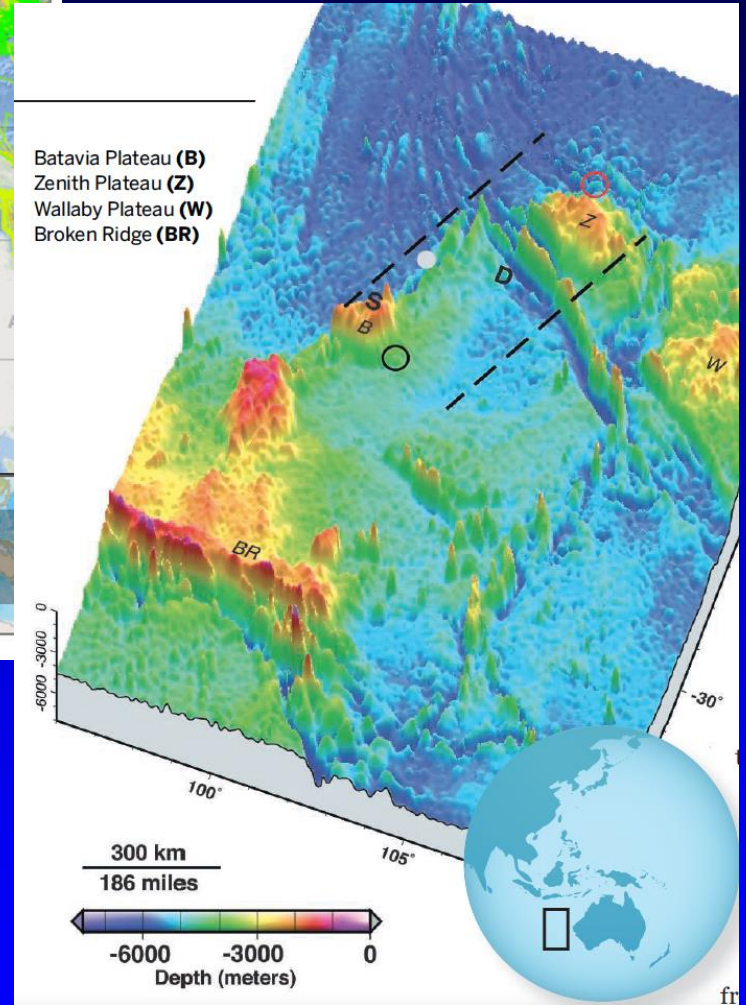
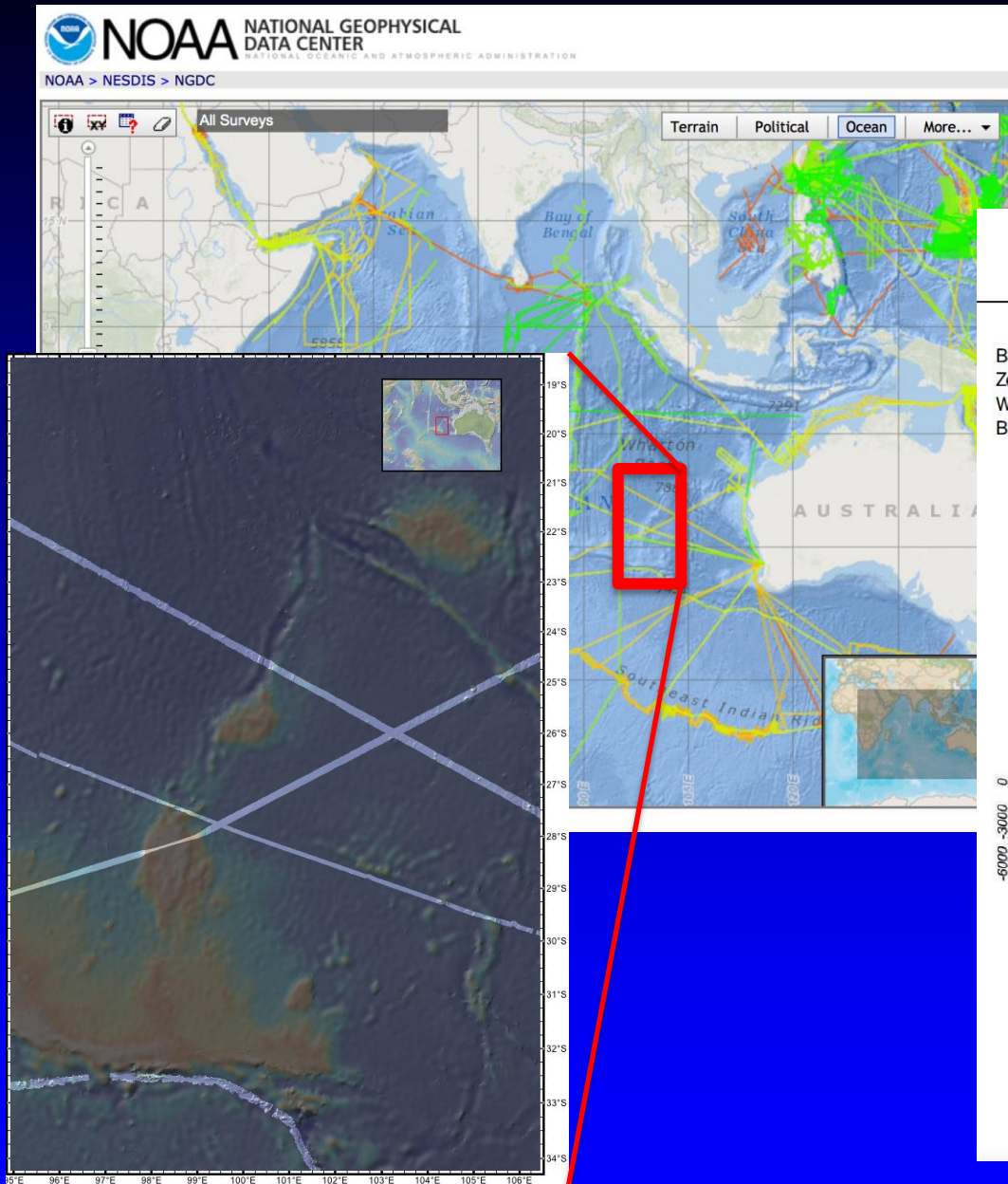


Swath sonar mapping of Earth's submarine plate boundaries

Suzanne M Carbotte, Vicki
Lynn Ferrini, Mollie Celnick,
Frank Oliver Nitsche, William
B F Ryan

LDEO - Columbia University
Palisades NY

MH370 Search Area



SRTM30_PLUS

SATELLITE GEODESY
Scripps Institution Of Oceanography, University of California San Diego, 9500 Gilman Drive, La Jolla, 92093-0225

HOME **GLOBAL TOPOGRAPHY**

BACKGROUND

PEOPLE

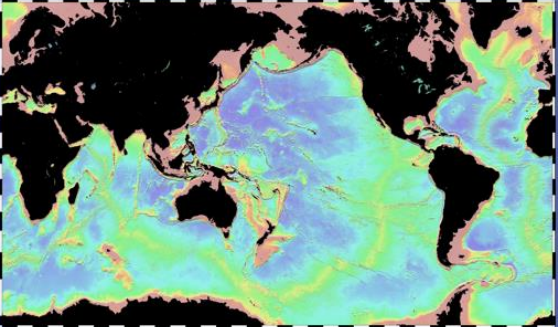
GLOBAL TOPOGRAPHY

RADAR ALTIMETRY

MEASURED AND ESTIMATED SEAFLOOR TOPOGRAPHY

| | | |
|-----------------------------------------------|-------|-------------------|
| NEW! SRTM15_PLUS | V1 | November 29, 2014 |
| NEW! SRTM30_PLUS | V10 | November 29, 2014 |
| NEW! Global Topography | V17.1 | November 29, 2014 |

Reference: Smith, W. H. F., and D. T. Sandwell, Global seafloor topography from satellite altimetry and ship depth soundings, Science, v. 277, p. 1957-1962, 26 Sept., 1997.



