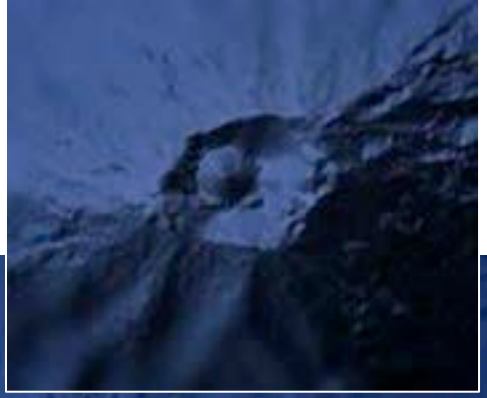
Double DriX (DriXs, DriXes, DriCes.....) in the Gulf of Maine

OTH Operations Samoa

Aug 6-28 2024



MANU'A

~40 nm

Ofu

Leusoalii

American Samoa

American Samoa

~100 nm

SAMOAN ISLANDS

Interacting with DriX off Samoa from 83 N

Dual DriX 2024

- First time UNH and NOAA used two uncrewed vehicles simultaneously
- Used two new NOAA-owned DriXs – Drix12 and DriX23 both with EM2040s and Starlink
- the object was the identification and development of technologies required to make dual vehicle operations safe, practical, efficient, and economical.
- Particularly understand gained efficiencies (if any), personnel requirements and op-tempo

Dual DriX 2024

Participants

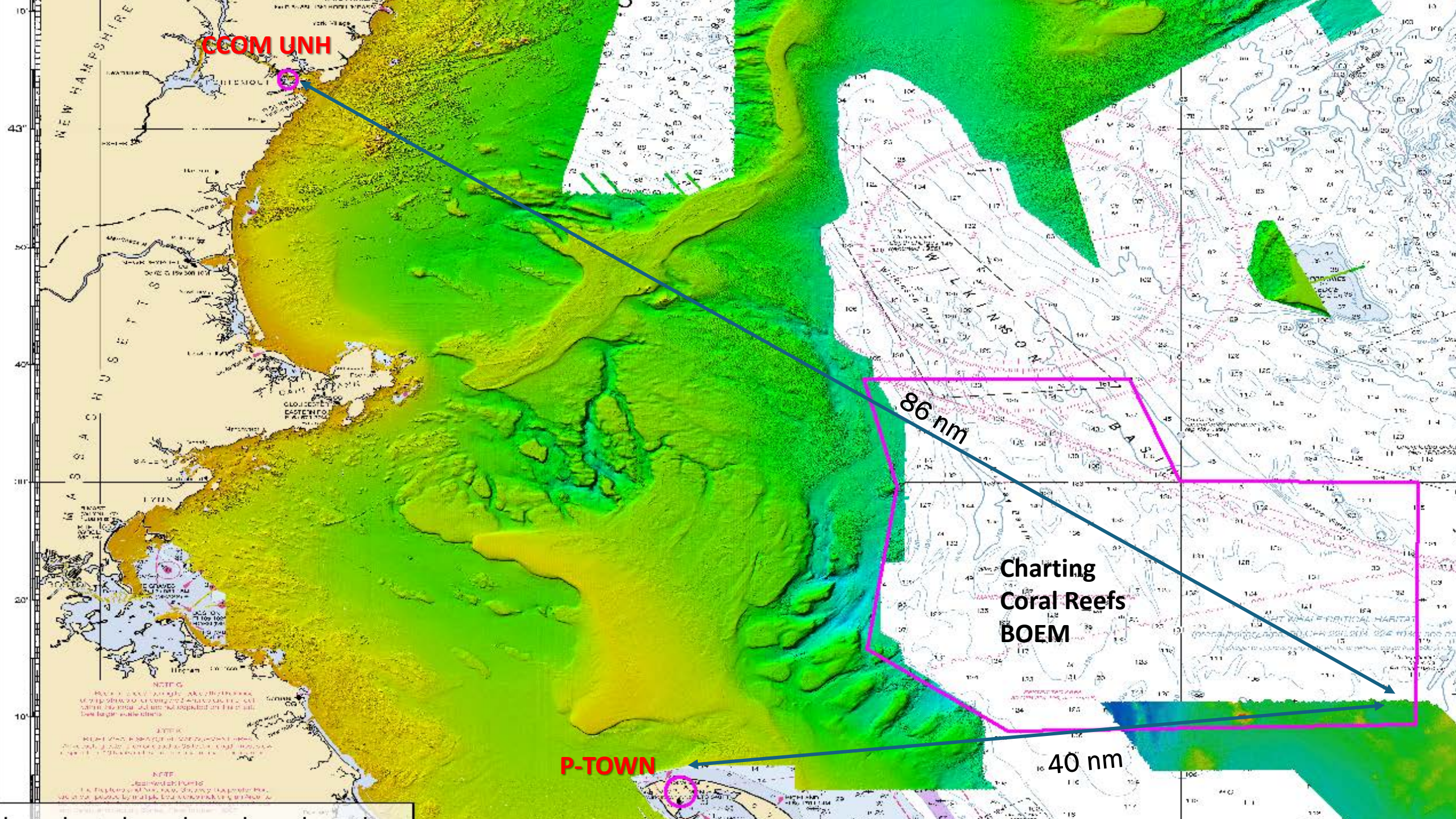
- University of New Hampshire – Host
- NOAA Uncrewed Systems Operations Center - 2 DriX
- NOAA Office of Coast Survey – Survey/Data Processing
- NOAAS Thomas Jefferson - Survey/Data Processing
- NAVO
- Exail
- Lynker

Direct Funding:

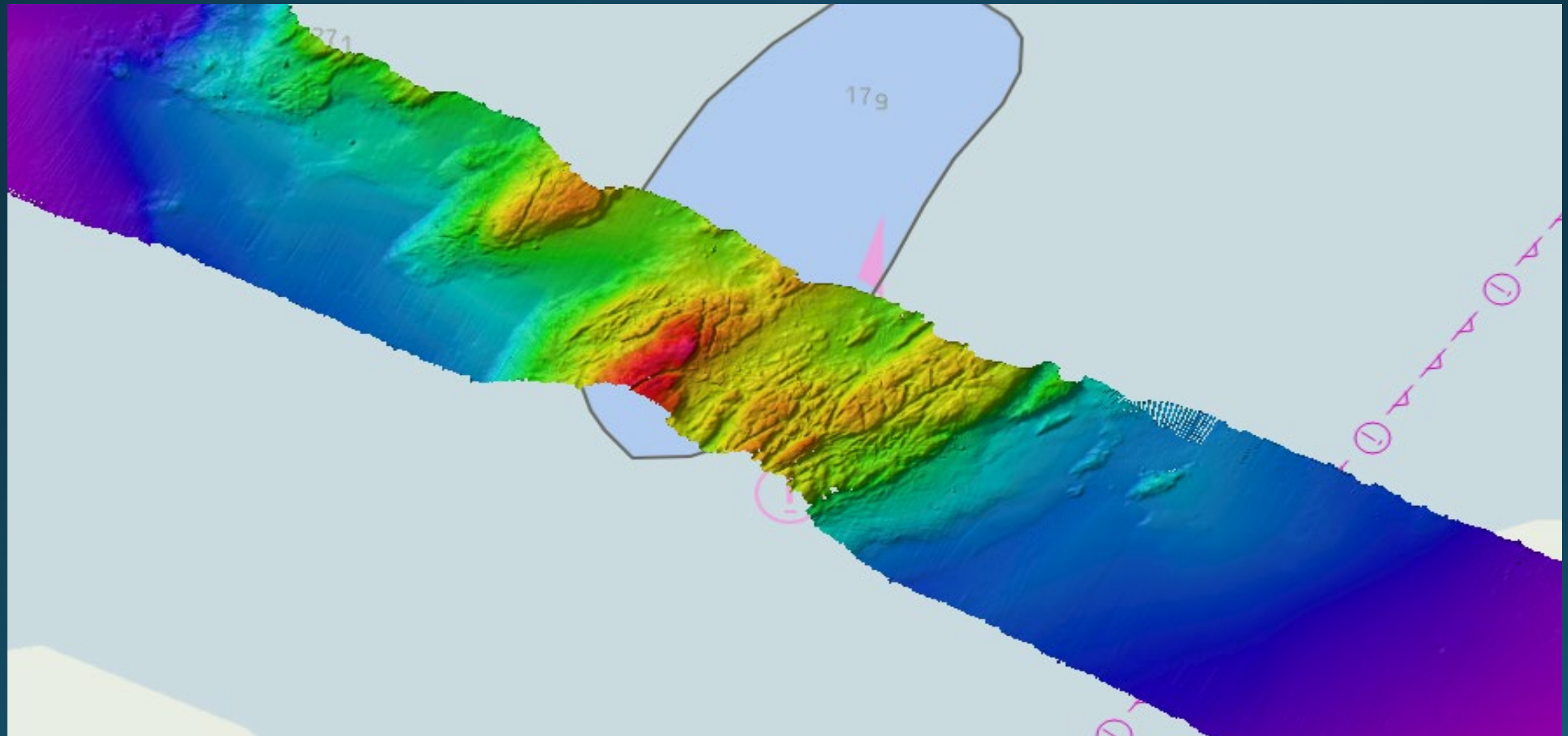
NOAA Office of Ocean Exploration - OECI

BOEM

NOAA Deep Water Coral Research Program

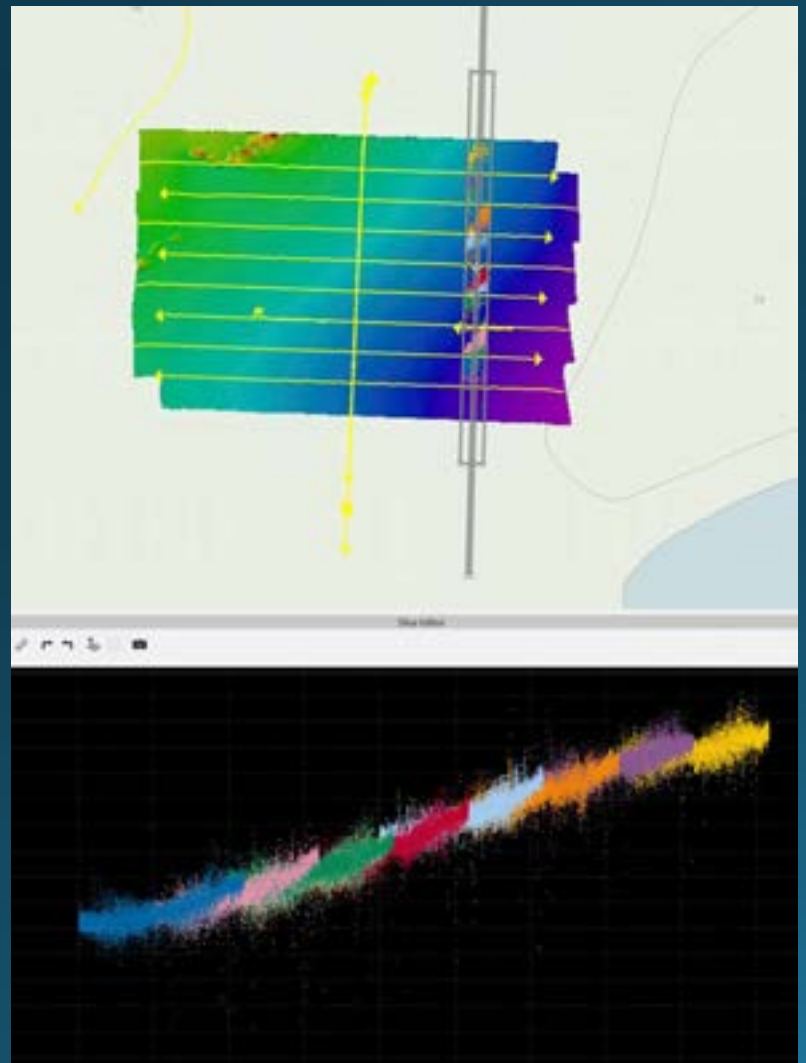

CCOM UNH
86 nm
Charting
Coral Reefs
BOEM
40 nm
P-TOWN

DriX 23 Patch Test Result in Deeper water...

