

Multibeam Advisory Committee (MAC) 2020 UNOLS Update

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The Multibeam Advisory Committee (MAC)

- Established 2011 with funding from NSF to ensure the consistent collection of high-quality multibeam data across the U.S. Academic Research Fleet
 - *Standardize the protocols & tools for system assessment*
 - *Document, report, & publish MBES system performance results*
 - *Provide on-board & remote support to ships*
 - *Share best practices & knowledge*
- Technical Reports
 - SAT, QAT, ANT
 - Document each MAC engagement
 - Host Non-USARF Reports
- Technical Resources
 - Cookbooks, tools, etc.
- Help Desk

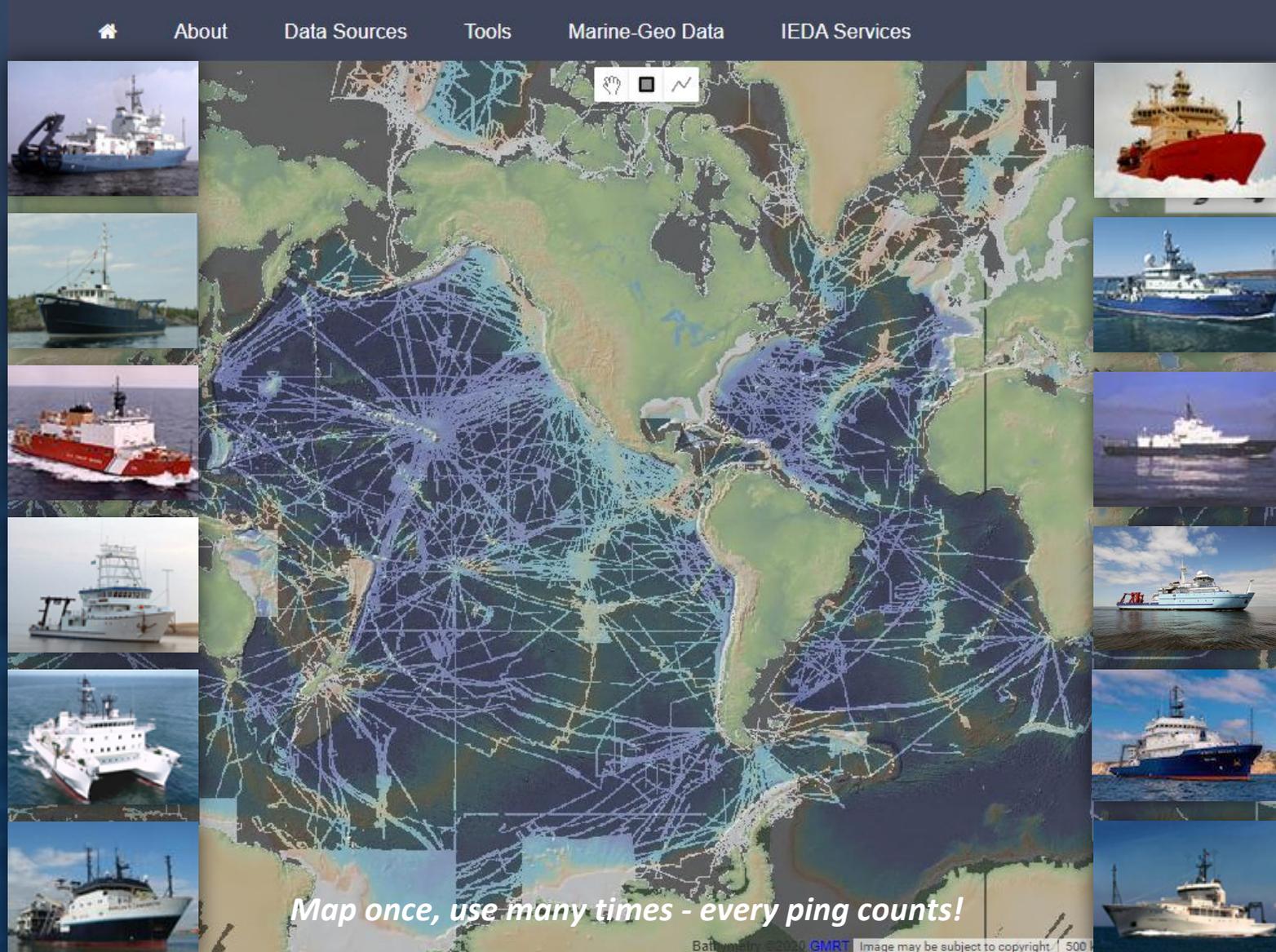


Report Title	Team	Post date
2020 Healy EM122 QAT Report	QAT	09-2020
2020 Kilo Moana EM122/EM710 QAT	QAT	09-2020
2018 Okeanos Explorer EM302 SAT	SAT	07-2020
2020 Sikuliaq EM302/EM710 Calibration Report	QAT	07-2020
2020 Okeanos Explorer EM304 SAT	SAT	04-2020
2019 Armstrong EM122 and EM710 Calibration	QAT	03-2020
Atlantis Seapath Test 2019	QAT	03-2020
2019 Okeanos Explorer EM302 Shakedown	QAT	12-2019
2019 R/V Armstrong EM710 Calibration	QAT	12-2019
2019 Sikuliaq Calibration Report	QAT	12-2019
2018 E/V Nautilus Quality Assessment Report	QAT	07-2019
2019 E/V Nautilus Quality Assessment Report	QAT	07-2019



Mapping Systems in the U.S. Academic Fleet

- USARF vessels with MBES
 - 11 Research Vessels
 - 1 USCG Icebreaker
- 16 Kongsberg systems
 - EM710 / EM712
 - EM302
 - EM122 / EM124
- 2 Reson shallow systems
- RCRVs coming online soon



