Multibeam Advisory Committee

RVTEC - UNH - Durham, NH

2024 Oct 23

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MAC supported under NSF grant 1933720

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The Multibeam Advisory Committee (MAC)

Established in 2011 with NSF funding to support collection of high-quality multibeam data across the U.S. Academic Research Fleet (USARF)

- **Standardized** system testing workflows
  - Sea Acceptance, Quality Assurance, Noise
- **On-board & remote support**
  - Flexible scheduling by ship request
- **Public reporting**
  - Technical reports and resources
  - Assessment tools, survey guidance
  - Non-USARF references

Website: mac.unols.org

Helpdesk: mac-help@unols.org

Wiki: github.com/oceanmapping/community/wiki

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Multibeam Systems Supported by the MAC

- 12 Vessels with MBES
  - 10 UNOLS Research Vessels
  - 2 Icebreakers
- 15 Deep water systems
  - EM710 / EM712 (40-100 kHz)
  - EM302 / EM304 MKII (30 kHz)
  - EM122 / EM124 (12 kHz)
- 2 Shallow water systems
  - EM2040 (200-400 kHz)
- +6 Systems (3 RCRVs) in 2025+
  - EM304s & EM2040s

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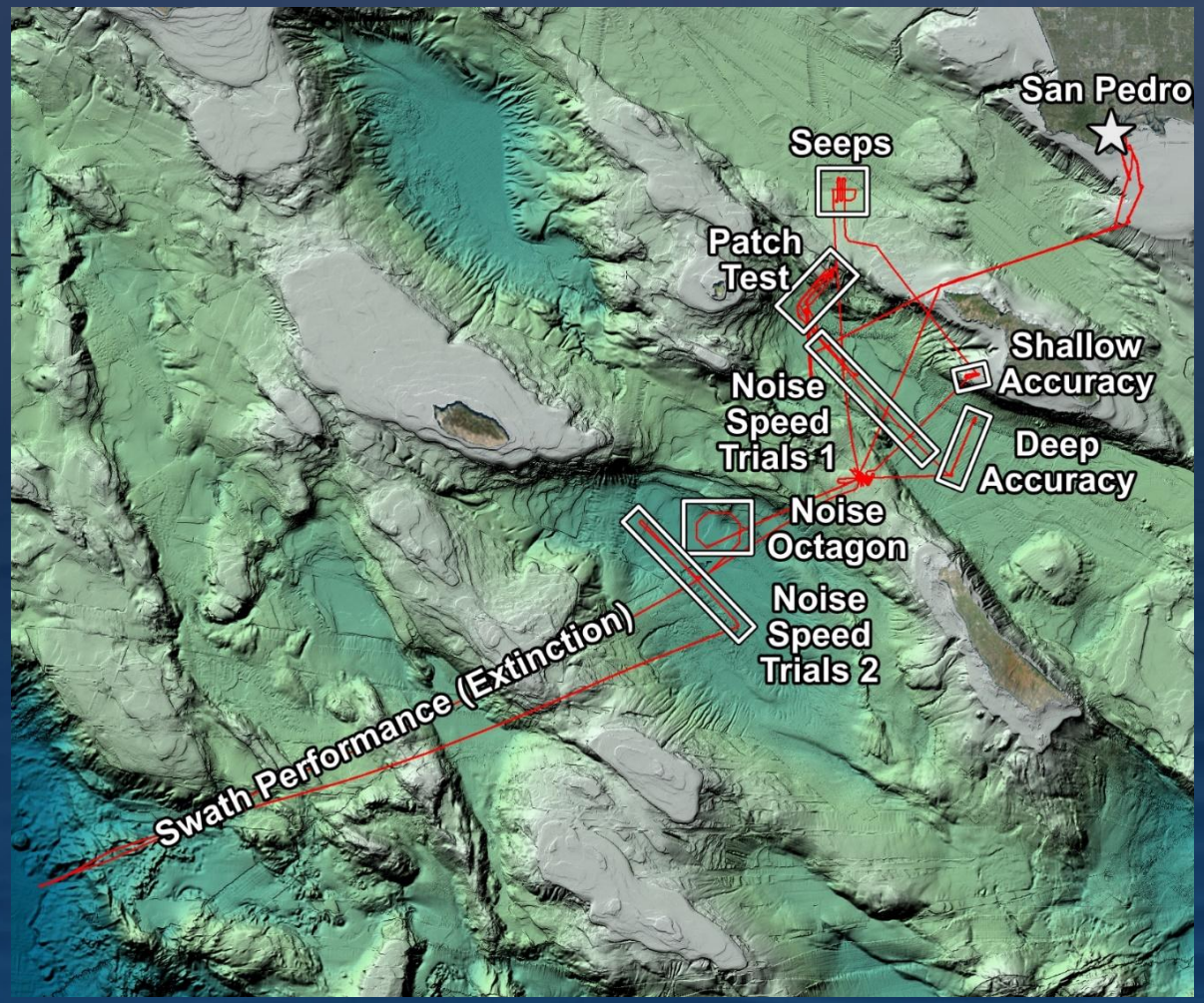
Kongsberg Installations and Life Cycles

Ship	System(s)	Arrays	Life Cycle	MAC Support (Most Recent)	2024-25 Plans
Atlantis	EM124 (g)	2021	Early	SAT*, QAT (2024)	QAT
Healy	*EM122*	2010 / 2023 RX	Late	ANT, SAT*, QAT* (2024)	QAT
Hugh R. Sharp	*EM2040 (pending)*	*2024*	Early	QAT (2016), SAT planning* (2024)	EM2040 SAT
Kilo Moana	EM122 / EM710	2012	Late	ANT, QAT* (2023), spares planning	QAT
Marcus G. Langseth	EM122 (g)	2007 TX / 2010 RX	Late	ANT, QAT (2023), spares planning	QAT
Nathaniel B. Palmer	EM122	2015	Late	SAT, ANT, QAT (2015), spares planning	TBD
Neil Armstrong	**EM124 / EM712**	2024 (2016 710 RX)	Early	SAT* (2024)	QAT
Rachel Carson	**EM2040**	2024	Early	SAT* (2024)	QAT
Roger Revelle	EM124 / EM712 (g)	2020	Mid	SAT*, QAT* (2024)	QAT
Sikuliaq	**EM304 MKII** / EM710	2024	Early/Late	SAT, SAT (2024)	QAT
Sally Ride	EM124 / EM712	2016	Mid	SAT, QAT* (2024)	QAT
Thomas G. Thompson	*EM302*	2018	Mid	SAT, QAT* (2023), spares planning	QAT

(g) indicates gondola installation
*Indicates remote support
Underline = recent install

Italic = pending replacement (2025+)
Green = testing in last year
ANT = Acoustic Noise Test (Gates)

System Performance Testing



Early as possible

Planning

1. Review of recent data, issues, etc.
2. Vessel + sensor offset survey (as needed)
3. Site selection + scheduling
4. Software + firmware updates

1-2 days

Dockside

5. Configuration + offset review
6. Hardware health check
7. Test plan review with bridge (ongoing)

1-10 days

At Sea

8. GNSS antenna calibration
9. Multibeam calibration ('patch test')
10. RX noise vs. speed / seas
11. Swath coverage (extinction)
12. Swath accuracy
13. Water column evaluation
14. Backscatter normalization

1-2 mos.

Follow-Up

15. Data and configuration backup
16. Public reporting (MAC website)
17. Opportunistic testing

SAT / QAT Checklist

Standardized (but flexible!) procedures in order of priority

Collaborative planning → data collection → follow-up

2024 RV *Neil Armstrong*

Multibeam Advisory

EM124 SAT / EM712

Adapted from standard Multibeam Advisory

Purpose

This document provides an overview of typical S
Testing (QAT) procedures performed by the Multi
are critical for establishing baseline performance
identifying and resolving problems; and deliverin
throughout the multibeam echosounder service li

The outlines and time estimates provided below
commitments for each SAT and QAT depend on
quality of survey reporting; test locations and sea

Detailed SAT and QAT reports for the UNOLS fle
http://mac.unols.org/. Reports for similar testing
available for reference.

Quick Links

2024 SAT data transfer from ship
2016 Armstrong EM122 / EM710 SAT report
MAC survey report recommendations
SmartMap: sound speed variability forecasts
Sound Speed Manager (plus WOA18 temp + sal
Python multibeam assessment tools
Ocean Mapping Community Wiki
Multibeam Echosounder Test Sites Database - E
Bahamas EEZ Boundaries : MRGID 8404
EM124 cal Blake Nose international (if not allowe
EM122 calibration Mytilus Seamount
EM122 calibration Physalia Seamount
EXAMPLE Kongsberg SIS 5 navigation config
Selecting active navigation sources in SIS - M

Planning Call Mar 5, 2024

1. MAC will provide remote support (at least
2. Returning to Woods Hole instead of Char
3. Departure date still March 13 0900, arrive
4. Data collection not allowed in Bahamas (
5. Survey report updates
6. Added EM712 cal site (AR0103)
7. MAC can support / process / report only
8. Noise testing in combination with Tim Ga

Next Steps and Follow-Up

March 12:

1. Set Time system in SIS to Time Datagra
   coming from Seapath (Attitude 1) *AR w
   Seapath 380R install manual.
   a. Selecting active navigation so
   b. https://github.com/oceanmapping
2. Confirm IMU and MGC reported locatio
   is available with diagrams)
3. Update all EM and Seapath configs with
   Navigation Reference Point for all mapp
4. Update ARMSTRONG_offset_reviev
5. Run Seapath antenna calibration docks
   swap back to surveyed/non-cal numbers
   a. Reapply survey results if they ag
   b. If not, need to discuss and consi
6. Provide bow/stern draft readings and al
   the Waterline Worksheet: ARMSTRC

March 13:

1. Seapath antenna updates / cal results a
2. Question: are both Seapath and POS M
   secondary nav source in Qimera calibra

Overview from 2016 SAT report

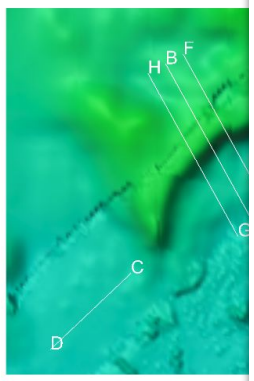
*Figure 2. Calibration and accuracy testing sites southe
suitable seafloor features in the operational depth ran
(acoustic extinction) data were collected up and down*

1. DONE: Pre-dockside
   a. Survey report / system geometry
   b. HAT review as available
   c. Firmware / software updates

2. DONE: Dockside
   a. Complete HAT
   b. Prelim noise / impedance testing
   c. Seapath antenna calibration / ver

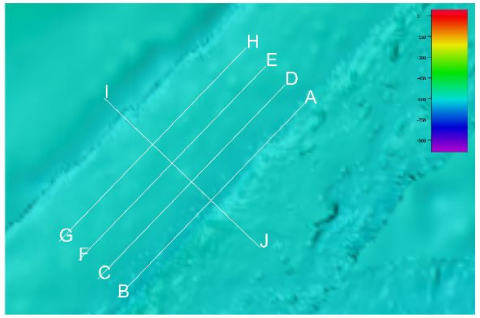
3. DONE: Speed-noise testing in deep wa
   a. Requires deep water (>1000 m);
   b. Confirm no new noise limitations
   c. RX Noise vs. speed in calm seas
   d. RX Noise vs. swell direction in ele
   e. RX Noise testing instructions

4. DONE: EM712 calibration and verifica
   a. Waypoints and settings: Atlantic_
   b. Time estimate: ~10 hrs with buffe
      i. Calibration: 5 hrs
      ii. Verification: 5 hrs
   c. **Note updated settings for head**
      are now adjusted instead of the s
      along the lines without the risk of



5. ~~POTENTIAL~~ EM124 initial calibration (
   a. ~~This is not in the intended depth~~
   b. ~~Waypoints and settings are the se~~

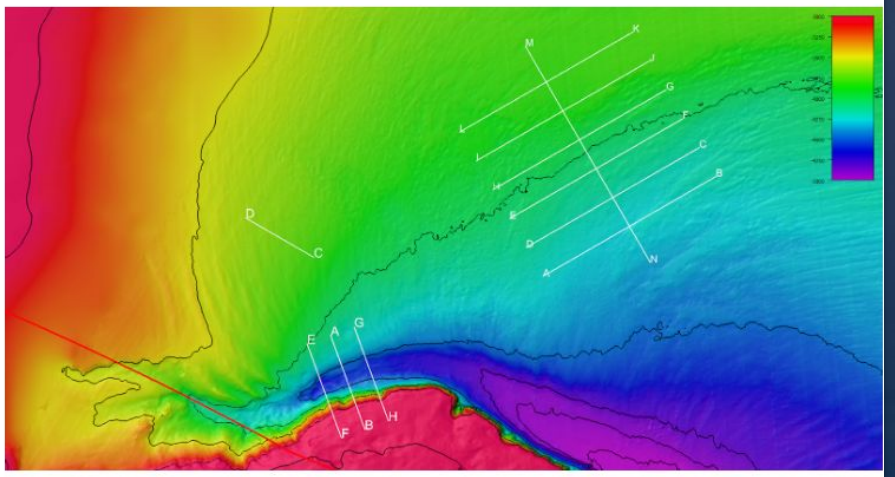
6. DONE: EM712 600 m accuracy / SAT contract demo survey
   a. Reference survey and crosslines over AR0103 600 m site
   b. Waypoints and settings: Atlantic_Charleston_accuracy_600_m
   c. Time estimate: ~8 hrs + buffer
      i. Reference surface: 5 hrs +/- buffer for sound speed profiling
      ii. Crossline 1: 1 hr for Very Deep mode (two passes) + XBT or CTD
      iii. Crossline 2: 1 hr for Deep mode (two passes) + XBT or CTD
      iv. Crossline 3: 1 hr for Extra Deep mode (two passes) + XBT or CTD



7. TRANSIT: Swath coverage testing on continental slope
   a. **Unless conditions are terrible (e.g., massive bubble sweep issues), MAC requests the transit at 8 kn (count the extra time as SAT time if nec.) in order to get realistic survey coverage trends over this depth range (600-4000 m)**
   b. EM712 and EM124 should be synced; EM712 may need to be secured at 2000-3000 m
   c. Other sonars can be run as long as they do not interference (sync if possible in the same group to avoid slowing down the EM ping rate)
   d. Swath coverage testing instructions

8. DONE: EM124 calibration and verification
   a. **~11 hrs per calibration and verification; ~24 hrs for planning w/ buffer for proc., etc.**
   b. New lines (black) planned for 2024 in international waters, if necessary (less ideal slopes)
      i. 2016 lines (red) are 'proven' and preferred, but they cross into Bahamian EEZ (thick red border line)
   c. New waypoints and settings: EM124 cal Blake Nose international
      i. Roll line is same location, oriented slightly differently for slopes observed in 2016
   d. **Note updated settings for heading calibration lines**: the port/stbd swath *distance* limits are now adjusted instead of the swath *angle* limits; this enables more uniform coverage along the lines without the risk of losing overlap in shallow regions due to angles

9. DONE: EM124 accuracy / SAT contract demo survey near calibration site
   a. AR0103 5000 m accuracy site is in Bahamian EEZ and cannot be used
   b. New 4000 m accuracy site planned nearby in international waters
   c. Waypoints: Atlantic Charleston accuracy 4000 m international
   d. Time estimate: 24 hours → RUN CROSSLINES FIRST IF WEATHER IS INCOMING
      i. Reference surface: 14 hrs +/- buffer for sound speed profiling
      ii. Crossline 1: 5 hrs for Deeper mode (two passes) + XBT or CTD applied at start
      iii. Crossline 2: 5 hrs for Very Deep mode (two passes) + XBT or CTD applied at start



