Multibeam Data Contributions from U.S. Academic Research Fleet: *Coordinated Data Stewardship, and Efforts to Optimize Data Quality*

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Multibeam Sonar Data Continuum

Data Acquisition → Data Documentation & Preservation → Data Reduction & Synthesis

MAC
2011

R2R
2009

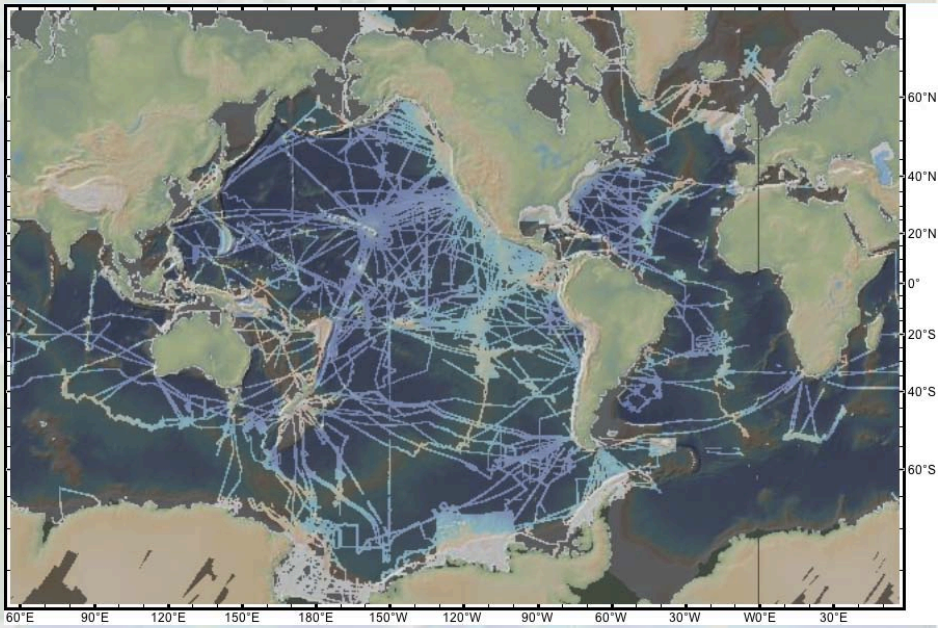
GMRT
1992

***GOAL**: Well-documented high-quality publicly available data*

Global Multi-Resolution Topography

- **1992** – Ridge Multibeam Synthesis Project
- **2003** – Expanded to include US-funded data from Southern Ocean
- **2004** – **present** -- Expanded to include public domain data from throughout global oceans
  - ongoing growth by > 60 cruises/yr

