

An aerial photograph of the research vessel RV Polarstern, a blue and white ship with a red superstructure, navigating through a vast expanse of the Beaufort Sea. The sea is covered with numerous ice floes of various sizes, creating a complex, textured pattern of white and grey against the dark water. The horizon is visible in the distance under a pale, overcast sky.

Research with the RV Polarstern in the Canadian Beaufort Sea in 2027

Beau PAIR:

Canadian-German **Beaufort** Sea **P**artnered **A**rctic **I**cebreaker **R**esearch

Gesine Mollenhauer, Bennet Juhls, Susann Henkel (AWI)
Marcus Gutjahr (GEOMAR)

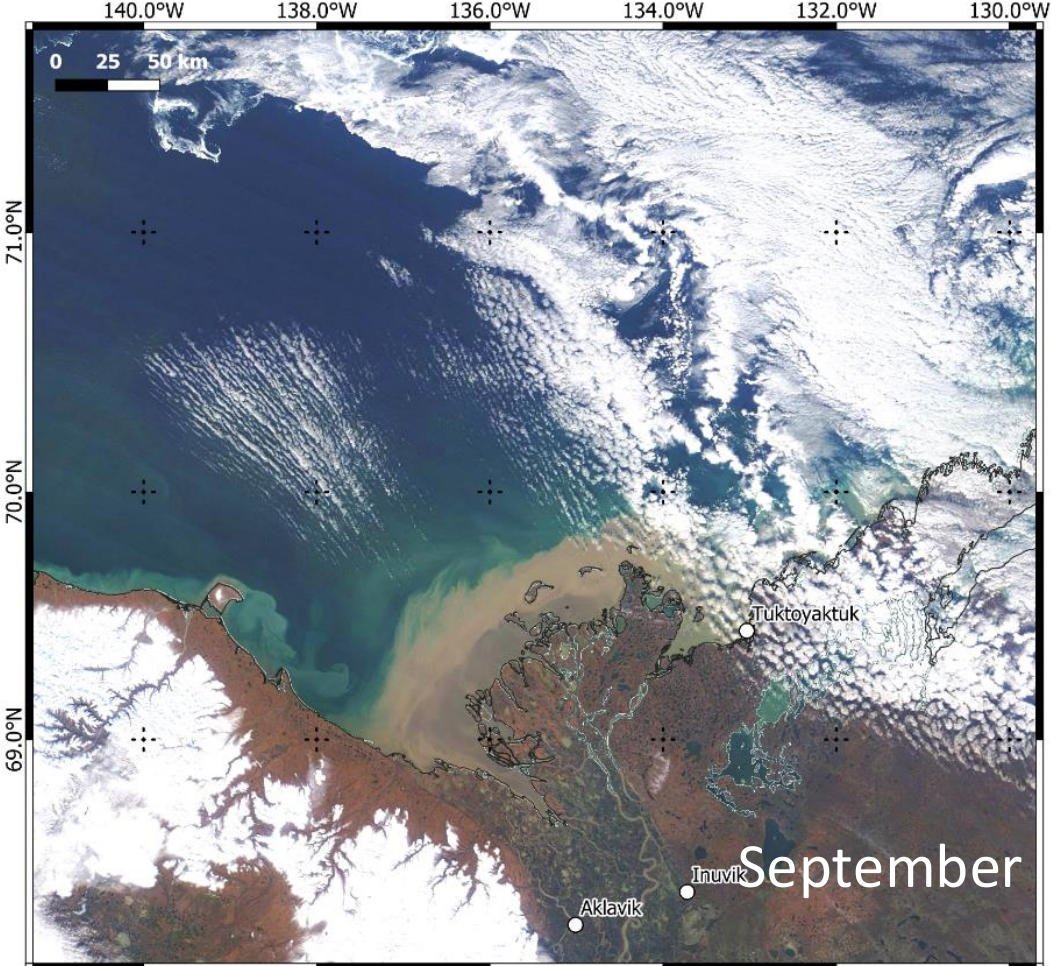
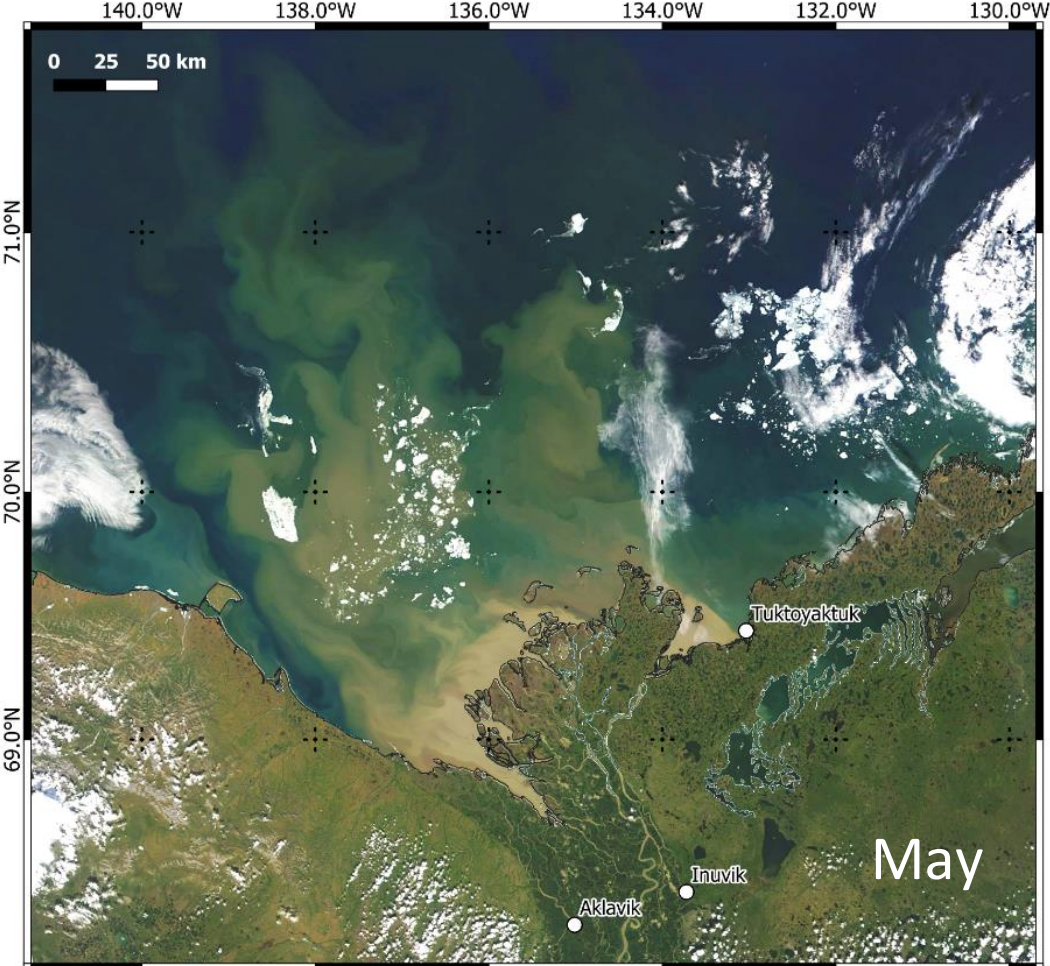
Beau PAIR Expedition: June – September 2027