10. Opportunistic: Coverage testing on continental slope
   a. Swath coverage trends are important indicators of noise or hardware limitations over the service life of the system (and help users plan survey line spacing)
   b. Collecting a baseline coverage curve is important for the new systems
   c. Transit at survey speed across a wide depth range, crossing contours perpendicularly (directly up and down the slope) to avoid slopes facing toward / away from the arrays
   d. Swath coverage testing instructions
   e. Line location is flexible around other SAT objectives; waypoints for a suitable swath coverage line can be provided during SAT

11. Additional EM124 accuracy testing - to be planned near SBP test location / route to WHOI
   a. Need several depth ranges to verify all depth modes are functional
   b. Possible combination with Kongsberg SAT 'demo survey' for ONE MODE (see above)
   c. 24 hrs minimum typical time commitment for one mode in deep water (~4000-5000 m)

12. Additional EM712 accuracy testing - to be planned near SBP test location / route to WHOI
   a. Typically need several depth ranges to verify all depth modes are functional
   b. Possible combination with Kongsberg SAT 'demo survey' for ONE MODE (see above)
   c. 12 hrs min. typical time commitment for one mode in deep water (~1000 m)

13. Backup calibration sites along shelf break:
   a. PENDING (MAC will review other SATs conducted out of Norfolk, etc.)
   b. PENDING (possible Cape Fear Diapir calibration adjacent to SBP test plans)

14. Backup EM124 calibration sites at New England Seamounts:
   a. EM122 calibration Mytilus Seamount
   b. EM122 calibration Physalia Seamount

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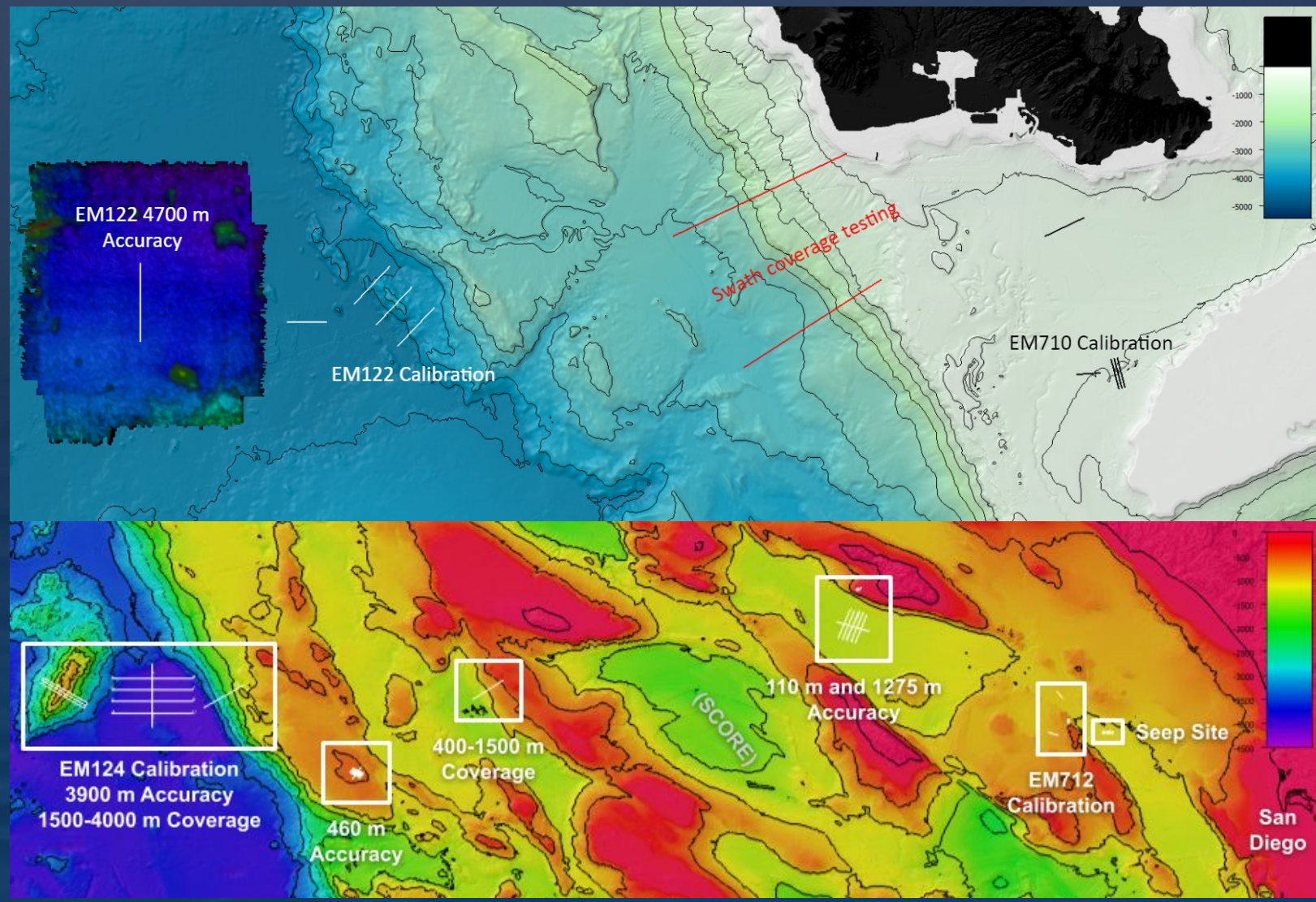
Related Activities Since RVTEC 2023

MAC-related projects:

- Ocean Mapping Community Wiki
- Sonar Test Site Database
- Sound Speed Manager
- GMRT tiling package
- Assessment tools
- Spares planning

<u>Non-MAC</u> field work:

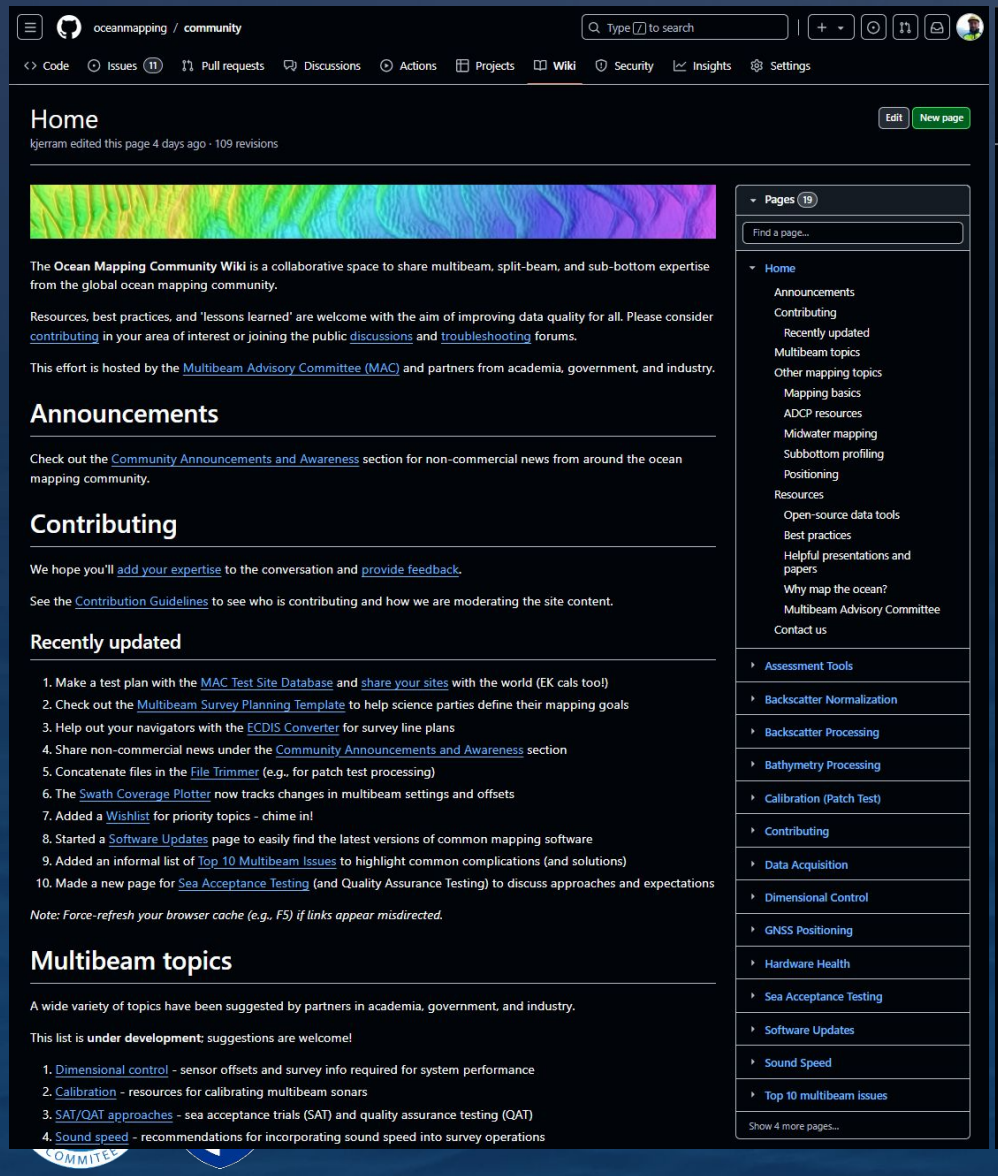
- *Okeanos Explorer* (QAT)
- *David Packard* (SAT)
- *Nautilus* (QAT)
- Saildrone *Surveyor* (planning)

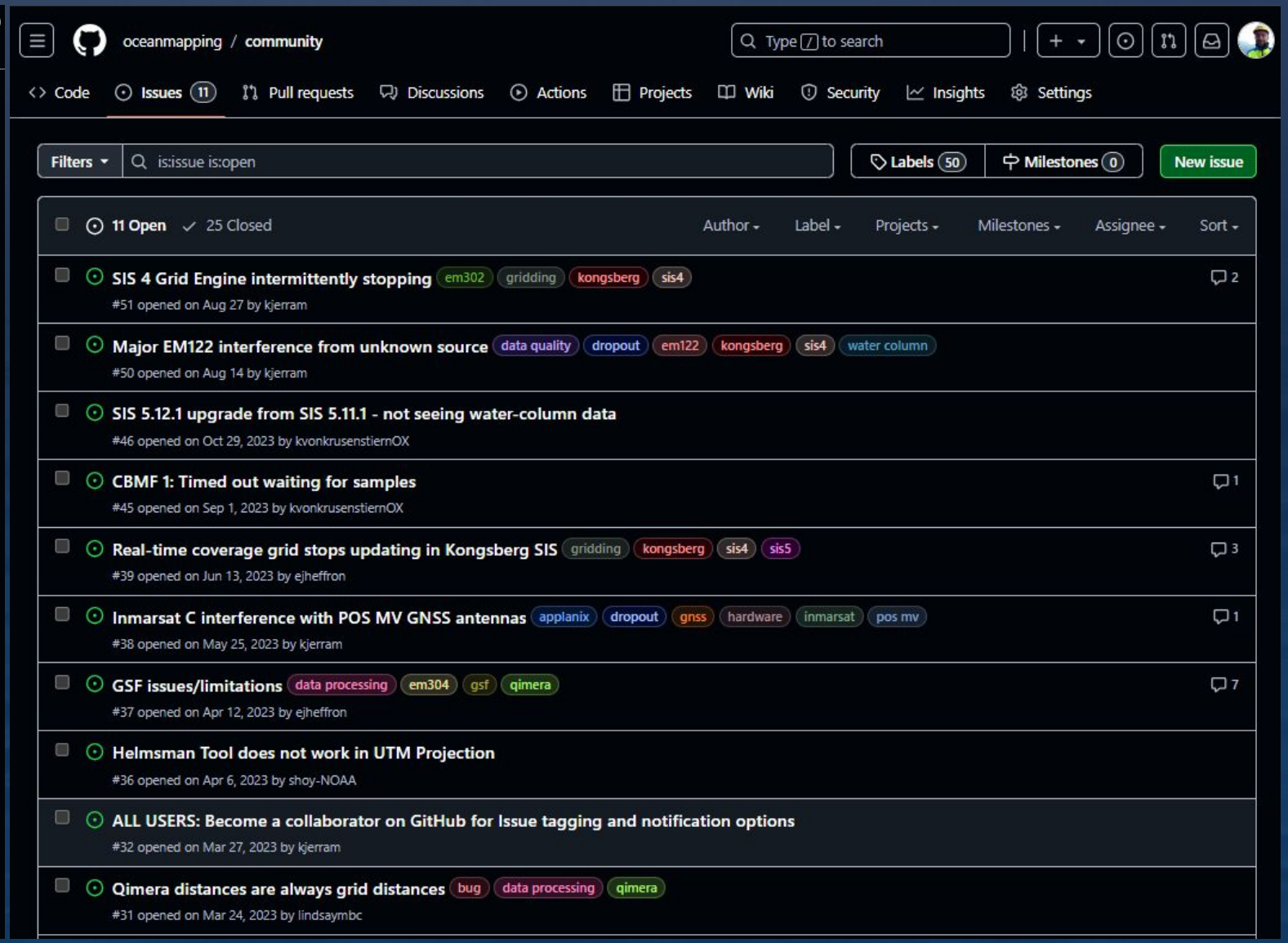


Ocean Mapping Community Wiki

github.com/oceanmapping/community/wiki

omcadmin@ccom.unh.edu or *mac-help@unols.org*





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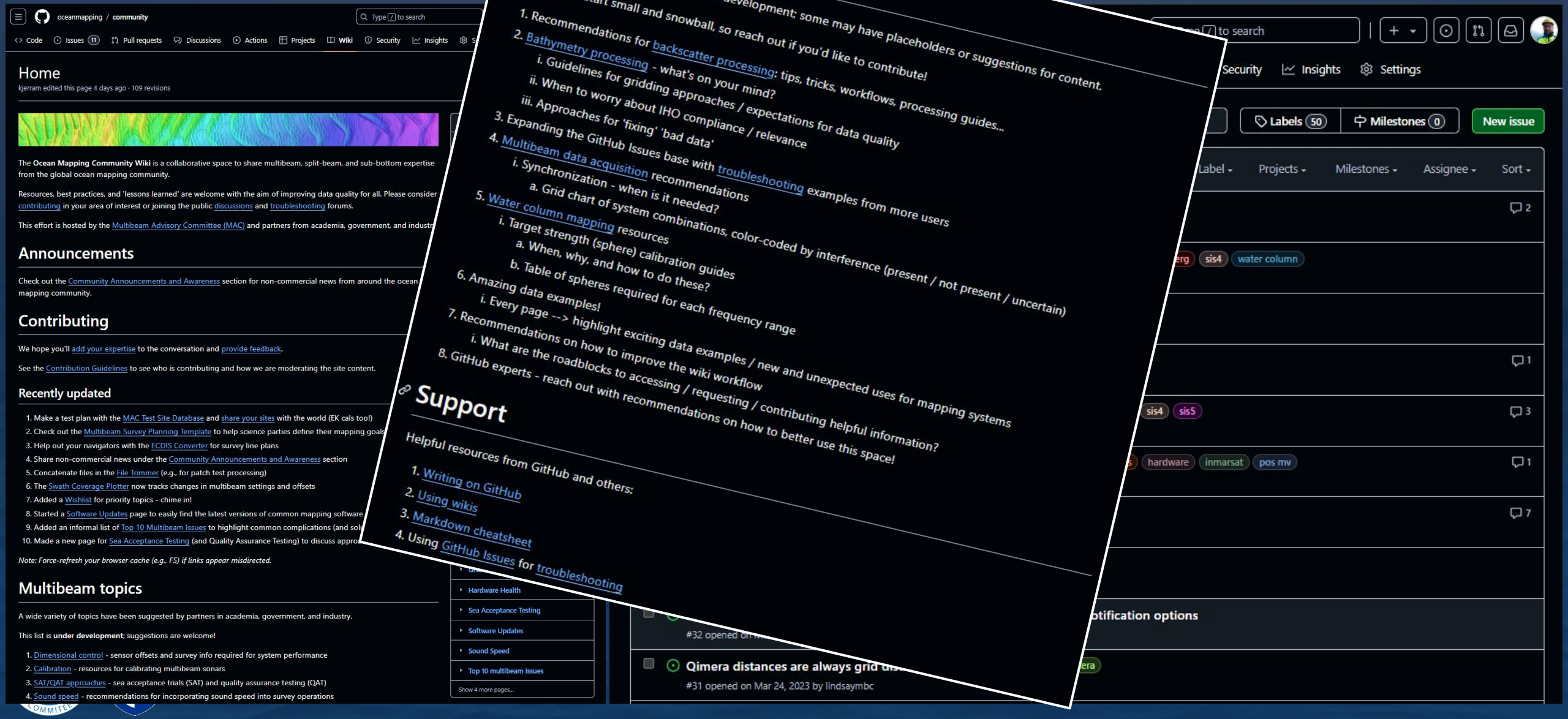


Wish list

The topics below are high priority for development; some may have placeholders or suggestions for content.