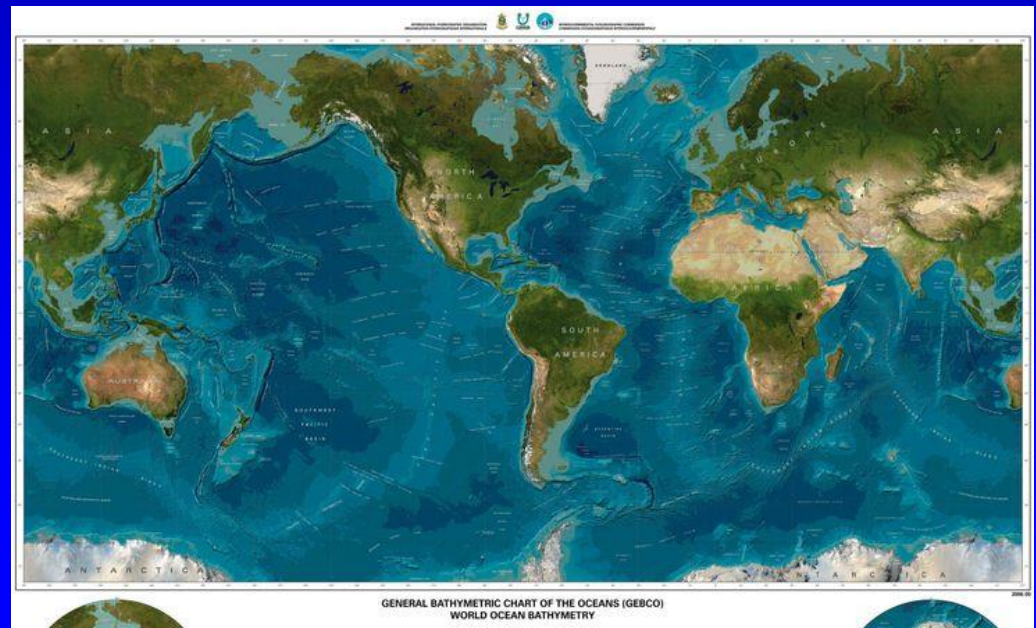
Global Seafloor Topography Compilations

GEBCO -2014

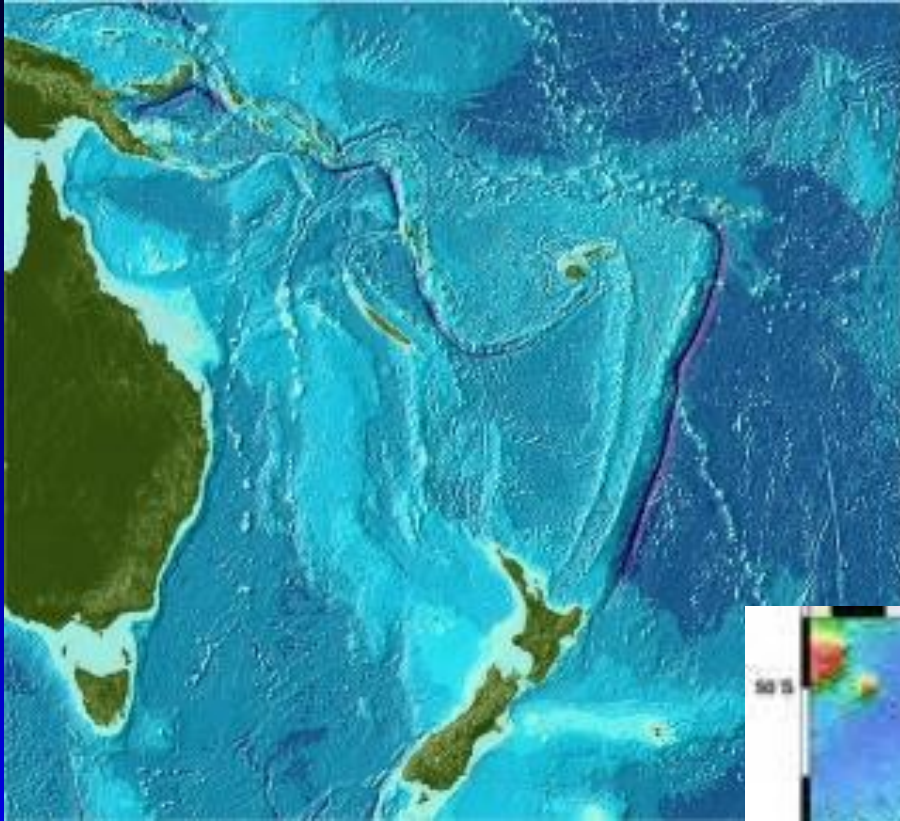
30 arc second
resolution

Ship-track soundings

Gravity-derived
topography

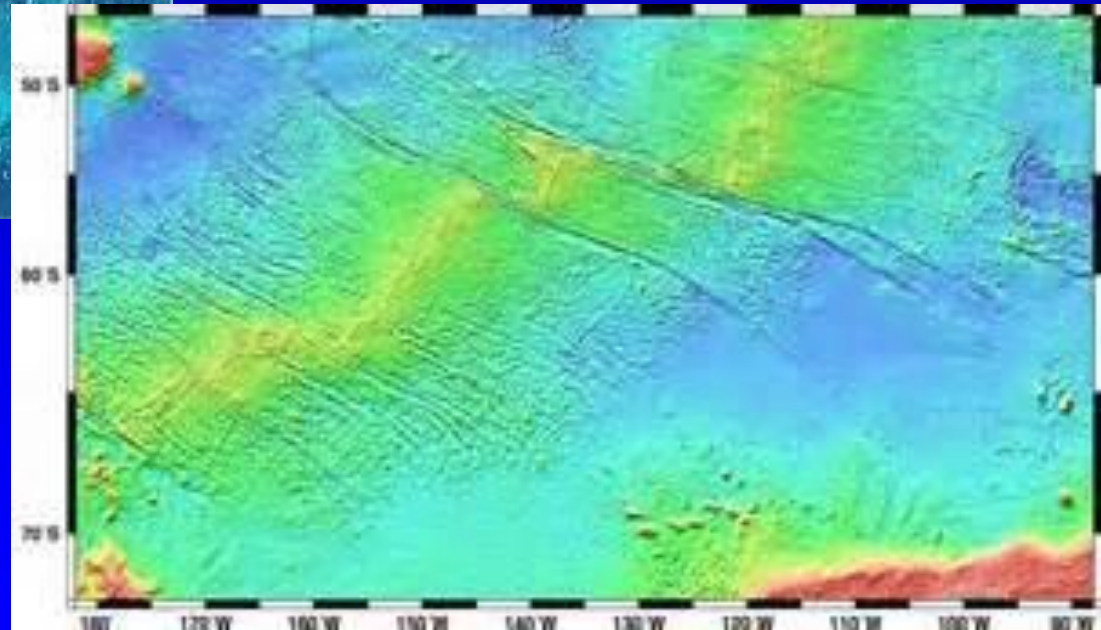