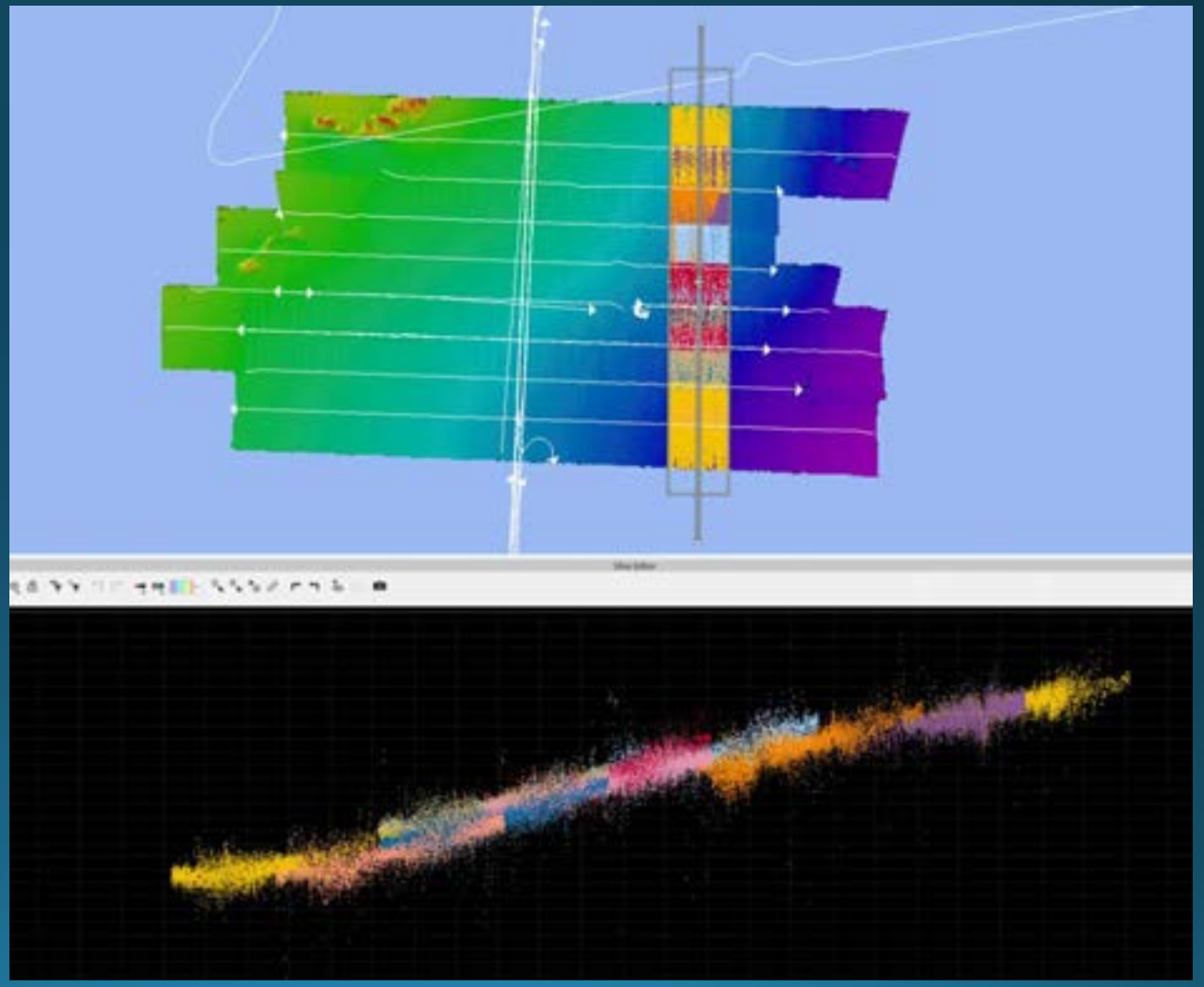


Reference Surface Testing

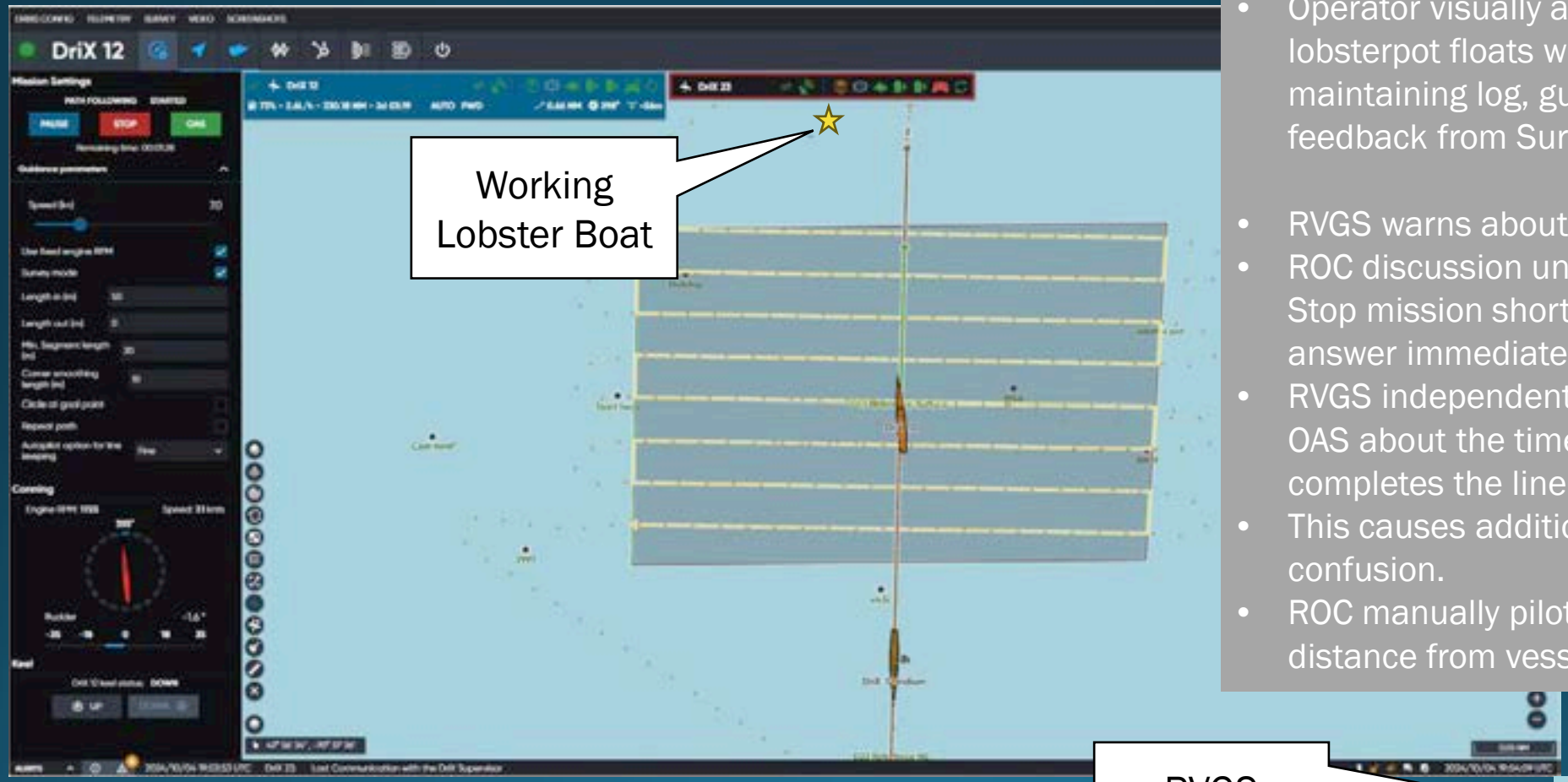
DriX 12



DriX 23



One Pilot, Two or Three? And who has control?



- OAS is off to maintain line.
- Operator visually avoiding lobsterpot floats while also maintaining log, guiding co-pilot, feedback from Survey, etc.

- RVGS warns about vessel.
- ROC discussion underway (OAS? Stop mission short?), does not answer immediately.
- RVGS independently activates OAS about the time DriX completes the line. (~50 m)
- This causes additional confusion.
- ROC manually pilots DriX safe distance from vessel.