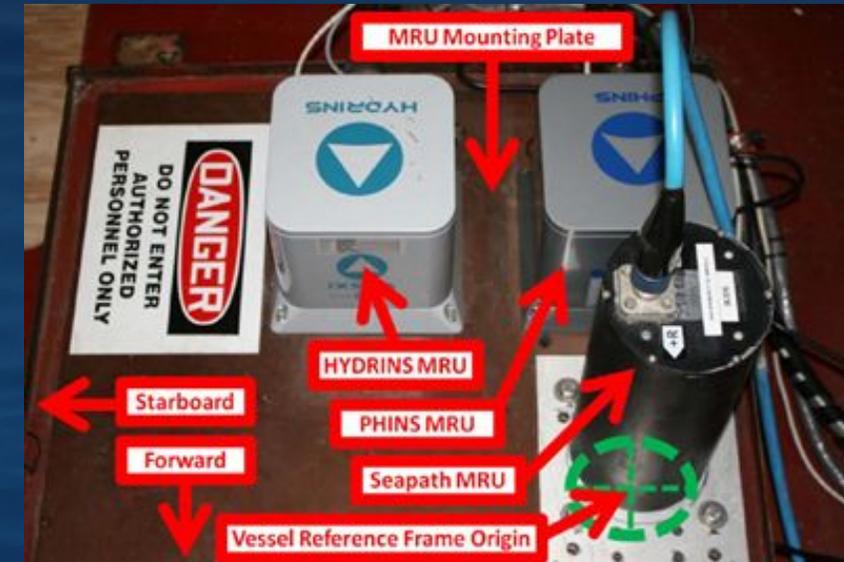
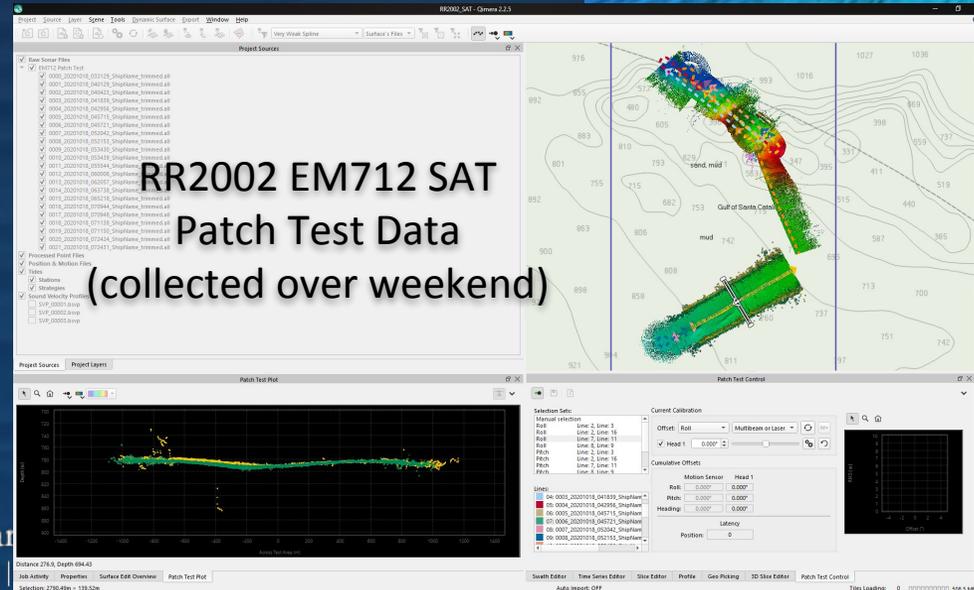
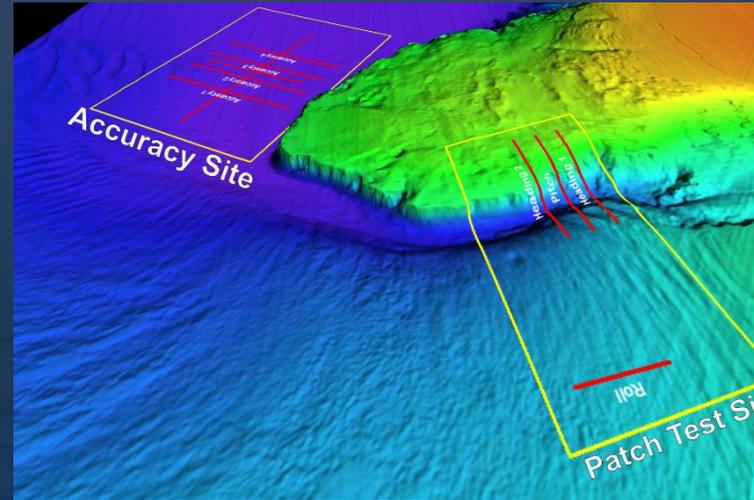
