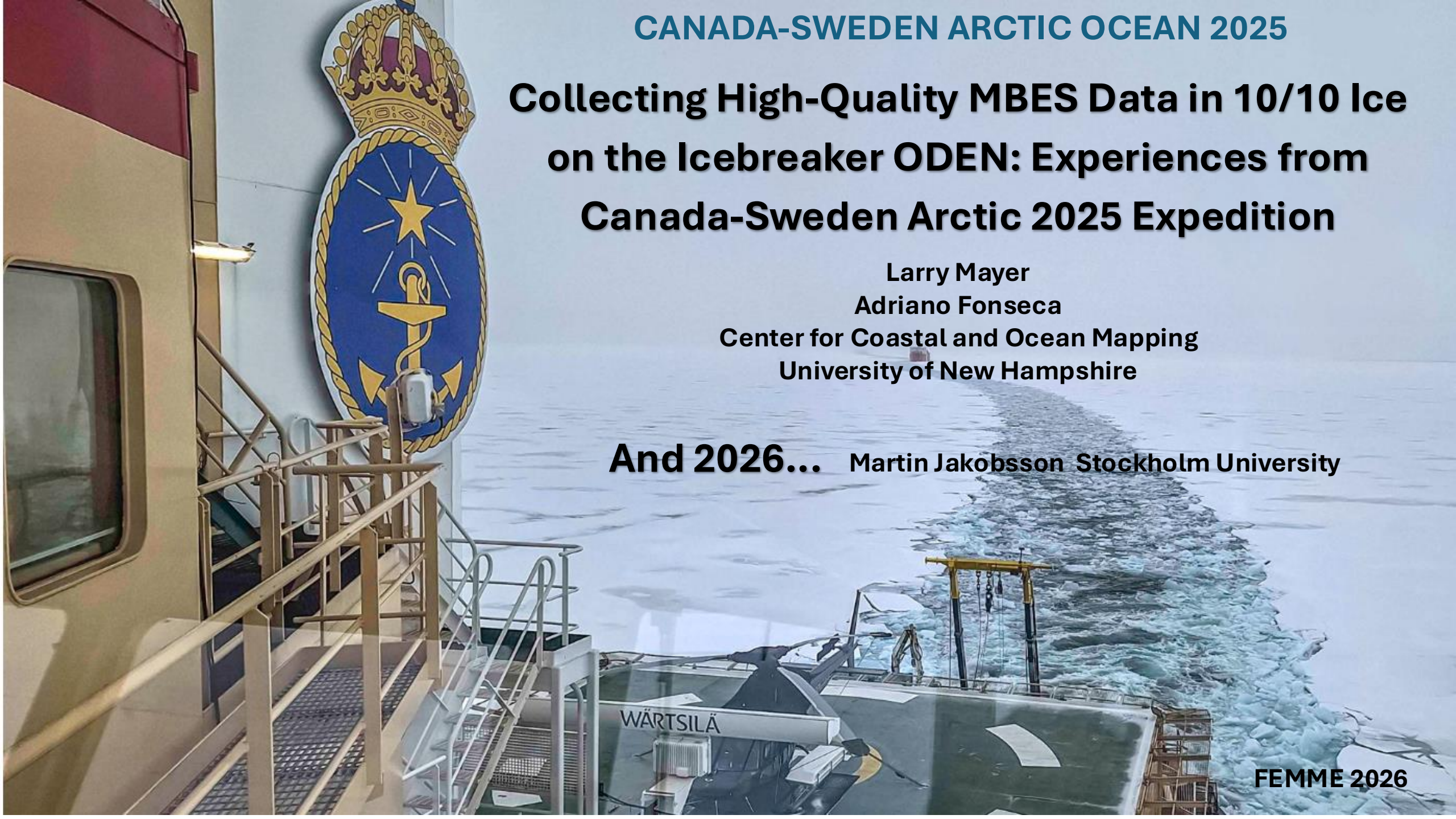




CANADA-SWEDEN ARCTIC OCEAN 2025

**Collecting High-Quality MBES Data in 10/10 Ice
on the Icebreaker ODEN: Experiences from
Canada-Sweden Arctic 2025 Expedition**

Larry Mayer

Adriano Fonseca

Center for Coastal and Ocean Mapping

University of New Hampshire

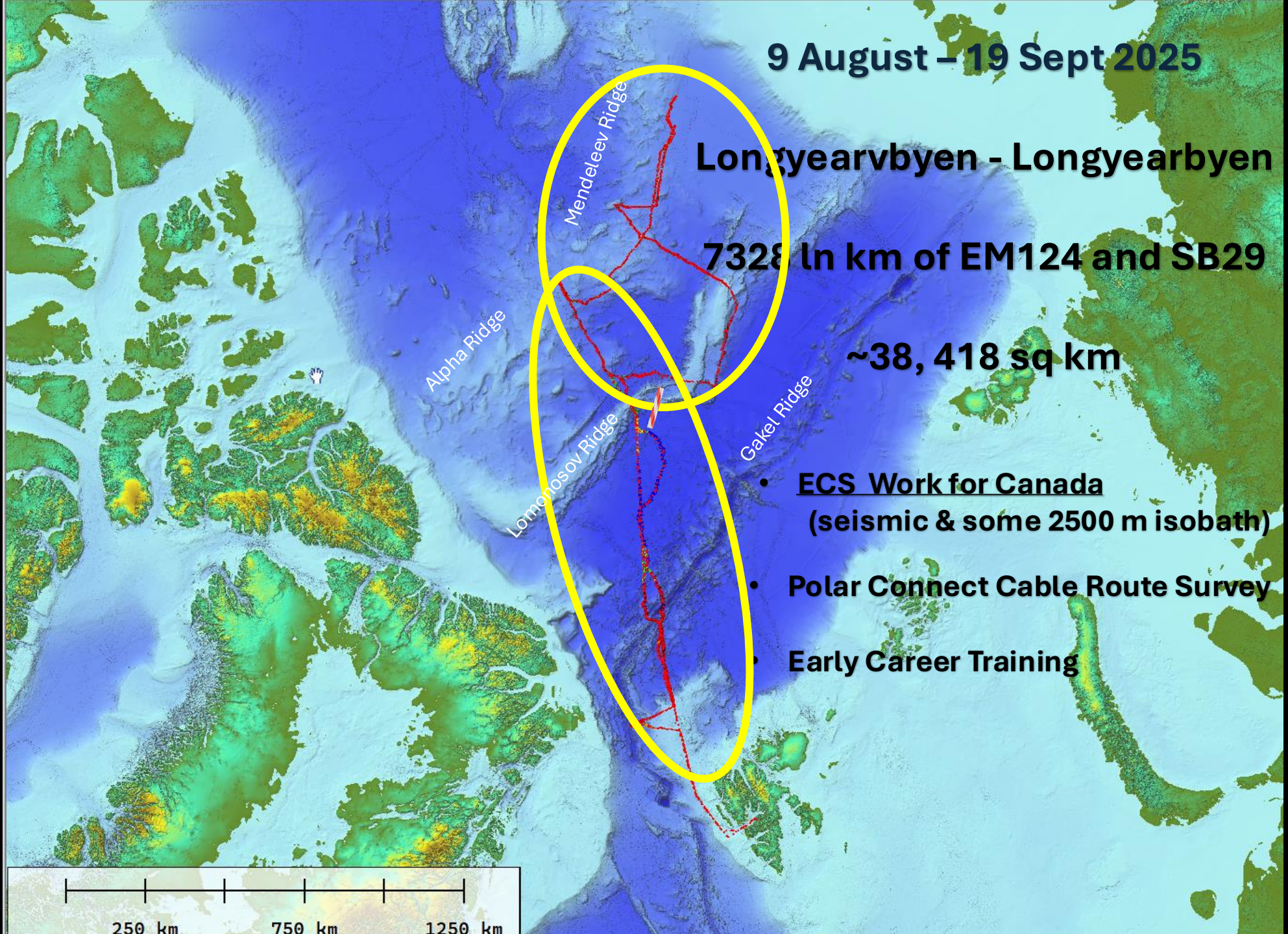
And 2026... Martin Jakobsson Stockholm University

FEMME 2026

ODEN



LOUIS S. St. LAURENT





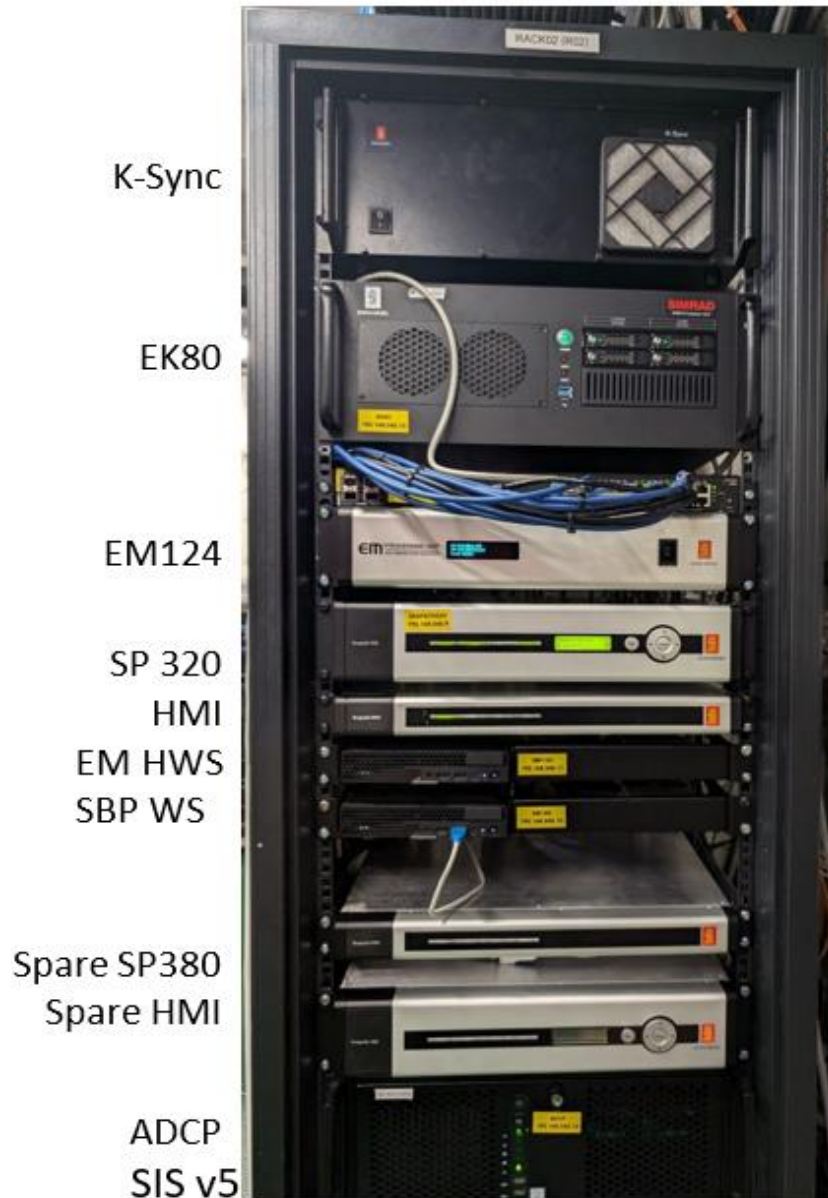
I/B ODEN

EM124 Multibeam Echosounder
Sea Acceptance Testing (AO25)
Aug 1-8, 2025

*Report prepared by
Paul Johnson
Kevin Jerram*

image: Björn Eriksson

Survey System Components



Kongsberg Maritime EM124

12 kHz, 1.0° TX x 1.0° RX
TX s/n 154, RX s/n 147

Seapath 320 / MRU 5 nav. system

NovAtel GPS-702-GG antennae

Kongsberg Maritime SBP 29

2-9 kHz Subbottom Profiler

Kongsberg Maritime K-Sync

Surface sound speed sensors

SBE-45 in 'kofferdamm' (calculated)
Valeport in sea chest (not used)