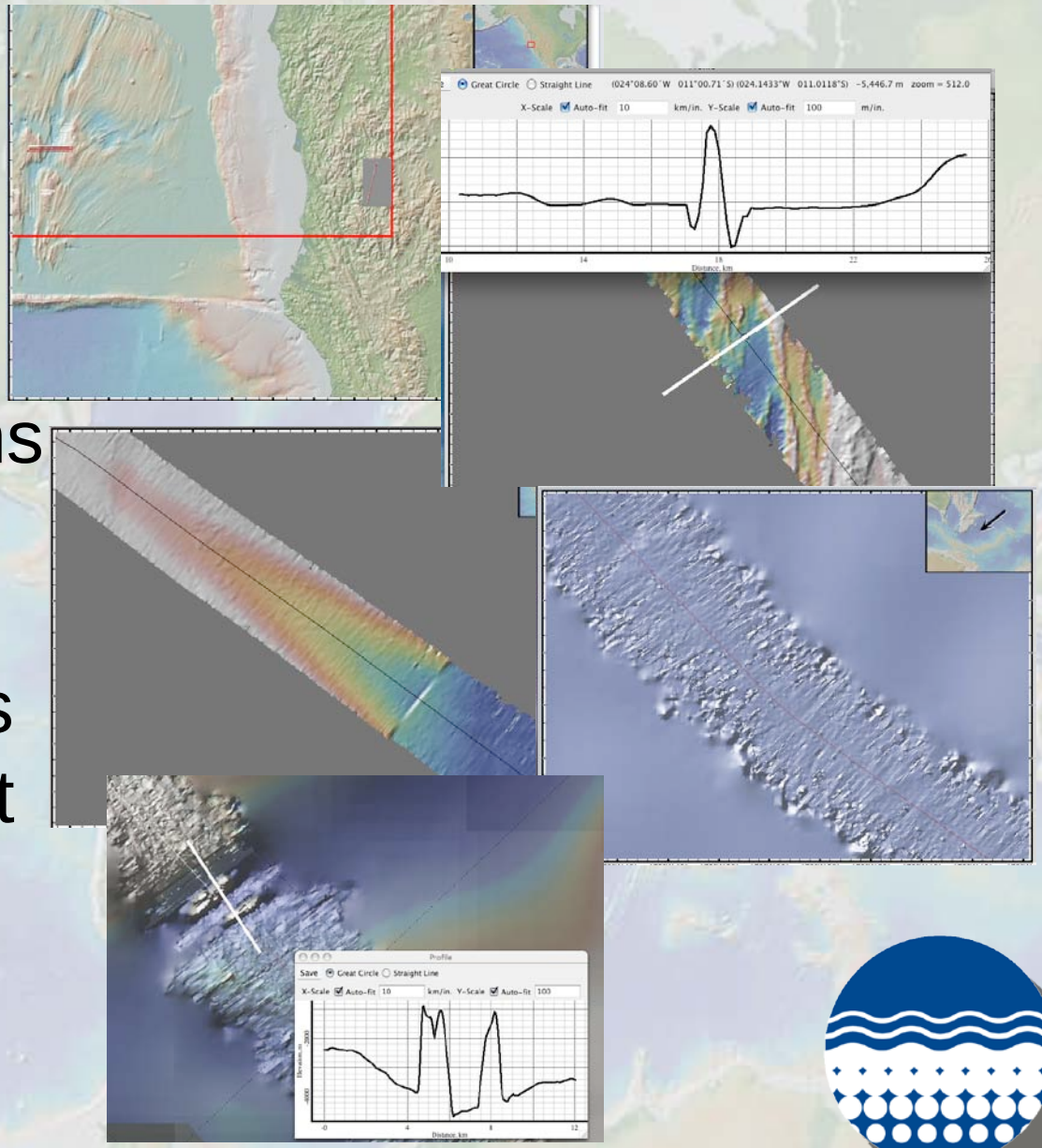
http://gmrt.marine-geo.org



GMRTv2.3 ~650 cruises (Oct 2012)