STAFFING:

By the numbers

Legend
Leadership
Watch Supervisor
DriX Pilot/Tech
Pilot/Tech Under Instruction
Survey Supervisor
Survey Watchstander
Data Processor
Exail Pilot/Tech
Software Dev

† On call
* Exail DriX Supervisor Trained
Δ NOAA DriX Pilot Trained

UNH	UXS/Linker	OCS/TJ	Exail/UNH	Exail Dev
Larry†	Josh*	Clint	Basile	Corintin
Val*	Tyler*	Kathyrn Δ	Matt	Axel
KG*	Alex*	Genesis	Robin	
Roland	Don J.*	Harper	Loic	
Avery*	Erica*	Jess		
Andy*	Will Δ			
Skylar Δ	Acacia Δ			
Jenna Δ	Riley Δ			
Nate				
Adriano				
Fahima				
Natalie				
12	8	5	4	2
			Total	31

UNH ROC

Exail Onsite Software Support and Development

A summary of SOME of the software updates applied by onsite developers during Dual DriX 2024

10/10 :

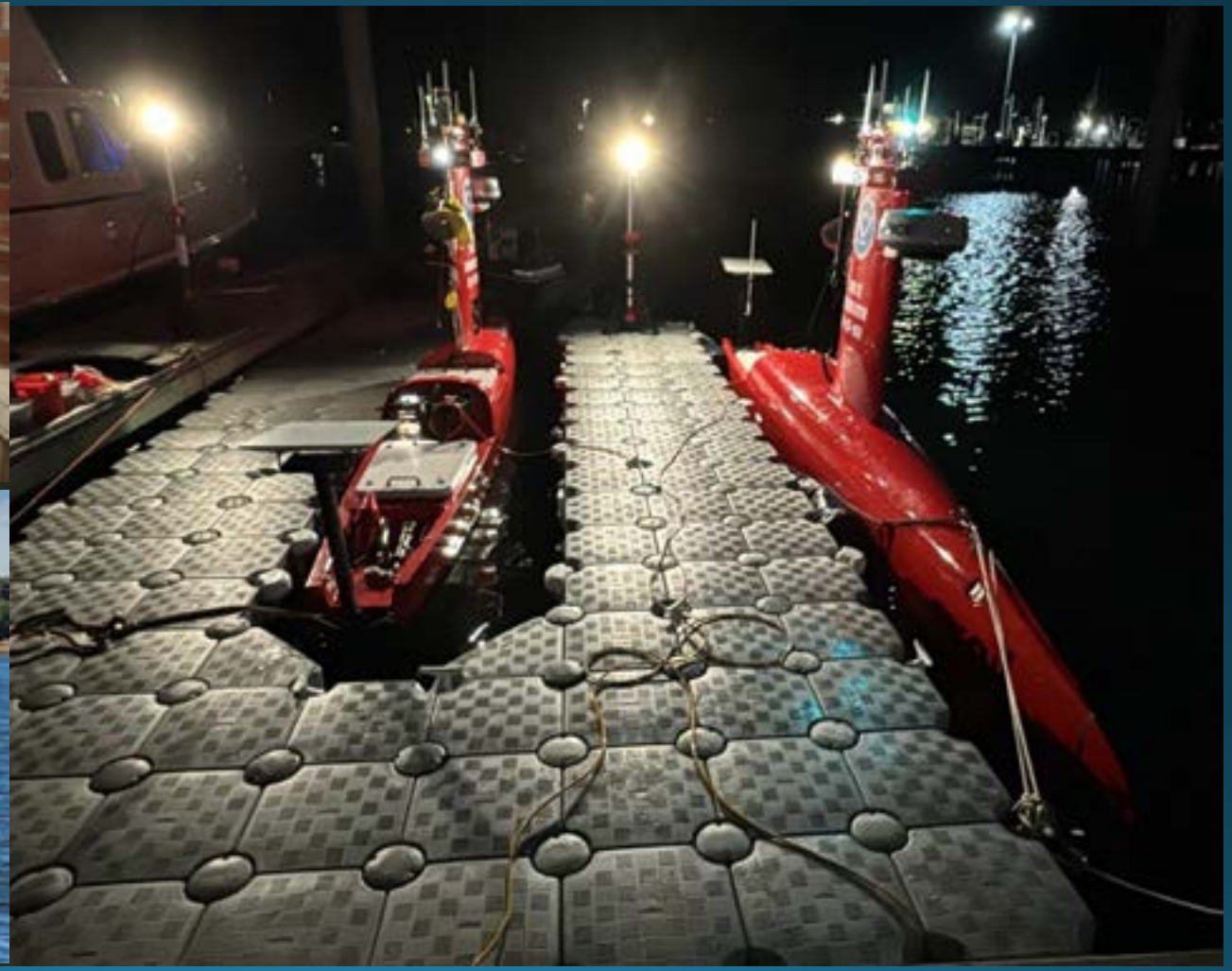
- Fixed geotiffs (save + sftp config).
- Added low visibility mode on Estop app: makes a 5sec fog horn blast every 2 minutes.
- Sorting geoserver workspaces alphabetically.
- Added Drix selected name to header in all pages.
- Colors the app header on multi-drix applications.
- Floating items can now be closed from menu.
- Geometry window now automatically scrolls on selected geometry.
- Shift+click on DriX card to select it without center view on it.
- Display the name of the user who locked the geometry on geometry edition window.
- Added unlock all geometries button in Robobox HMI.
- Fixed toggle digital output in iridium.
- Corrected displayed ip adresses in Robobox and Drix HMI
- Window "Drix Diagnostics" was renamed in "Drix NB Diagnotics"
- Power supply page top bar now fixed on top for better visibility.

10/18:

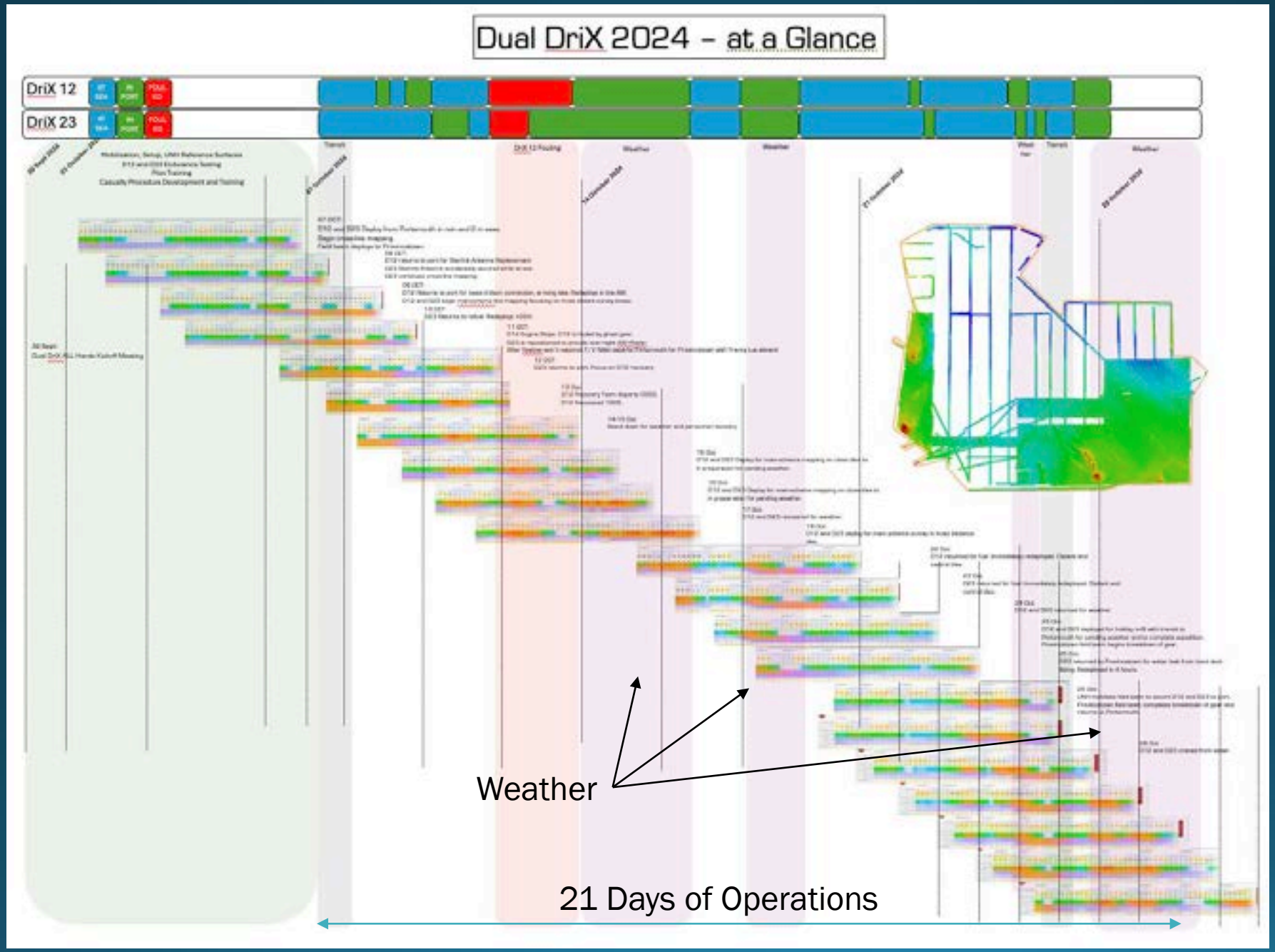
- Iriudium popup: Added button to request Srix status + Display expected next status update time.
- Videos page & network window now only show the currently selected Drix.
- Can now copy Drix coordinates to clipboard from bottom left box.
- Press escape to exit edition mode.
- Can now choose point's name and coordinates while adding a new Point
- Fixed scroll up bug on expansion panel.
- Sensor log file names now specify the Drix name.
- Fixed PLC reboot request from HMI.

NCE
LO
exoil

Provincetown Marina Field Station Setup and ROCIt.