Sections can start small and snowball, so reach out if you'd like to contribute!

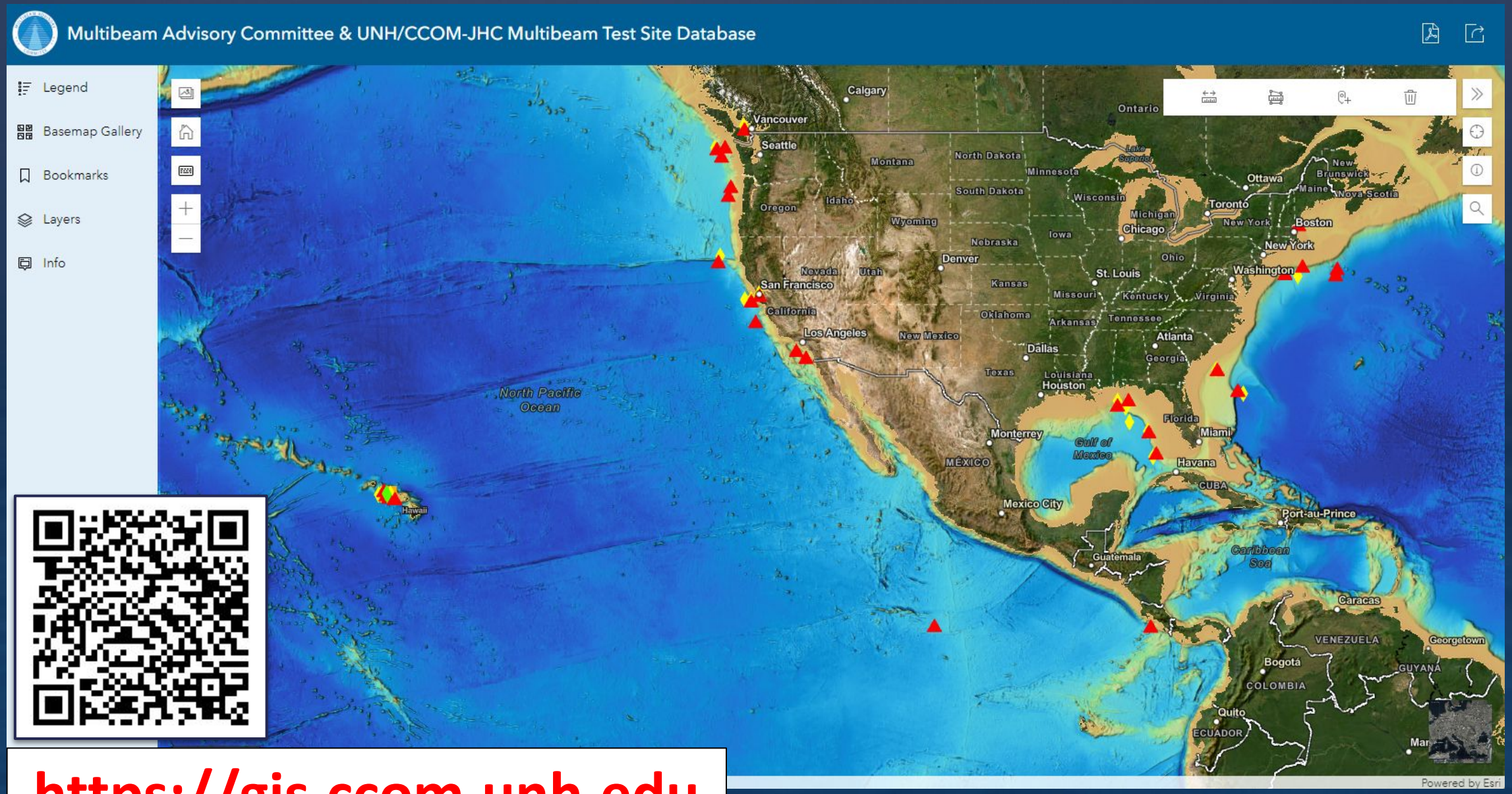
1. Recommendations for backscatter processing: tips, tricks, workflows, processing guides...
2. Bathymetry processing - what's on your mind?
   i. Guidelines for gridding approaches / expectations for data quality
   ii. When to worry about IHO compliance / relevance
   iii. Approaches for 'fixing' 'bad data'
3. Expanding the GitHub Issues base with troubleshooting examples from more users
4. Multibeam data acquisition recommendations
   i. Synchronization - when is it needed?
   a. Grid chart of system combinations, color-coded by interference (present / not present / uncertain)
5. Water column mapping resources
   i. Target strength (sphere) calibration guides
   a. When, why, and how to do these?
   b. Table of spheres required for each frequency range
6. Amazing data examples!
   i. Every page --> highlight exciting data examples / new and unexpected uses for mapping systems
7. Recommendations on how to improve the wiki workflow
   i. What are the roadblocks to accessing / requesting / contributing helpful information?
8. GitHub experts - reach out with recommendations on how to better use this space!

Support

Helpful resources from GitHub and others:

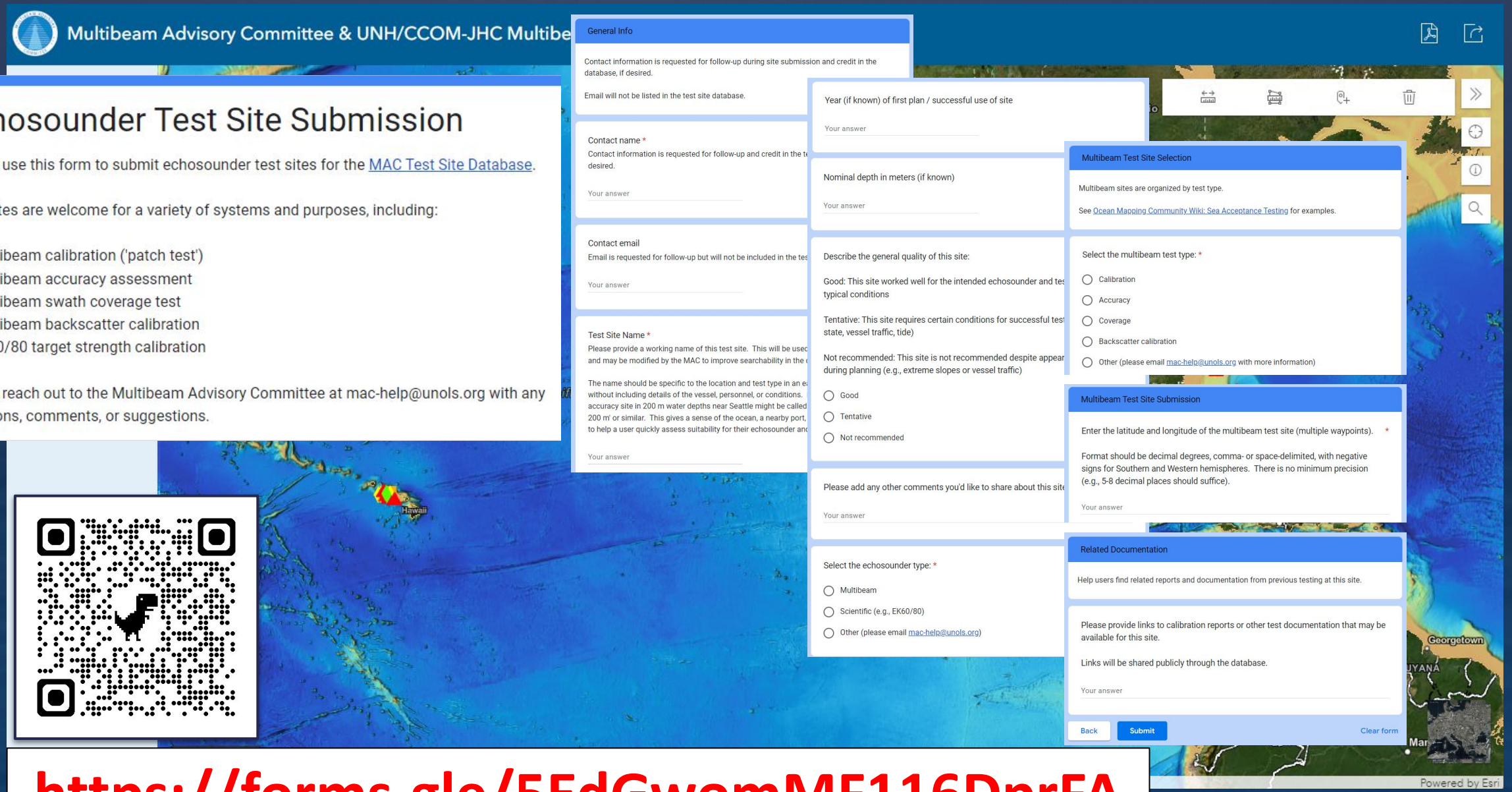
1. Writing on GitHub
2. Using wikis
3. Markdown cheatsheet
4. Using GitHub Issues for troubleshooting

Test Site Database – Work in Progress



https://gis.ccom.unh.edu

Test Site Database – Submission Form (EM, EK, Etc.)



https://forms.gle/5EdGwomMF116DprFA

Sound Speed Manager

A **ready-to-go** and **free**
solution to ease
the **management of**
sound speed profiles
for ocean mapping

POCs: Giuseppe (gmasetti@ccom.unh.edu),
Barry (barry.gallagher@noaa.gov),
Chen (chen.zhang@noaa.gov)

Available in

&

https://www.hydroffice.org/soundspeed/

https://svn.pydro.noaa.gov/Docs/html/Pydro/downloads.html

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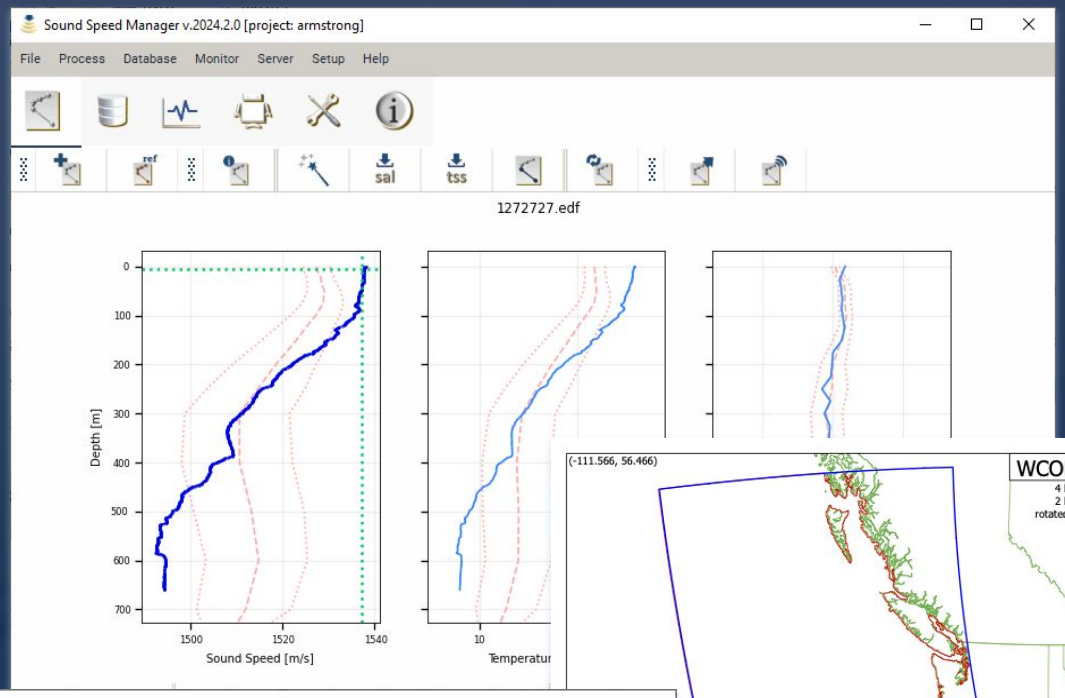
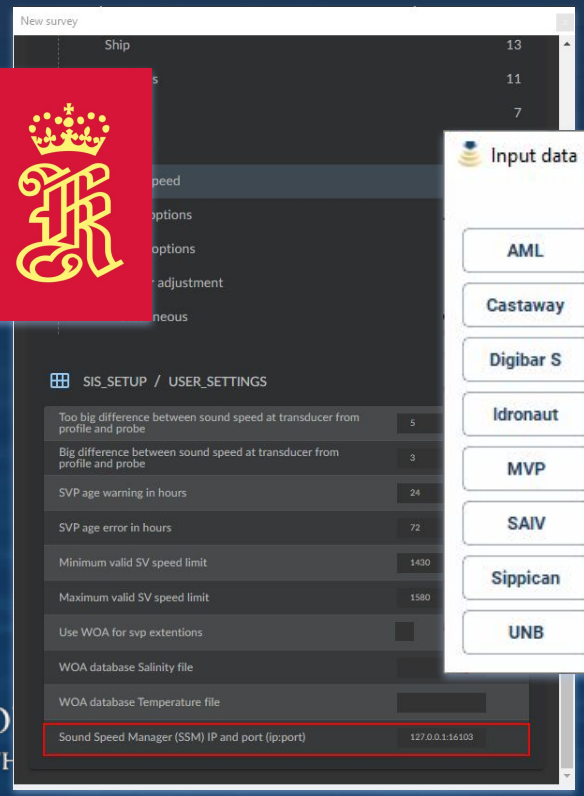
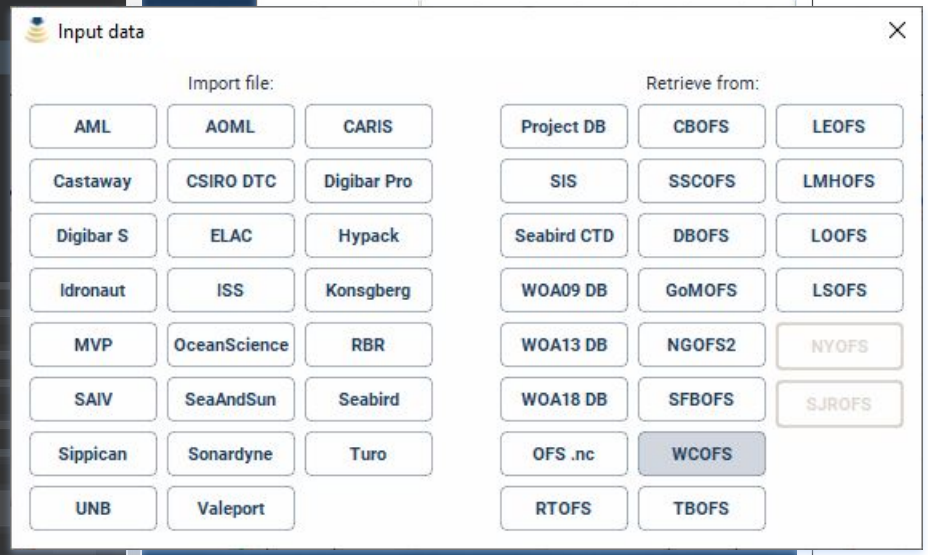
Ref.: Masetti, G. et al., *Sound Speed Manager: An open-source application to manage sound speed profiles*, International Hydrographic Review, vol. 17, pp. 31-40, 2017.