Sound speed profiling systems

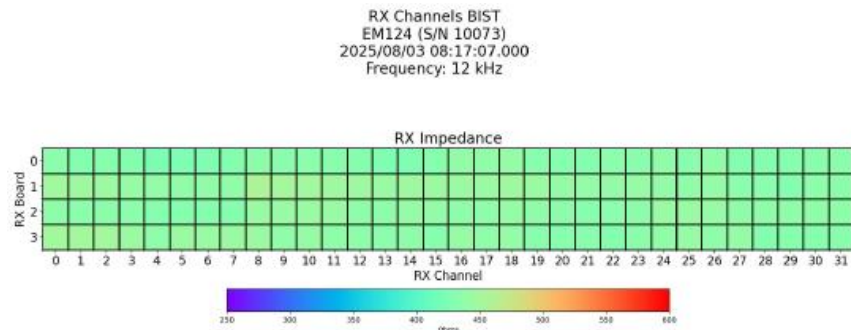
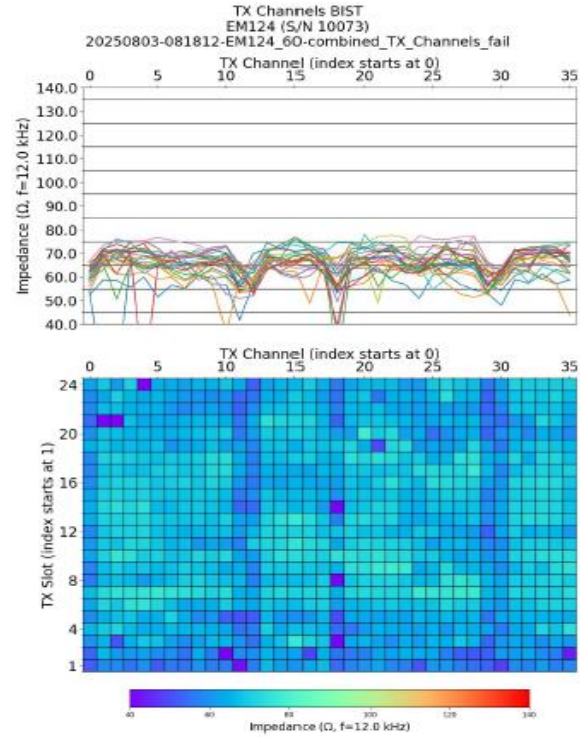
Sippican MK21 XBT profiling
Seabird CTD profiling
Sound Speed Manager

EK-80s and ADCP

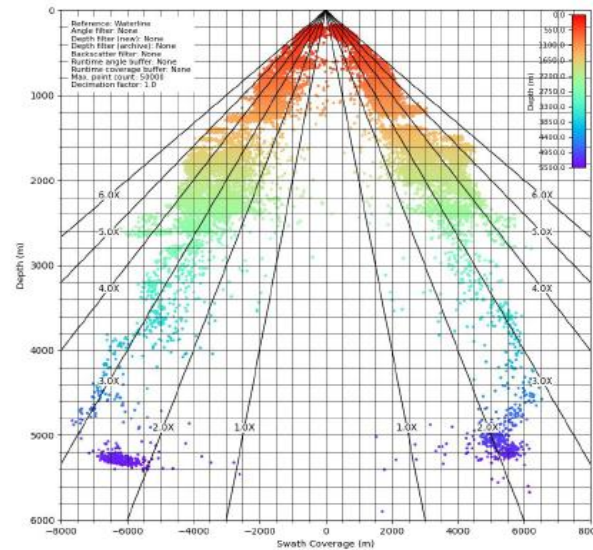
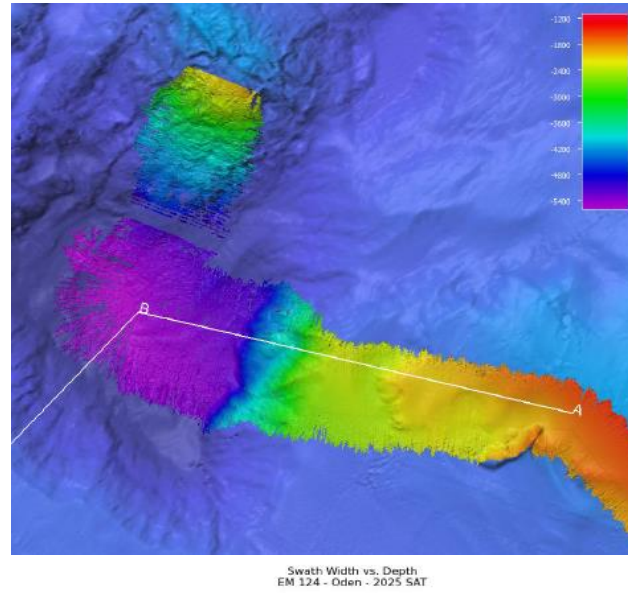


From P. Johnson and K. Jerram SAT Report

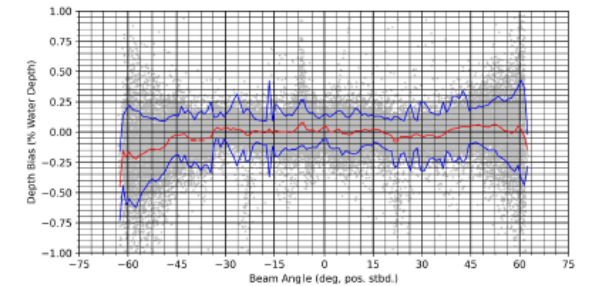
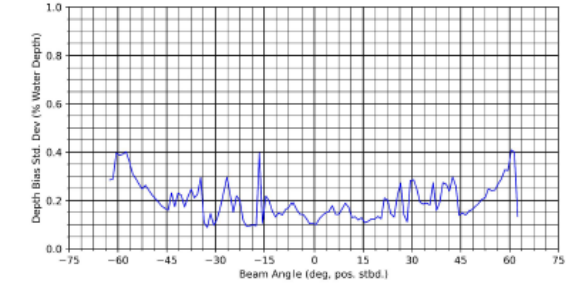
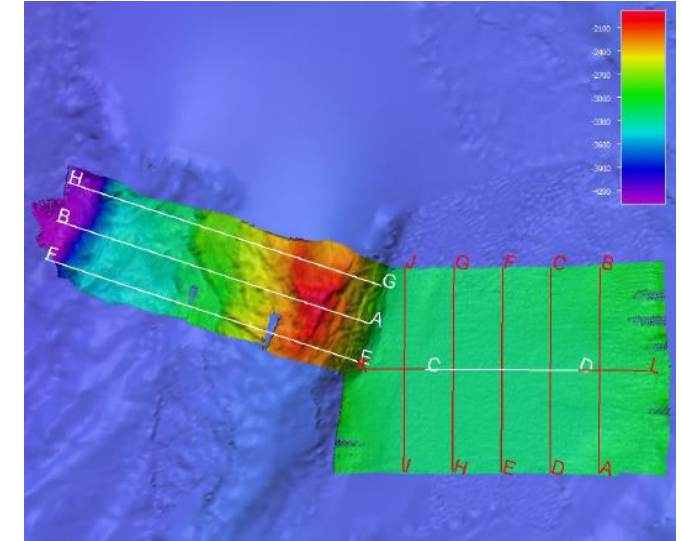
HARDWARE HEALTH

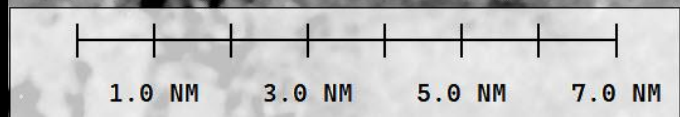
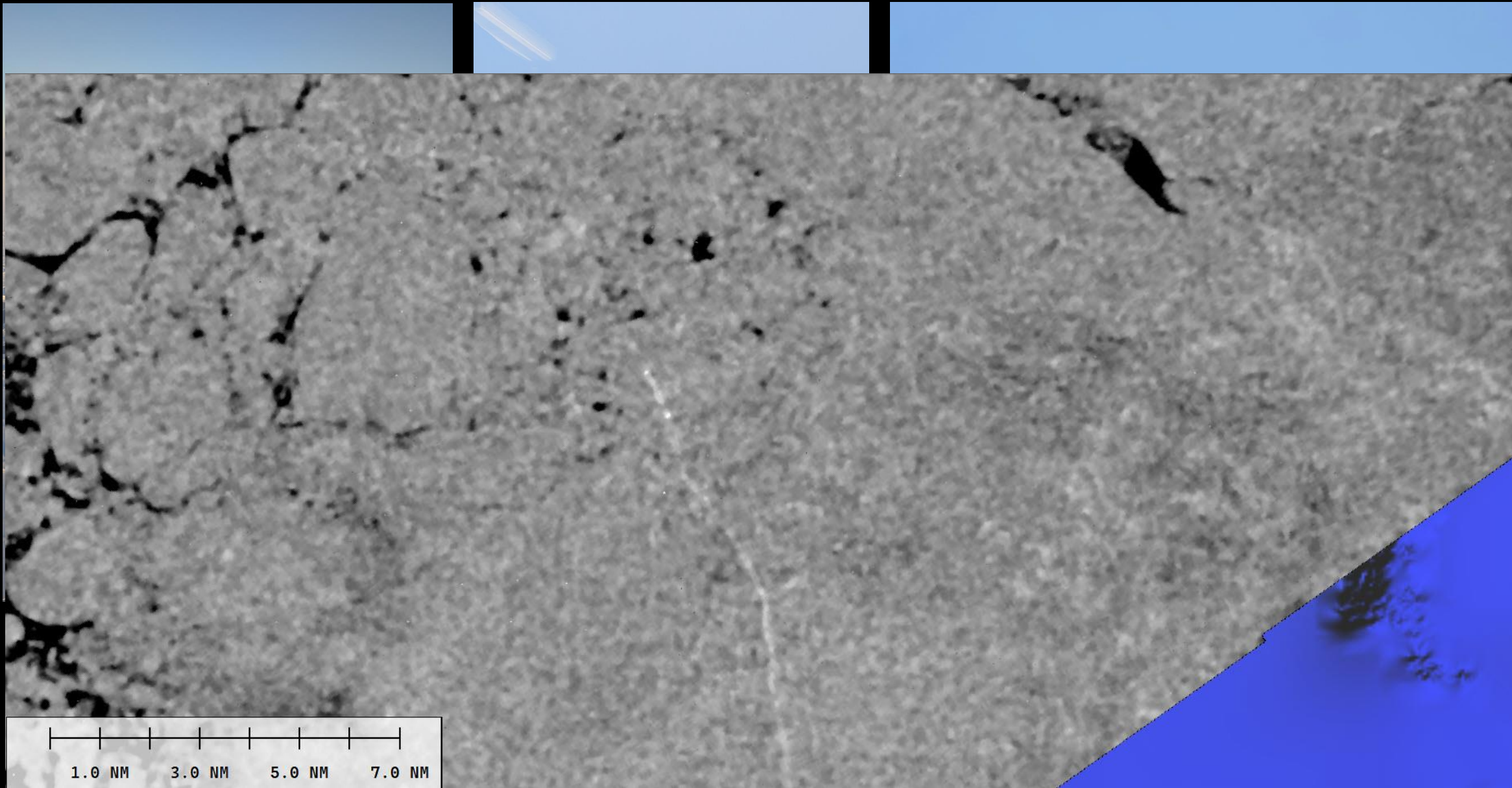