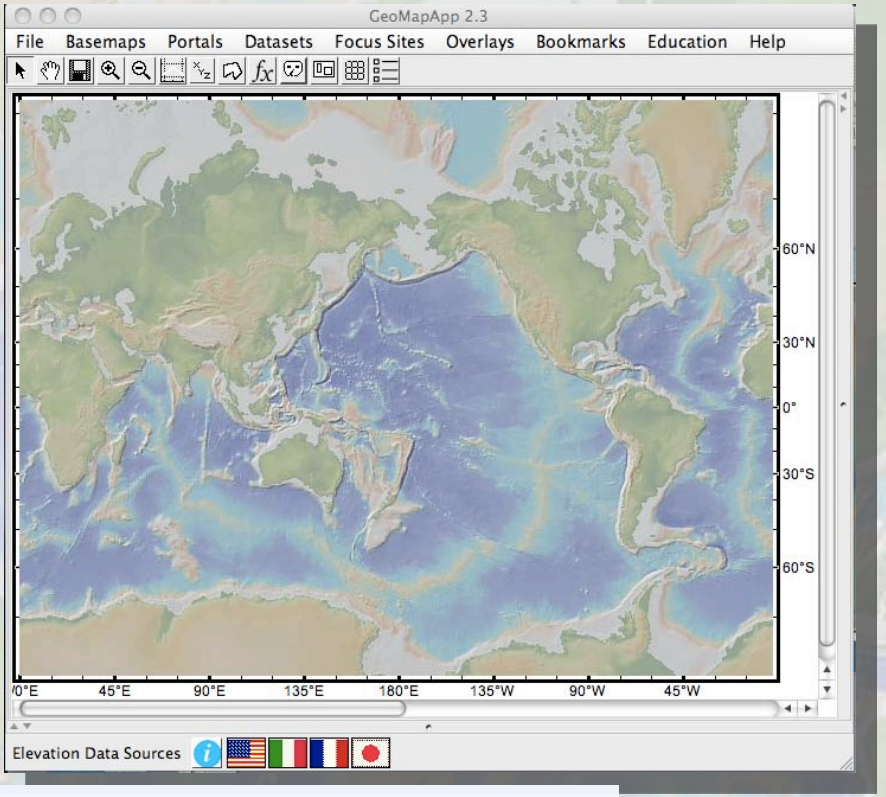
GMRT: MB Data Reduction & Synthesis

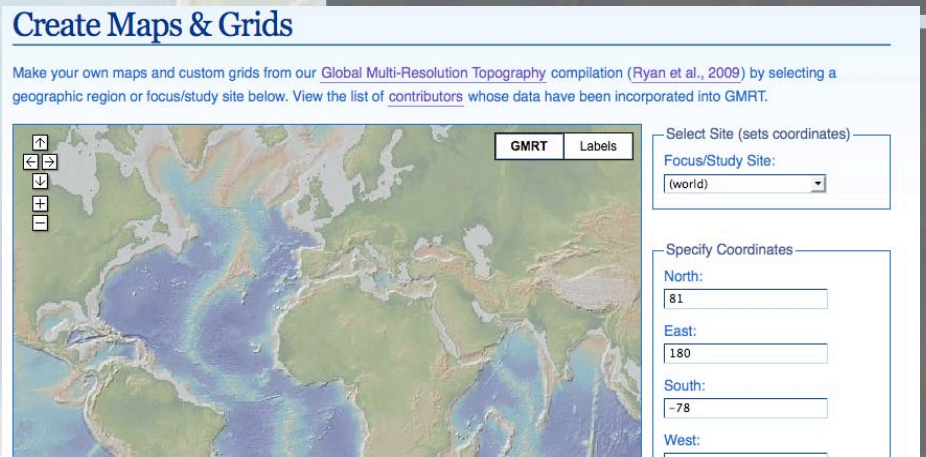
- Bad navigation
- Noisy outer beams
- Attitude problems
- Bad soundings
- Instrument problems
- Bad weather
- Sound velocity
- Slow speed in turns
- Quality assessment for grid weighting and resolution



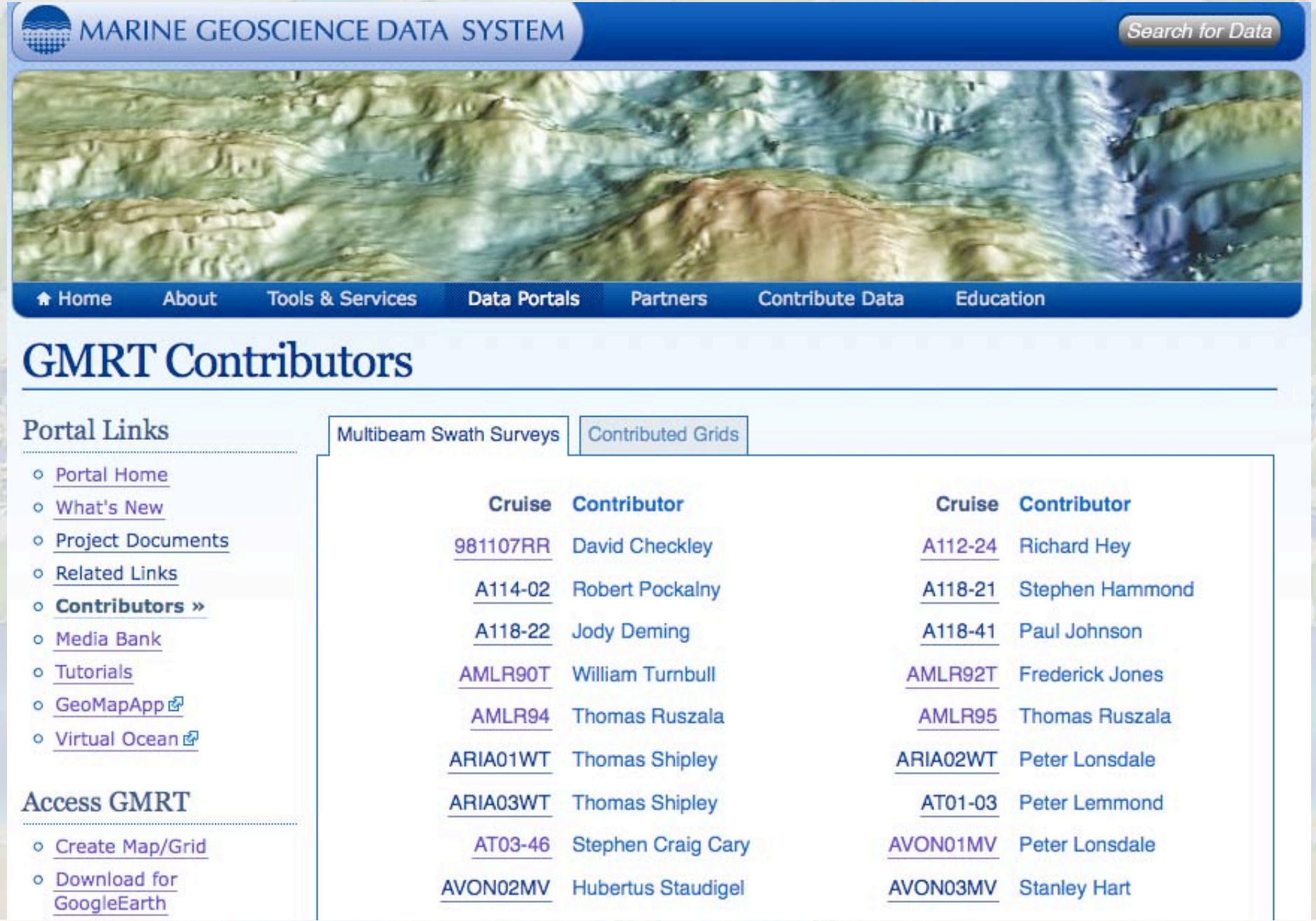
GMRT: Access

- Images & gridded data
- Desktop Apps
  - GeoMapApp
  - Virtual Ocean
- Web App
  - CM&G
- Web Map Service
  - Images & Mask
- iPad/iPhone
  - Earth Observer