Global compilations



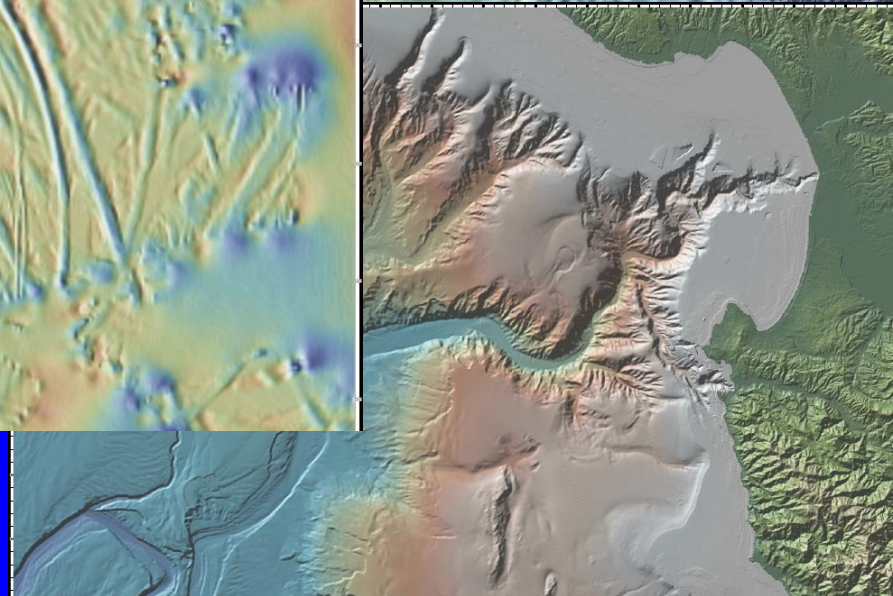
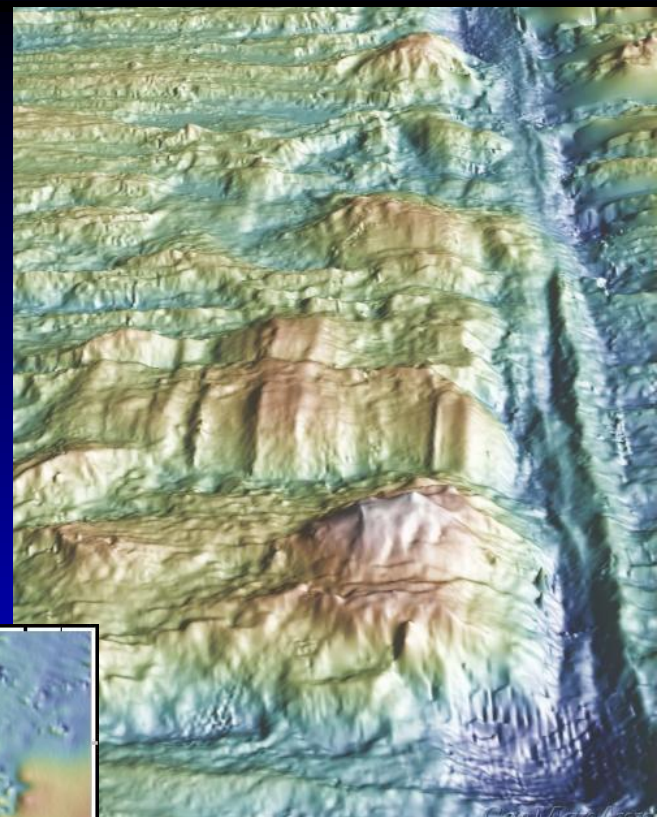
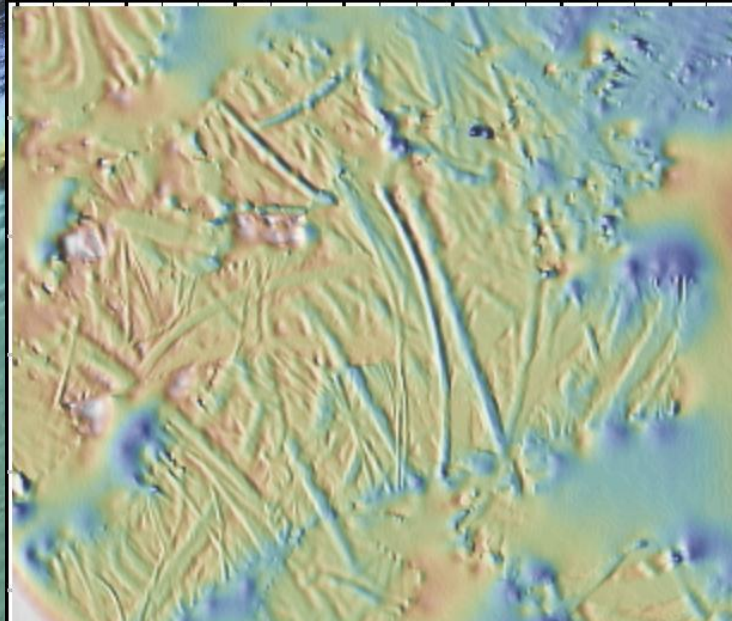
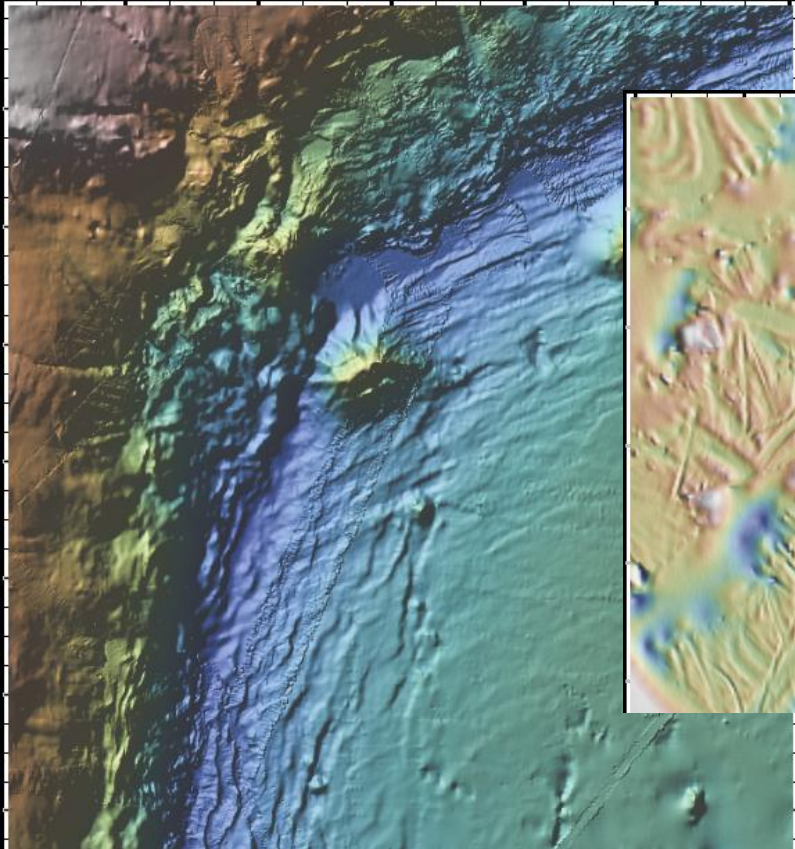
- Large-scale structure of plate boundaries,
- Evolving geometry through time