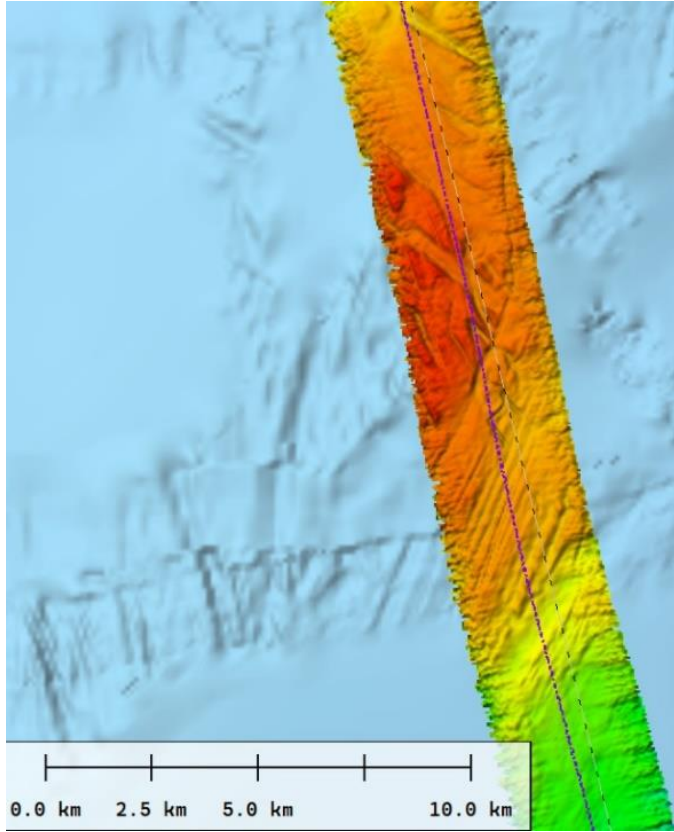
SWATH COVERAGE



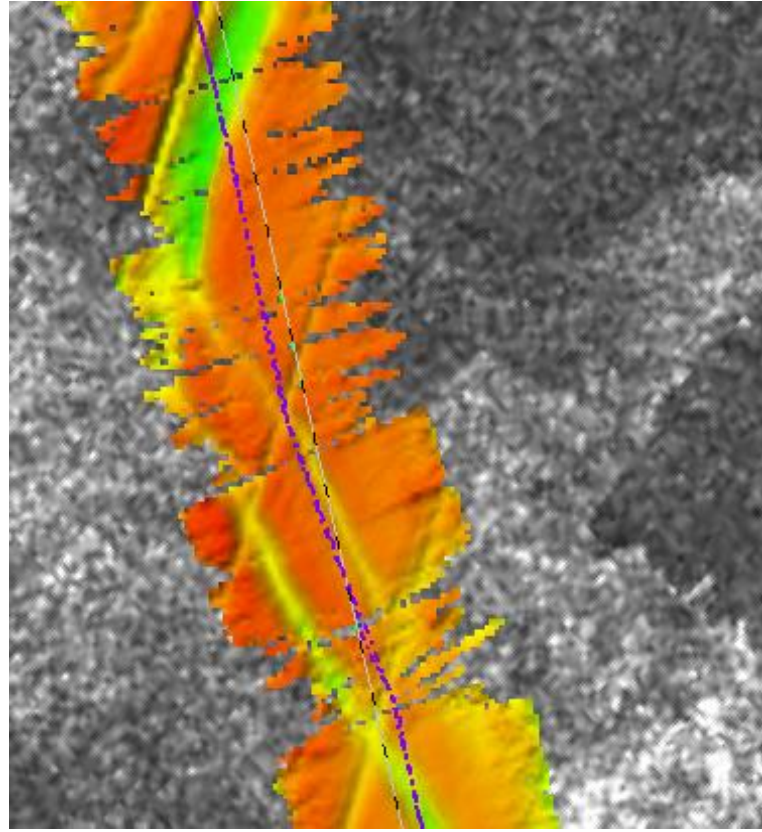
PATCH and ACCURACY TESTS



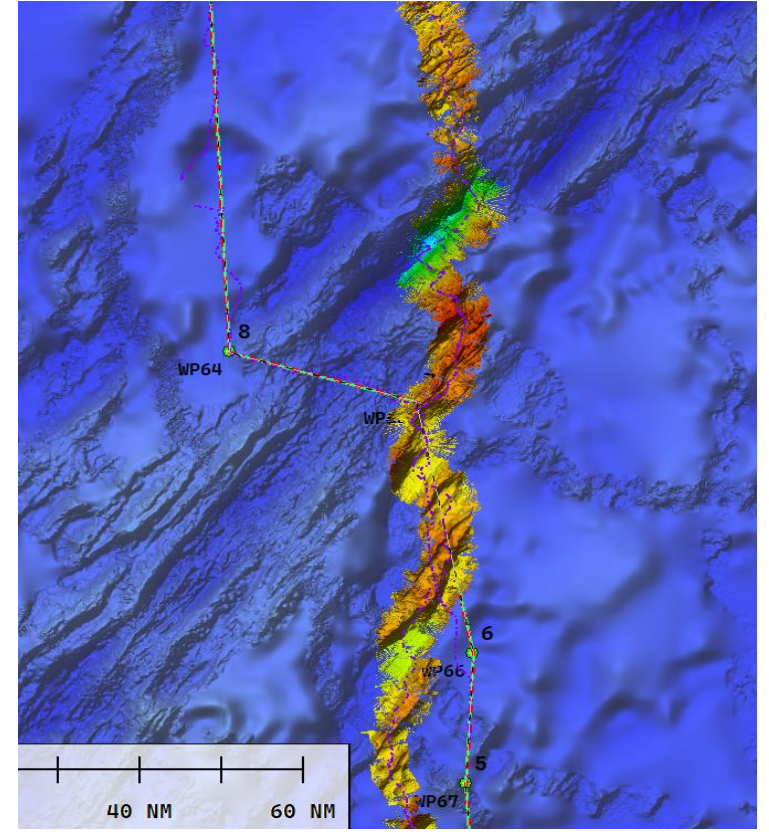




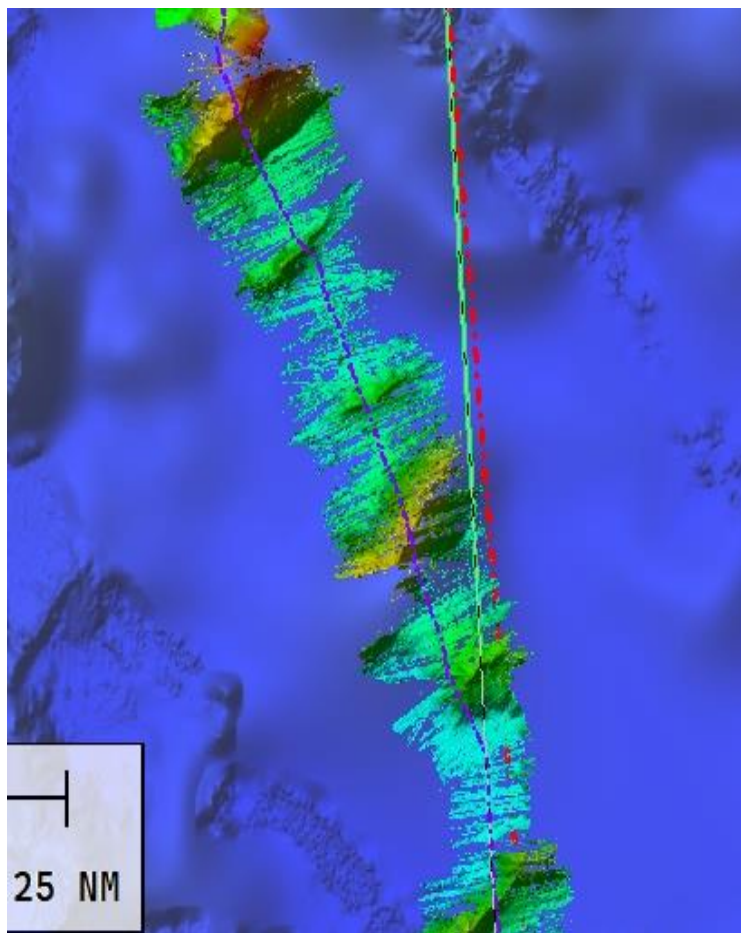
Open water – 8-10 knts



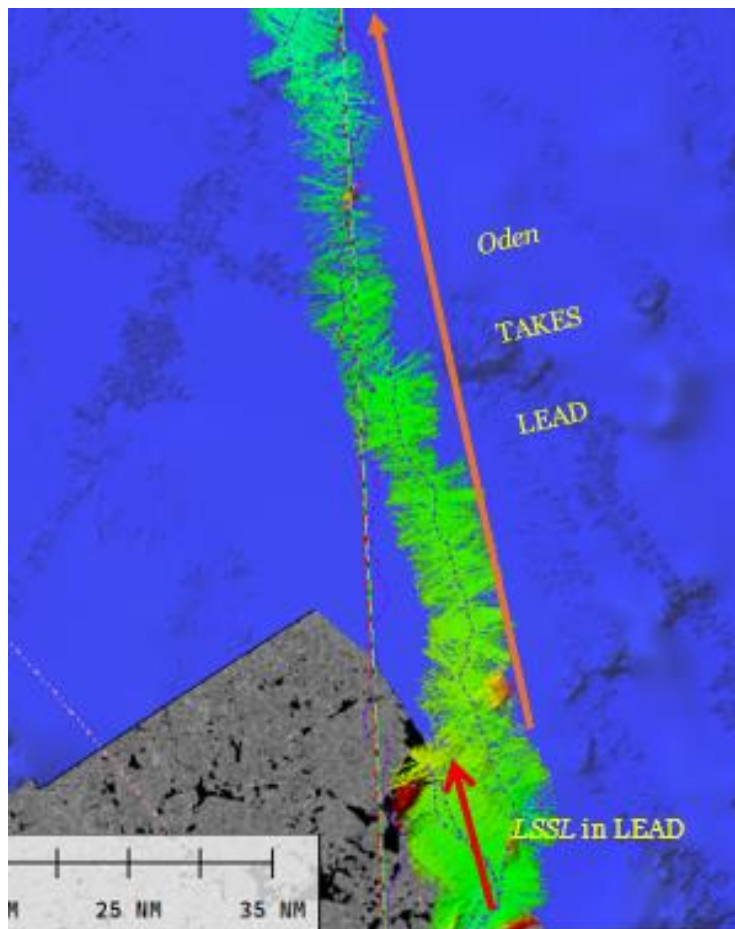
Marginal Ice Zone – 7-9 knts



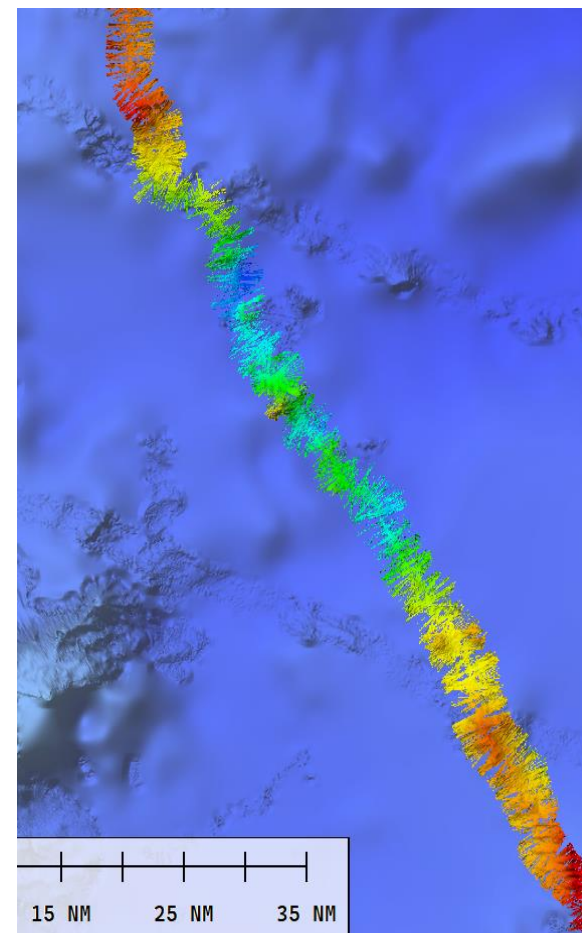
LSSL leads slow enough to
keep ice open (3-4 knts)