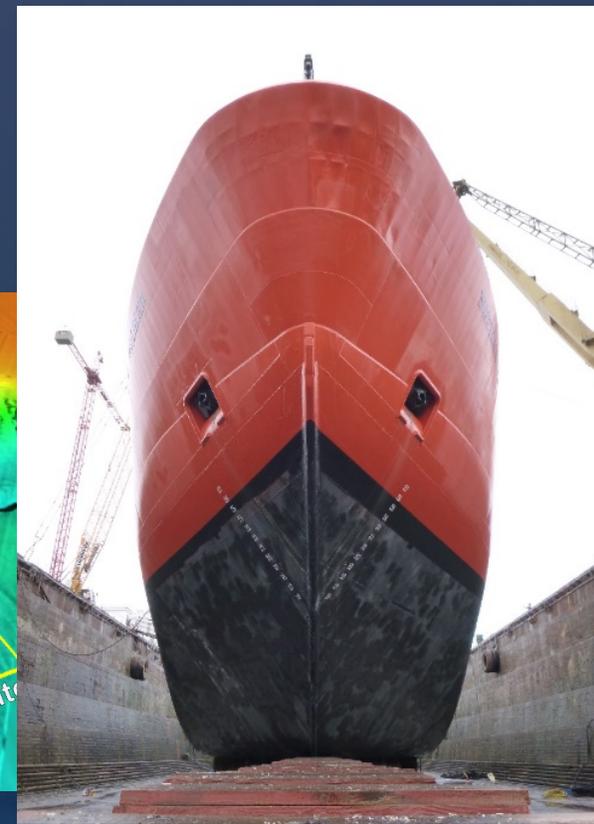
Kongsberg Systems in the U.S. Academic Fleet

