retreating glaciers on the continental margin, and the warm current moving along the seafloor in the eastern Fram Strait. The climate proxies contained in these sediment drifts hold clues of key climate transitions, useful climate proxies of the past which, can be used as analogs for future climate transitions. Through a more detailed reconstruction of the West Spitsbergen Current and North Atlantic Water, researchers will be better able to inform the climate models that guide our future in a warming world.

While the Arctic and North Atlantic Oceans play a significant role in the climatic evolution of the Northern Hemisphere, the findings of this expedition also shine a light on the future of the South Pole. One particularly influential aspect of Expedition 403 is what can be learned from the depositional history of this region as it is applied to onshore geology, including the dynamics of the Svalbard-Barents Sea Ice Sheet (SBSIS) complex. The paleo marine-based SBSIS is considered the best analog for the modern West Antarctic Ice Sheet (WAIS). Easier to access than the Antarctic ice sheet, the paleo SBSIS record becomes an ideal laboratory to explore the effects of ice-atmosphere-ocean interactions under fast, warm climatic change. With an increasingly warming climate, the loss of stability of the WAIS is a significant concern for future global projections of sea level rise.

Expedition 403 stands out in significance not only because it will return with data to better understand some of the most pressing details of our changing climate, but also for its historic role as the last expedition of the *JOIDES Resolution* within the International Ocean Discovery Program. While the future of the veteran ship is still uncertain, the likeliest outcome is that the decommissioning process will begin in the port of Amsterdam soon after the conclusion of this expedition.

Join the Slingshot production team as they document the final IODP expedition for the upcoming feature length documentary: [The Time Travelers](#). For more information visit the [expedition page](#) on the International Ocean Discovery Program website. Stay up-to-date with expedition news on the *JOIDES Resolution X* (formerly Twitter), [Facebook](#), and [Instagram](#) accounts.