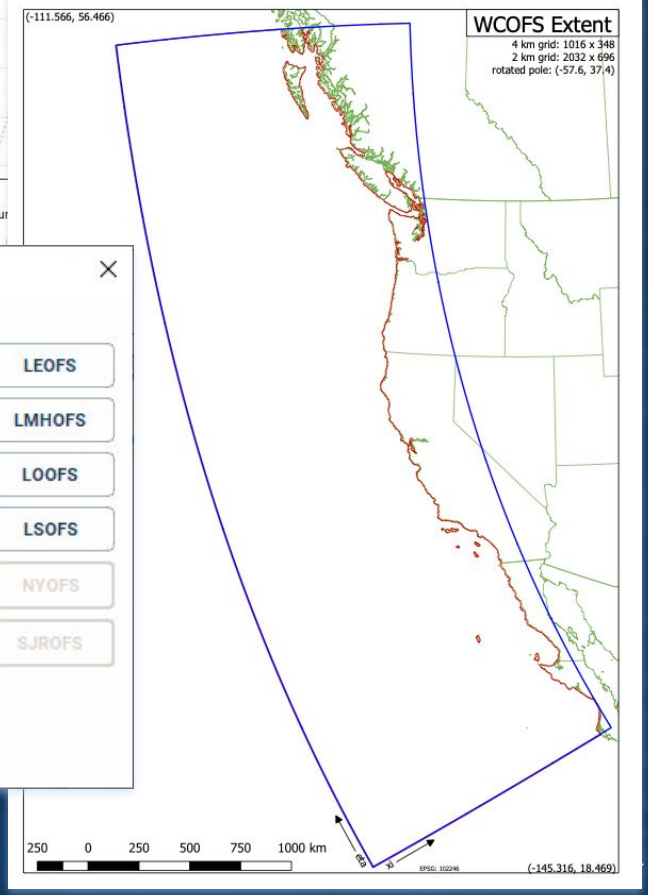
SSM Updates for v2024.2.0

- Improved integration with **Kongsberg SIS** and **Hypack**
  - Dedicated ***#SSM* datagram** from SIS 5.14+
- Enhanced **Server Mode**
- Extended/improved **supported formats**
  - Sea & Sun
  - Valeport (miniSVP, RapidSV, RapidSVT, SWiFT CTD)
  - Sippican (XBT T-6)
  - CSIRO
  - PDS2000
- Extended **OFS support**
  - LEOFS
  - LMHOFS
  - LSOFS
  - NGSOFS2
  - SSCOFS
  - WCOFS





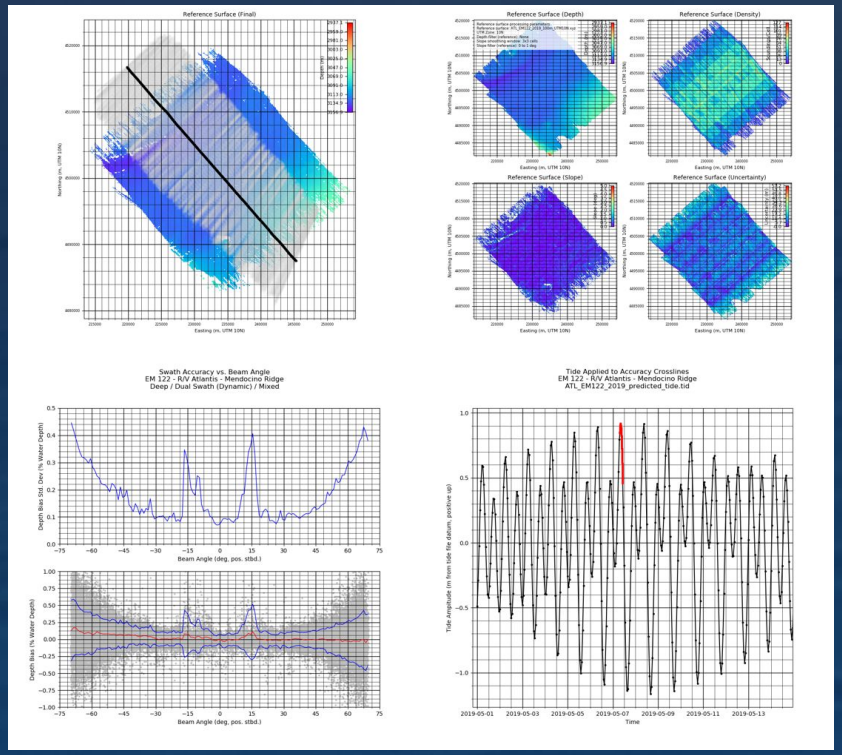


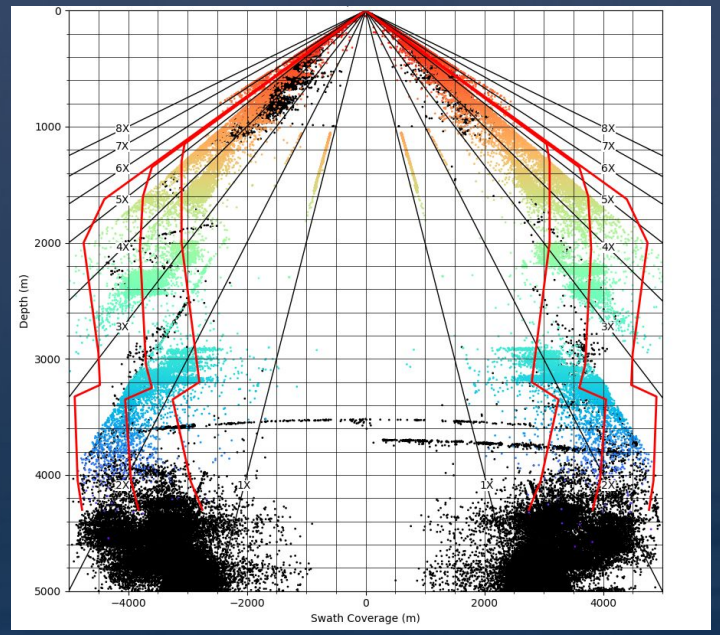


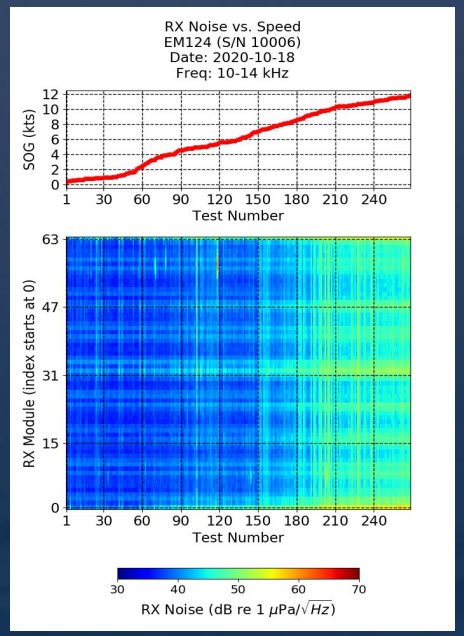
Assessment Tools

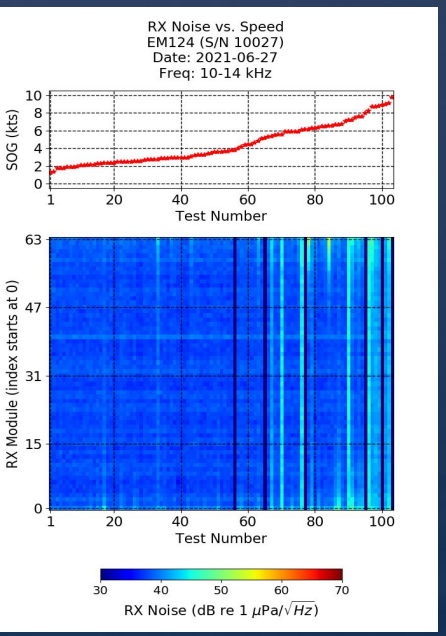
github.com/oceanmapping/community/wiki/Assessment-Tools

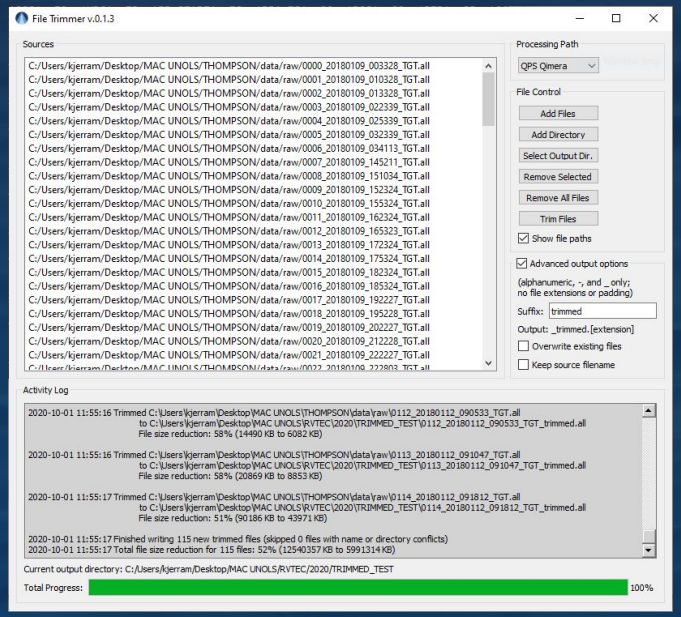
1. File Trimmer
2. BIST Plotter
3. Swath Coverage Plotter
4. Swath Accuracy Plotter
5. ECDIS Converter