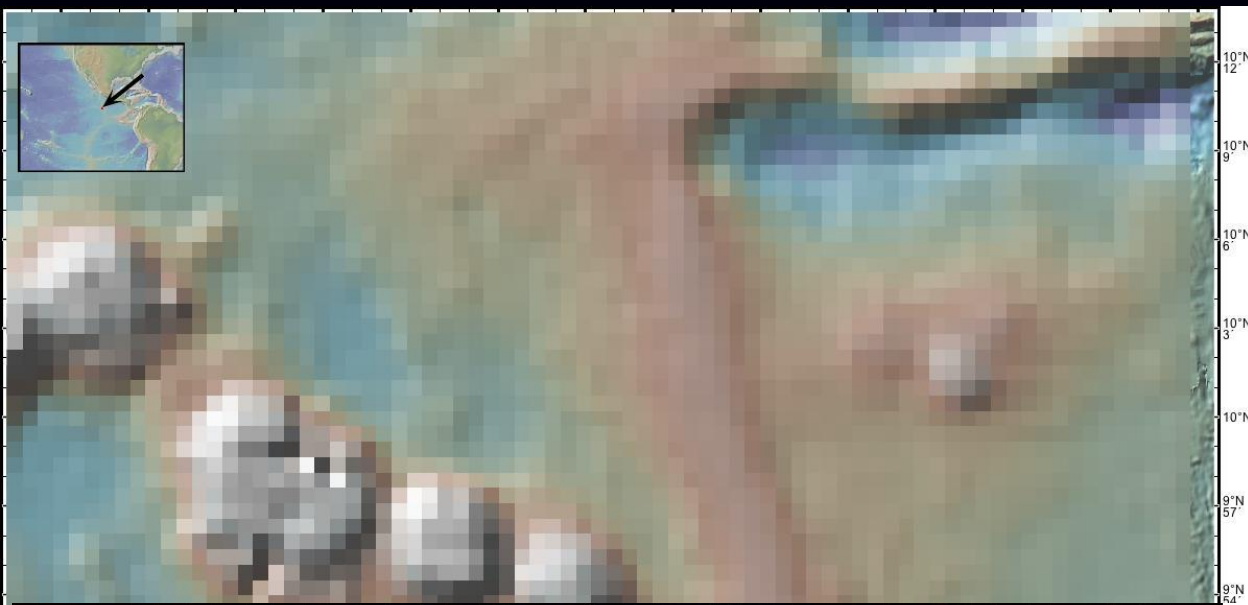
- Global distribution of seamounts
- Relationships with Hotspots