Ship	System(s)	Gondola	Array	Life Cycle	MAC Visits
<i>Atlantis</i>	EM122	Y	2010 ?	Late-Life	QAT*
<i>Healy</i>	EM122	N	2010	Late-Life	QAT, ANT
<i>Kilo Moana</i>	EM122 / EM710	N	2012	Mid-Life	SAT, QAT*, ANT
<i>Marcus G. Langseth</i>	EM122	Y	2007 (TX) / 2010 (RX)	Late-Life	QAT*
<i>Nathaniel B. Palmer</i>	EM122	N	2015	Mid-Life	SAT, QAT, ANT
<i>Neil Armstrong</i>	EM122 / EM710	N	2016	Mid-Life	SAT, QAT
<i>Roger Revelle</i>	EM124 / EM712	Y	2020	Early-Life	SAT*, QAT
<i>Sikuliaq</i>	EM302 / EM710	N	2014	Mid-Life	SAT, QAT*
<i>Sally Ride</i>	EM122 / EM712	N	2016	Mid-Life	SAT, QAT
<i>Thomas G. Thompson</i>	EM302	N	2018	Early-Life	SAT



MAC System Performance Approach

1. Shipboard Acceptance Tests - SAT -(11)
 - Baseline performance
2. Acoustic Noise Tests - ANT - (9)
 - Characterize vessel noise
3. Quality Assurance Tests - QAT - (24)
 - Monitor existing installations
4. Tools
 - Acquisition and planning
 - Assessment



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System Performance Testing



SAT and QAT procedures include:

1. Geometry & Configuration
2. Calibration (patch test)
3. RX noise testing
4. Swath accuracy
5. Swath coverage (extinction)
6. Impedance testing
7. Reporting

Multibeam Advisory Committee Mapping System SAT/QAT Checklist

Roger Revelle EM124 / EM712 SAT
San Diego, October 2020

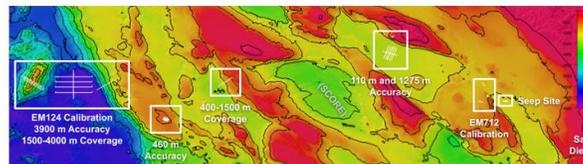
General

[Shared documents for RR 2020 SAT planning](#)

[Revelle IMTEC survey docs](#)

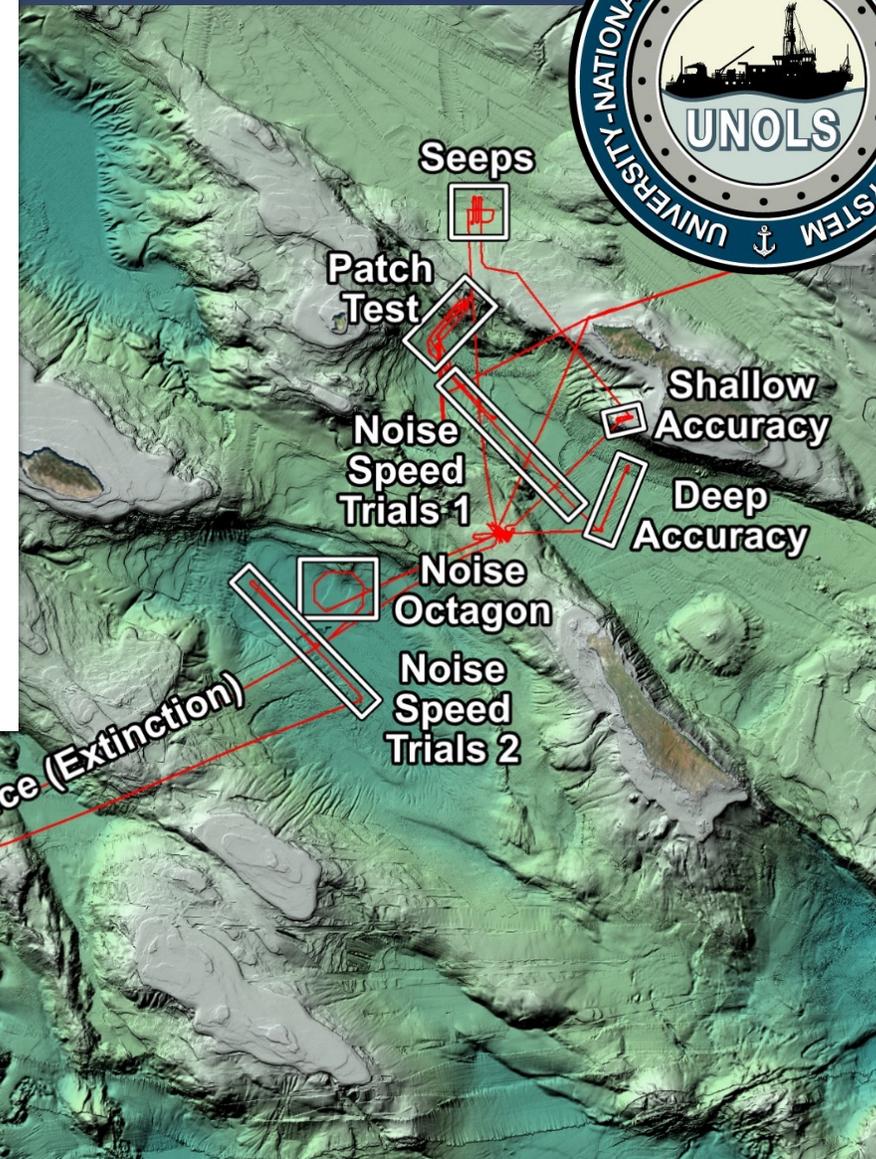
[MAC geometry review](#)