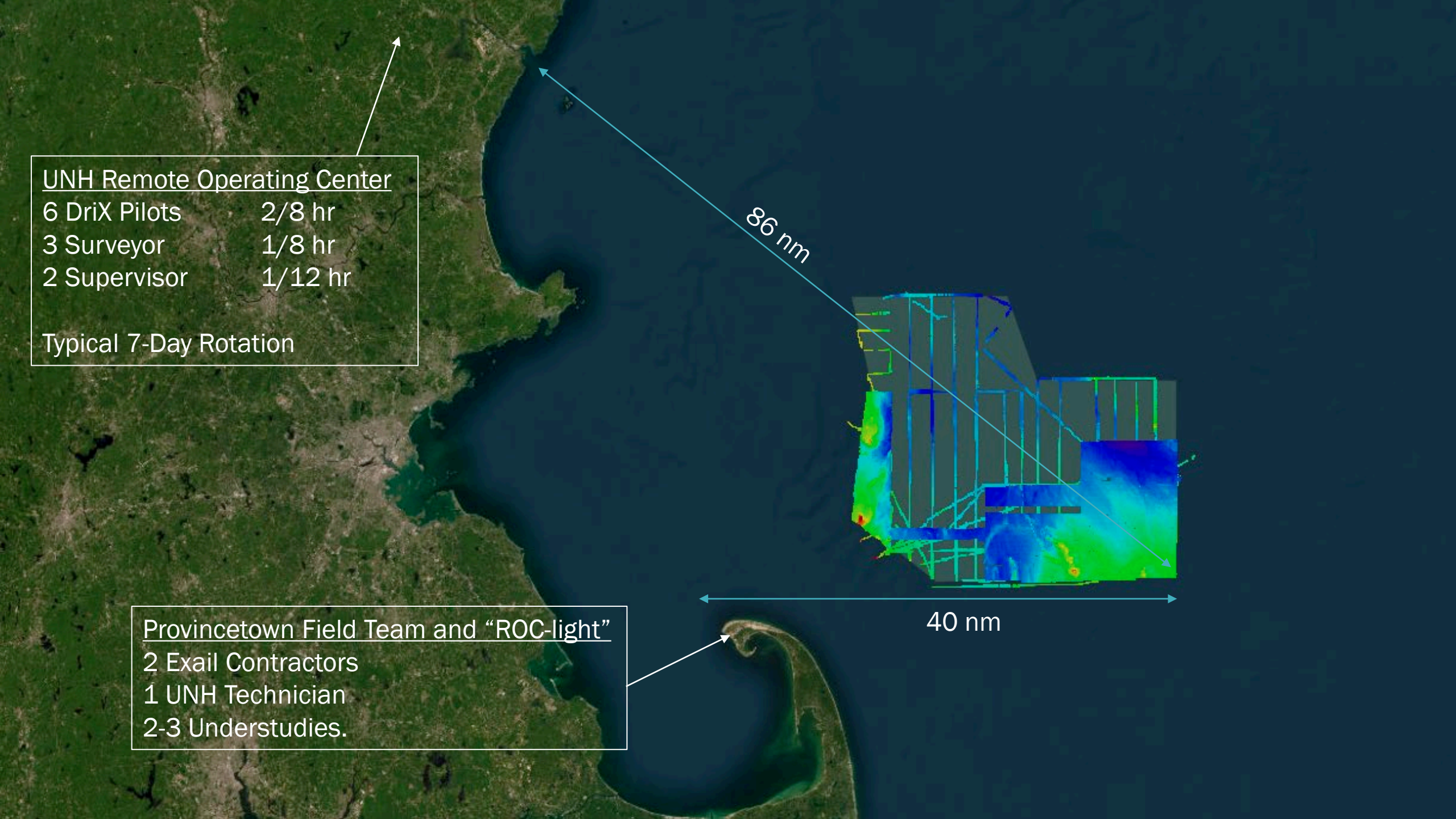


Dual DriX 2024 – at a Glance



October 1

November 1


UNH Remote Operating Center
6 DriX Pilots 2/8 hr
3 Surveyor 1/8 hr
2 Supervisor 1/12 hr
Typical 7-Day Rotation
86 nm
40 nm
Provincetown Field Team and “ROC-light”
2 Exail Contractors
1 UNH Technician
2-3 Understudies.

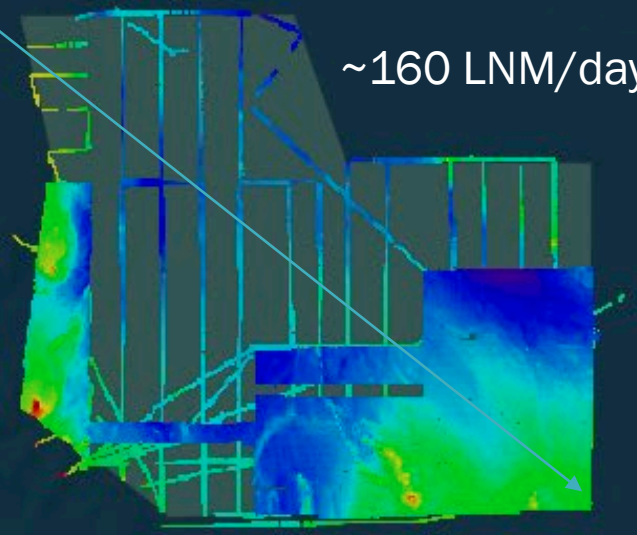
UNH Remote Operating Center

2 DriX Pilots 3/8 hr
1 Surveyor 3/8 hr
1 Supervisor 2/12 hr

Provincetown Field Team and “ROC-light”