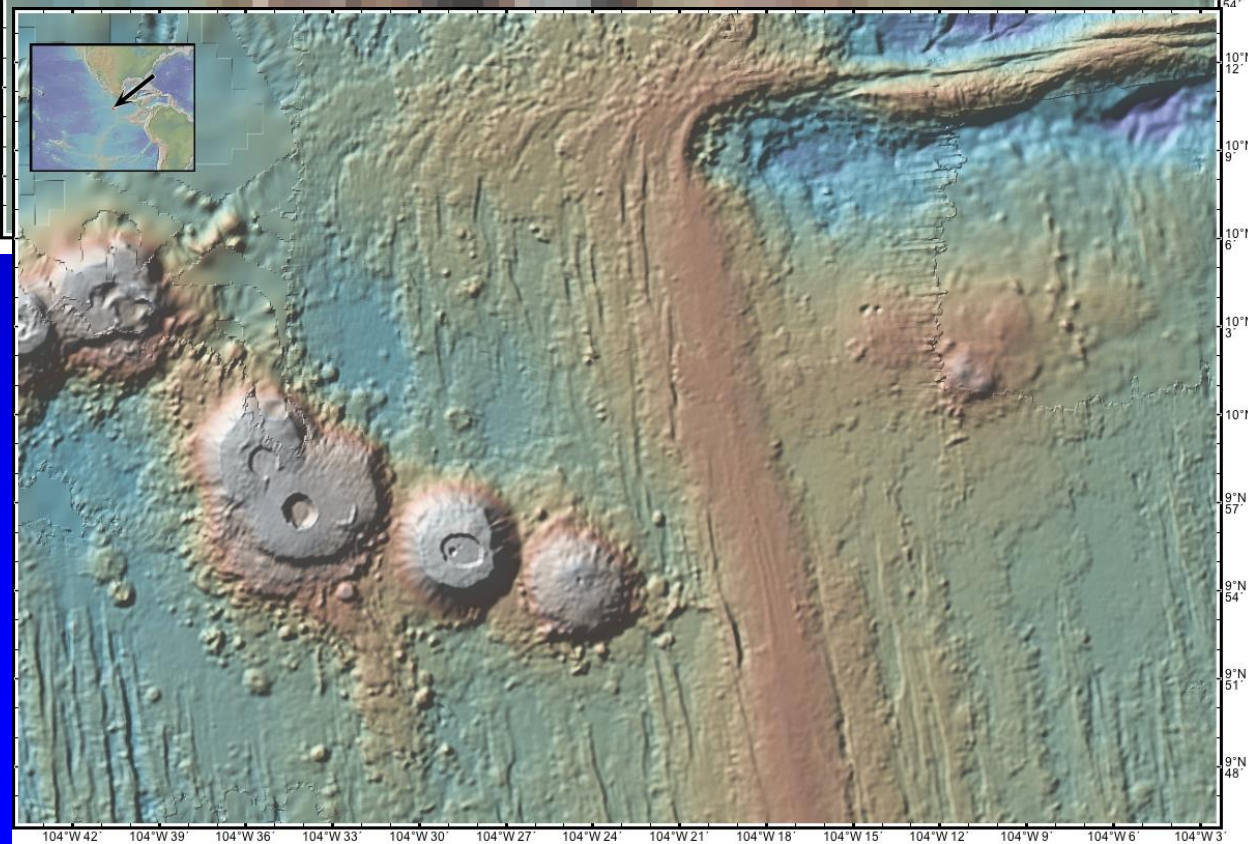
SRTM_30Plus, Smith and Sandwell, 1997

Swath Sonar needed to study active seafloor processes





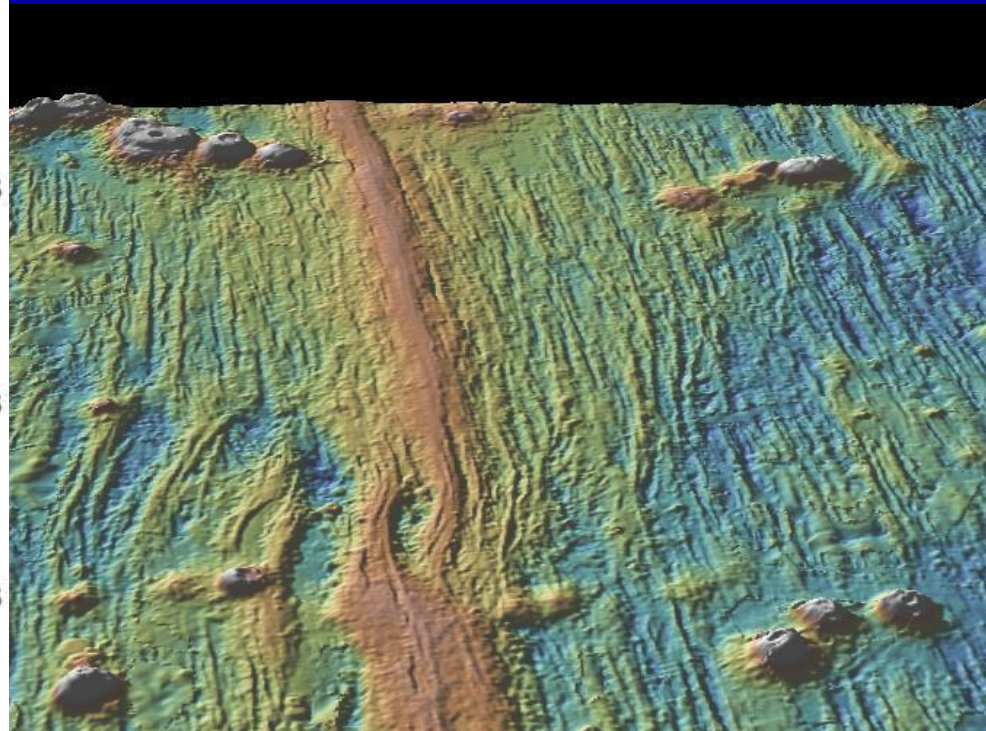
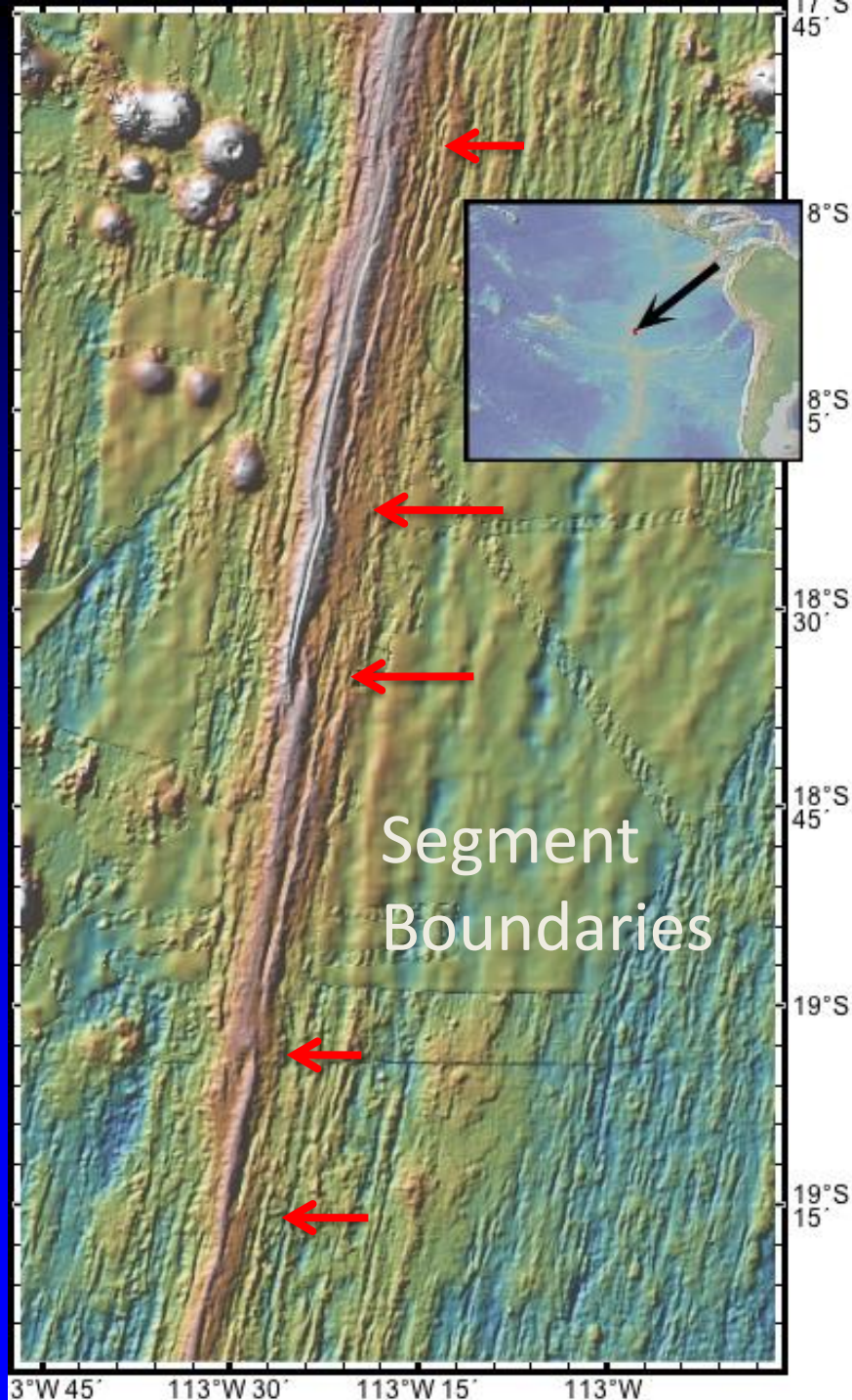
GEBCO,
Smith&Sandwell

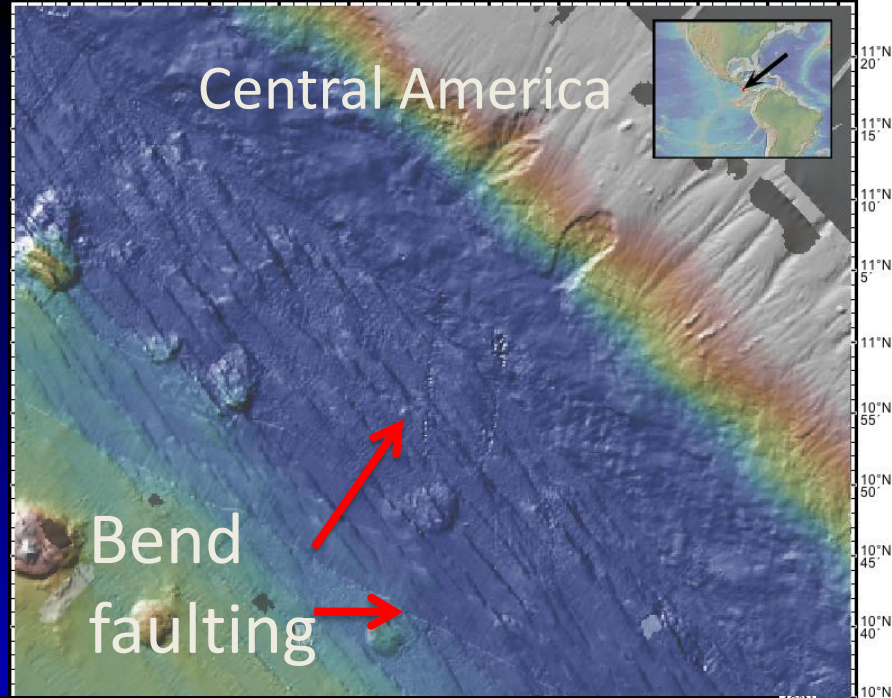


Swath Sonar
Up to 40x
improvement
in resolution
(100 to 25 m)