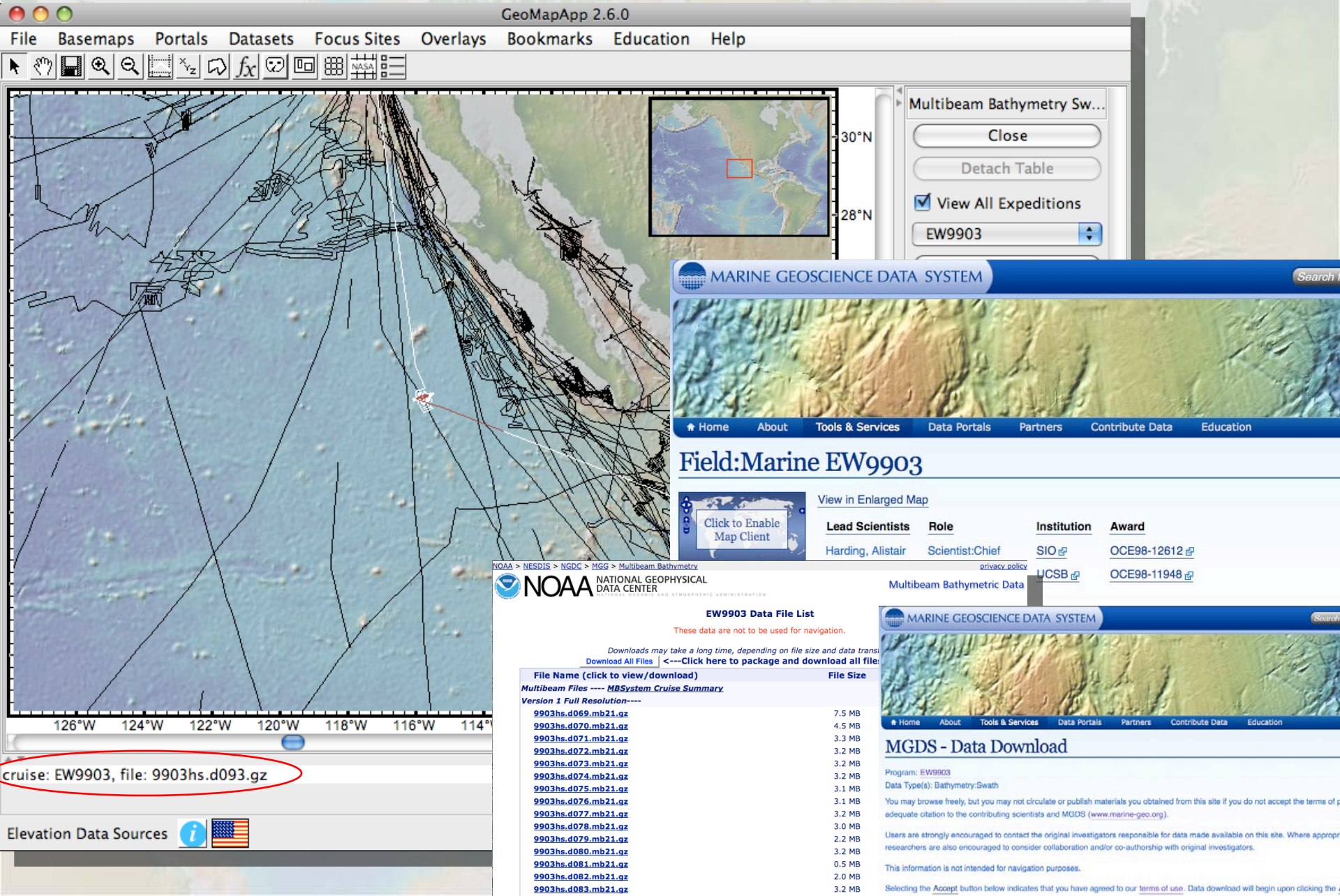




GMRT: Attribution to Contributors



GMRT: Attribution & Access to Source Data



MBES files from US Academic Fleet

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Rolling Deck to Repository (R2R)