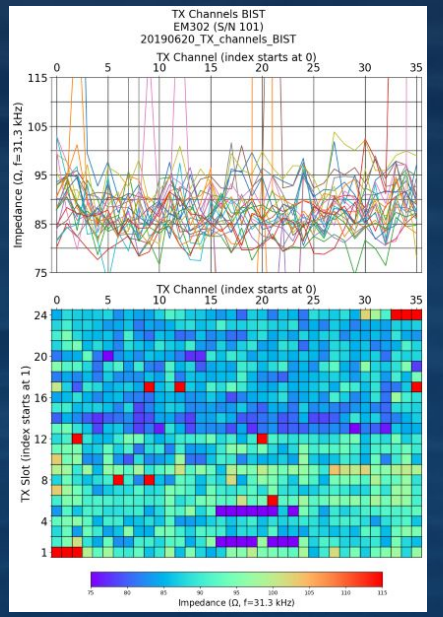


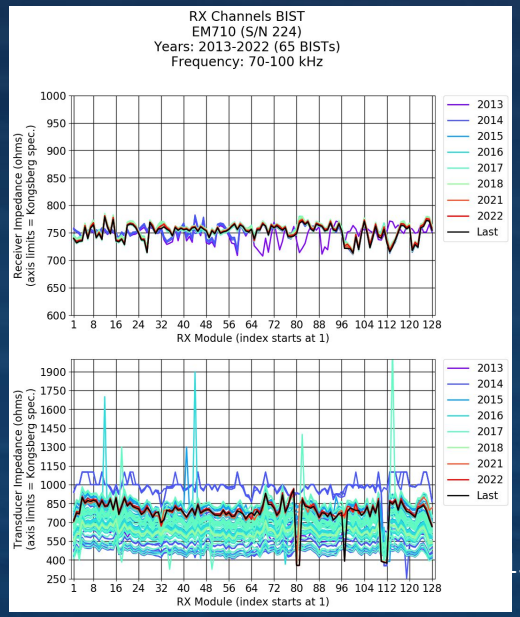












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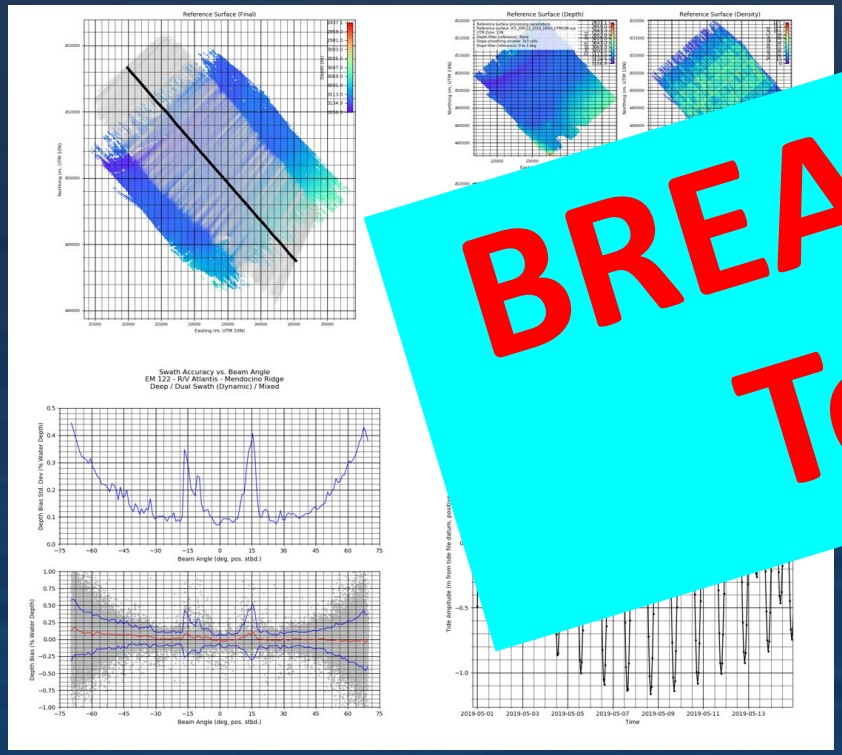
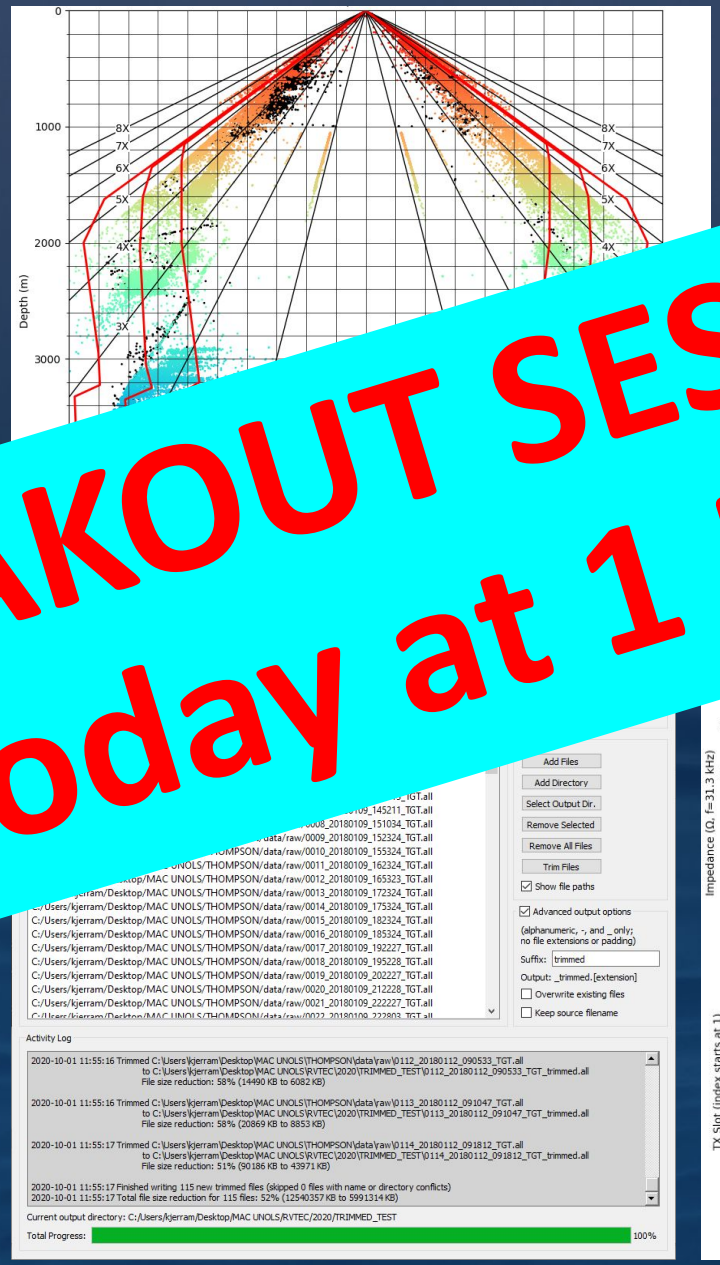
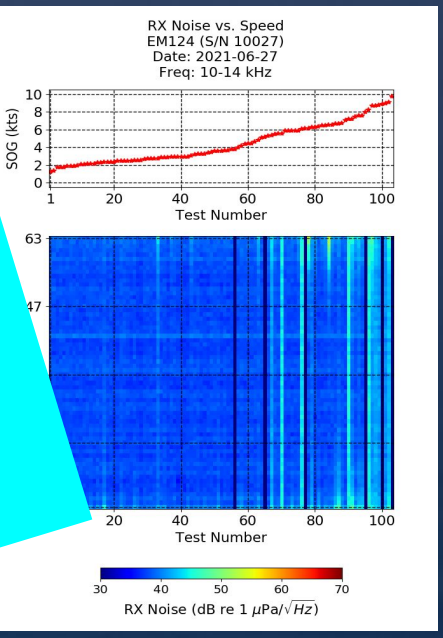
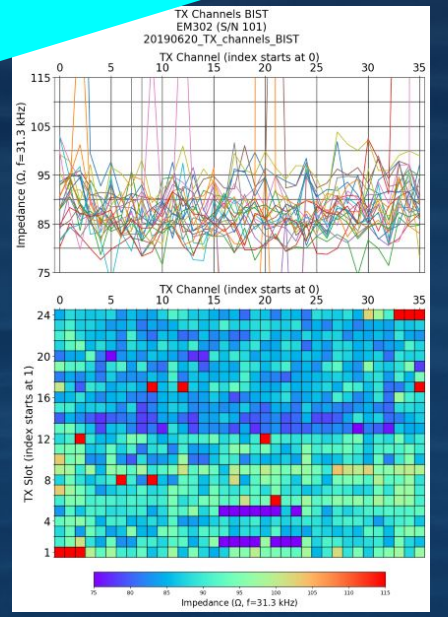
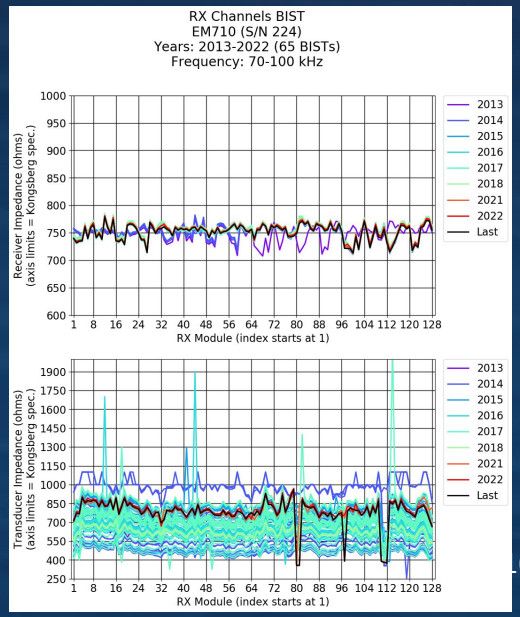










BREAKOUT SESSION
Today at 1 PM

Lamont-Doherty Earth Observatory
COLUMBIA UNIVERSITY | EARTH INSTITUTE

EM122 / EM302 Spares from USNS *Pathfinder*

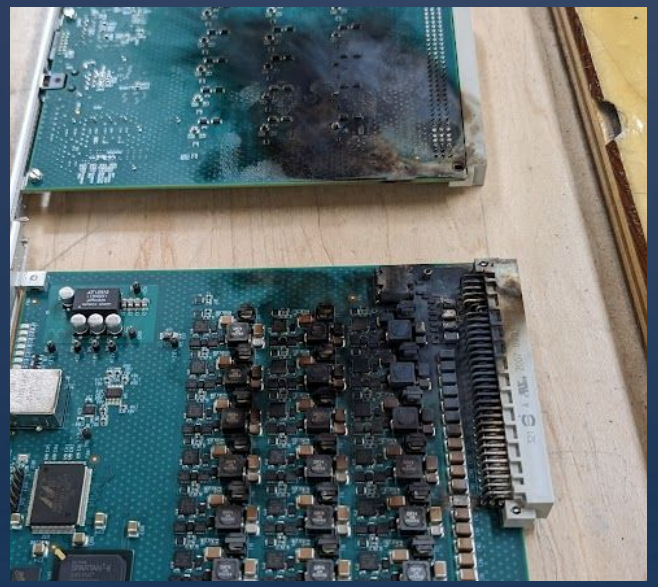
Thanks to Rob Sparrock for recognizing UNOLS needs and navigating ONR transfers

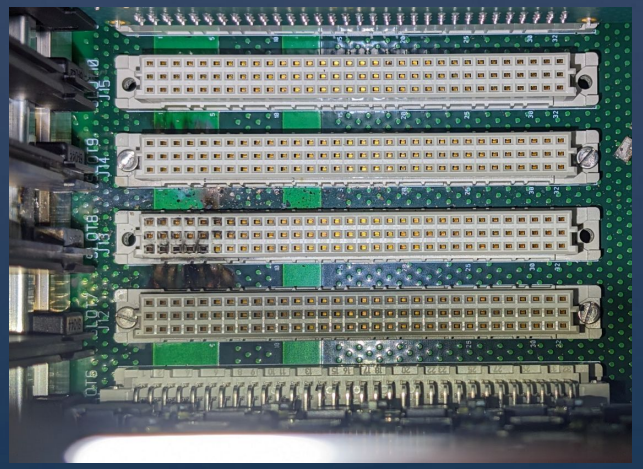
July shipment to WHOI (now at LDEO) augments R/V *Armstrong* spares at UH

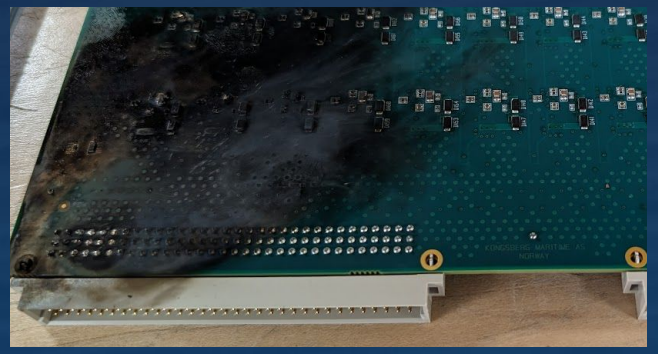
Warning: Kongsberg 122/302/710 RX cards are becoming extremely scarce

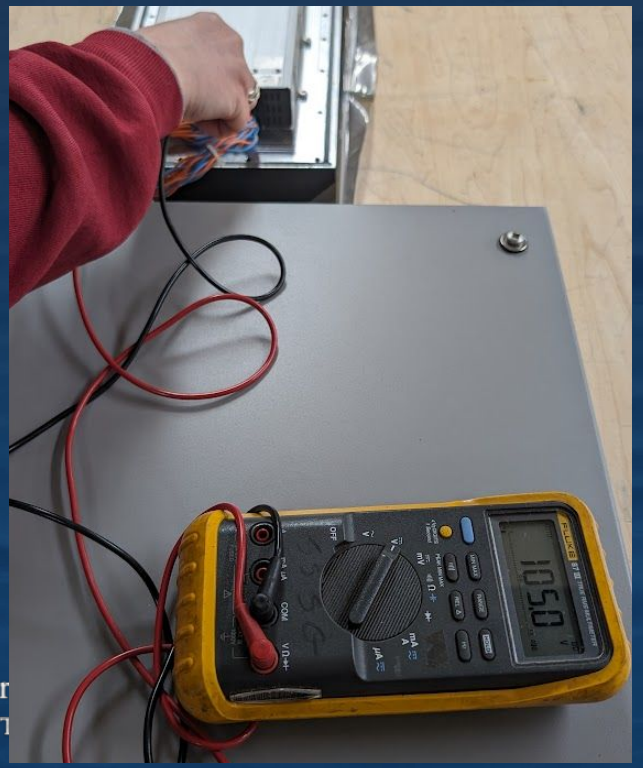
						ONR SPARES INVENTORY AT LDEO (DOES NOT INCLUDE ARMSTRONG SPARES AT UH)			REQUESTS THAT MAY BE IN SPARES INVENTORY (COPIED FROM 2023 - UPDATE AS NEEDED)			Notes
List Num	Part Number	Description (packing list)	Description (Kongsberg)	Subsystem	Qty (list)	Langseth 2007-10 J. Gaytan	Healy 2010 STARC	Kilo Moana 2012 M. Cremer	Palmer 2014-15 S. Walker	Sikuliaq 2014 E. Roth	Thompson 2018 B. Murphy	EM122 Manual Page Num. (Kongsberg #)
6	303694	Fan unit for TX and HV subrack	Fan unit for TX and HV subrack	High Voltage Unit	1							
7	306318	CAP PCB	Capacitor module, CAP PCB	High Voltage Unit	9							
8	306397	HVP RIO	HVP RIO 306397	High Voltage Unit	4				X, 1			92
9	306397	HV Interface	Interface card HV w/ bleeder, heater, remote on/off	High Voltage Unit	3							
10	307677	TX36LC	PCB TX 36	TX Unit	30	X, at least 2			X, 1-2			79
11	308085	Dual Preamplifier	PCB Dual Preamplifier EM 122	Preamplifier Cabinet	2							
12	308301	RX RIO	Interface card RX RIO	RX Unit	5				X, 1			73 (not sure this is correct item)
13	308879	CPU KONTRON	CPU Board Kontron KIT	RX Unit	4							
14	309057	RX32	PCB RX 32	RX Unit	2	X, need qty			X, 1-2			67
15	309082	Fan unit RX32	FAN Unit RX 32 Section	RX Unit	6							
16	309083	CPU Fan	FAN Unit CPU Section	RX Unit	2							
17	310231	BSP67B	PCB BSP67B	RX Unit	4			X, 1-2 (710 critical)	X, 1-2			60
18	316694	BSP RIO	Interface card RIO BSP	RX Unit	4				X, 1-2			75
19	338124 (not found in manual)	BSP67 CPCI	***PART NUMBER NOT FOUND***	RX Unit	7							
20	338124 (not found in manual)	Compact Switch	***PART NUMBER NOT FOUND***	RX Unit	4							
21	340384	CPU Concurrent	***PART NUMBER NOT FOUND***		1				X, 1 (not sure this is it)			55, 57? Two types...
22	290-213103	12V Power Supply Complete	12V Power Supply Complete	Preamplifier Cabinet	5							
23	303424C	TX RIO	Interface Card TX RIO ***only 303424 PN found***	TX Unit	12							
24	308301A	RX RIO	Interface Card RX RIO ***only 308301 PN found***	RX Unit	4				X, 1 (not sure this is it)			73
25	316694B	RIO	Interface Card RIO BSP ***only 316694 PN found***	RX Unit	1							
26	334138C	RIO Concurrent	***PART NUMBER NOT FOUND***		1							
27	382-098939	PSU-6V	Power Supply PSU-6V	Power Supplies	8	X, need qty			X, 1			66
28	382-099656	PSU-CPCI	Power Supply cPCI	Power Supplies	6				X, 1			53
29	382-22334E	BSP67B	***PART NUMBER NOT FOUND***	RX Unit	1							
30	719-098652	Serial PCB	***PART NUMBER NOT FOUND***		1							
31	719-098950	Ethernet Switch	Megabit Ethernet Switch	RX Unit	7					X (for 710?)		62, 64 Two types...
32	CABLES	None	NA		1							
33	NA	Power Switch	NA		1							
34	NA	Logger Interface	NA		1							

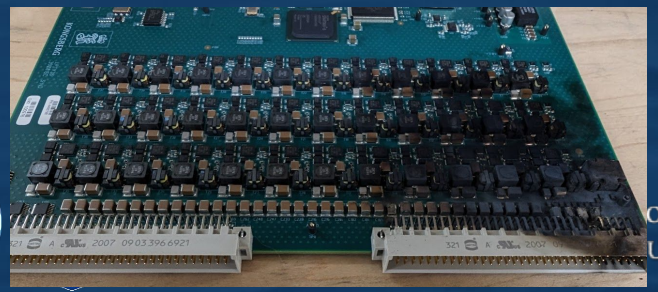
EM124 TXU Failure: Takeaways + Thanks



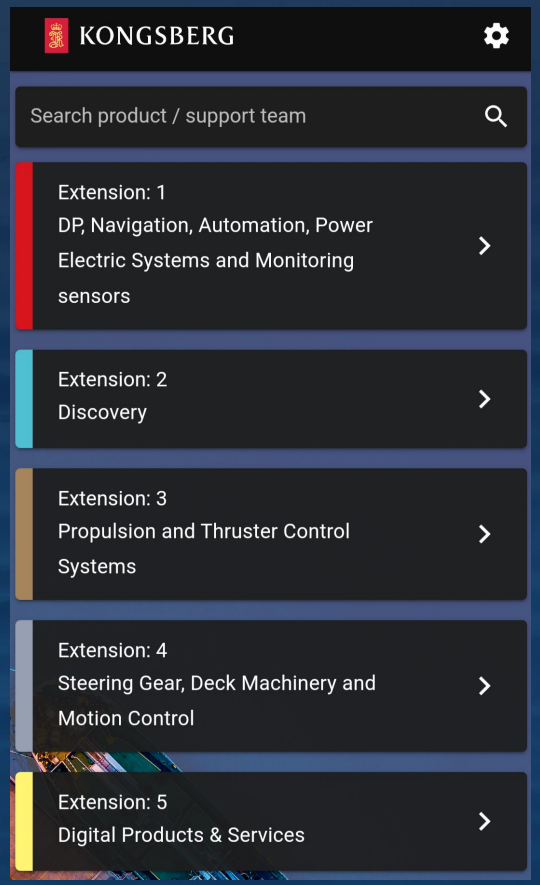


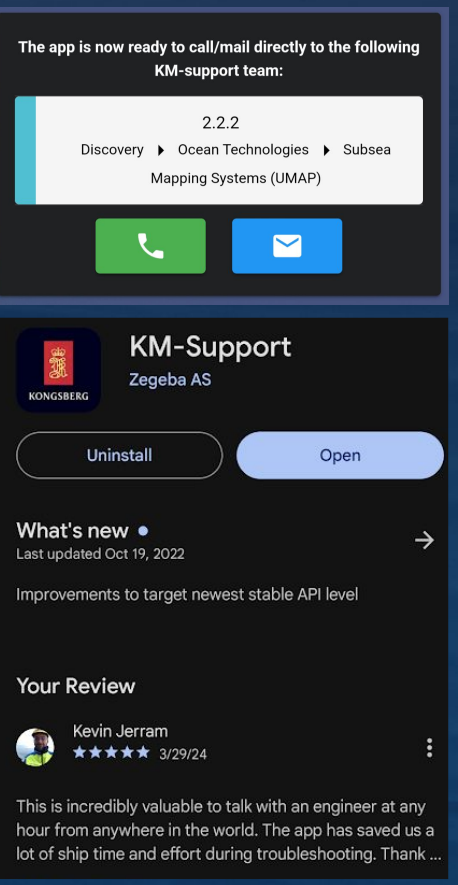






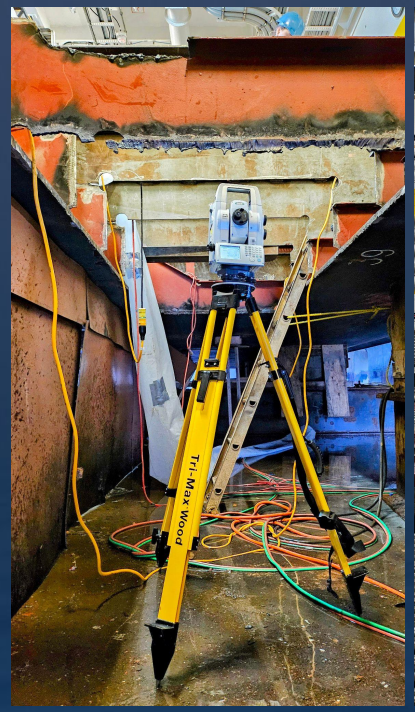
1. Investigate all BIST failures
2. Check HV reduction (EM 304, 124)
3. Kongsberg Support app ★★★★★