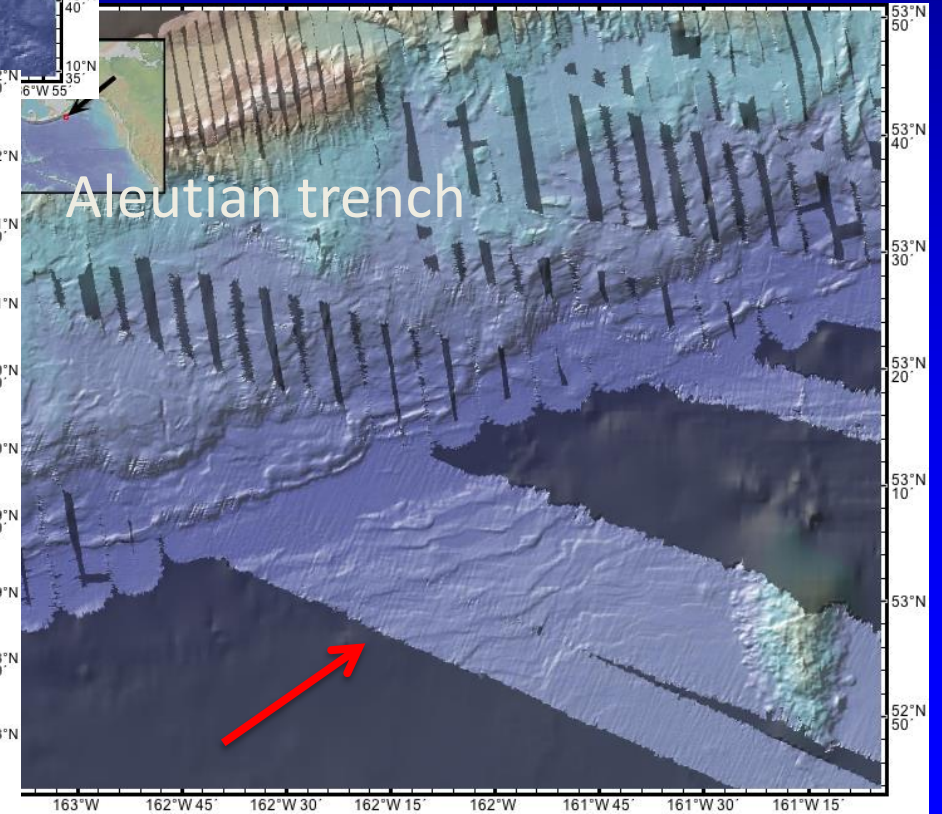
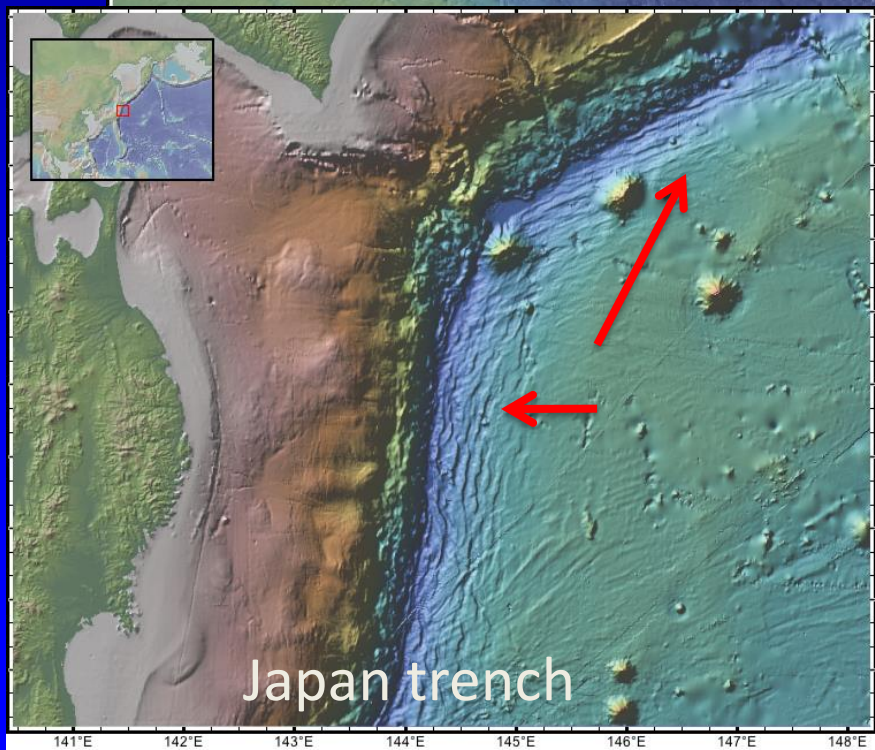
Spatial and Temporal Variability in Ocean Crustal Creation

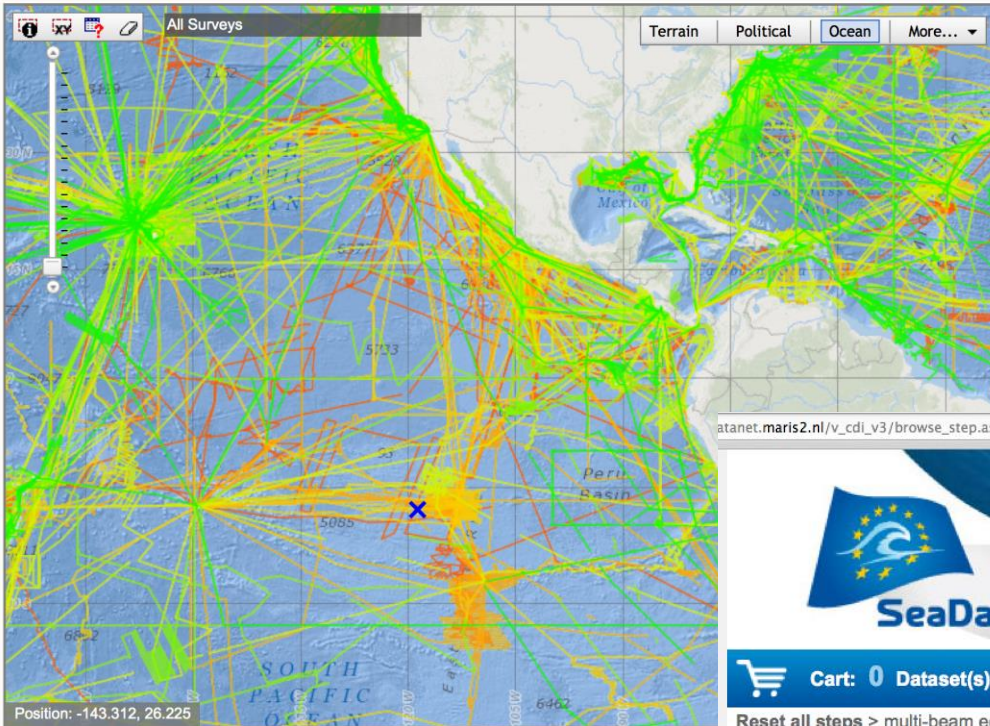
Fine-scale segmentation





Subduction Bend Faulting and Plate Hydration





Swath sonar coverage

- Plate boundaries
- Coastal Waters- EEZ and UNCLOS mapping

- Academic research
- National hydrographic and oceanographic centers

atanet.maris2.nl/v_cdi_v3/browse_step.asp?step=01143_006DS04_0076

SeaDataNet

Cart: 0 Dataset(s) Proceed to check out Reset Basket Timeseries on Export Store que

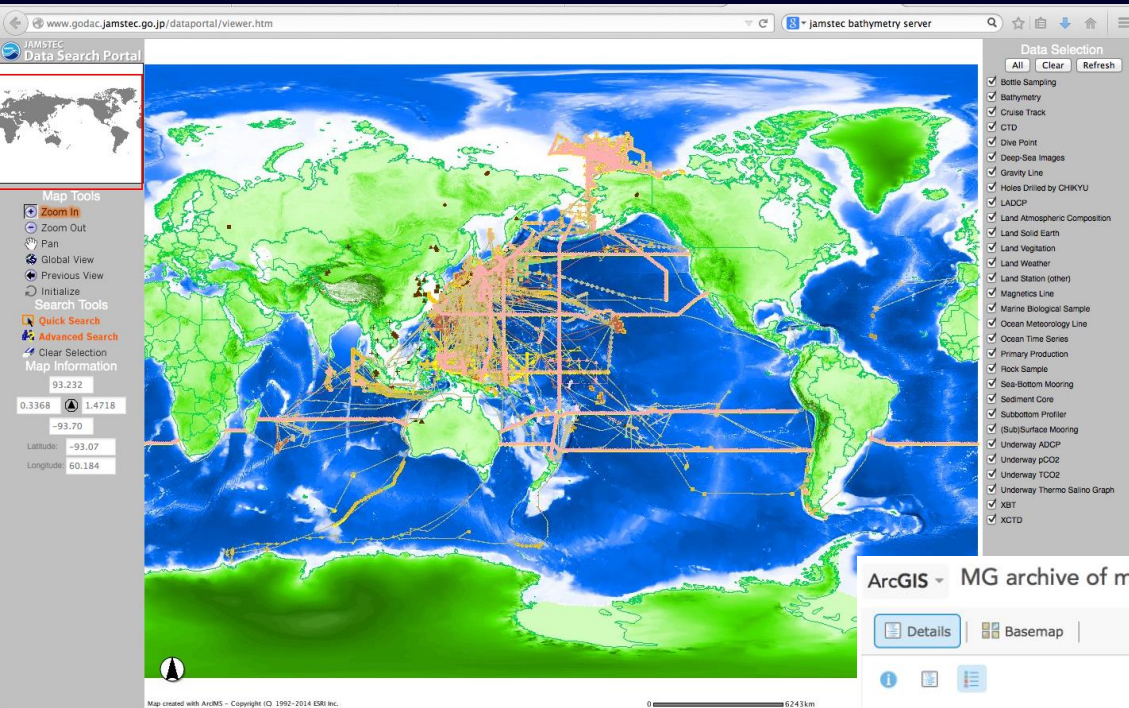
Reset all steps > multi-beam echosounders

Tools ?