- Ensure routine data documentation & delivery to National Data Centers (e.g. NGDC, NODC)
- Facilitate compliance with data policies

rvdata.us

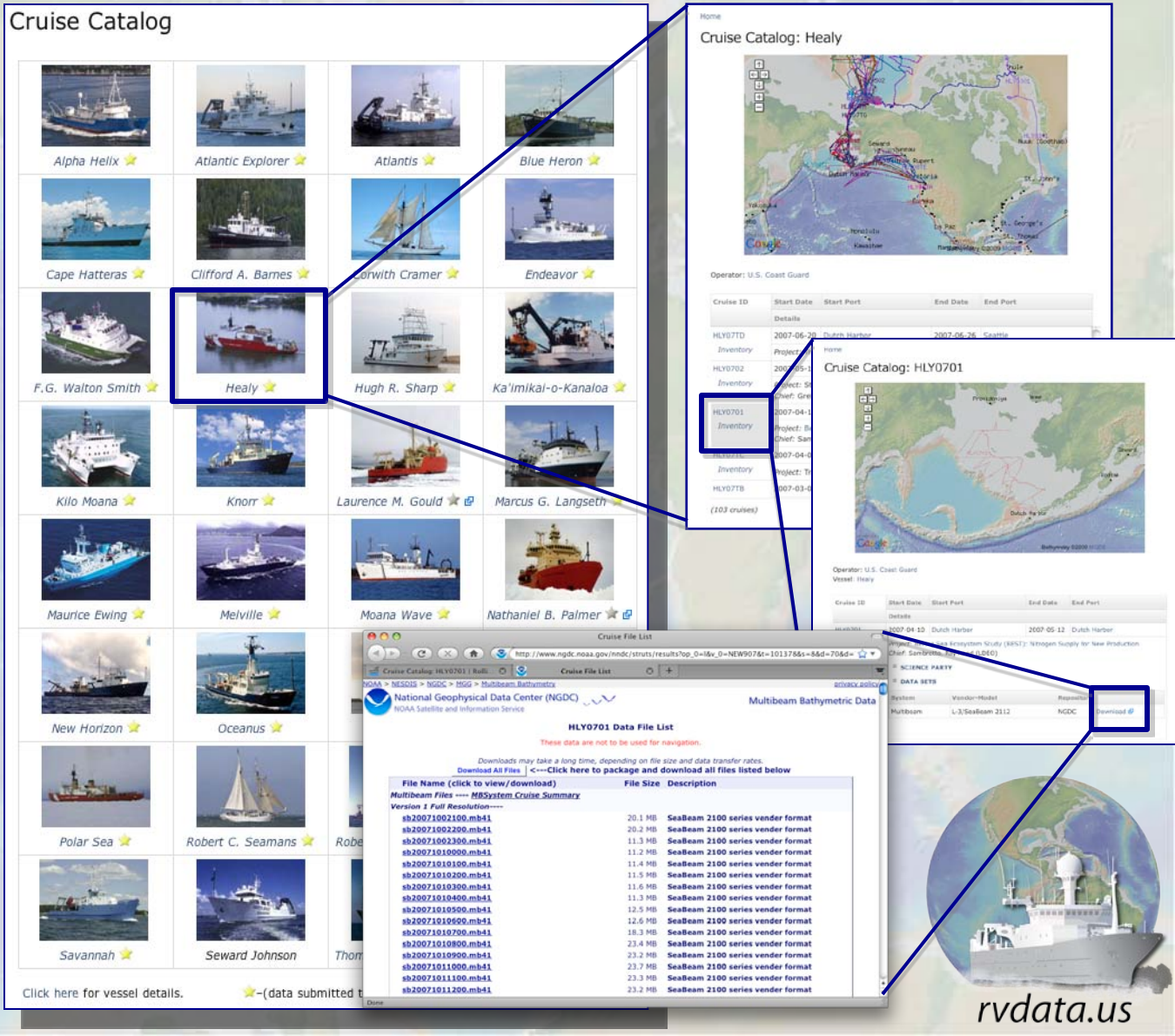
R2R Data Stewardship

- Underway Data Types
  - Instruments permanently installed on ships
- Fleet-wide solution
  - Full range of vessels and classes
  - ~500 cruises/year
- Core Services
  - *Data documentation & preservation*
  - *Programmatic Quality Assessment*
  - Final Navigation
  - Event Logger & Real-time MET/TSG