- Two legs with 7 ½ weeks each (2x51 days at sea):
 - Leg 1 Bremerhaven-Beaufort (June 23- August 11)
focus on water column sampling and sediment-water interface
 - Leg 2: Beaufort-Bremerhaven (August 14-October 2)
focus on benthic observations, sediment coring), marine biota studies, and water column particle sampling
- Applicants: G. Mollenhauer, M. Gutjahr, B. Juhls, S. Henkel, H. Flores, C. Havermanns, M. T. Maldonado*, R. Middag, P. Overduin, A. Pellerin*, S. Primpke, F. Wenzhöfer

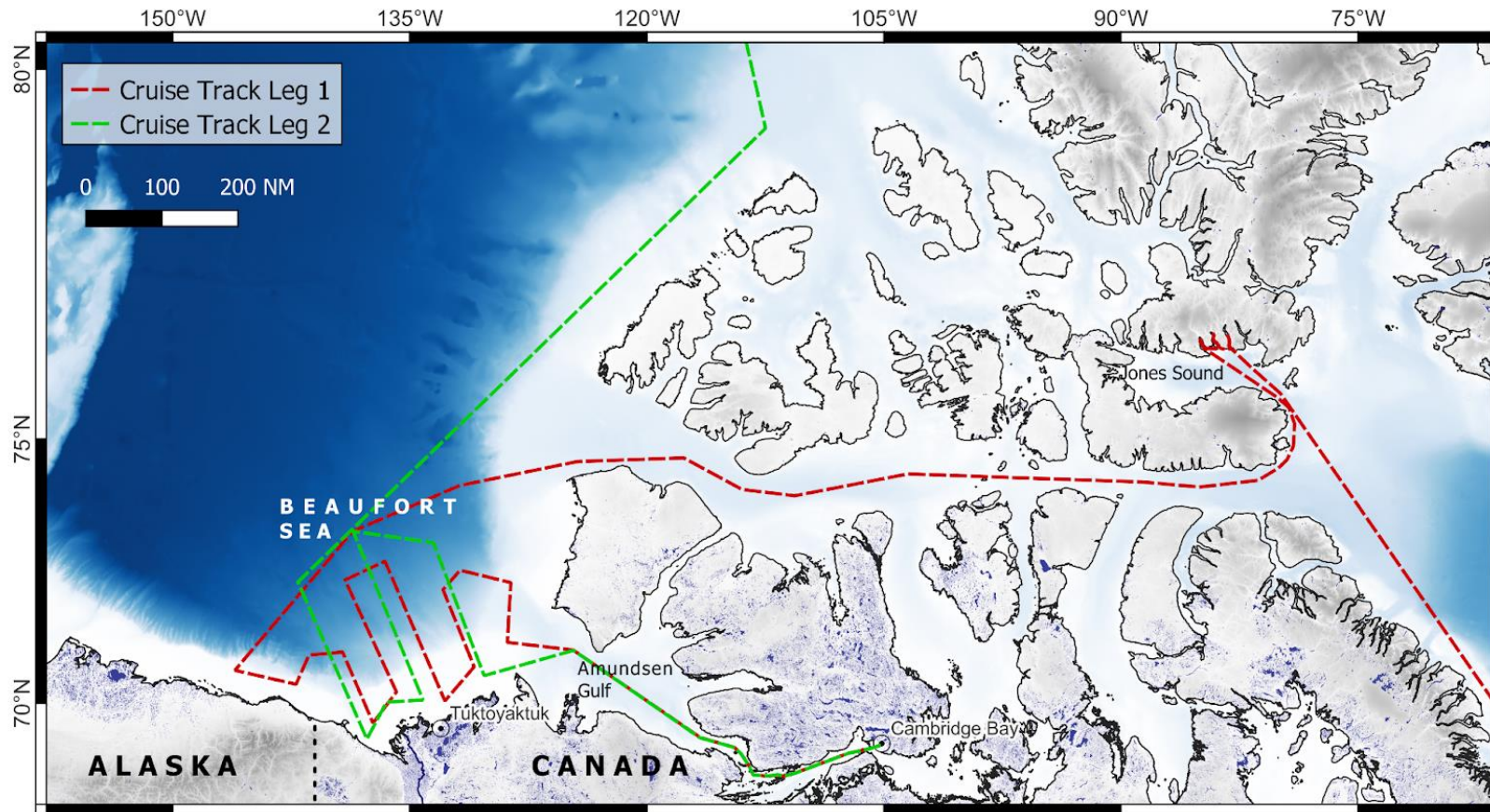
**based in Canada*

Land-ocean transport offshore the Mackenzie



Beau PAIR cruise plan

Tentative cruise plan



LEG1
chief: Marcus Gutjahr (GEOMAR)
co-chief: Bennet Juhls (AWI)