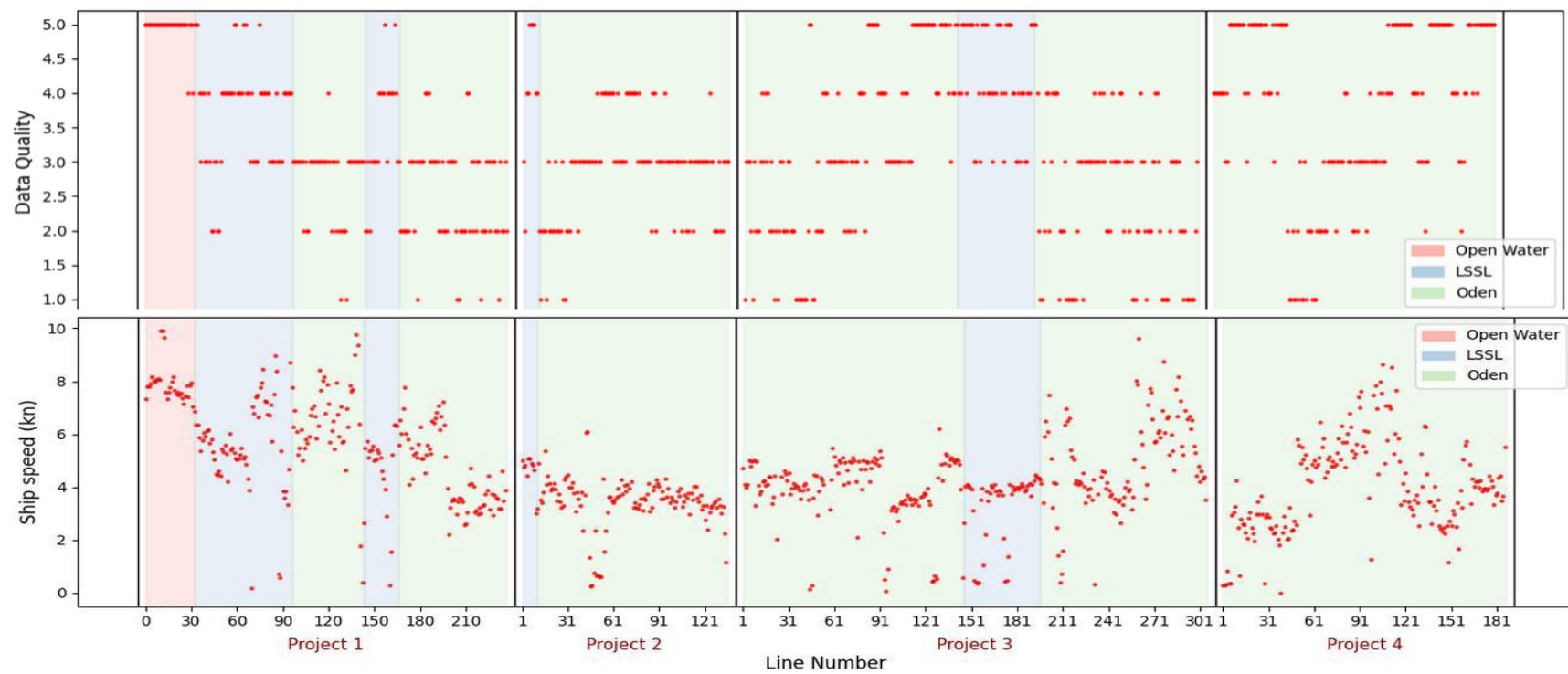
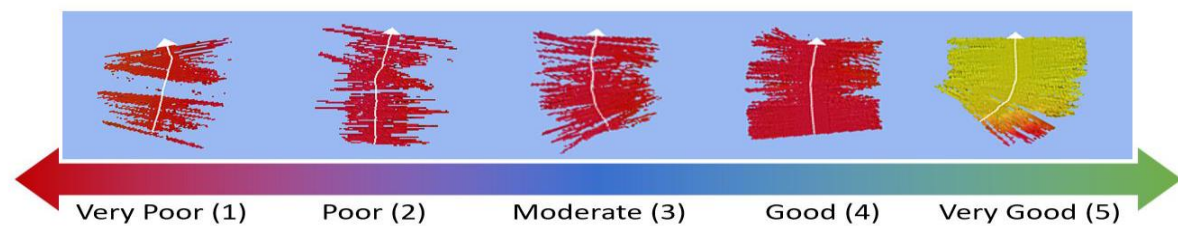
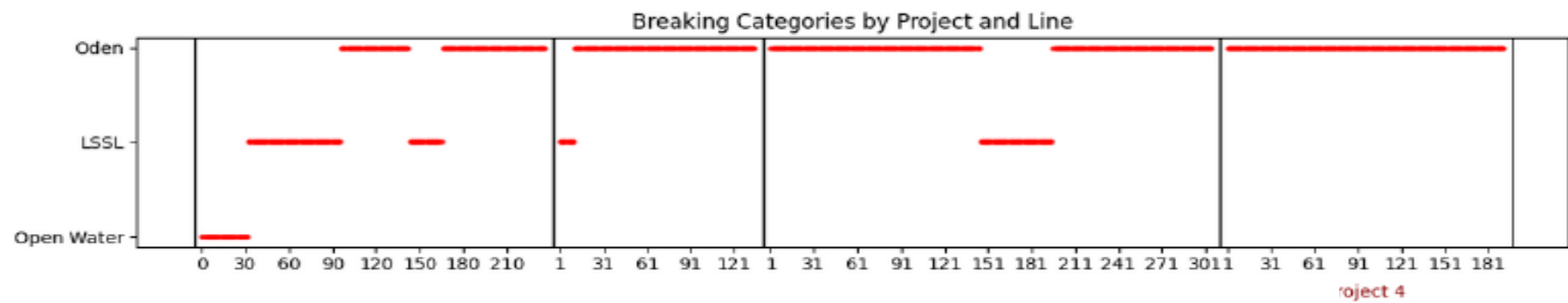
ODEN following LSSL – too far ahead 5.5 – 7knts

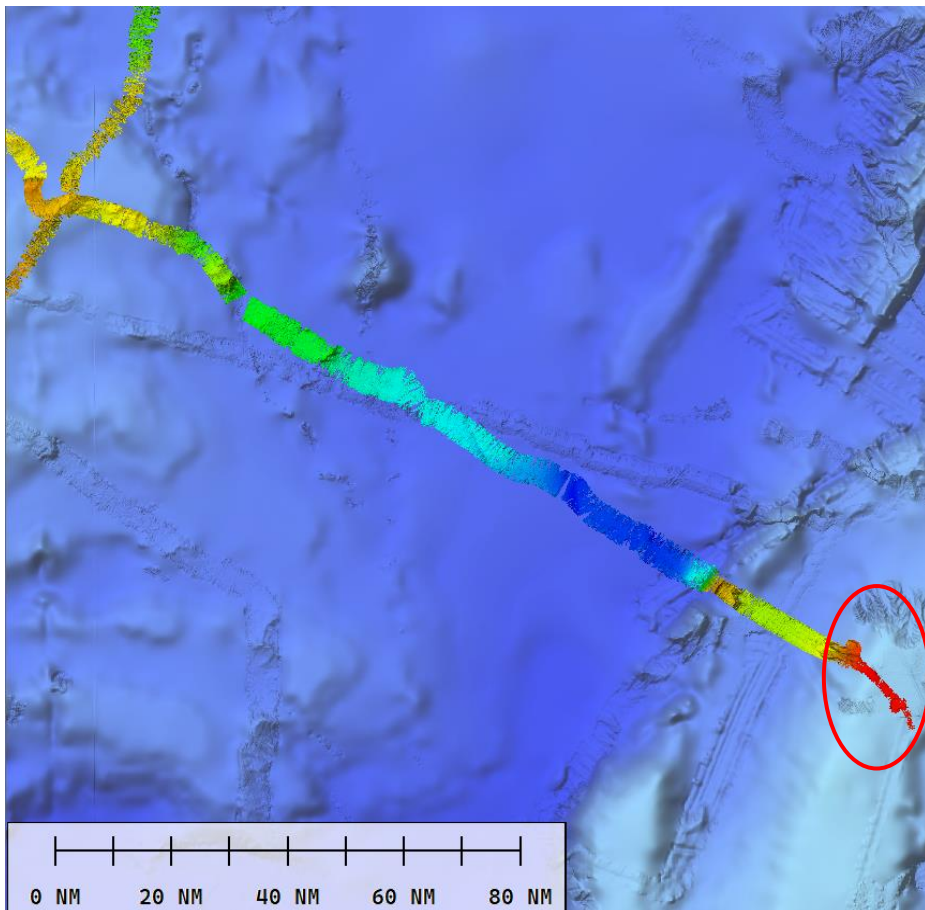


ODEN LEADING – 8/10-9/10 ice

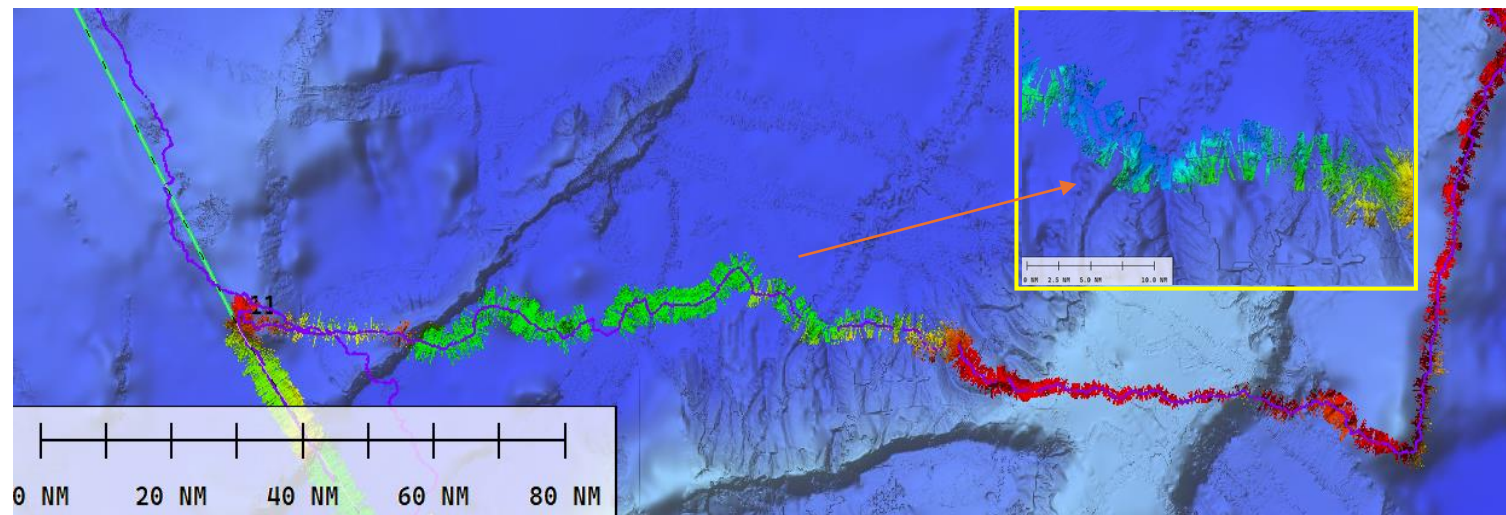


ODEN leading during seismic data collection on LSSL ~5-6 knts 9/10-10/10 ice



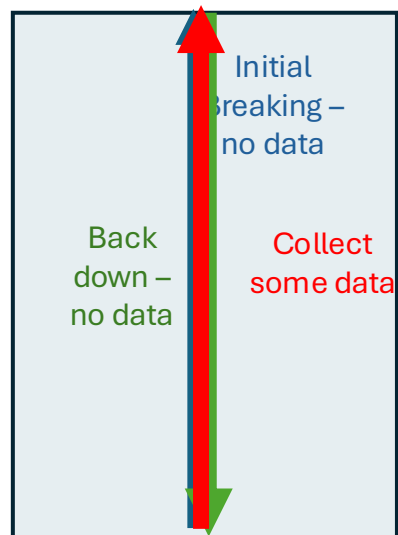


Alpha Ridge - LSSL leading –
ODEN collect seismics and
MBES 3-4 knots 10/10 ice
red area only ODEN



ODEN alone – high-speed run from Lomonosov Ridge to
Polar Connect Route 10/10 ice – as fast as we could go

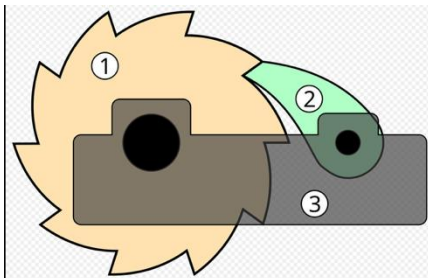
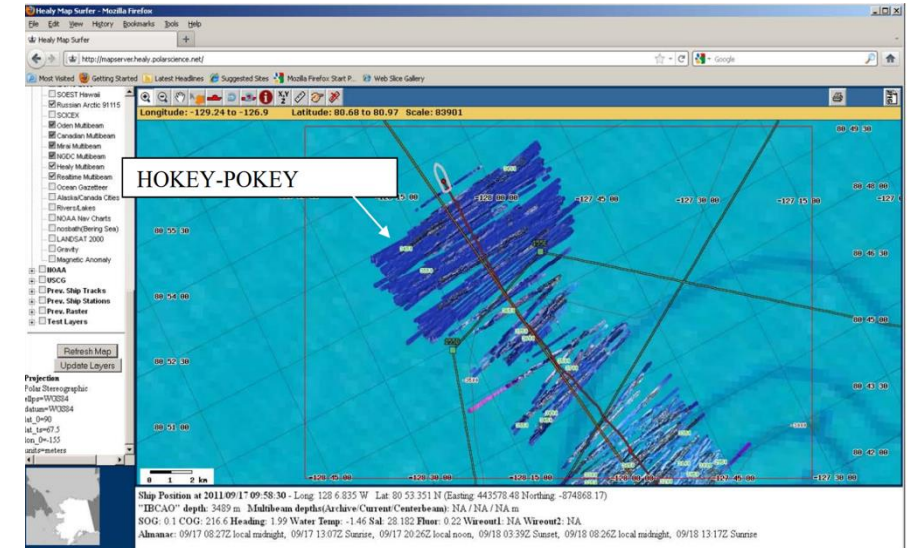
HEALY Ratchet Survey