2 Exail Contractors
1 UNH Technician
2-3 Understudies.

86 nm

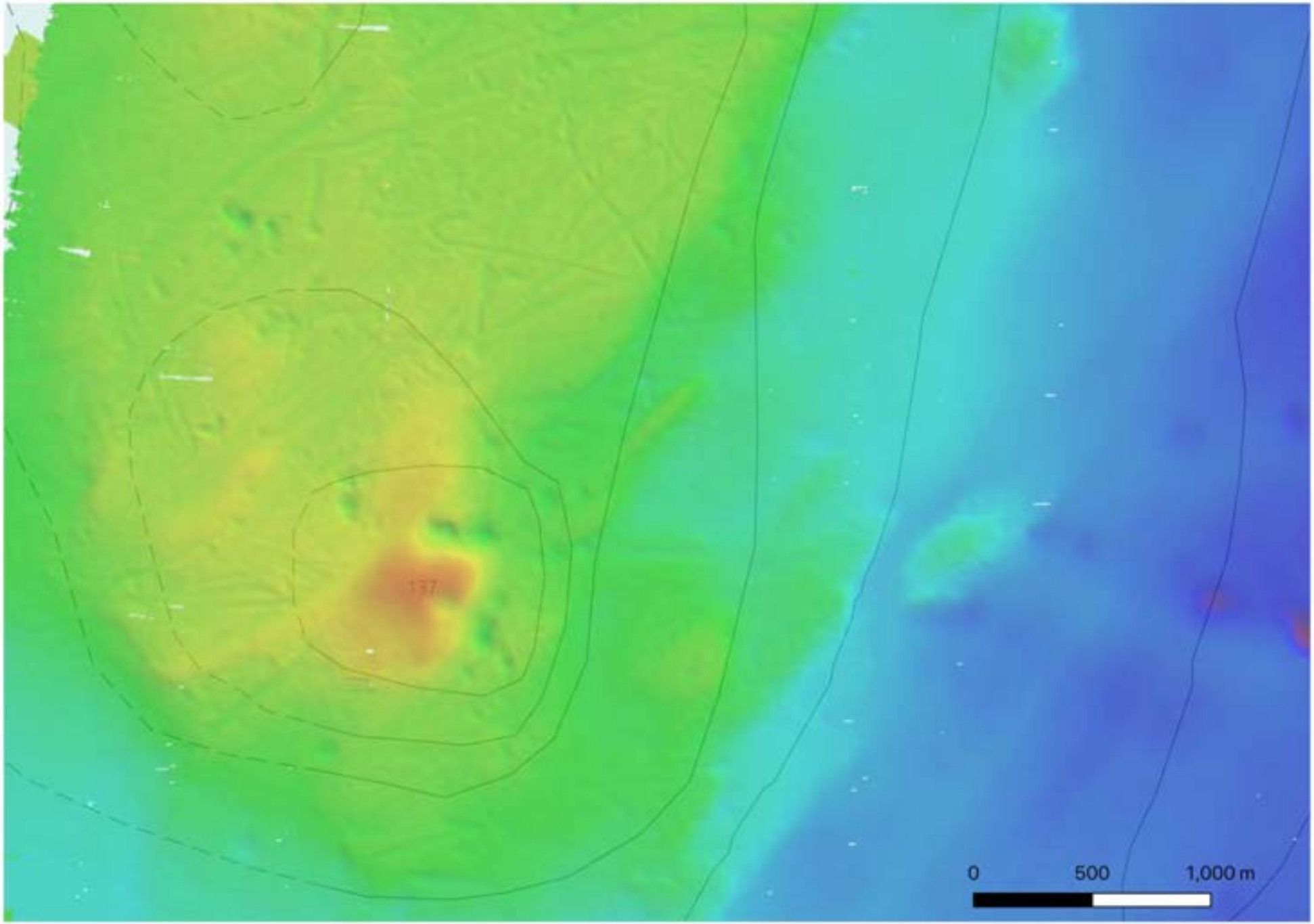


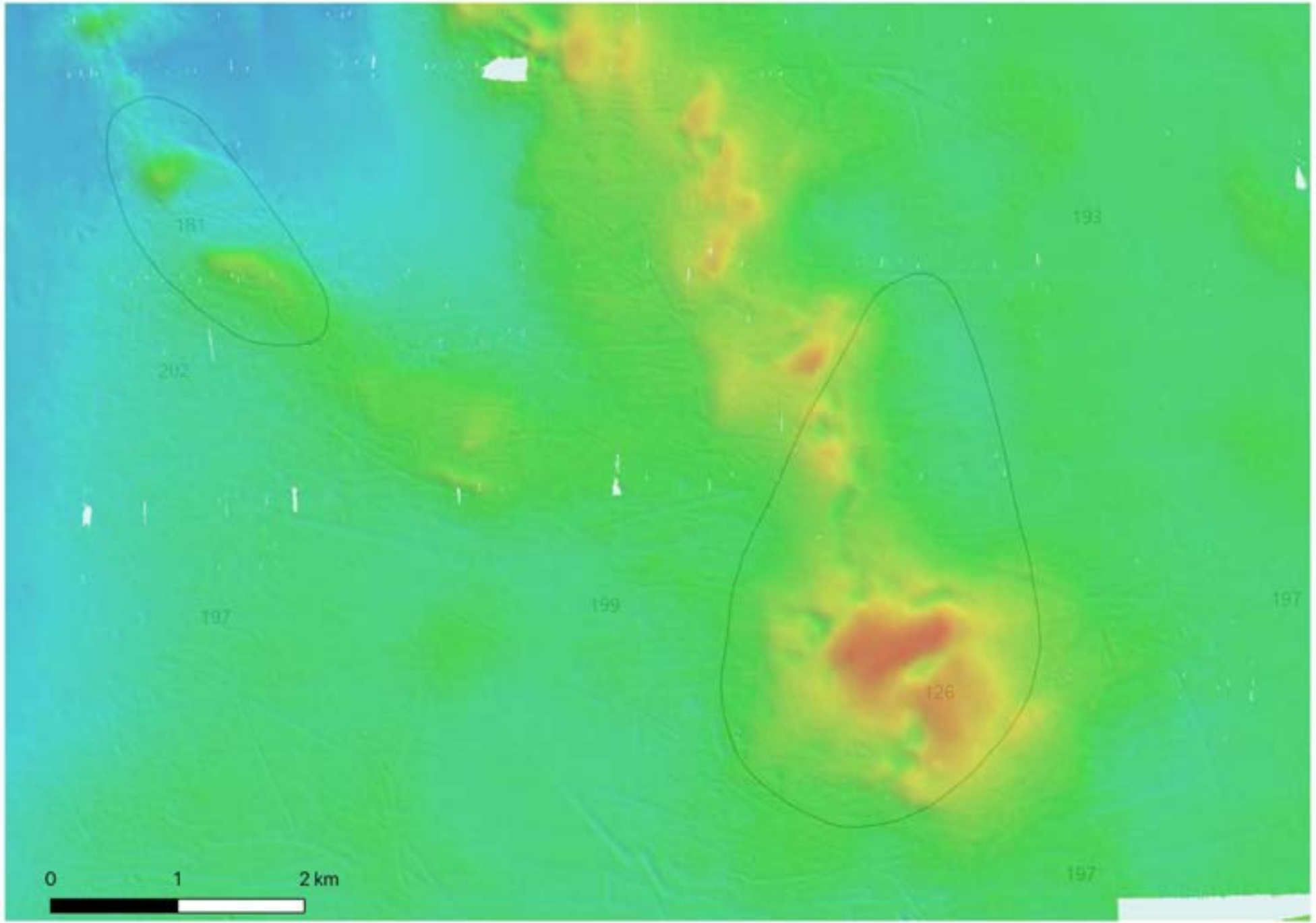
40 nm

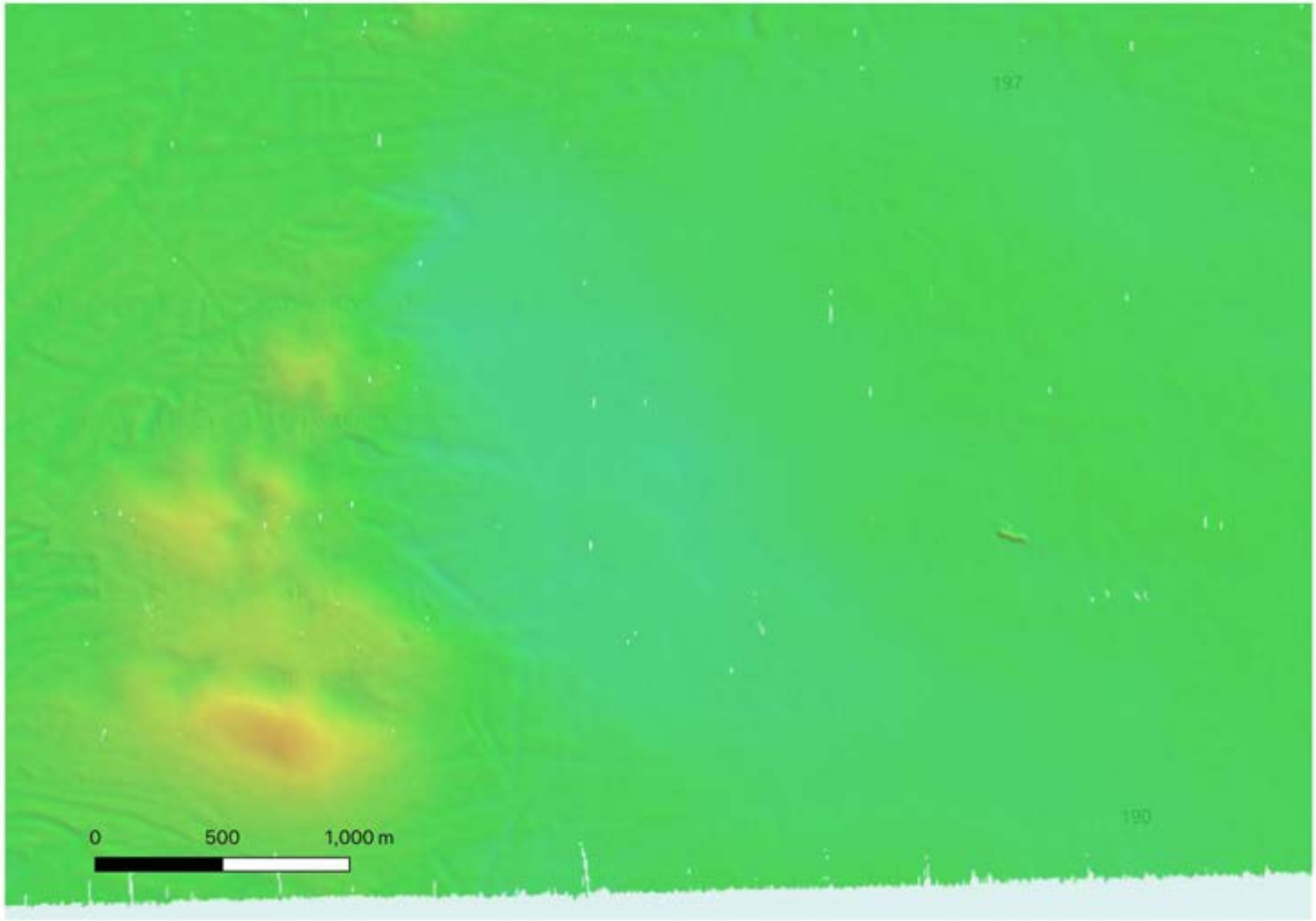
Total LNM:
D12: 1332
D23: 1351
Total Acquisition Hours:
D12: 191.6
D23: 209.75