MBES Data Delivery via R2R

- 491 filesets
- 413 cruises
- > 3 TB

as of Oct. 1, 2012



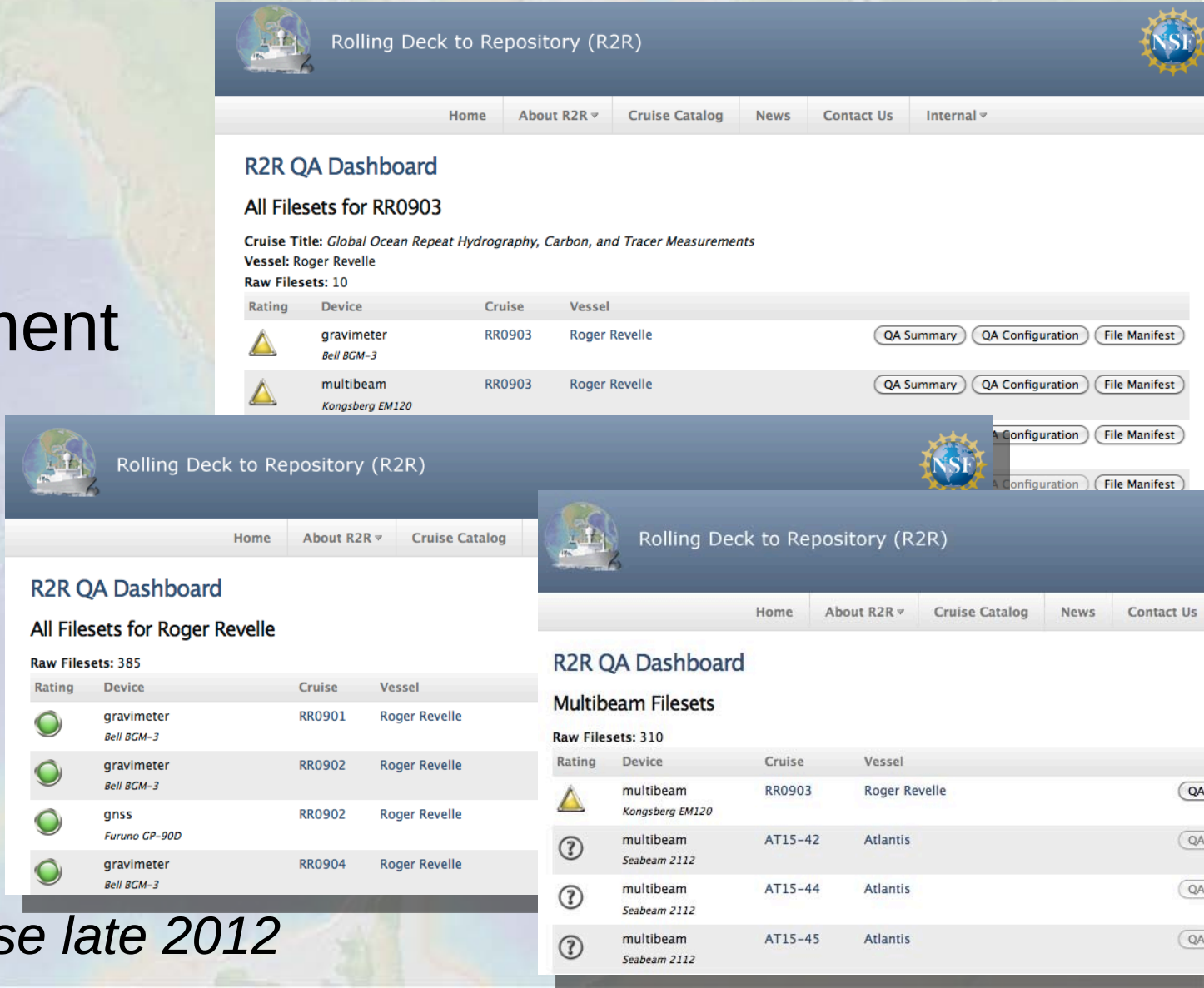
R2R: Quality Assessment

- Programmatic post-cruise review of data
  - Identify “suspicious” data
  - Feedback to Operators
- Distributable Code
  - Leverage existing tools where possible (for MBES data: MB-System)
  - Customizable thresholds
- Generate QA Report
  - Document QA procedures
  - Provide info for downstream data use

rvdata.us

R2R: QA Dashboard

- By Cruise
- By Ship
- By Instrument
- By Test



Planned release late 2012

R2R: MB Quality Assessment

Rolling Deck to Repository (

Home | About R2R

R2R QA Dashboard

All Filesets for RR0903

Cruise Title: *Global Ocean Repeat Hydrography, Carbon,*
Vessel: Roger Revelle
Raw Filesets: 10

Rating	Device	Cruise	Ves
	gravimeter *Bell BGM-3*	RR0903	Rog
	multibeam *Kongsberg EM120*	RR0903	Rog
	gnss *Furuno GP-90D*	RR0903	Rog
	gnss *MX Marine MX421*	RR0903	Rog