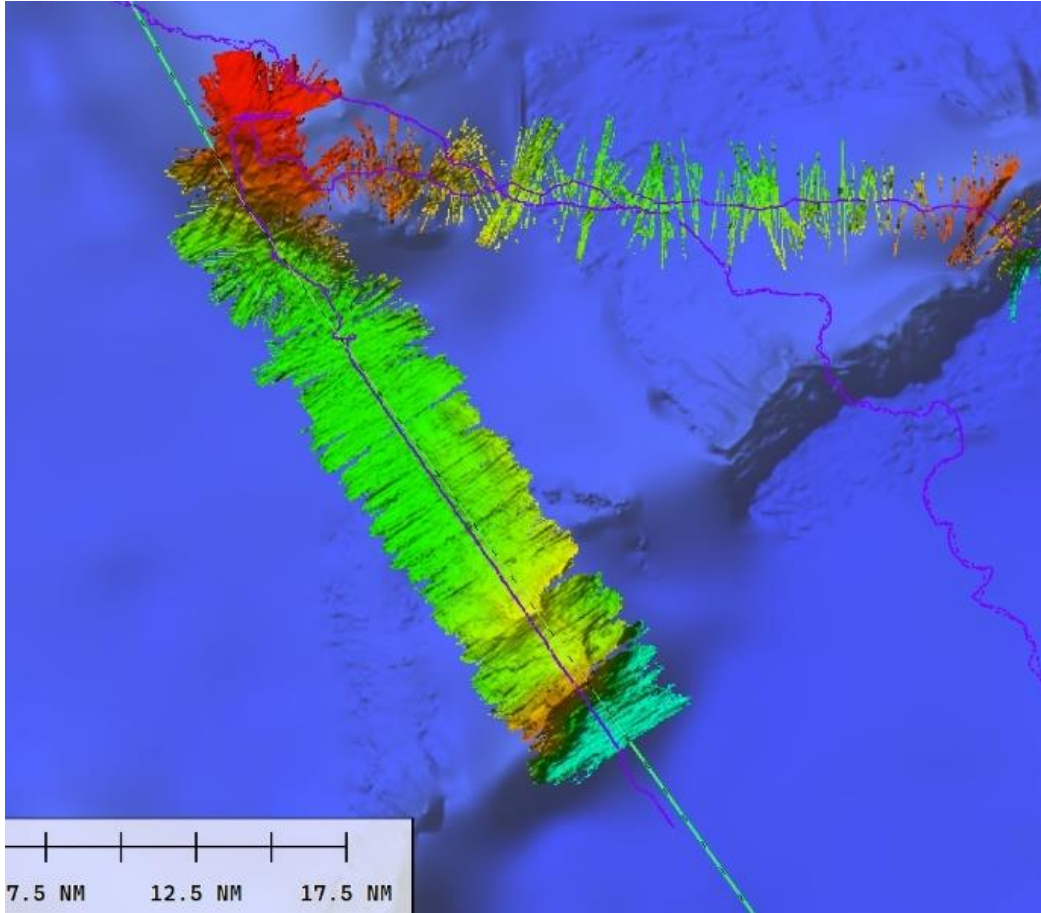
ODEN Pirouette



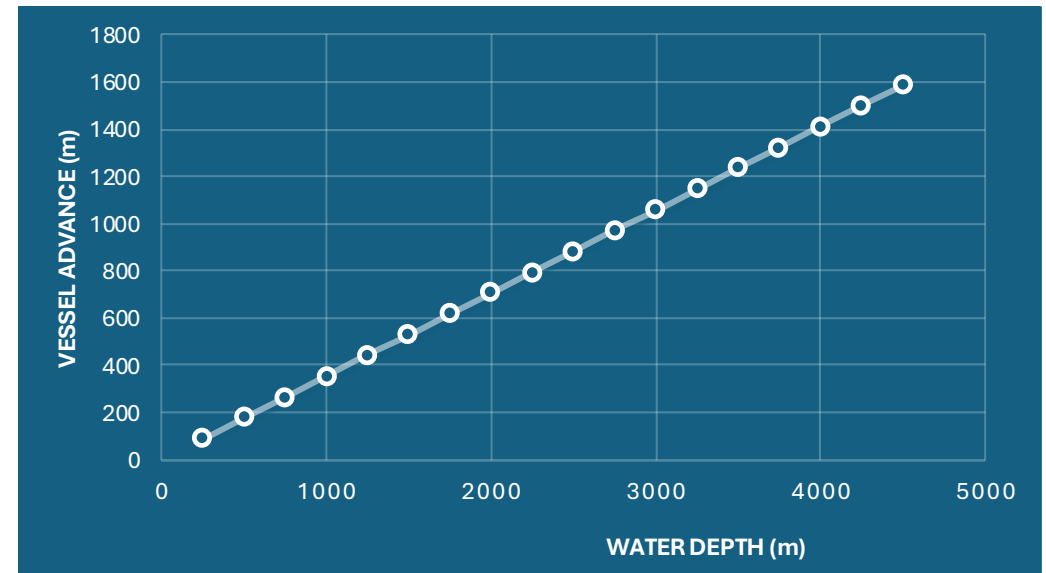
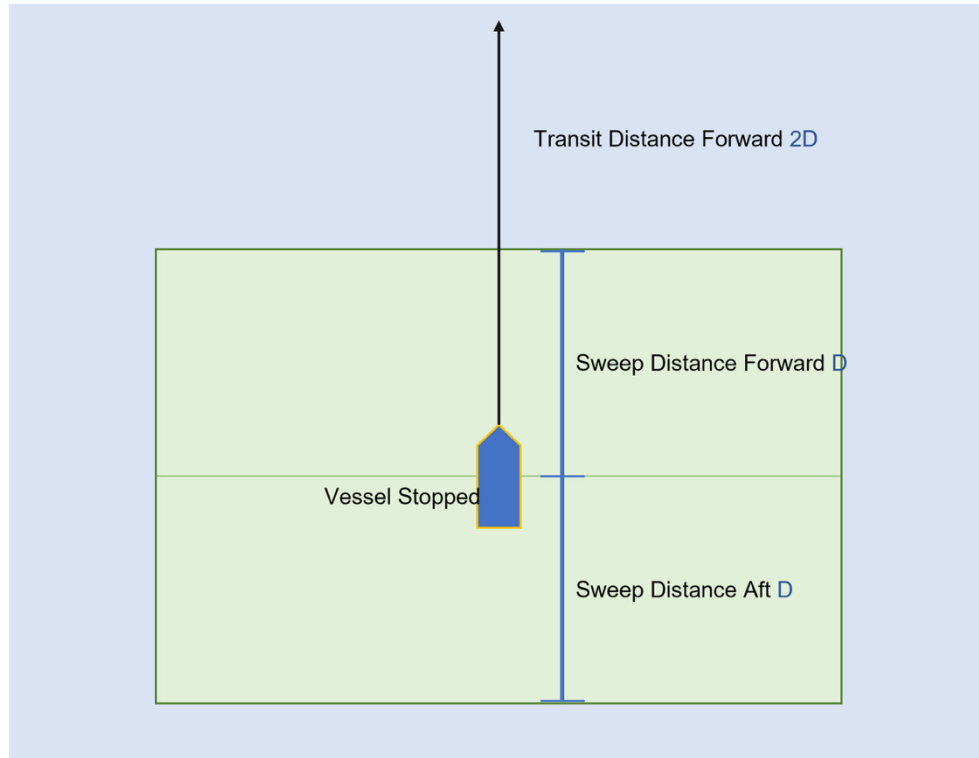
HEALY – any EM HOKEY POKEY