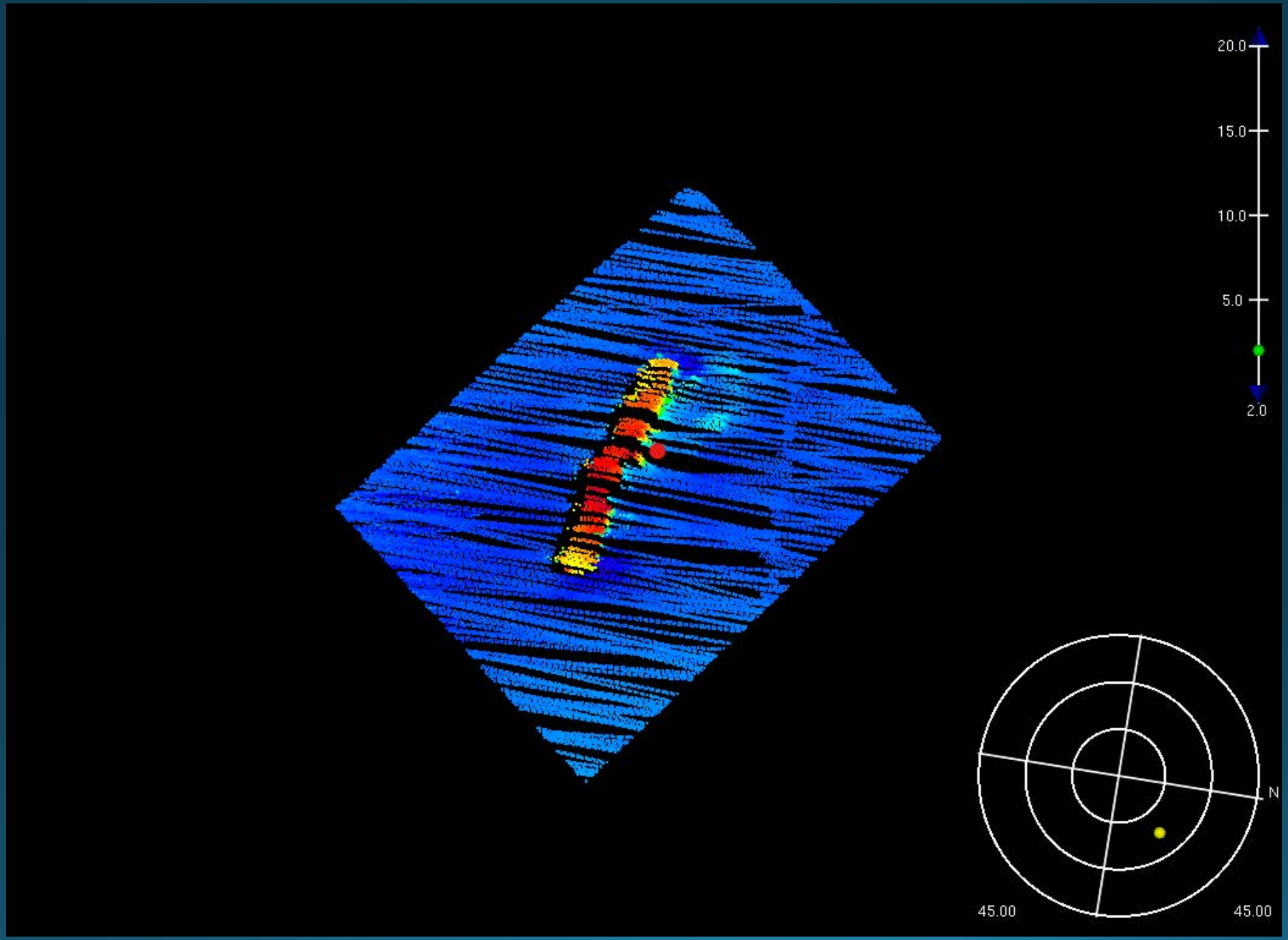
420 Sq NM Surveyed of 815 SqNM

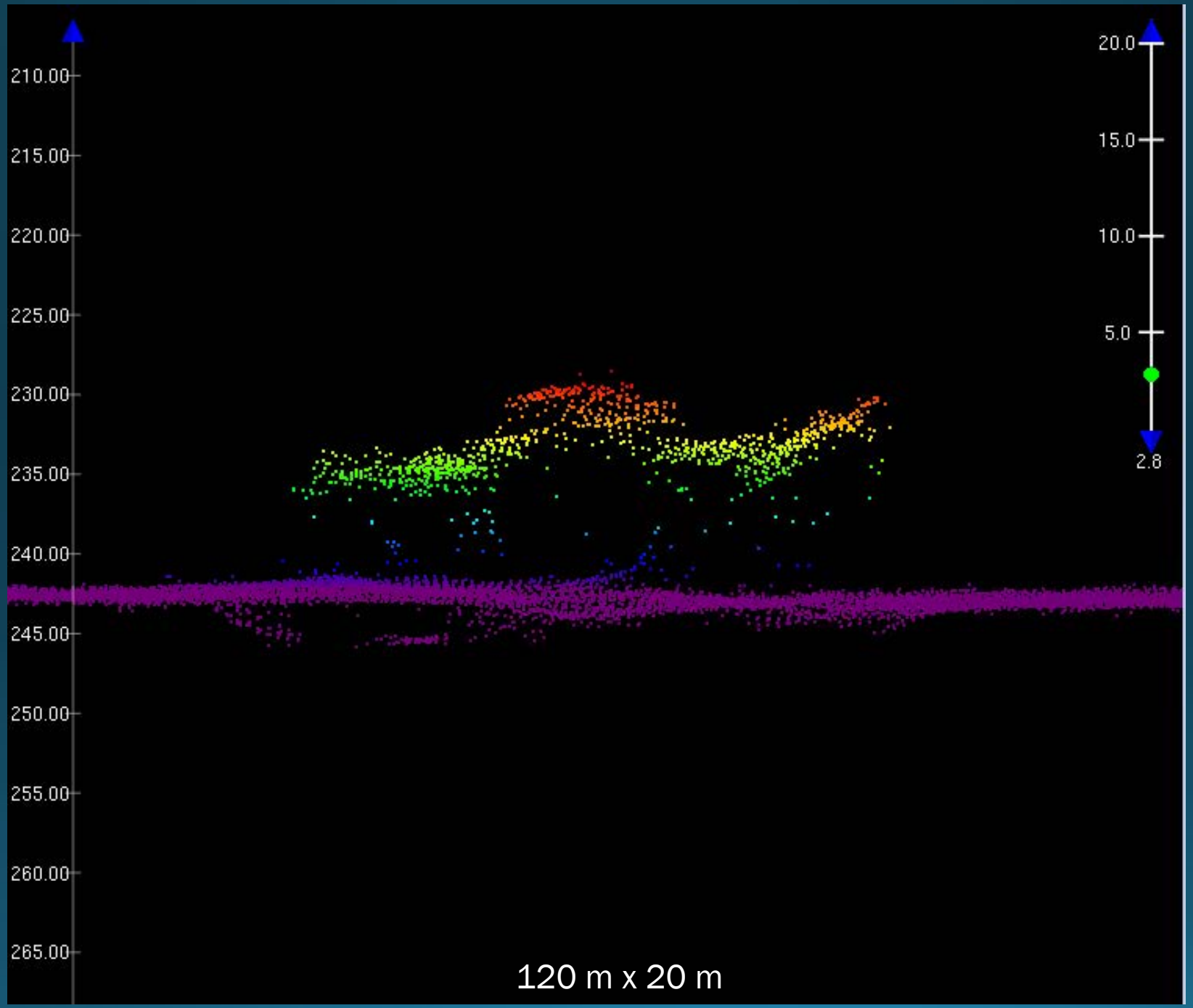
~160 LNM/day/vehicle

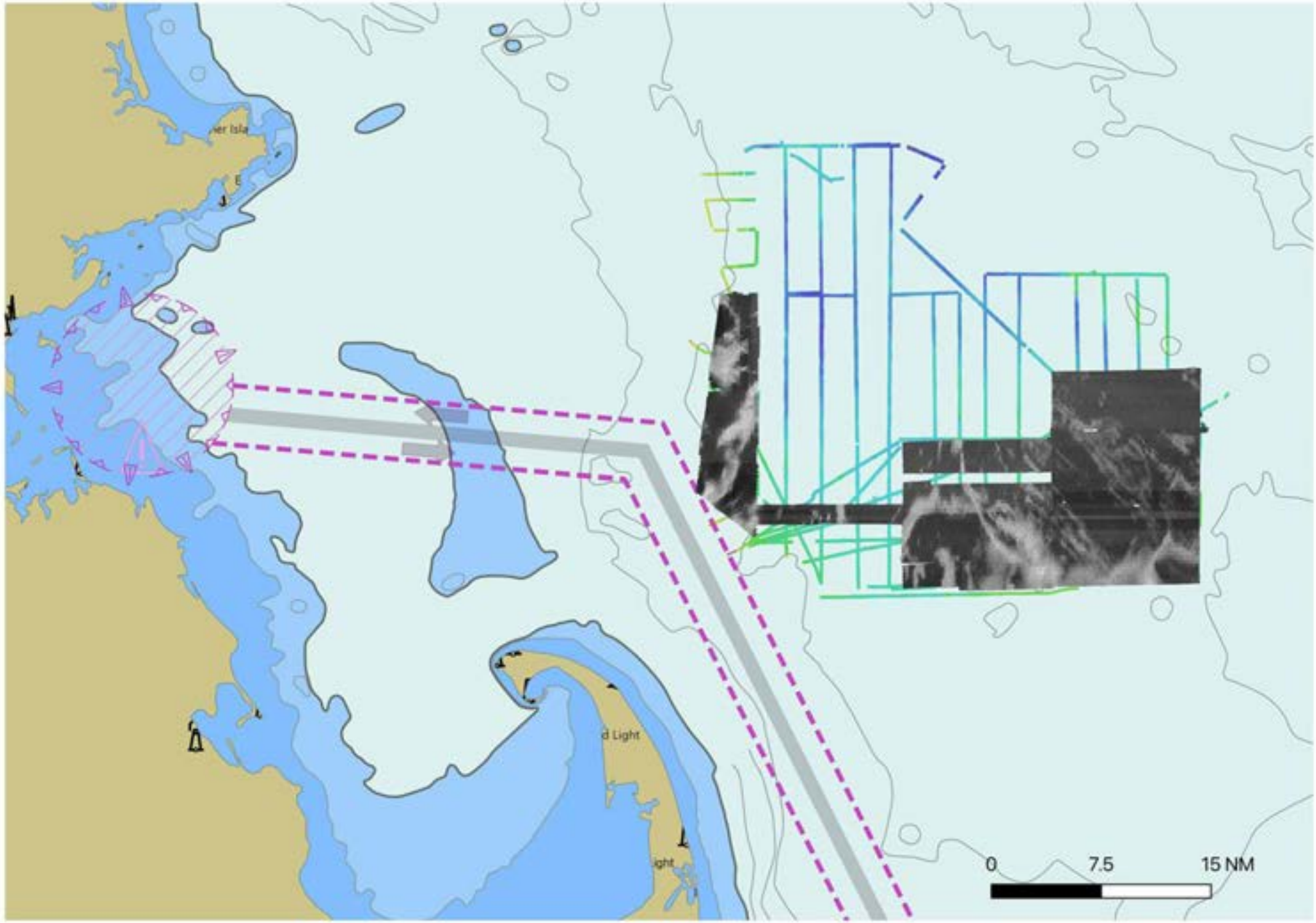

137
0
500
1,000 m

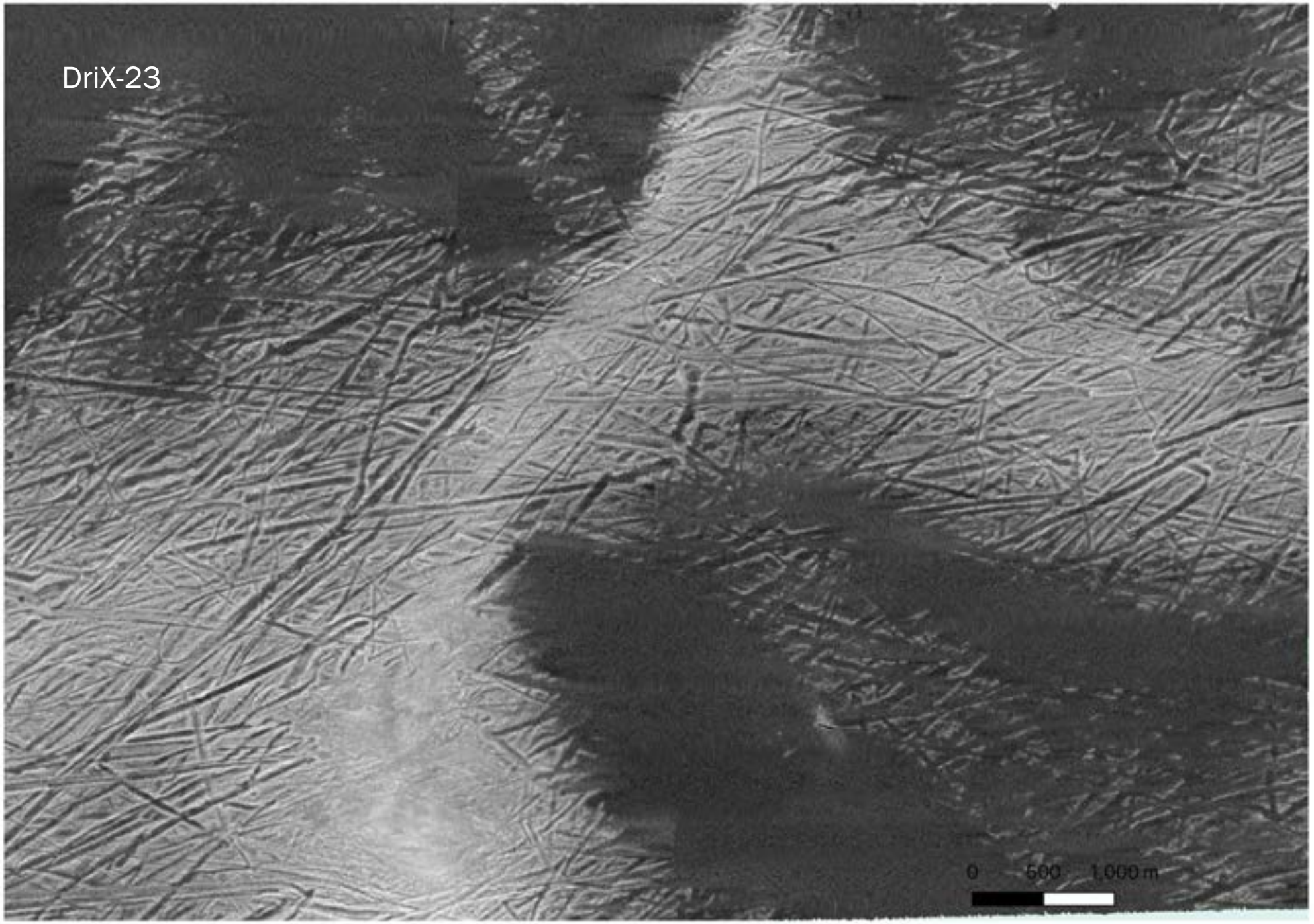

181
193
202
199
197
197
126
197
0
1
2 km

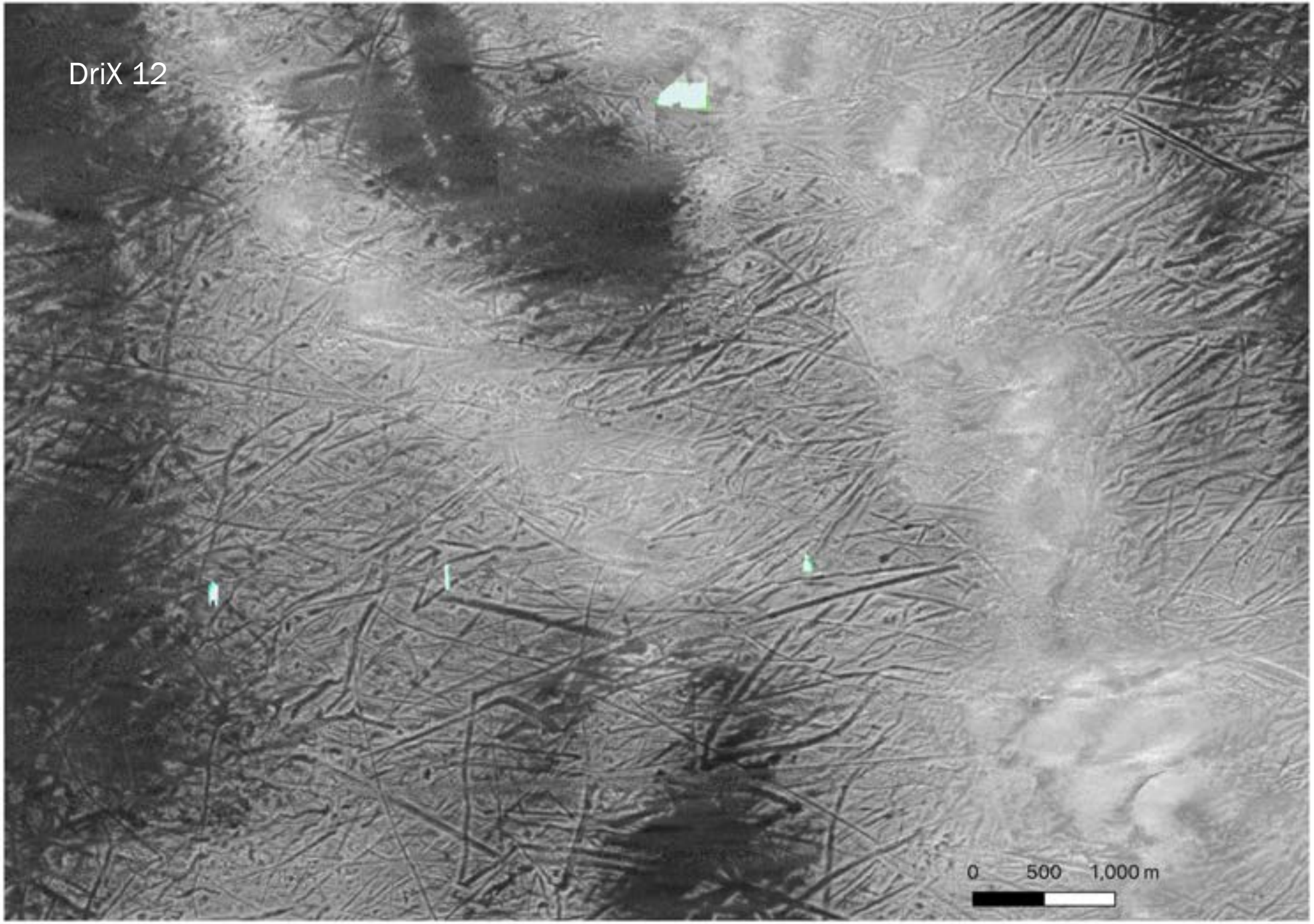

197
190
0
500
1,000 m


20.0
15.0
10.0
5.0
2.0
N
45.00
45.00

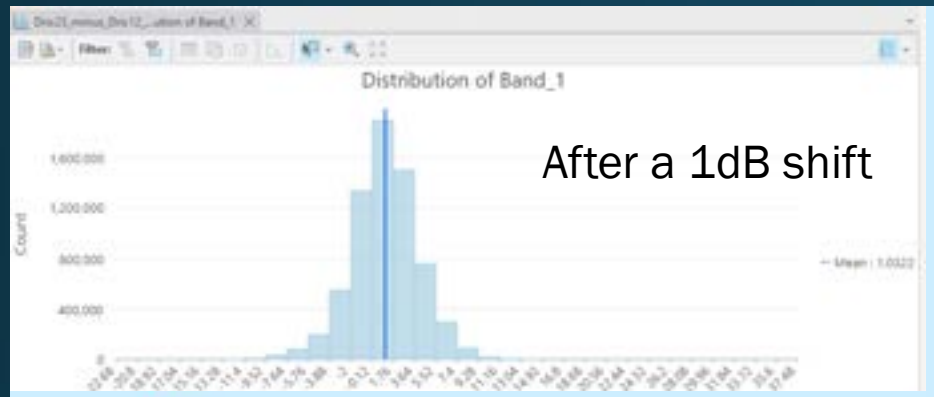

210.00
215.00
220.00
225.00
230.00
235.00
240.00
245.00
250.00
255.00
260.00
265.00
20.0
15.0
10.0
5.0
2.8
120 m x 20 m


0
7.5
15 NM

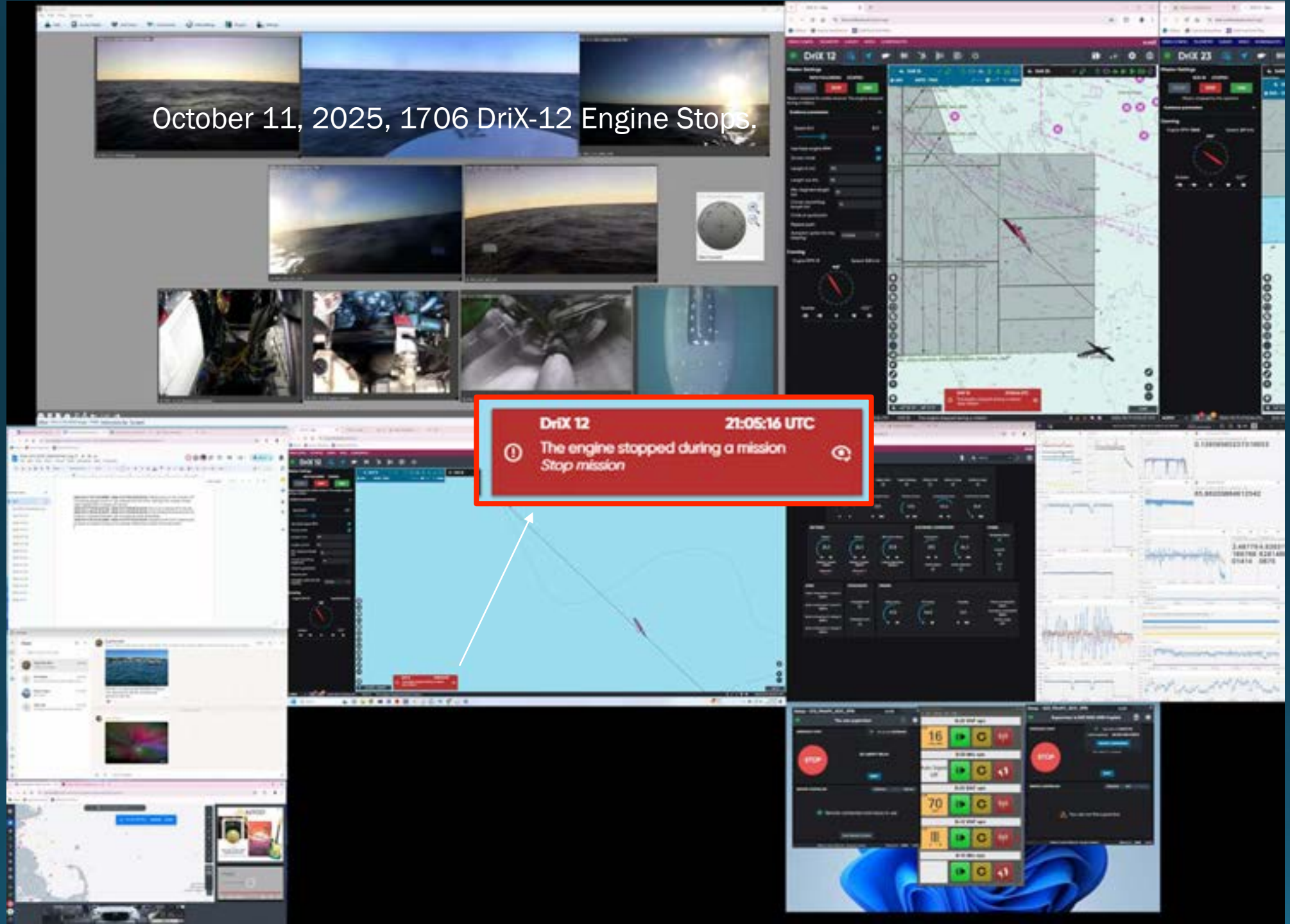

DriX-23
0
500
1,000 m


DriX 12
0
500
1,000 m

After a bulk shift, DriX-12's Backscatter remains less consistent than DriX 23, likely due to poor absorption coefficient from CTD data.

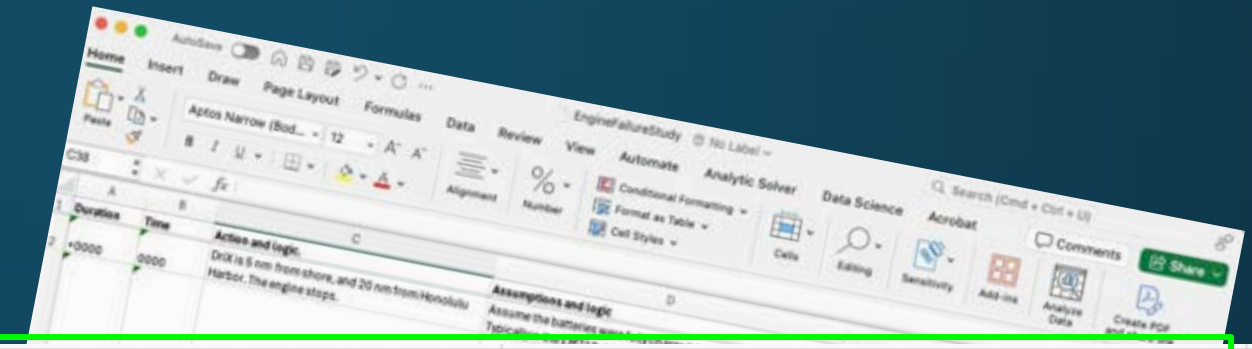


After a 1dB shift


October 11, 2025, 1706 DriX-12 Engine Stops.
DriX 12
21:05:16 UTC
The engine stopped during a mission
Stop mission

0.13956565237310053
65.86203884812542
2.48779189766 01414
4.82631628146 0675
Fuel Consumption
Oil Pressure
Coolant Temperature
Speed Over Ground
Engine RPM

2023 Engine Failure Roll Play



Duration	Time	Action and logic.	Assumptions and logic	What one needs to know.	Implic
+0000	0000	DriX is 5 nm from shore, and 20 nm from Honolulu Harbor. The engine stops.	Assume the batteries were fully charged. DriX was surveying. Typically w the EM712, 32 A discharge rate.		DriX is
+0001	0001	Inform all watch standarders.	Assume there are two people on watch in HI and two at UNH. Internet connectivity is good. There is a Teams chat window open between watch-standers. If it can be supported, the two watch teams should start a video (or at least audio call on speaker).	* Teams user account credentials for each DriX Pilot. * Teams Watchstander Chat. * What's Up Watchstander Chat * All Watchstanders have Teams account with full read/write access. * All watchstanders are in each other's contacts so they show up in Whats App. Whats App Chat with watch team (or everyone)?	Make s
	0001	Assess whether DriX is in immediate danger. If DriX is in immediate danger, very close to shore or in the path of another rapidly approaching vessel, it may be necessary to attempt an immediate engine restart in the hope that one can propell DriX to a safer location.	5 nm from shore on the west side of Oahu, DriX is not likely to be in any immediate danger.	What vessels may be approaching. A quick survey of the HMI.	