Armstrong EM124/712: Shipyard Visits

R/V Neil Armstrong	X	Y	Z	ROLL	PITCH	HEADING	NOTES
Sign Convention	Positive forward	Positive to starboard	Positive down	Positive with starboard side down	Positive with forward side up	Positive with forward side to starboard	
Units	meters	meters	meters	degrees	degrees	degrees	
Granite Block	0.000	0.000	0.000	n/a	n/a	n/a	
POS/MV IMU	-5.964	0.008	-0.071	-0.0565	0.0046	-0.3824	
MGC	-3.186	-0.002	0.002	0.0418	0.0194	0.0354	
TX 124	-1.467	-0.550	1.112	0.0064	0.0005	0.0069	
RX 124	-5.873	0.005	1.105	-0.0003	-0.0281	0.1171	
TX 712	-3.188	0.286	1.107	0.0182	-0.0024	-0.0183	
RX 712	-4.604	0.626	1.107	0.0031	0.0062	0.1762	
SBP	-1.407	-2.085	1.101	0.1019	0.1414	-0.0004	
ADCP 38 kHz	3.395	-1.217	1.110	0.2298	0.0051	n/a	
ADCP 150 kHz	3.037	-2.435	1.105	-0.0376	0.2280	n/a	
ADCP 300 kHz	2.730	0.611	1.108	-0.2668	0.1878	n/a	
EK80 18 kHz	-4.887	2.432	1.107	0.0491	-0.1373	4.2362	
EK80 38 kHz	-1.847	2.452	1.111	-0.4646	0.2902	1.2306	
EK80 70 kHz	-3.365	2.511	1.107	0.0107	-0.1344	0.7829	
EK80 120 kHz	-2.755	2.894	1.107	-0.0842	0.0474	-0.1197	
EK80 200 kHz	-2.755	2.208	1.109	-0.3820	0.2998	-0.5444	
Micromodem Center	-7.324	2.433	1.107	n/a	n/a	n/a	
Micromodem Fwd	-7.199	2.413	1.141	n/a	n/a	n/a	
Micromodem Aft	-7.449	2.453	1.145	n/a	n/a	n/a	
Micromodem Stbd	-7.305	2.558	1.126	n/a	n/a	n/a	
Micromodem Port	-7.344	2.308	1.094	n/a	n/a	n/a	
USBL	-7.322	0.608	1.362	0.1884	0.0254	0.4575	
Speedlog	3.937	0.616	1.110	0.0323	0.2214	n/a	



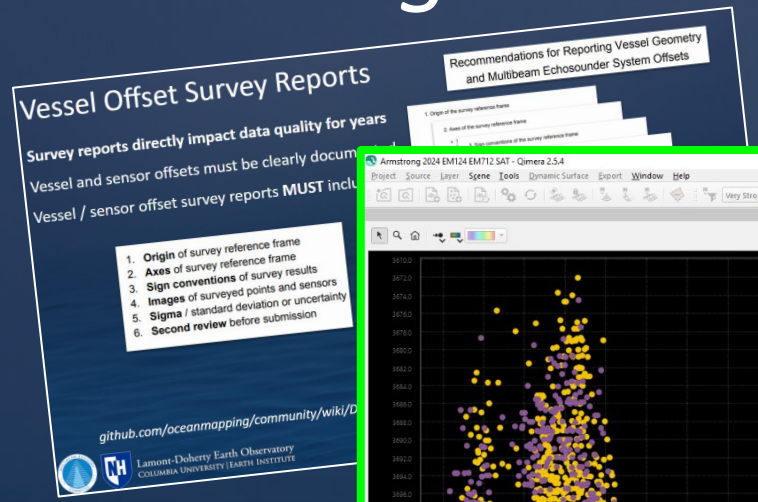
Short window to find surveyor; two MAC visits to support surveys

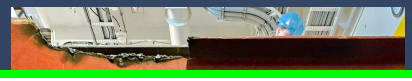
WHOI, Anand, others guided survey company to follow Kongsberg spec and MAC report recommendations

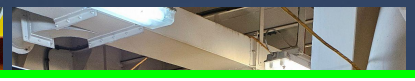
SAT results suggest excellent survey; new contractor to consider for future surveys

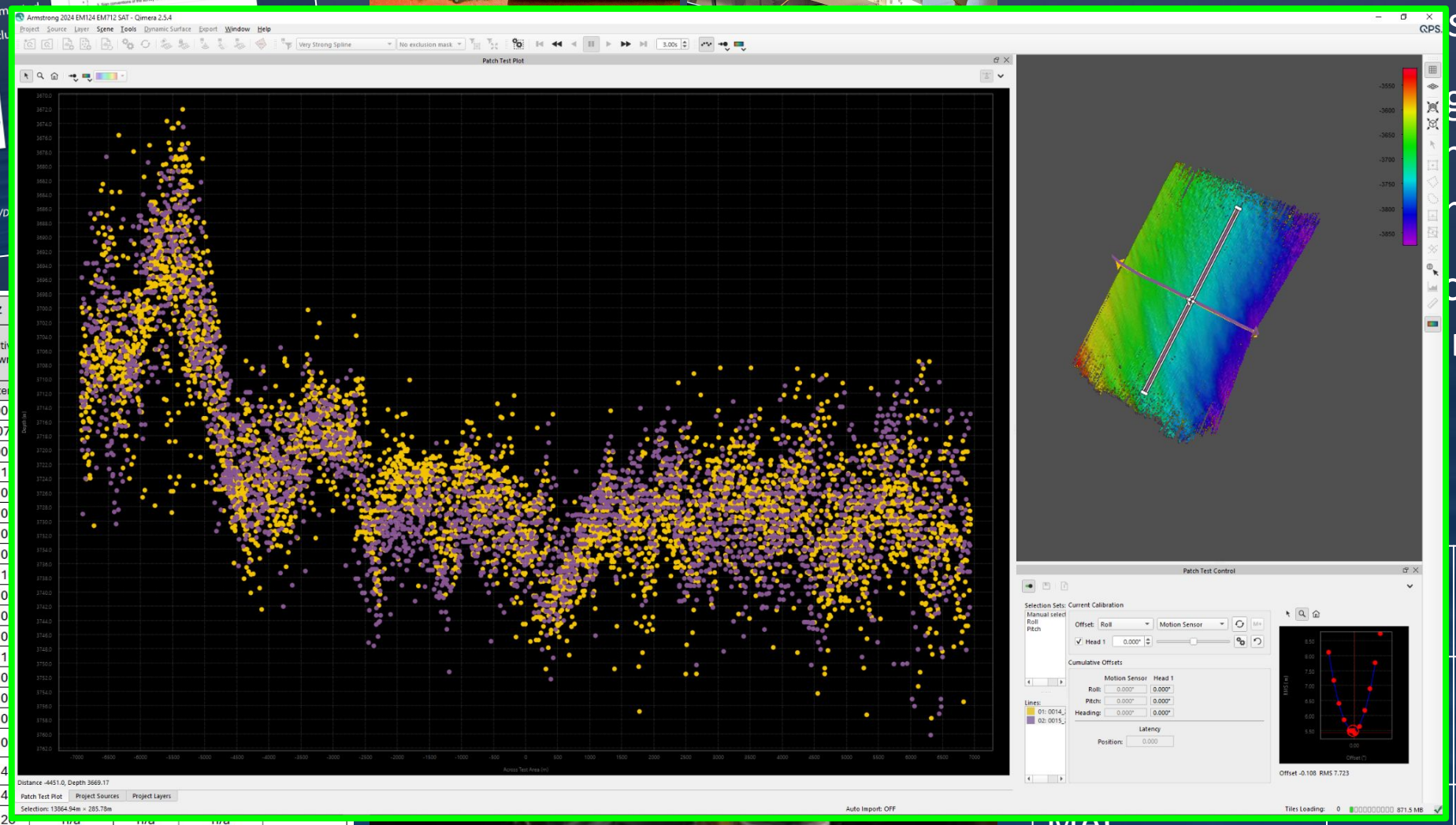
MGC Offsets	**Roll**	**Pitch**	**Hdg.**
Contractor (Laser Tracker)	-0.057	0.005	-0.382
MAC (Total Station)	-0.065	-0.020	-0.313

Armstrong EM124/712: Shipyard Visits









Short window to find surveyor; two surveys

guided survey

ngsberg spec

mmendations

cellent

r to consider

R/V Neil Armstrong	X	Y	Z
Sign Convention	Positive forward	Positive to starboard	Positi down
Units	meters	meters	mete
Granite Block	0.000	0.000	0.00
POS/MV IMU	-5.964	0.008	-0.07
MGC	-3.186	-0.002	0.00
TX 124	-1.467	-0.550	1.11
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TX 712	-3.188	0.286	1.10
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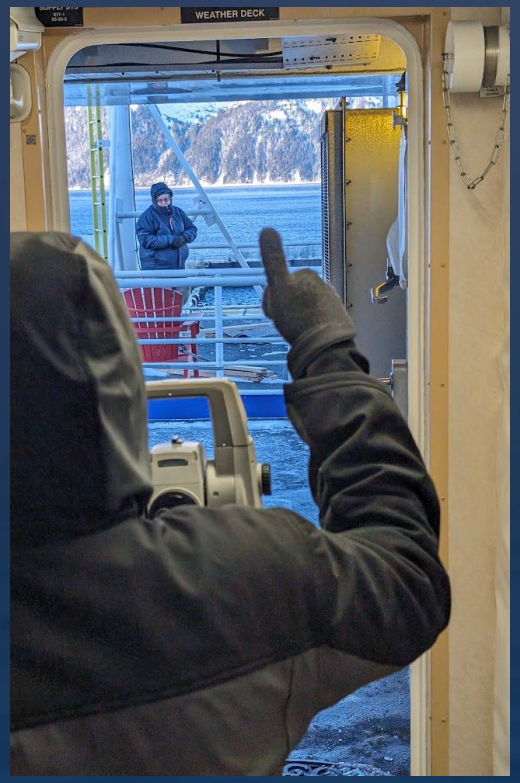
USBL	-7.322	0.608	1.362
Speedlog	3.937	0.616	1.110