QA Summary Info

Cruise: RR0903
Vessel: Roger Revelle
Device Info: multibeam (Kongsberg E

QA Tests

Across track slope: *0.58 deg*
minimum: -.5 deg
maximum: .5 deg

Has minimum metadata

Has surface sound velo

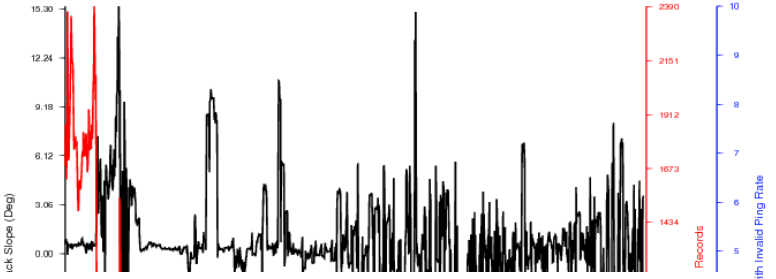
Number of sound veloc
total_mb_days: 30
minimum_number_for_
expected: true
days_per_svp: 2

Percent expected data f
percentage: 100
number_files_found: 14
number_files_expected:

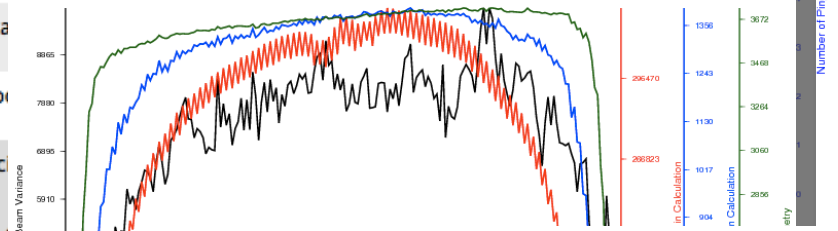
Percent files all valid alt
minimum: 0 m
maximum: 12000 m
percentage: 80

Percent files all valid navigation:
minimum_longitude: 18.199900 deg
minimum_latitude: -35.183607 deg
maximum_longitude: 115.749498 deg
maximum_latitude: -30.379563 deg
percentage: 80

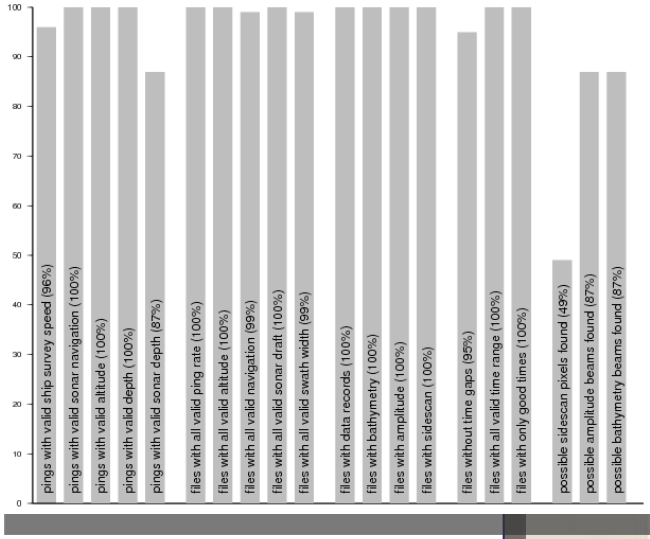
Multibeam File Level QA (Cruise RR0903 File Set 100000515)



Multibeam Variance (Cruise RR0903 File Set 100000515)



Multibeam Percents (Cruise RR0903 File Set 100000515)



Lead: S. O'Hara (LDEO)

Meanwhile…

- 2010: recognition of fleet-wide issues with multibeam sensor performance
- Workshop Convened at NSF
  - Identified several operational and technical issues, impacting multibeam data quality
  - Strong need to coordinate *operational* and *technical* efforts across the fleet

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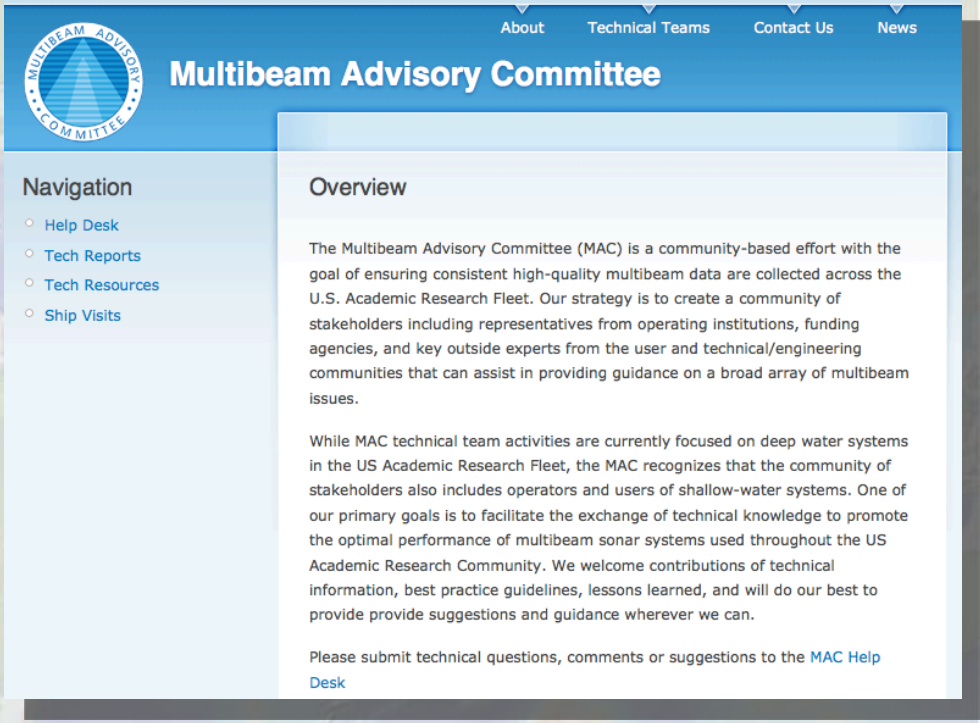
Multibeam Advisory Committee