2023 Engine Failure Roll Play

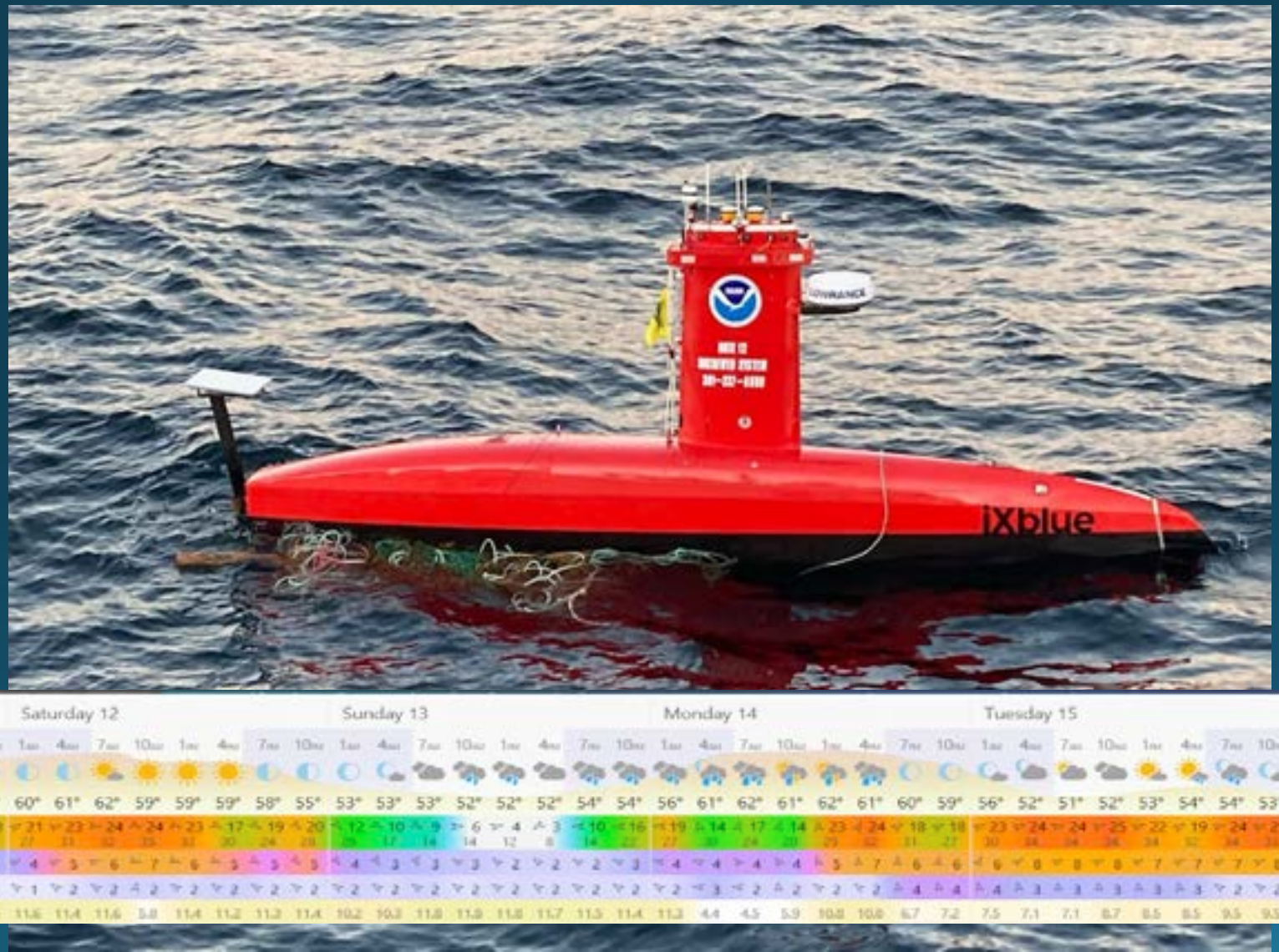
	Implications	Tools and Follow-up Actions	Questions
	DriX is now adrift.		
/write		A phyiscal binder at each watch station with tabs for mission critical information. Should include a complete list of contact information (mobile numbers) for eac watch stander, USCG emergency contact number, Honolulu Harbor Master, UH Marine Center Contacts (Max, Rocky, Ryan), Larry.	
y show up	Make sure everyone knows and all help can be brought to bear.		Should we have a separate chat channel for watchstanders from the DriXOps channel? I think we should so non-watchstanding discussions and one can optionally silence one or the other.
HMI.		Need a VHF Radio Call script in the binder. "SECURITE, SECUITE, SECURITE..." When in a panic this is REALLY helpful to be able to just read.	Is it better to not attempt this immediately and instead hail via VHF any approaching vessel? Watch team is big enoguh to do both.

October 11, 2025, 1706 DriX-12 Engine Stops.

2024-10-11T21:06:21.163Z / 2024-10-11T17:06:21-04:00: Engine stopped on Drix12, manual restart with RC Control failed. There were slight dips in Oil Pressure too Low, Coolant temp too High, but there were no major alarms or Starlink drop before D12's Engine Stopped. Nothing wrong in the cameras or fluids sloshing in the compartments. Error "Engine Stopped. Mission Stopped". Engine alternator and regulator lights are off on PLC. Engine cabinet breakers 22q2

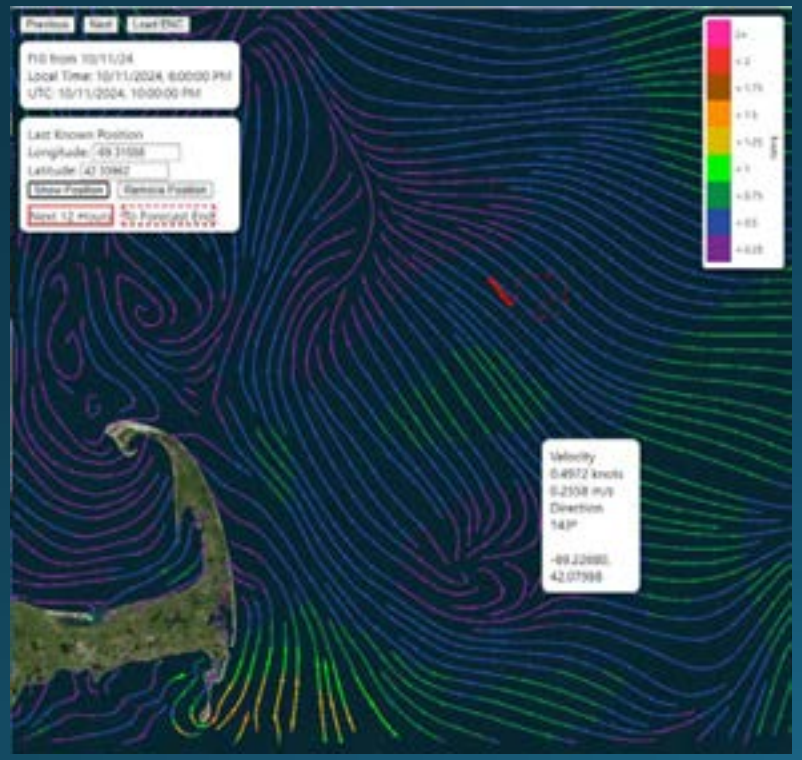
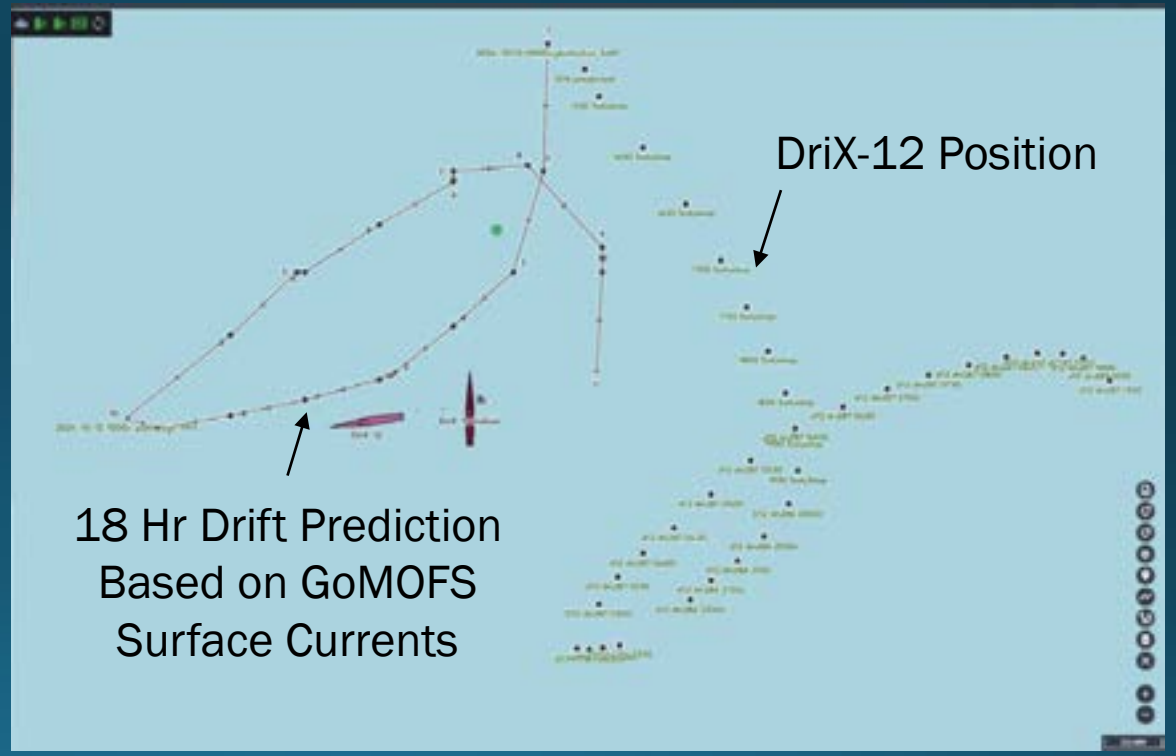
Although we could not see it, engine was mechanically bound.
Had we continued engine start attempts we would have destroyed the transmission!

DriX-12 Fouling and Recovery



Testing the GoMOFS Model

CCOM Vizlab Tool with GoMOFS Surface Current and Drift Prediction



Post-Mortem Comparison