3D-SCAN -/+10 deg 1 deg increment ~ 5 min

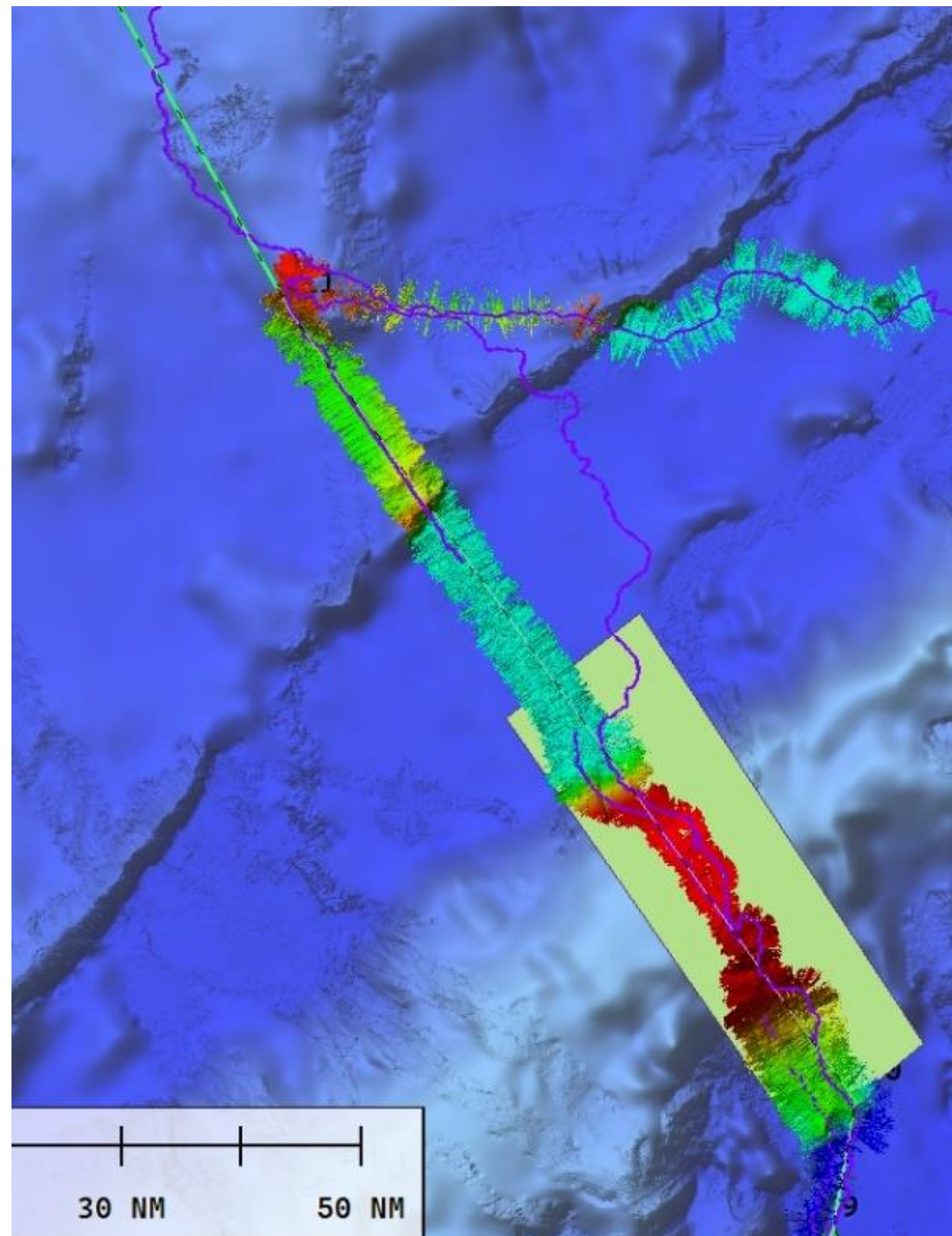


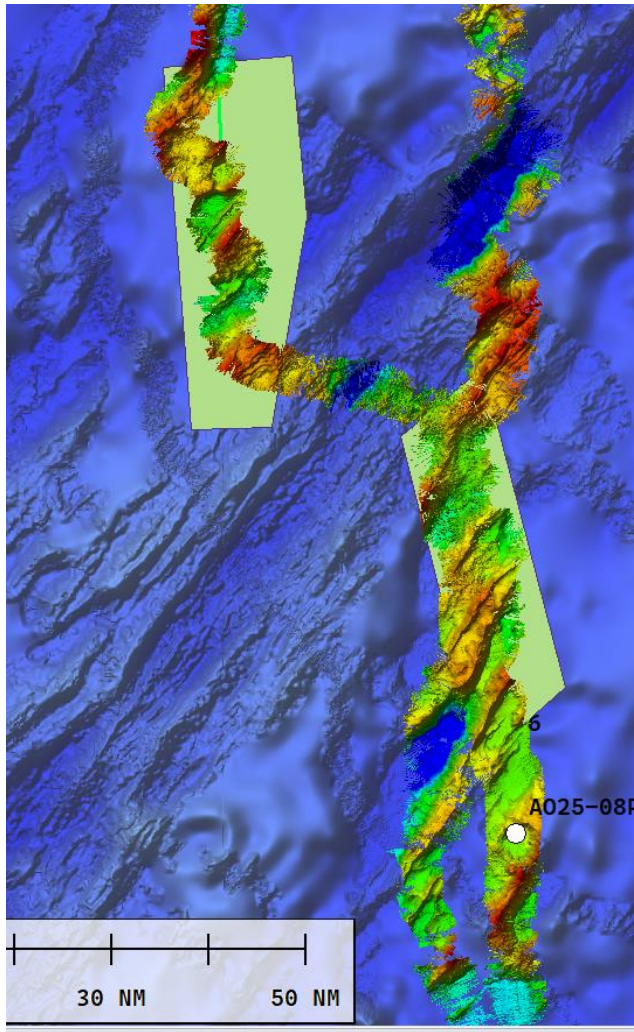
HOKEY POKEY PROTOCOL



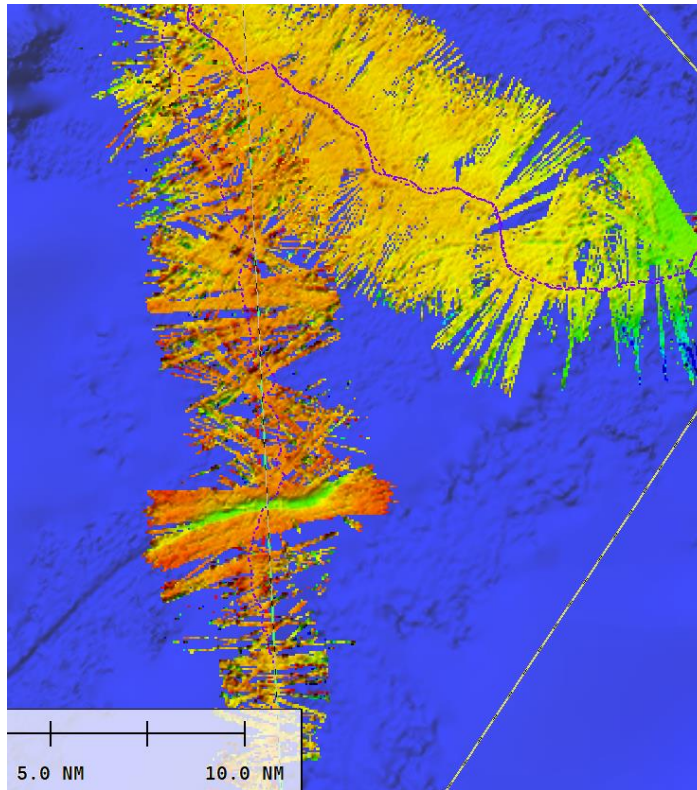
Polar Connect Route Survey

Avg speed @2.5
knts

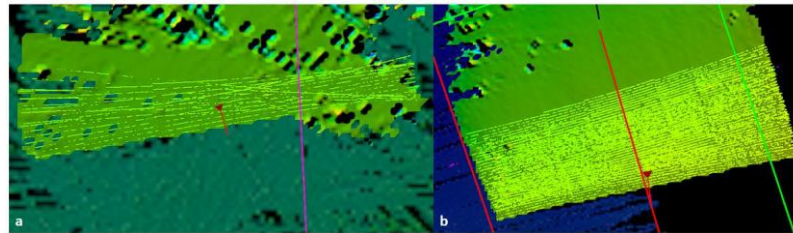




3-D scan data of Polar
Connect Gakkel Ridge
crossings

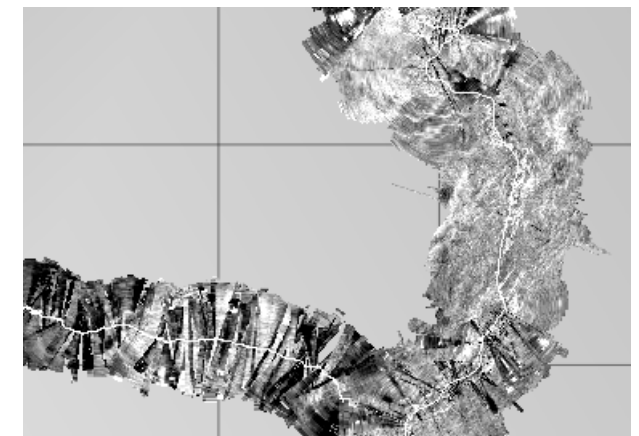
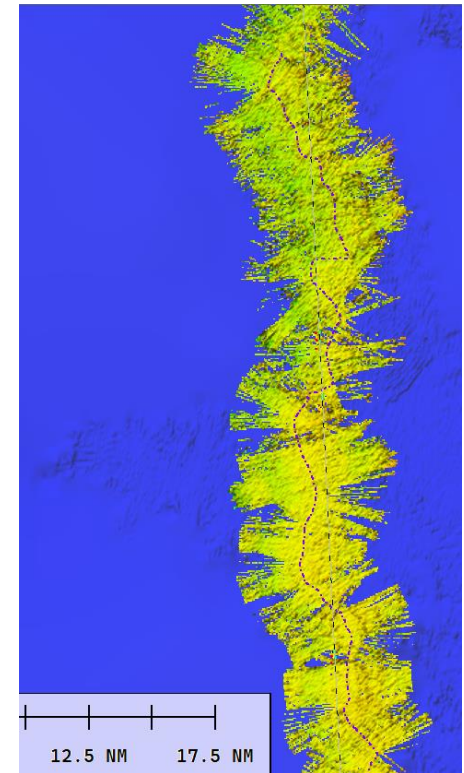


Transit home – no 3D scan
(except at NP Channel)