- +
- i
- ↶
- ↷
- ⌂

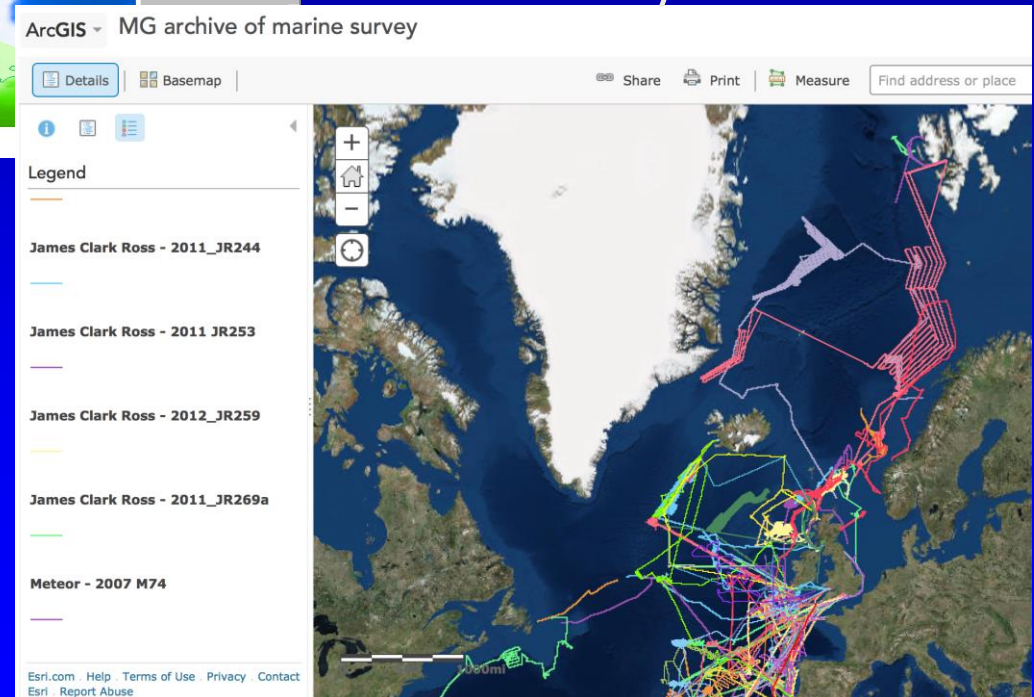
Enlarge Position Index

A world map showing global swath sonar coverage. The coverage is represented by a dense network of red lines that fan out from various points across the globe, indicating the paths of sonar surveys. The map includes a toolbar with various navigation and tool options.



Last 10 years:
Many national efforts to
deploy web interfaces
for data holdings

UK-BODC/NERC



Different levels of data access

- Open & free
- For purchase
- Limited access
- Restricted Access

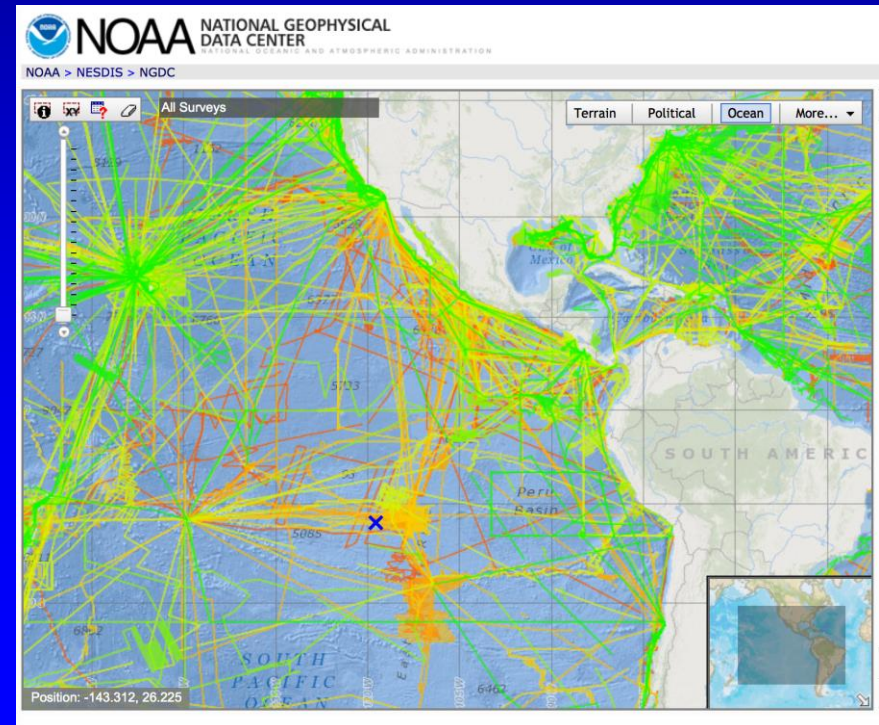


Global Multi-Resolution Topography Synthesis

gmrt.marine-geo.org

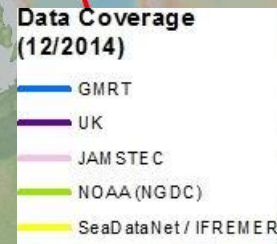
Gridded swath sonar to
full native resolution

- Swath sonar data cleaned & edited
- Data Homogenization & DEM construction
- Merge with regional topography (GEBCO, ASTER IBCAO, other)
- Uses public access swath data from NOAA archives