- Community of Stakeholders
- Fleet-wide Approach
  - Best Practices
  - Technical Resources
- Technical Teams
  - Shipboard Acceptance
  - Acoustic Noise
  - Quality Assurance
- Help Desk



Co-Chairs:
V. Ferrini (LDEO), J. Beaudoin (UNH), P. Johnson (UNH)

MAC Accomplishments

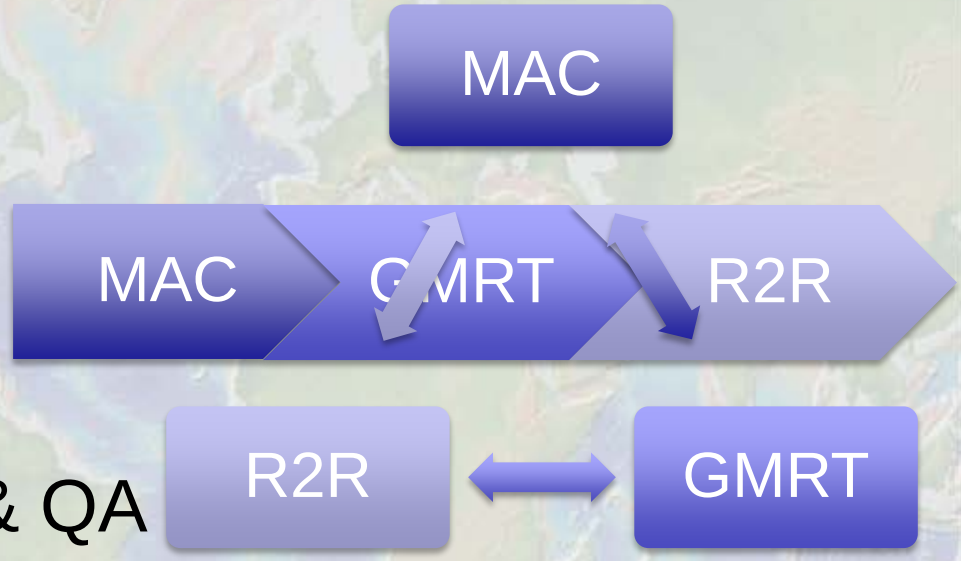
- Test Reports Gathered and Posted
- Tools
  - SVP Editor Tool
  - SVP Mission Planning Tool
- Best Practice Cookbooks
- Ship visits
  - Acoustic Noise Testing
  - Quality Assurance
  - Sea Acceptance
- Assistance to Operators & Investigators

Reports from Technical Teams

Technical Resources

Next Steps: Ongoing work & *Integrate*

- *GMRT Synthesis*
  - Ongoing Content
  - QC Reports
- *R2R*
  - Ongoing data delivery & QA
  - Rollout QA Dashboard
- *MAC*
  - Ongoing community engagement
  - Routinely review R2R MBQA Results
  - Provide device-specific info to R2R



Acknowledgements

- *GMRT Synthesis*
  - LDEO: W.B.F Ryan, S.M. Carbotte, R. Arko, S. O'Hara, K. McLain + more…
- R2R
  - *LDEO*: S.M. Carbotte, R. Arko, J. Morton, S. O'Hara
  - *SIO*: S.P. Miller, K. Stocks, D. Clark, A. Sweeney
  - *WHOI*: A. Maffei, C. Chandler, L. Stolp
  - *FSU*: S. Smith, M. Bourasa
- MAC
  - *UNH*: J. Beaudoin & P. Johnson

GMRT:

http://gmrt.marine-geo.org

R2R:

http://rvdata.us

MAC:

http://mac.unols.org