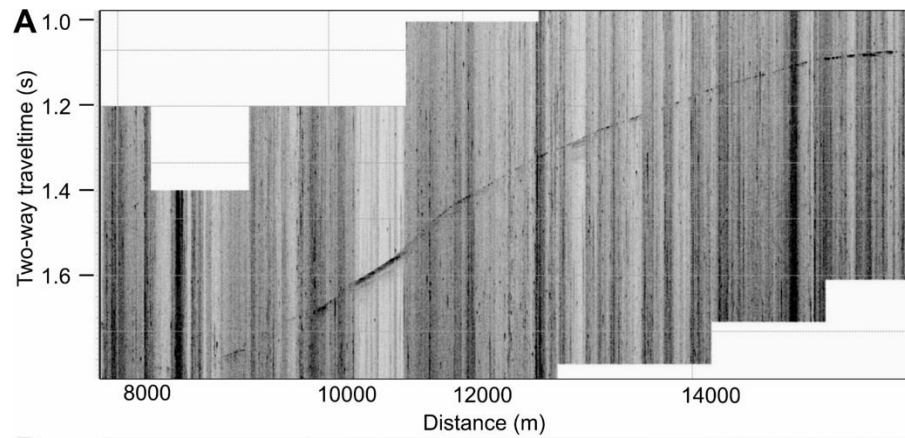
Stationary

Moving

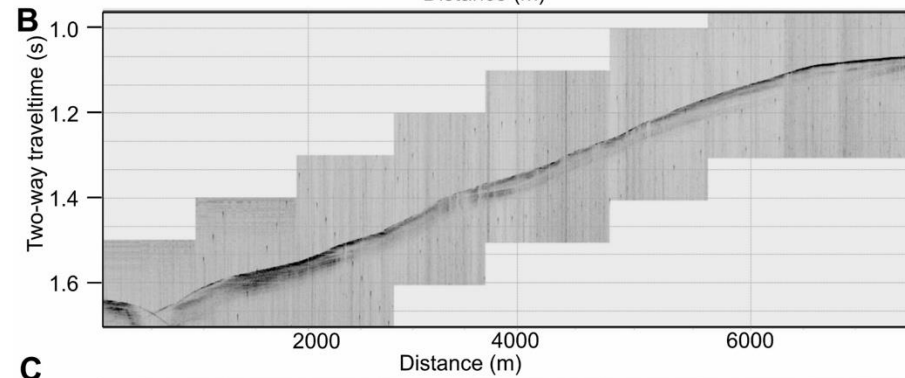


3-D scan while transiting

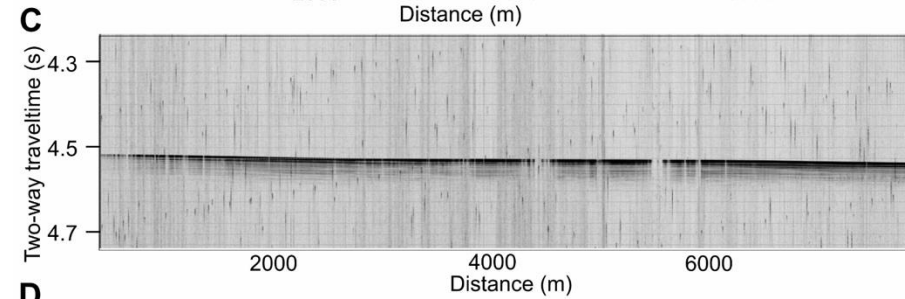
SB29



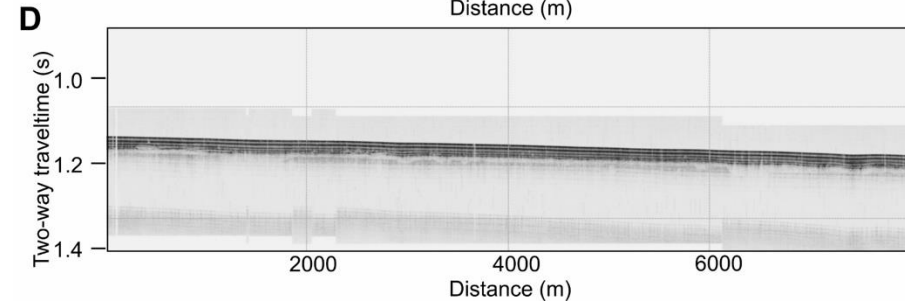
During ice breaking – ODEN leading



Same area as above – now traveling
in self-made track

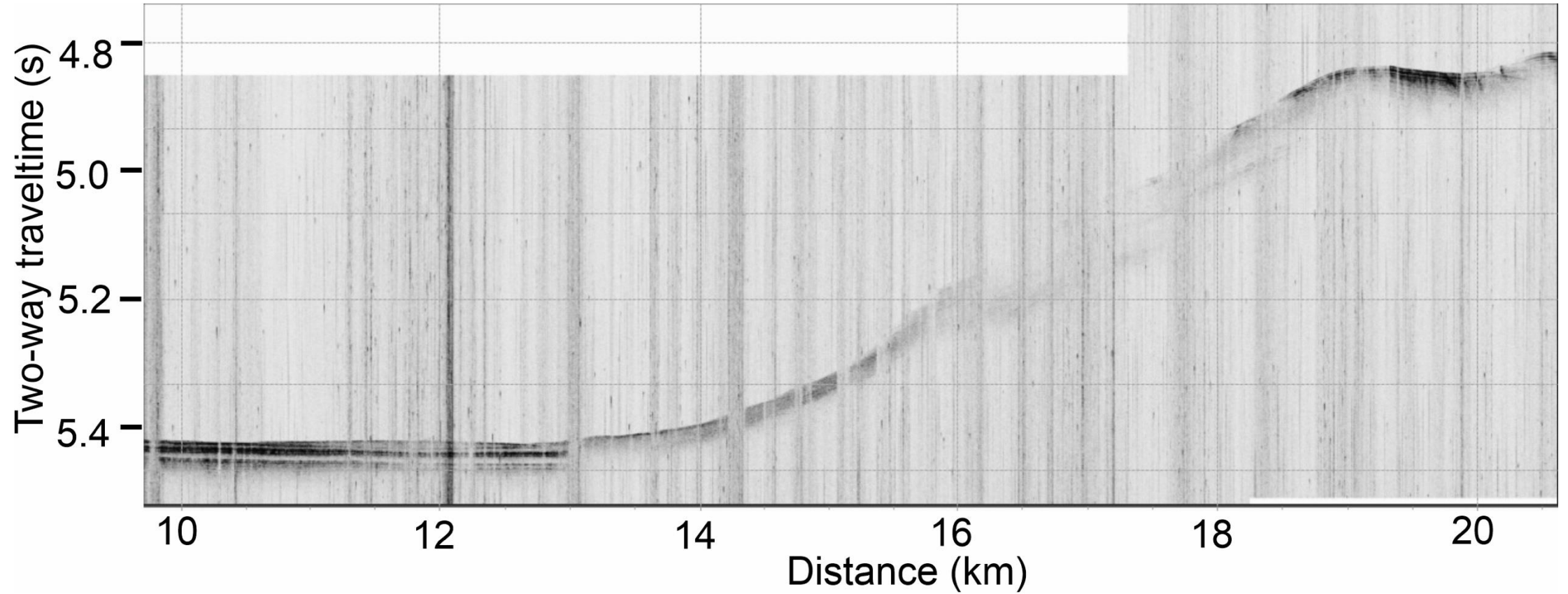


Following in LSSL track



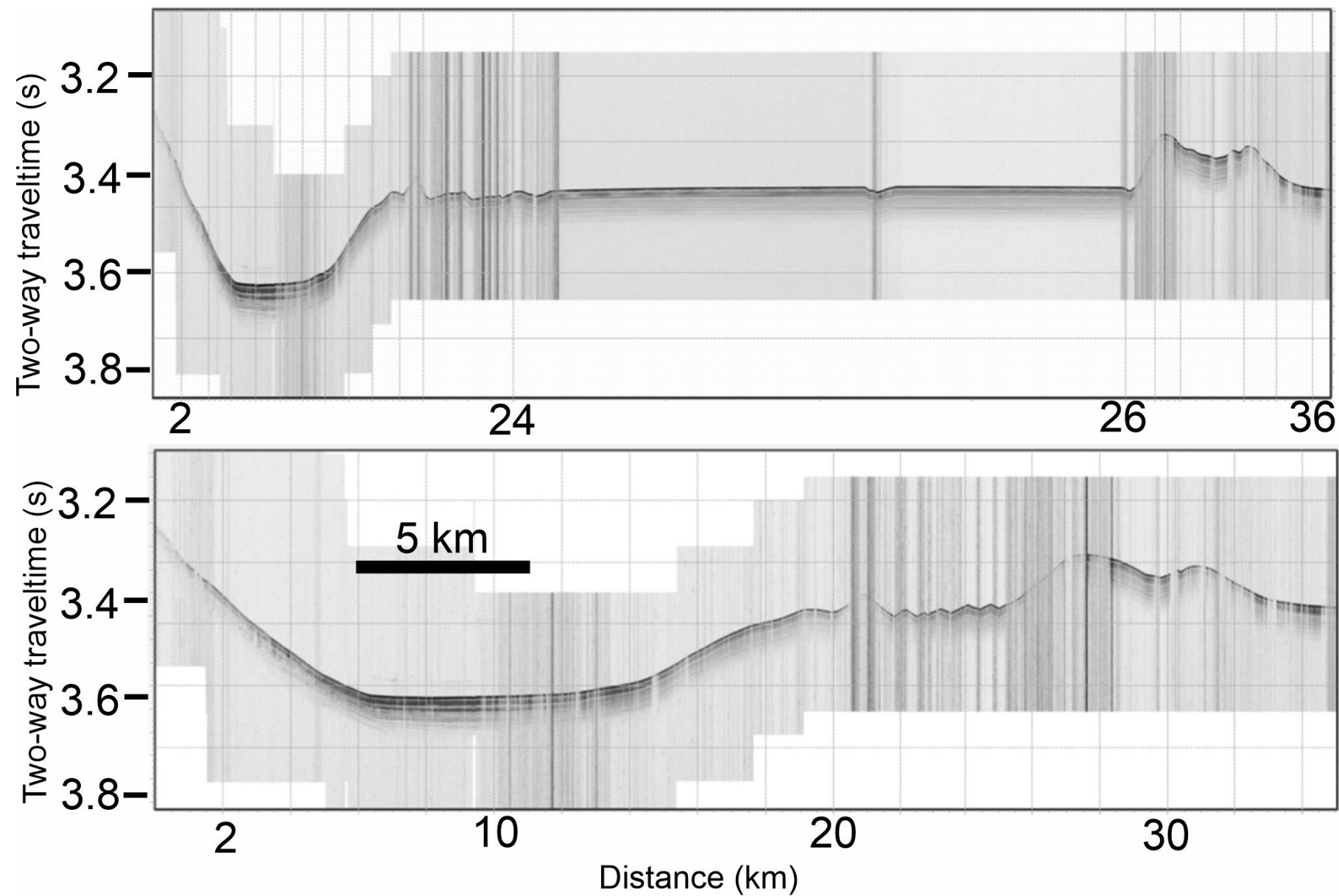
Open water

SB29

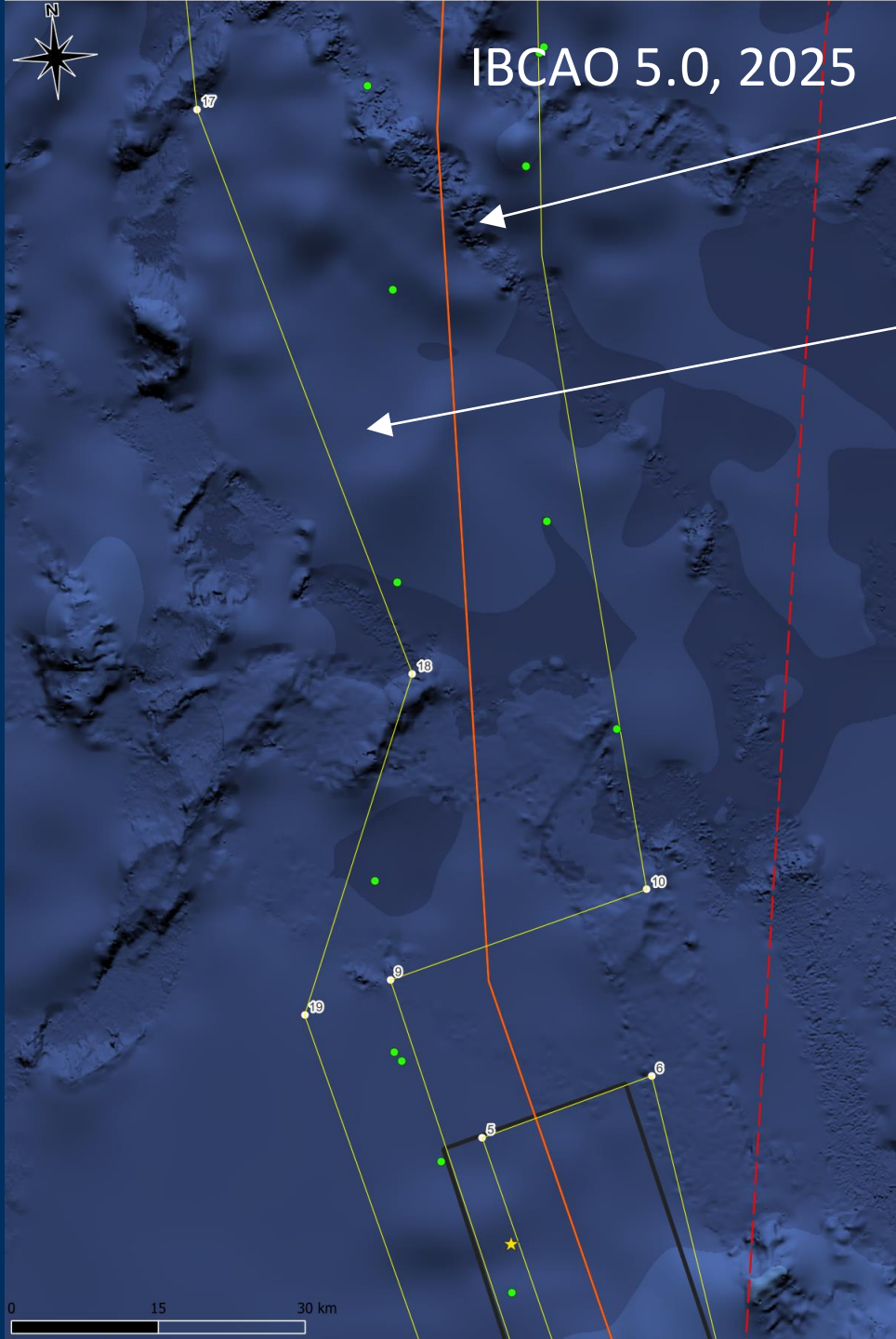


Biggest issue was loss of bottom on slopes (here slope is 2.3 deg)

SB29



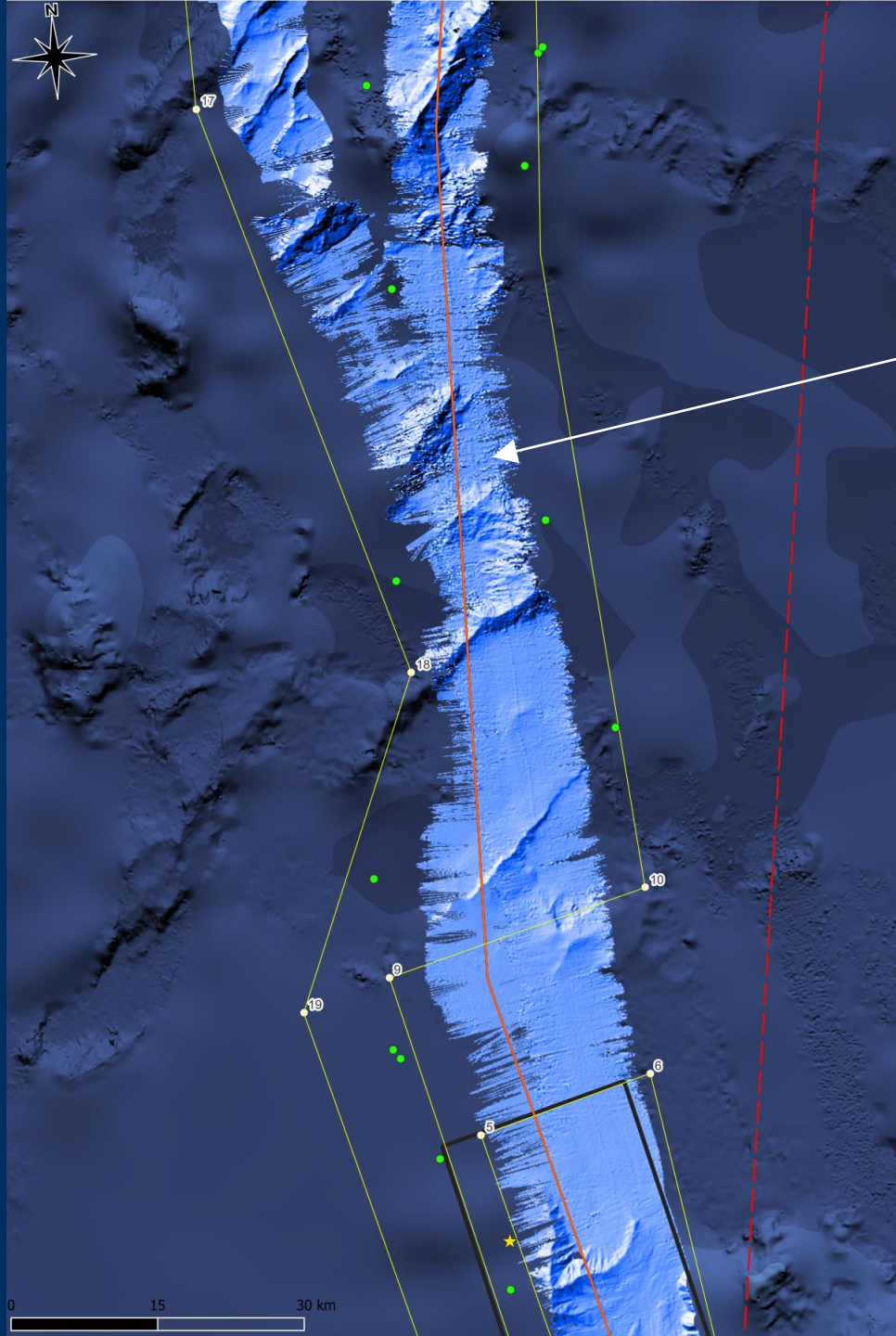
Speed correction for SB29 critical for interpretation