Swath Sonar Mapping Coverage for the Global Mid-Ocean Ridge

Unmapped/
data coverage
not online

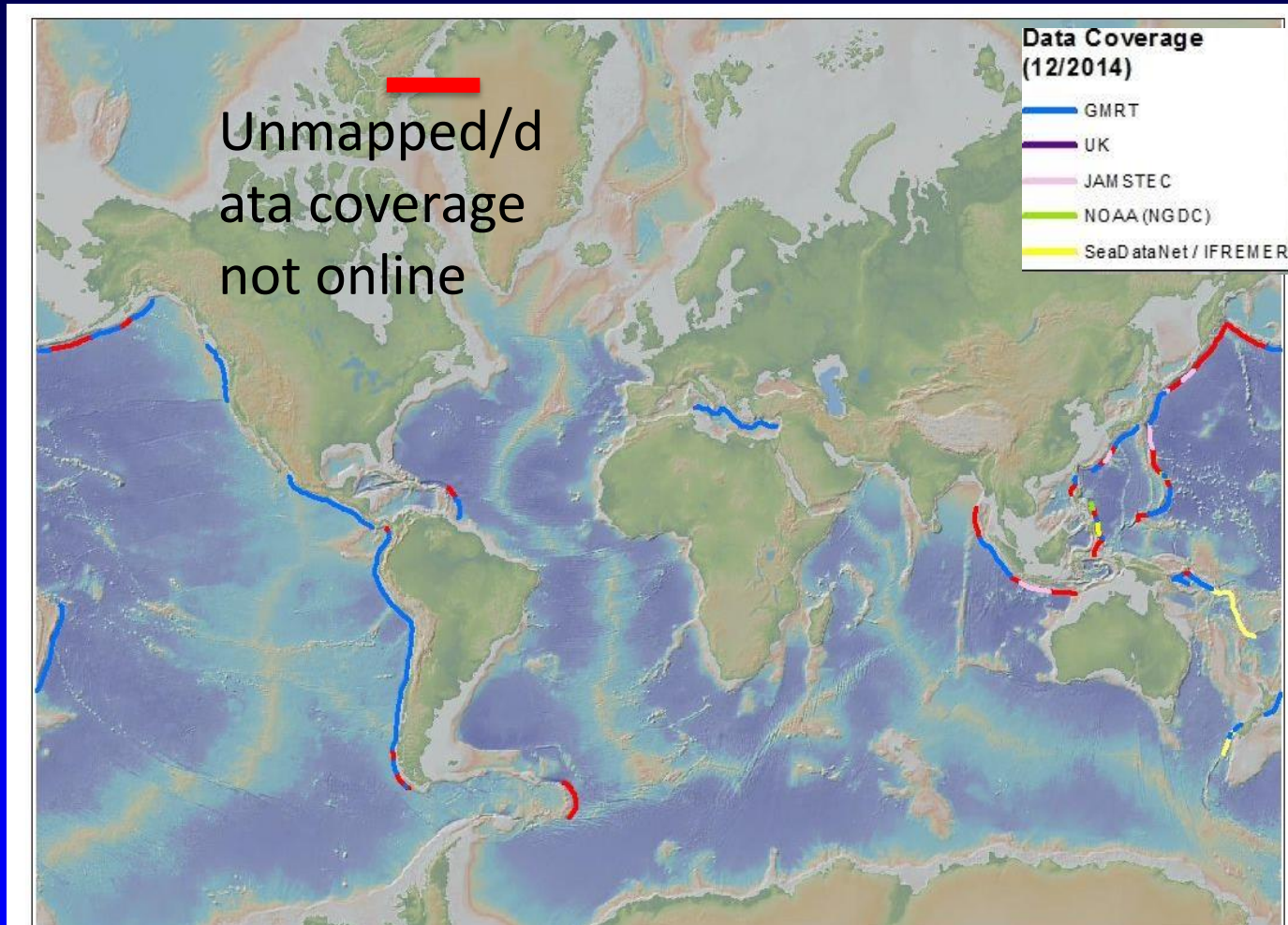


60% in Open
access archives

~22% Unmapped
in web accessible
archives

- Pacific-Antarctic Ridge
- Central Indian Ridges
- Arctic Ridges

Swath Sonar Mapping Coverage for Subduction Zones



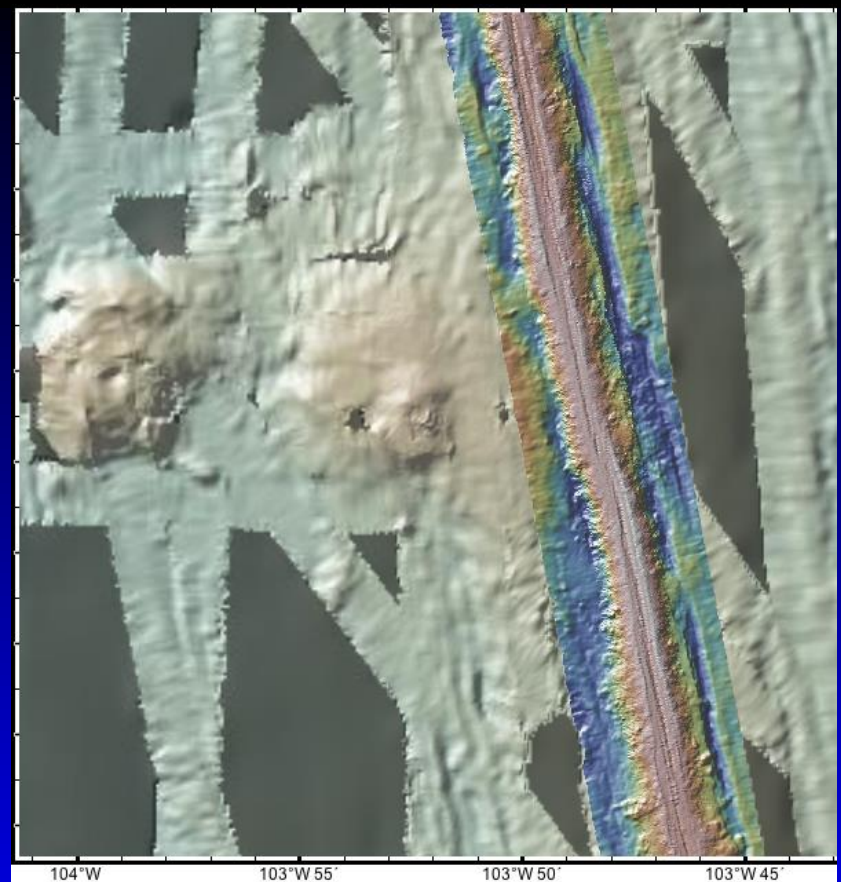
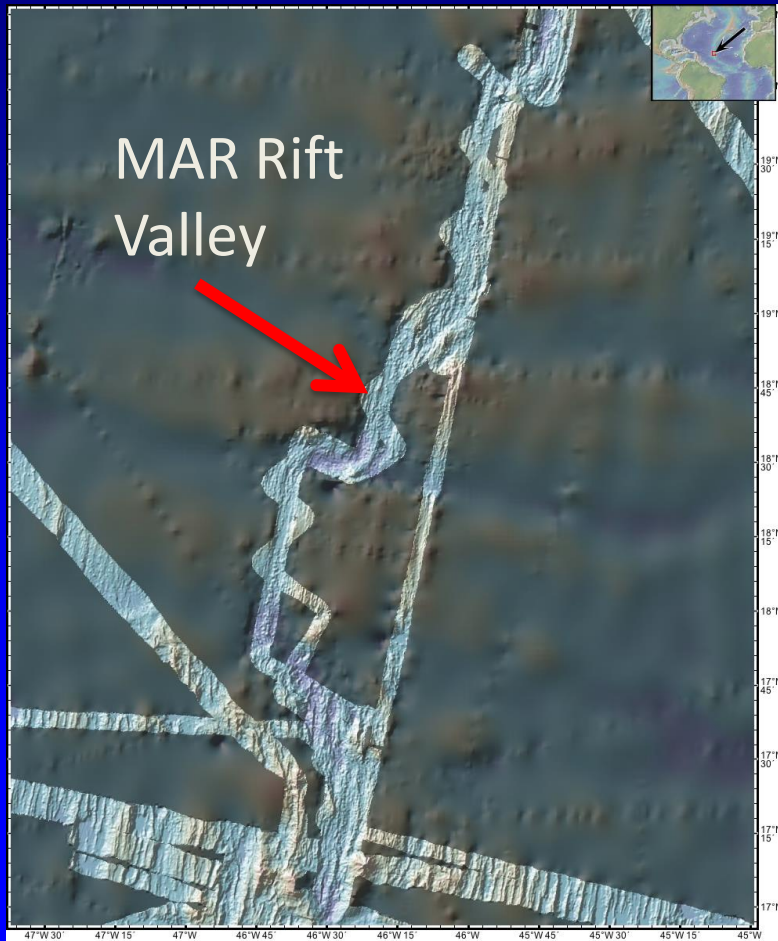
70% in open access archives

Unmapped in web accessible archives

~ 15%

- Kuril/Aleutian
- Java
- South Sandwich

Much MOR mapped with early generation Seabeam “Classic” – narrow swath, pre-full coverage GPS



Modern systems provide >2x improvement in resolution and ~5x improvement in coverage over early generation swath mapping

Summary

- While only ~10-15% of the global oceans have been mapped with swath sonar, percent of the global plate boundaries with some swath coverage is much higher.
- Partial (much pre-GPS) coverage available in public archives for ~60-70% of MOR and subduction zones.
- Adding coverage from restricted access archives – some data for 75-85% of the world's subduction zones and MOR
- Global compilations - opportunities for new global comparisons
- Modern sonars provide improvements in resolution/coverage – worth collecting new data in areas of old sparse coverage!