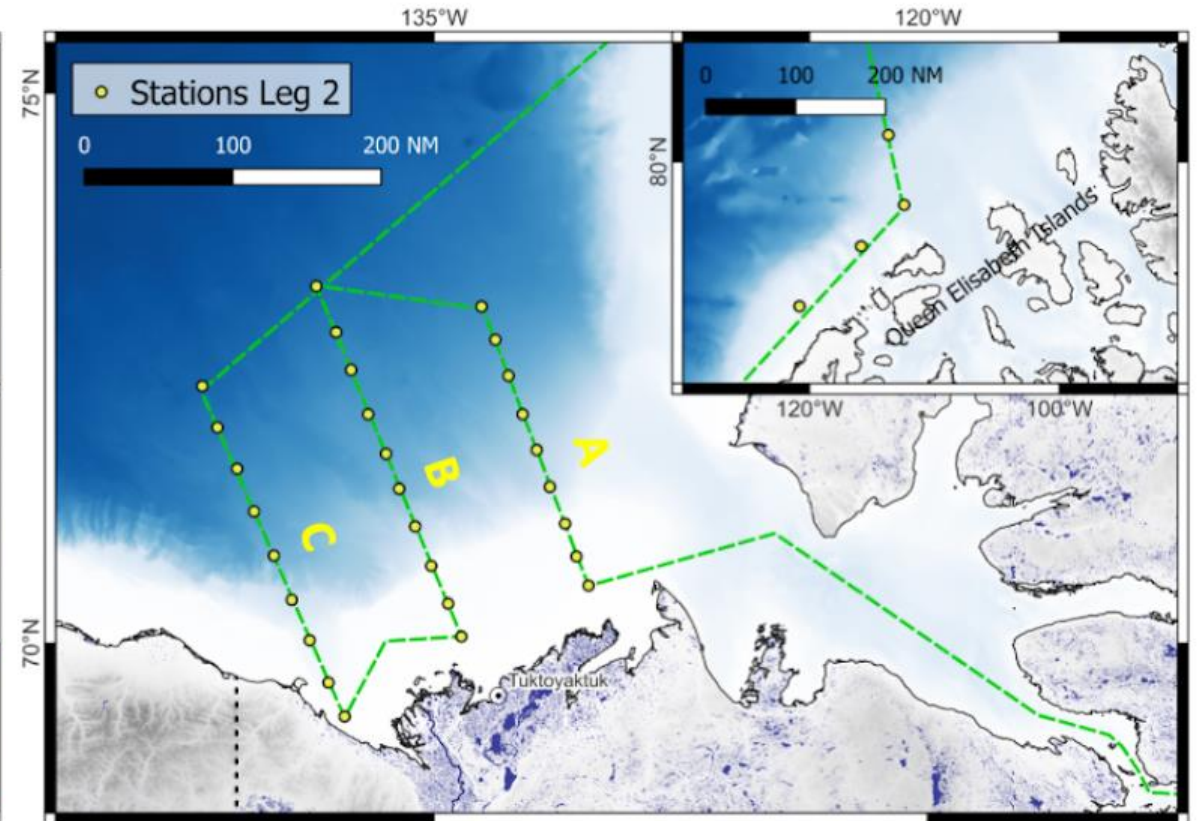
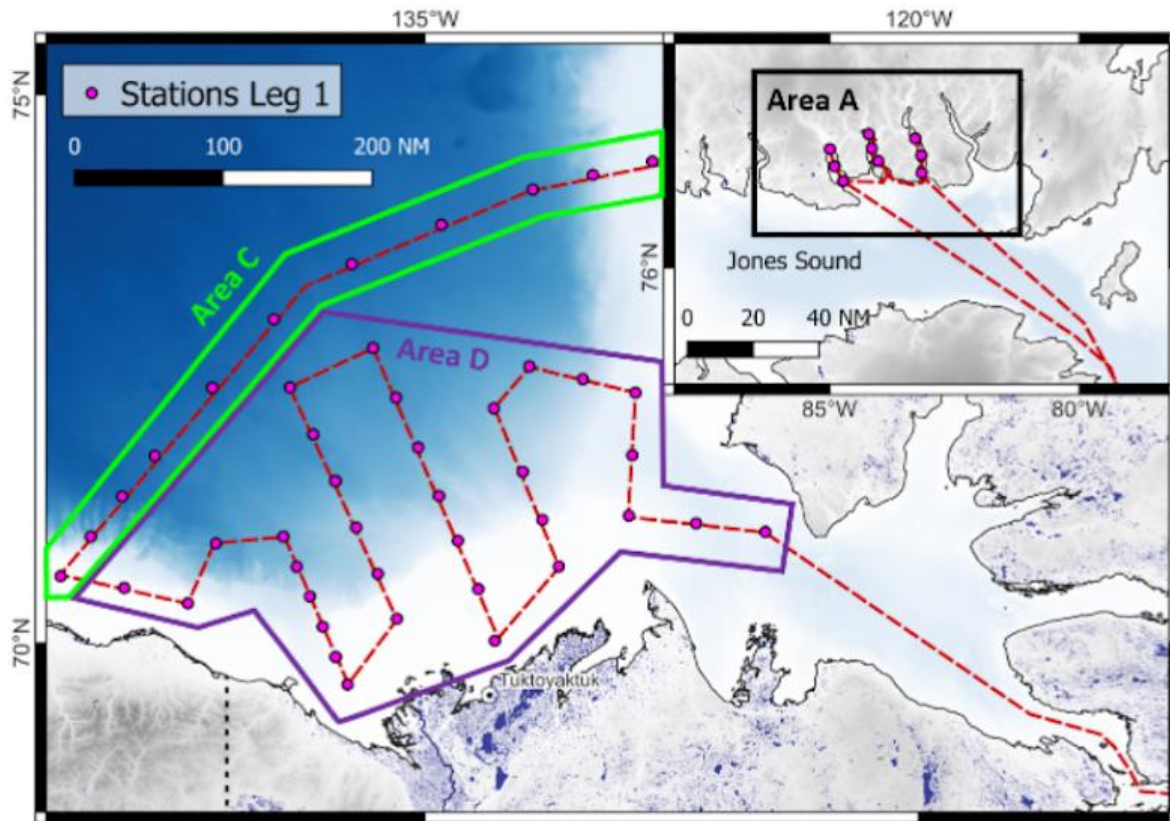
LEG2
chief: Gesine Mollenhauer (AWI)
co-chief: Frank Wenzhöfer (AWI)