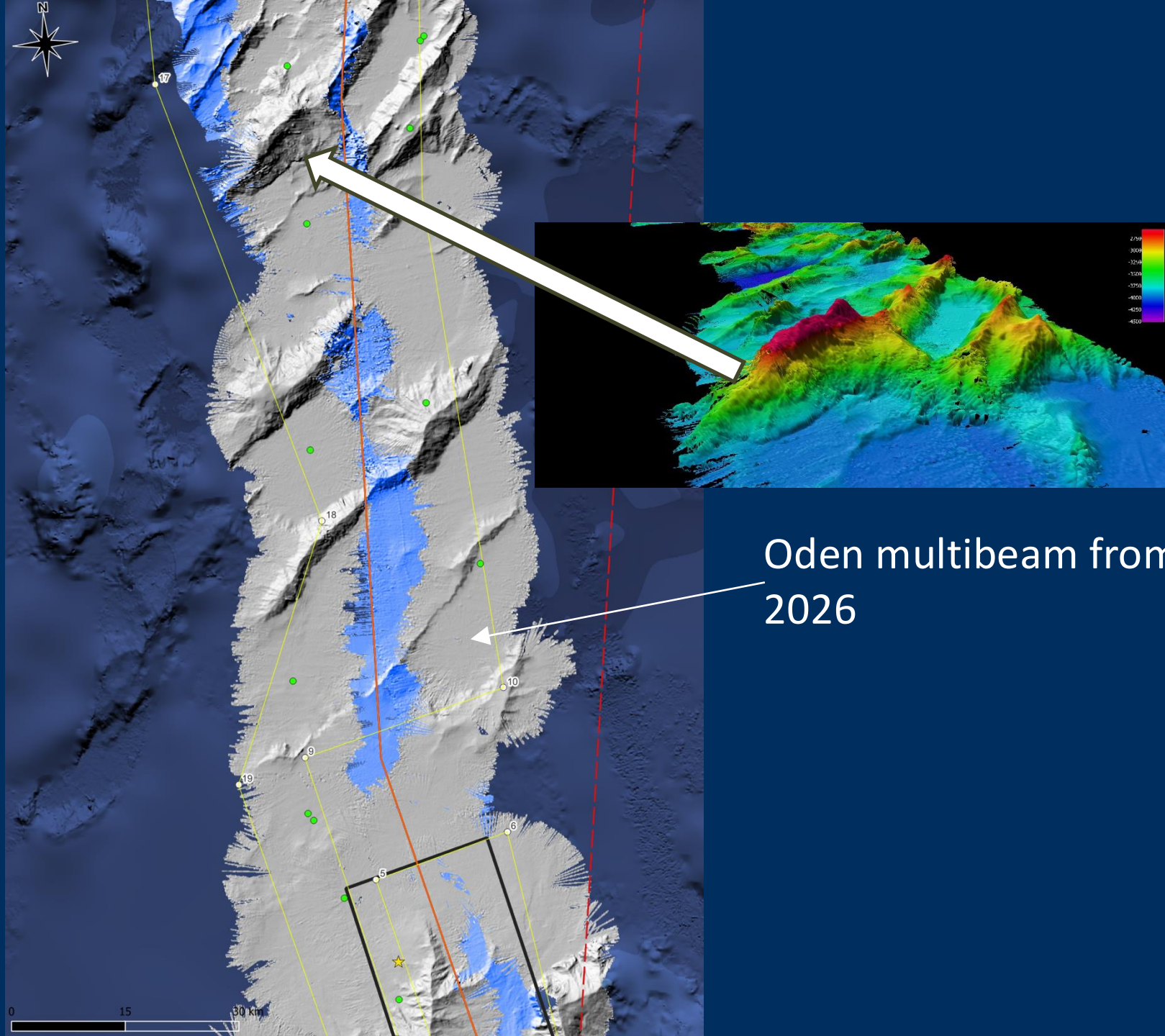
IBCAO 5.0, 2025

Multibeamdata

Interpolated from
sparse data

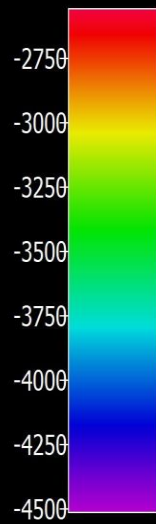


Oden multibeam from
2025



Oden multibeam from
2026

“Freja Seamount”

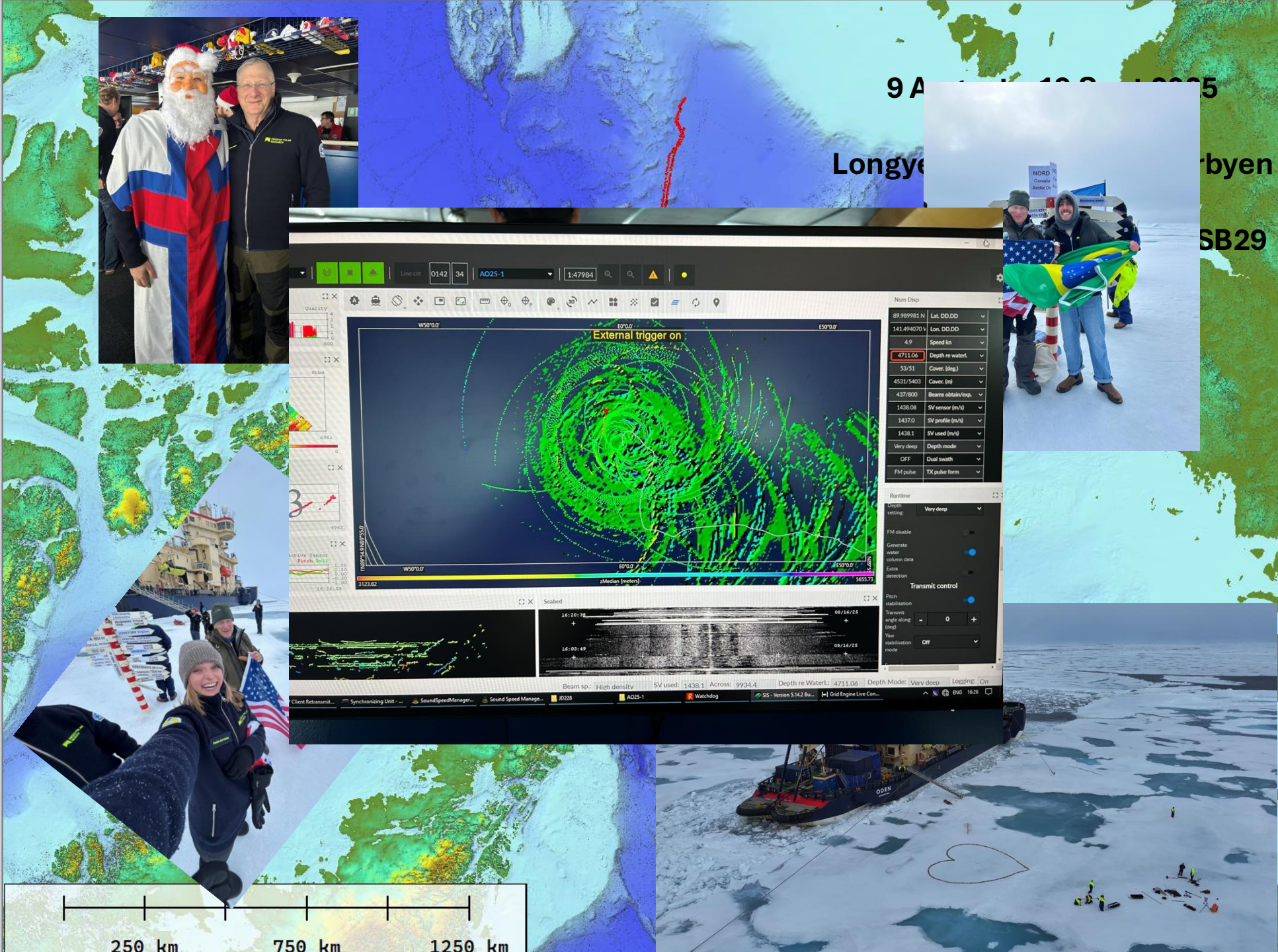


ODEN



LOUIS S. St. LAURENT



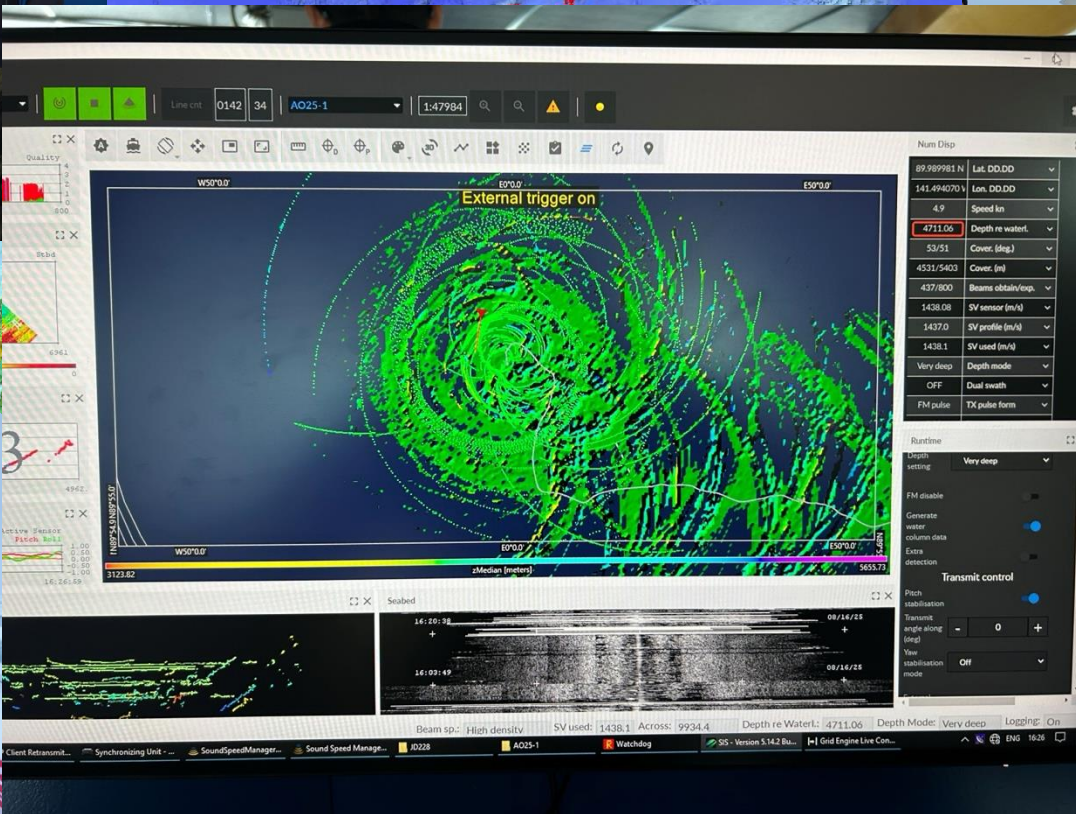


9A 100 1000000

Longye

byen

SB29



External trigger on

Num Disp

Lat. DO.DD	Lon. DO.DD	Speed kn
89.989981 N	141.494070 W	4.9
4711.06	Depth re waterf.	53/51
53/51	Cover. (deg.)	4531/5403
4531/5403	Cover. (m)	437/800
437/800	Beams obtain/comp.	1438.08
1438.08	SV sensor (m/s)	1437.0
1437.0	SV profile (m/s)	1438.1
1438.1	SV used (m/s)	Very deep
Very deep	Depth mode	OFF
OFF	Dual swath	FM pulse
FM pulse	TX pulse form	

Runtime

Depth setting: Very deep

FM disable

Generate water column data

Extra detection

Transmit control

Prich stabilization

Transmit angle along (deg)

View stabilisation mode

Beam sp.: High density SV used: 1438.1 Across: 9934.4 Depth re Waterf.: 4711.06 Depth Mode: Very deep Logging: On

Client Retransmit... Synchronizing Unit... SoundSpeedManager... Sound Speed Manager... A0228 A025-1 Watchdog 95 - Version 5.14.2 B... Grid Engine Live Con...

250 km 750 km 1250 km