[MAC assessment tools in development](#)



Notes for next planning call (2020/10/14 ~5 PM ET)

1. Vessel offset review and SIS/Seapath/PHINS configurations
2. Updated reference surface surveys and crosslines
 - a. Added reference lines for new surveys at existing 110, 1275, and 3900 m sites
 - b. Added 400 m site
3. Coverage line and transits may pass through/near SCORE basin - need to file intent? (or we can find a different line)
4. Expectation for PHINS calibration - need to repeat with PHINS realtime attitude velocity?
5. Marine forecast and early predictions for rough schedule? Noise testing, then EM124 cal first?
6. MAC: provide updated noise test procedure for SIS 5
7. MAC: provide crossline settings
8. MAC: provide data trimming procedure for kmall
 - a. Tested with latest SIS 5 format?
9. Seapath: antennas = RR-41 and RR-47



Lessons Learned from a Fleet-wide Perspective

- Collecting high quality **raw** MBES data from the beginning saves time and \$\$
- Rigorous performance testing catches problems early
- Common testing protocols allow for easy intra-system/ship comparison
- Use of common tools across data life cycle helps system performance assessment
- Open access to performance reports is critical
- Cost of spares < cost ship time (National spares pool with commonly used systems ?)
- Post-cruise quality assessment via R2R and GMRT provides important information about system performance and consistency



Benefits to US Research Community

- Seabed mapping data is an essential ocean observation
 - Bathymetry, backscatter, water column data have broad applications in interdisciplinary research
- Very little of the ocean has been mapped
 - ~20% of the global ocean has been mapped
 - ~50% of US EEZ
- Best practices and routine system checks promote data acquisition even when mapping is not a primary objective
 - US ARF vessels routinely acquire data during transits - providing new data that fills gaps in data coverage globally and within US EEZ
- Mapping data stewarded by complementary efforts of MAC, R2R and GMRT increase return on investment by ensuring that high quality data are acquired, archived and integrated into publicly available data syntheses

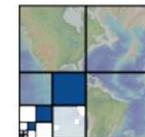


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R2R

ROLLING DECK TO REPOSITORY



GMRT

Contributions of the US ARF to National and Global Mapping

- US ARF is a significant contributor to:
 - NCEI/IHO MB archive > 60% by cruise
 - US EEZ mapping > 20%**
 - Global ocean mapping ~9%**
- Coordinated presentations at NOAA-led Standard Ocean Mapping Protocol (SOMP) Symposium
 - R2R, MAC, GMRT
- GMRT synthesis serves as base maps for many national and international web apps
- GMRT contributed directly to GEBCO/Seabed 2030