Beau PAIR cruise tracks

Planned stations

Leg 1: Transit time: 34 days, station time 17 days

Leg 2: Transit time: 28 days, station time 23 days



Assess the effects of human-driven and natural climate changes across the Mackenzie-Beaufort Sea transect, focusing on how changing freshwater discharge from the Mackenzie River impacts biogeochemical cycles, marine ecosystems, pollution, benthic processes, and sediment dynamics today and in the geological past.

“AWI and the co-proponent’s institutions are committed to co-developing this research program in close partnership with local communities and stakeholders, recognizing that environmental changes in the Beaufort Sea have direct impacts on local livelihoods, food systems and cultural practices.”

Research priorities that are of interest and concern to Inuvialuit communities align closely with the scientific goals proposed in this campaign, creating a strong basis for collaborative research and mutual benefit.

- Analysis of the Mackenzie **River plume and associated land–ocean fluxes** of carbon, nutrients, various particulate and dissolved pollutants, trace metals, and sediments
- Assessment of **air–sea CO₂ and CH₄ fluxes**, links to gas seepage and permafrost thaw
- Investigation of **food web dynamics**, including zooplankton, prey availability for fish, pollutant exposure, and boreal fish migration
- Monitoring of **harmful algal blooms** and algal toxin occurrence
- Mapping **phytoplankton community composition** along transitional waters away from the delta
- Study of **terrestrial organic matter** in sediments and its role in carbon cycling
- Reconstruction of **past biodiversity** and ecosystem change by aDNA
- Observations of **sea-ice** extent, thickness, and optical properties
- Improve data on **subsea permafrost**, its carbon fluxes, and links to geological processes
- Quantification of **coastal erosion** and its effects on nearshore ecosystems
- Validation of **satellite ocean color products** (e.g., Sentinel-3, EnMAP) through in situ optical and chemical measurements

Biogeochemical Shifts, Carbon Pathways, and Emerging Contaminants

Arctic amplification, permafrost thaw, increased river runoff and retreating glaciers lead to biogeochemical shifts, increased input of carbon and emerging contaminants.

Ecosystem Dynamics, Arctic Cod and fishes of the Central Arctic Ocean

Substantial shifts in productivity, ecosystem dynamics result from changes in runoff and biogeochemical processes, affecting the entire food web including Arctic Cod and fishes of the Central Arctic Ocean.

Seafloor Processes

Input of terrestrial materials, particularly from the Mackenzie River, determines benthic fluxes and microbial communities.

Circulation and Paleo Perspectives

Land-ocean interplay in concert with sea-level change induced opening and closure of the Bering Strait determine sediment budgets as well as circulation patterns of the Arctic Ocean and beyond.

*A central priority of the project is the **timely and transparent communication of results to Inuvialuit communities** through respectful, direct dialogue and appropriate knowledge-sharing channels.*

Land-ocean connectivity in the Arctic

2027

Land-ocean connectivity under climate change

Integrates ship-based, airborne, coastal and on-land observations

Internationally coordinated

Co-designed and coordinated with indigenous communities

ARCTIC PULSE