		Pitch	Hdg.
		0.005	-0.382
MAC (Total Station)	-0.065	-0.020	-0.313

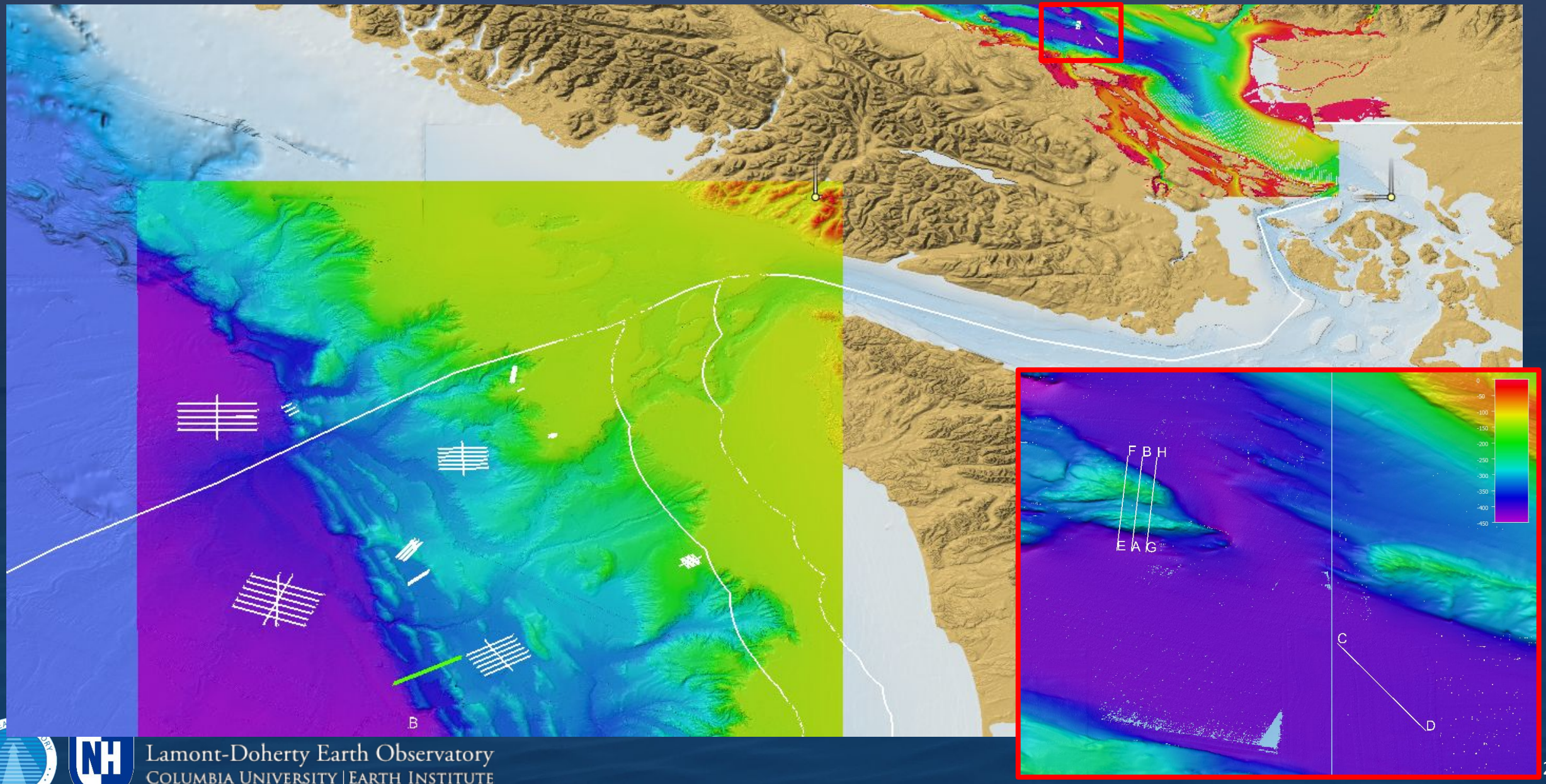
Sikuliaq EM304 MKII: Shipyard Visit



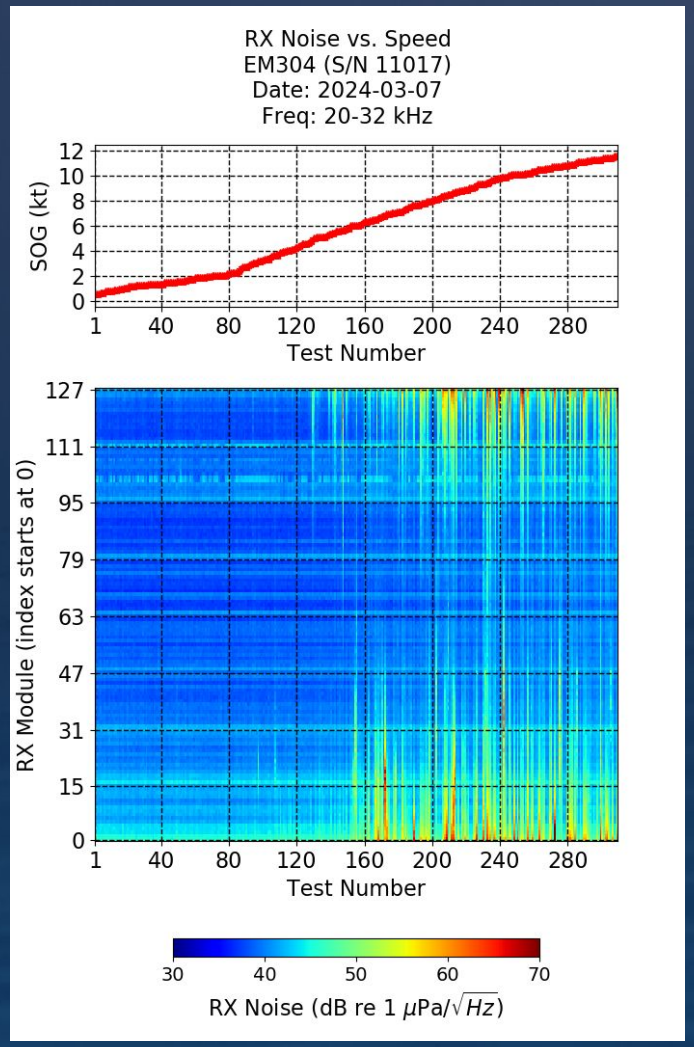
- Independent verification survey of MGCs and laser scanning
- Discussions with the survey team to confirm best practices
- Experiments to improve methods, especially in low temps
- 3D point cloud

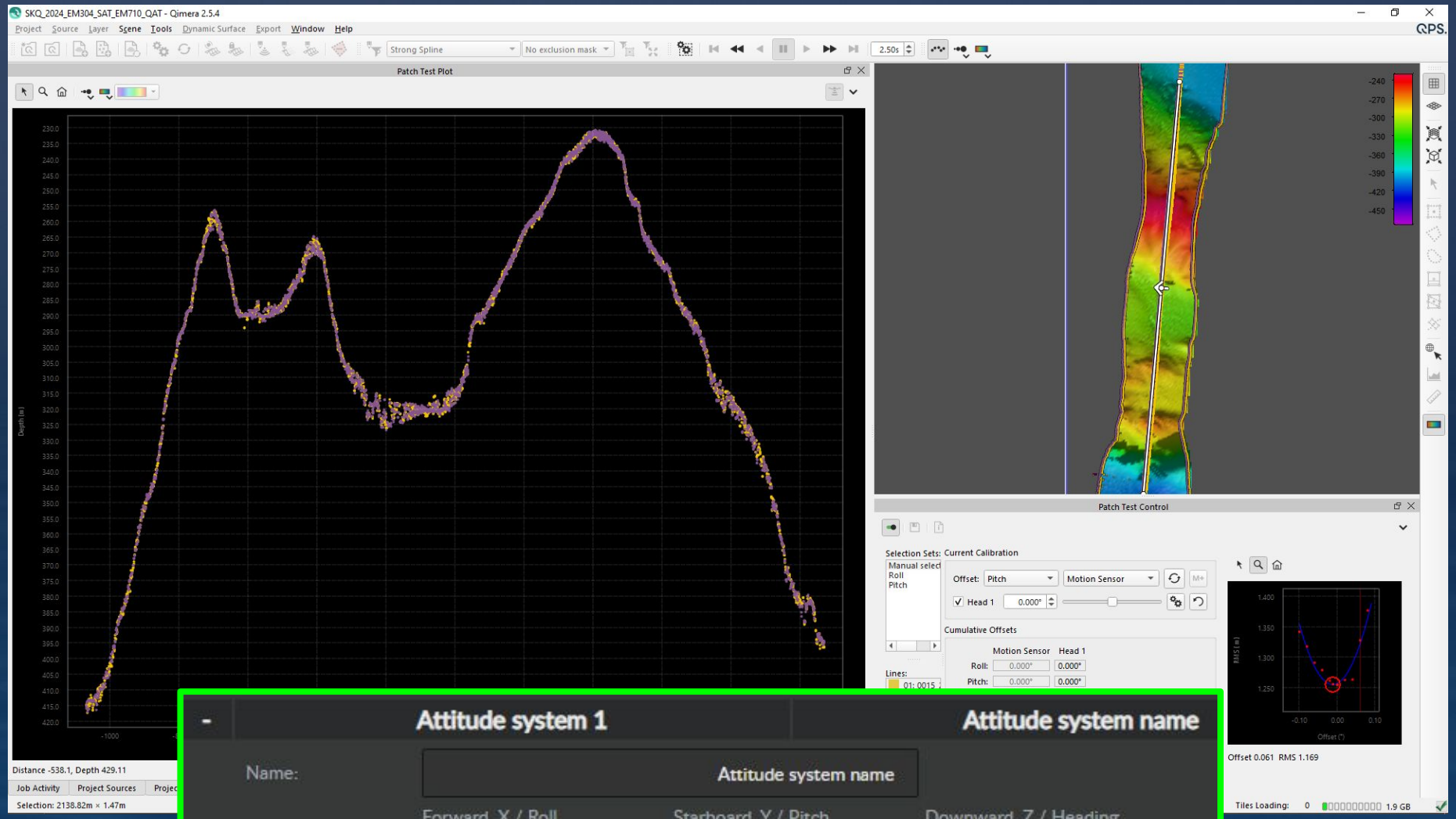
MGC Offsets (Total Station)	**Roll**	**Pitch**
Contractor	0.050	0.730
MAC	-0.022	0.789

Sikuliaq EM304 MKII: Sea Acceptance Testing

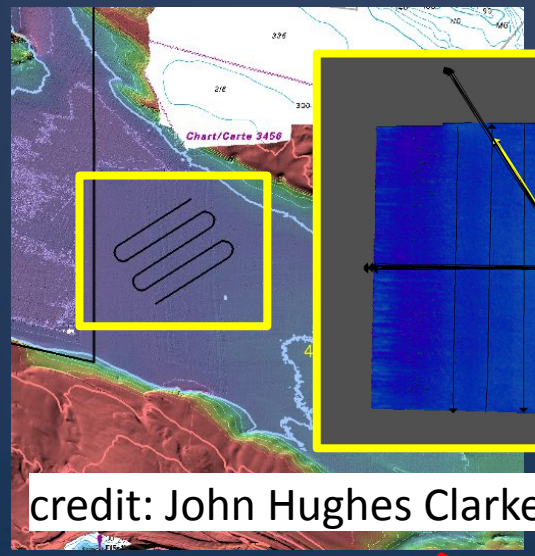


Sikuliaq EM304 MKII: Sea Acceptance Testing

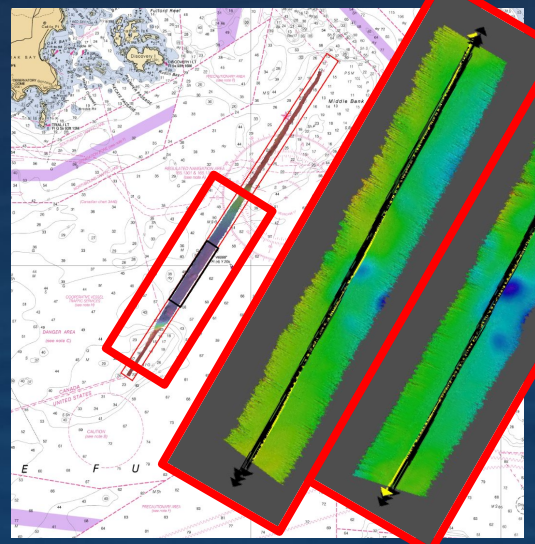


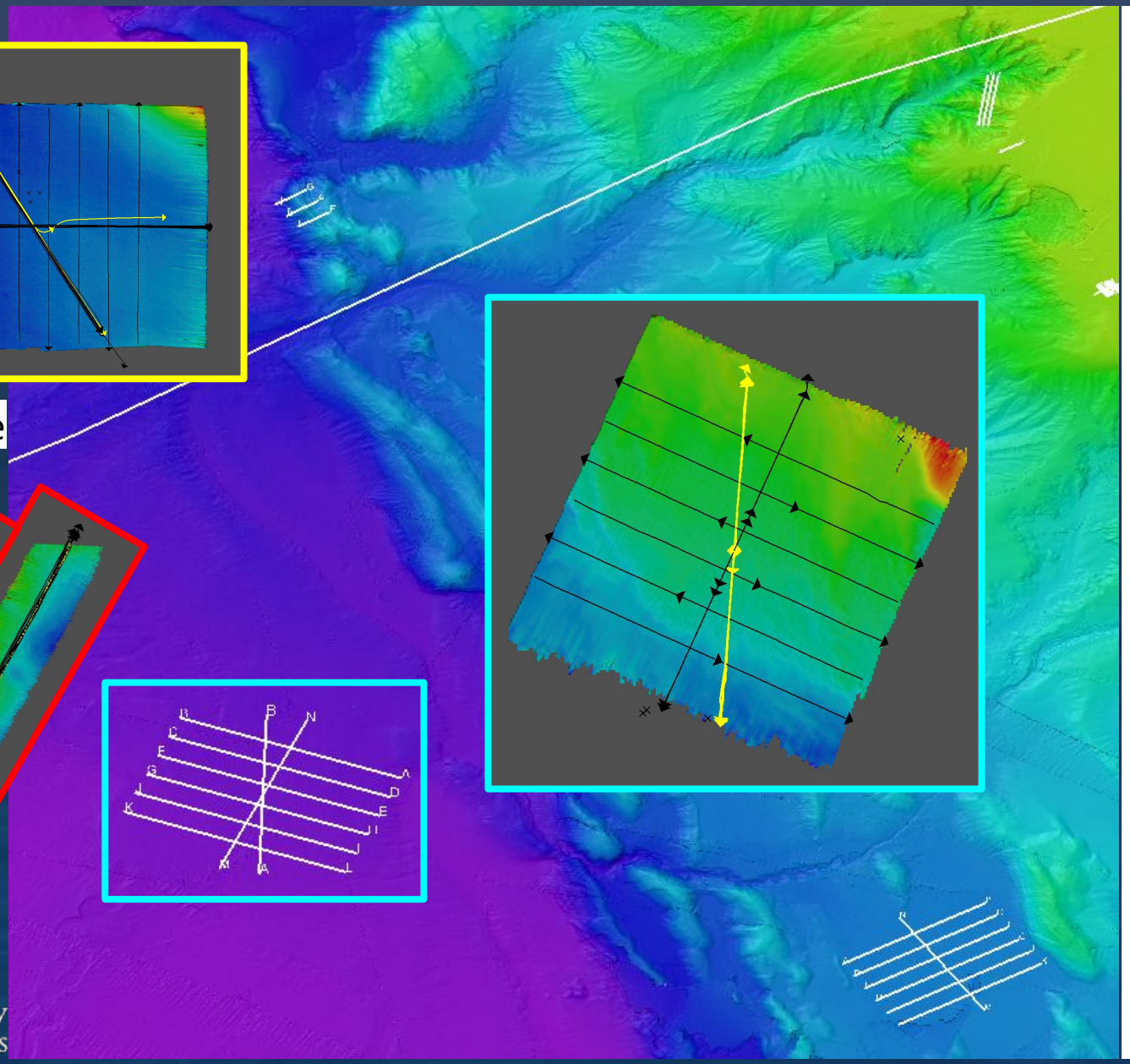


Sikuliaq Backscatter Calibration: 100, 400, 2400 m Sites



credit: John Hughes Clarke

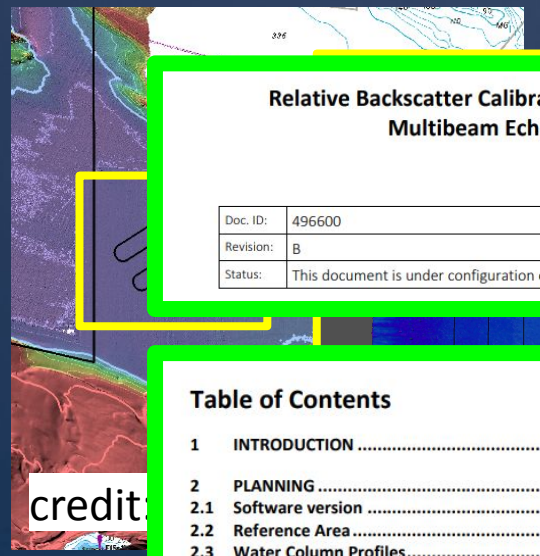


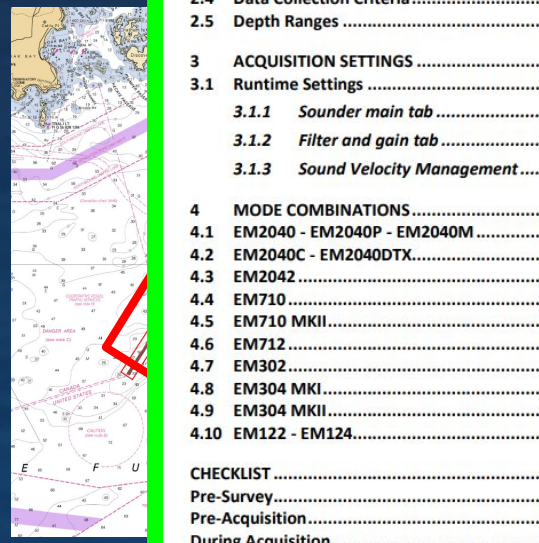


- EM304 Backscatter Calibration (400 m Georgia Basin)
  - Shallow
  - Medium
  - Deep
  - Shallow (again)
  - Deeper
  - Very Deep
- EM304 Backscatter Calibration (400 m) - Round 2
  - Medium - Extended JHC Line
  - Deep - Extended JHC Line
  - Shallow - Extended JHC Line
  - Medium - Extended JHC Line (again)
  - Deeper - Extended JHC Line
- EM710 Backscatter Calibration (400 m)
  - Extra Deep - Extended JHC Line
  - Extra Deep - East-West Line
  - Very Deep - East-West Line
  - Deep - East-West Line
  - Medium - East-West Line
  - Shallow - East-West Line
  - Very Shallow - East-West Line
- EM710 Backscatter Calibration (100 m)
  - Very Shallow
  - Shallow
  - Medium
  - Deep
  - Very Deep
- EM304 Backscatter Calibration (2400 m)
  - Deeper
  - Very Deep
  - Extra Deep
  - Deep

Lamont-Doherty
COLUMBIA UNIVERS

Sikuliaq Backscatter Calibration: 100, 400, 2400 m Sites





Relative Backscatter Calibration Procedure for EM Multibeam Echo Sounders

Doc. ID:	496600
Revision:	B
Status:	This document is under configuration control at Kongsberg Discovery.

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CHECKLIST

Pre-Survey

- ☐ Finalize the table of mode combinations to be collected (with assistance from Customer Support).
- ☐ Verify the software has been updated.

Pre-Acquisition

- ☐ Collect and apply CTD profile.
  - *Set the Absorption coefficient source*: CTD profile
- ☐ Set the acquisition settings:
  - *Angular coverage mode*: Manual at 65/65 unless otherwise specified
  - *Beam spacing*: High density Equidistant
  - *Coverage sector: Normal (EM204X family only,* single sector is not supported)
  - *Dual swath mode*: Off, fixed or dynamic
  - *Yaw stabilization*: Off
  - *Pitch stabilization*: On
  - *Tx Alongtrack*: 0
  - *Depth mode*: one pair of lines collected in each mode combination
  - *Frequency* mode: each mode combination
  - *Beam intensity*: Use Lamberts law
  - *Sector tracking*: **Off** (older systems, important!!)
  - *Penetration filter*: off
  - *Spike filter*: medium
  - *Range gate*: normal
  - *Phase ramp*: normal
- ☐ Start collecting data and verify the following:
  - The survey area is flat with homogenous terrain across track.
  - There is a constant seabed strength (low backscatter variation along and across track).
  - Coverage is consistent across and along track.
  - Seabed image in SIS is constant (sector stripes are acceptable, this is to be corrected).

During Acquisition

- ☐ Collect two overlapping lines for each mode combination. **Do not log turns!**
- ☐ If there is any doubt about the quality of the data, contact Customer Support and/or send data files or images to support your questions.

Post Acquisition

- ☐ Send data files and supporting documents, screenshots, reports and BIST to Customer Support.
  - support.umap@kd.kongsberg.com

EM304 Backscatter Calibration (400 m Georgia Basin)
- Shallow
- Medium
- Deep
- Shallow (again)
- Deeper
- Very Deep

M304 Backscatter Calibration (400 m) - Round 2
- Medium - Extended JHC Line
- Deep - Extended JHC Line
- Shallow - Extended JHC Line
- Medium - Extended JHC Line (again)
- Deeper - Extended JHC Line

M710 Backscatter Calibration (400 m)
- Extra Deep - Extended JHC Line
- Extra Deep - East-West Line
- Very Deep - East-West Line
- Deep - East-West Line
- Medium - East-West Line
- Shallow - East-West Line
- Very Shallow - East-West Line

M710 Backscatter Calibration (100 m)
- Very Shallow
- Shallow
- Medium
- Deep
- Very Deep

M304 Backscatter Calibration (2400 m)
- Deeper
- Very Deep
- Extra Deep
- Deep

Friday: Mini-MAC Visit + SIS 5.14 Workshop

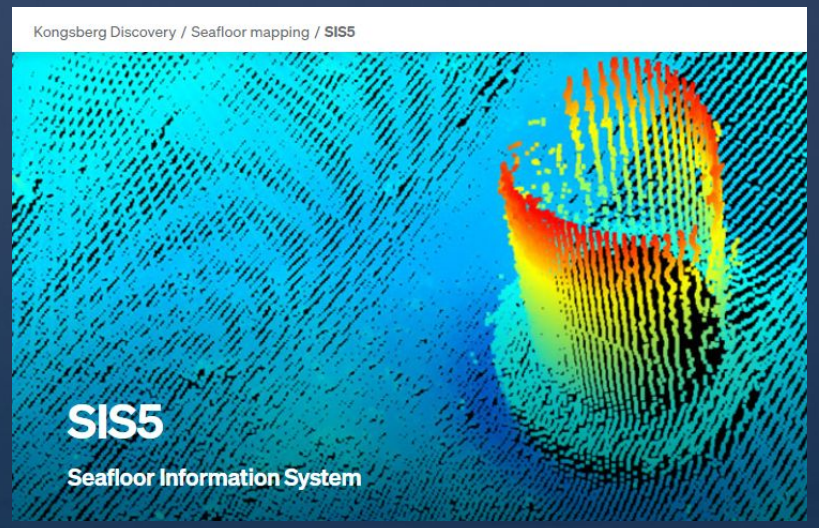
2024 RVTEC Training

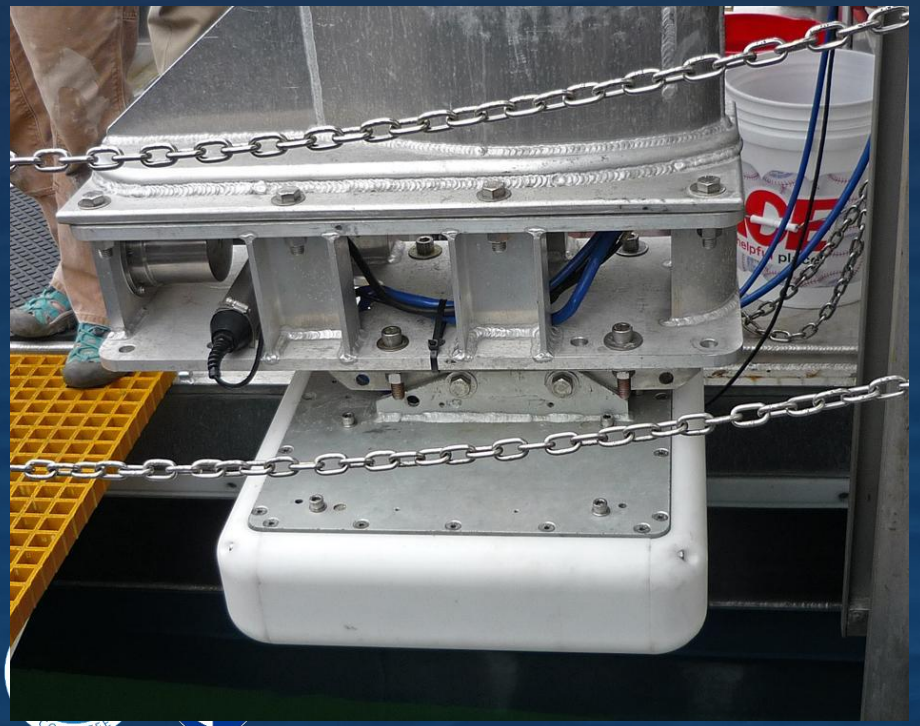
Multibeam Advisory Committee

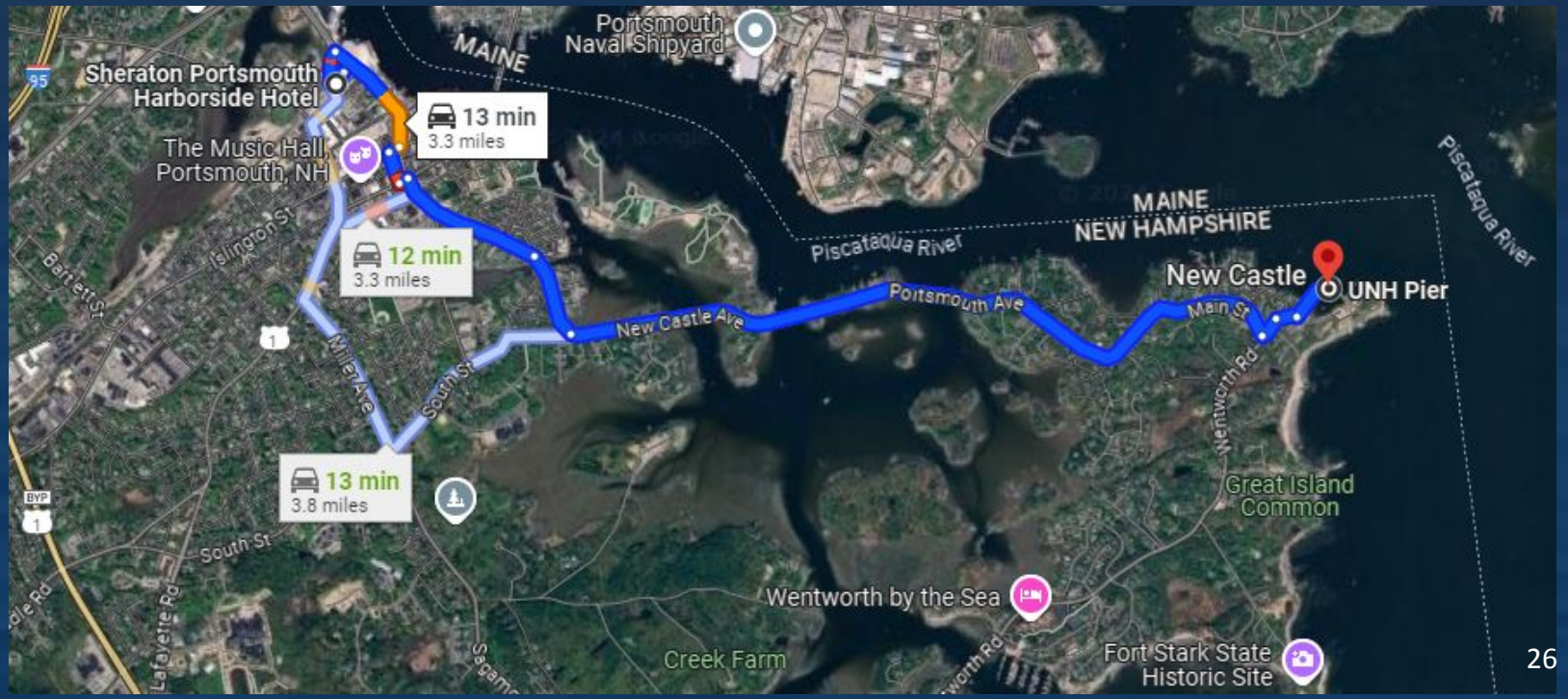
R/V *Gulf Surveyor* EM2040 QAT Checklist

Adapted from standard Multibeam Advisory Committee SAT / QAT checklist

Approx. Schedule	Group 1	Group 2	Group 3	Group 4
8:00-8:30	Arrival			
8:30-10:15	R/V Gulf Surveyor	Free time	SIS Workshop Pier Facility Conf. Room	
10:15-12:00	Free time	R/V Gulf Surveyor		
12:00-1:00	Lunch			
1:00-2:45	SIS Workshop Pier Facility Conf. Room		R/V Gulf Surveyor	Free time
2:45-4:30			Free time	R/V Gulf Surveyor







Questions? Answers? Reach out!

Ocean Mapping Community Wiki

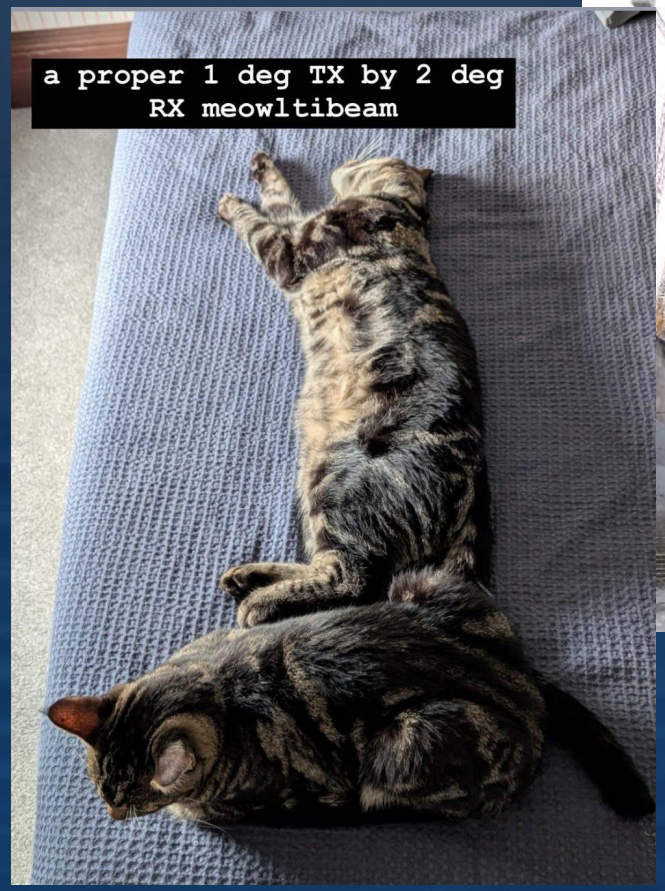
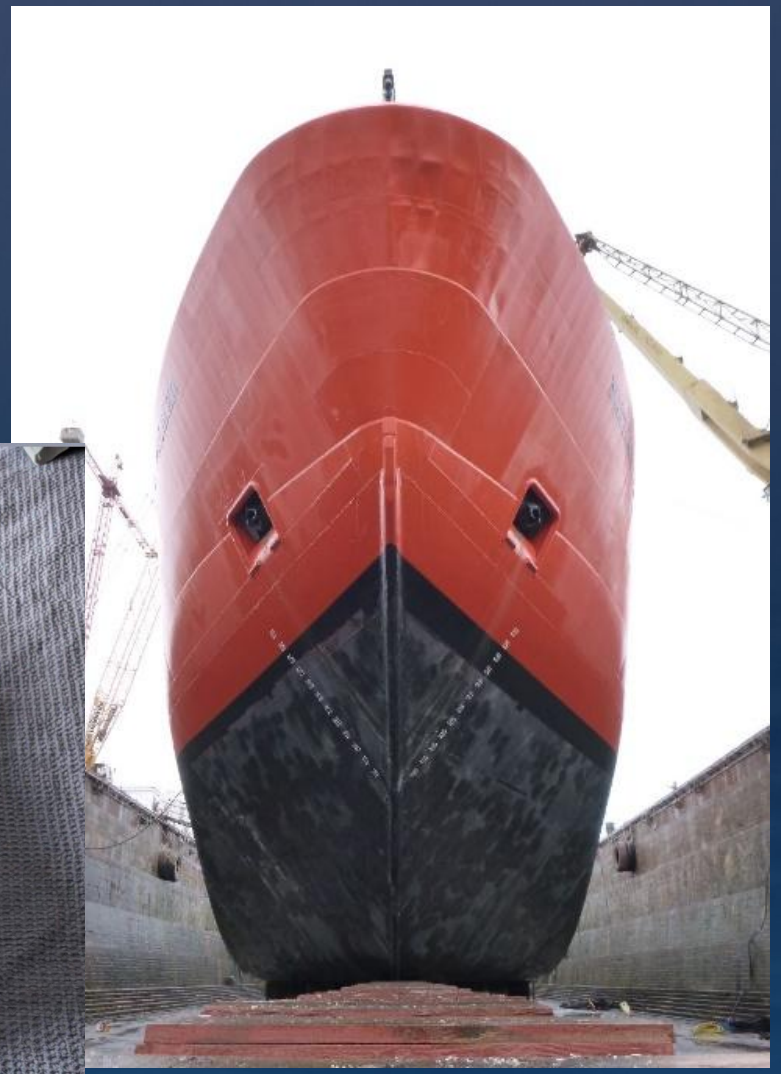
github.com/oceanmapping/community

omcadmin@ccom.unh.edu

Multibeam Advisory Committee

mac.unols.org

mac-help@unols.org



Kate von Krusenstiern