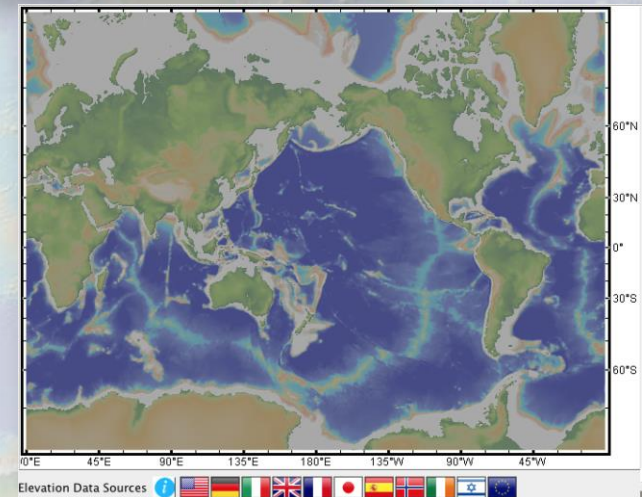
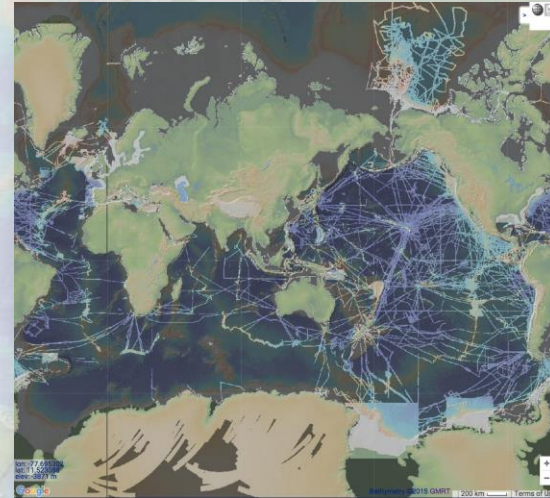


RESTful Services and an Augmented Map-based User Interface for the GMRT Synthesis

Vicki Ferrini, John Morton, Benjamin Barg,
Mollie Celnick, Kevin McLain, Frank Nitsche,
Suzanne O'Hara, Suzanne Carbotte

Global Multi-Resolution Topography

- Dynamically maintained tiled synthesis
- Mercator, South Polar, North Polar
- Complementary Tile-sets
 - Images, Grids, Mask
- Comprehensive Metadata
 - Attribution
 - Access to source data
- Compilation began in 1992
 - Since 2011, 2 releases (~80 cruises MB data) per year
- Multiple Apps for Access
 - Web, Java, iOS



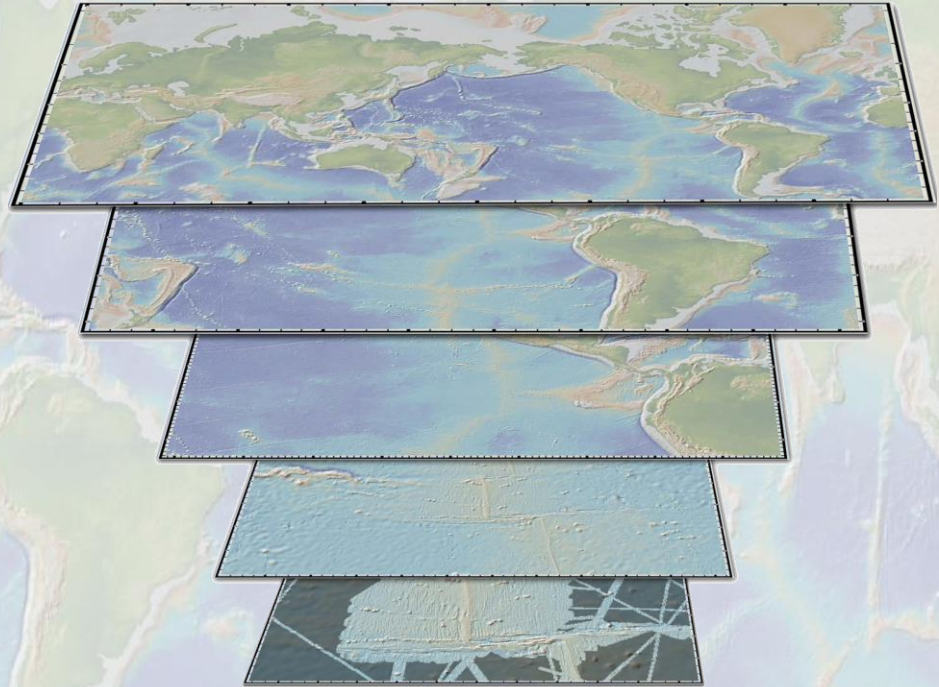
GMRT Grid Components

Land elevation
(30-10 m res)

Global & Regional
Grids (≥ 500 m res.)
e.g. *GEBCO_2014*

Contributed
Grids (< 500 m res.)

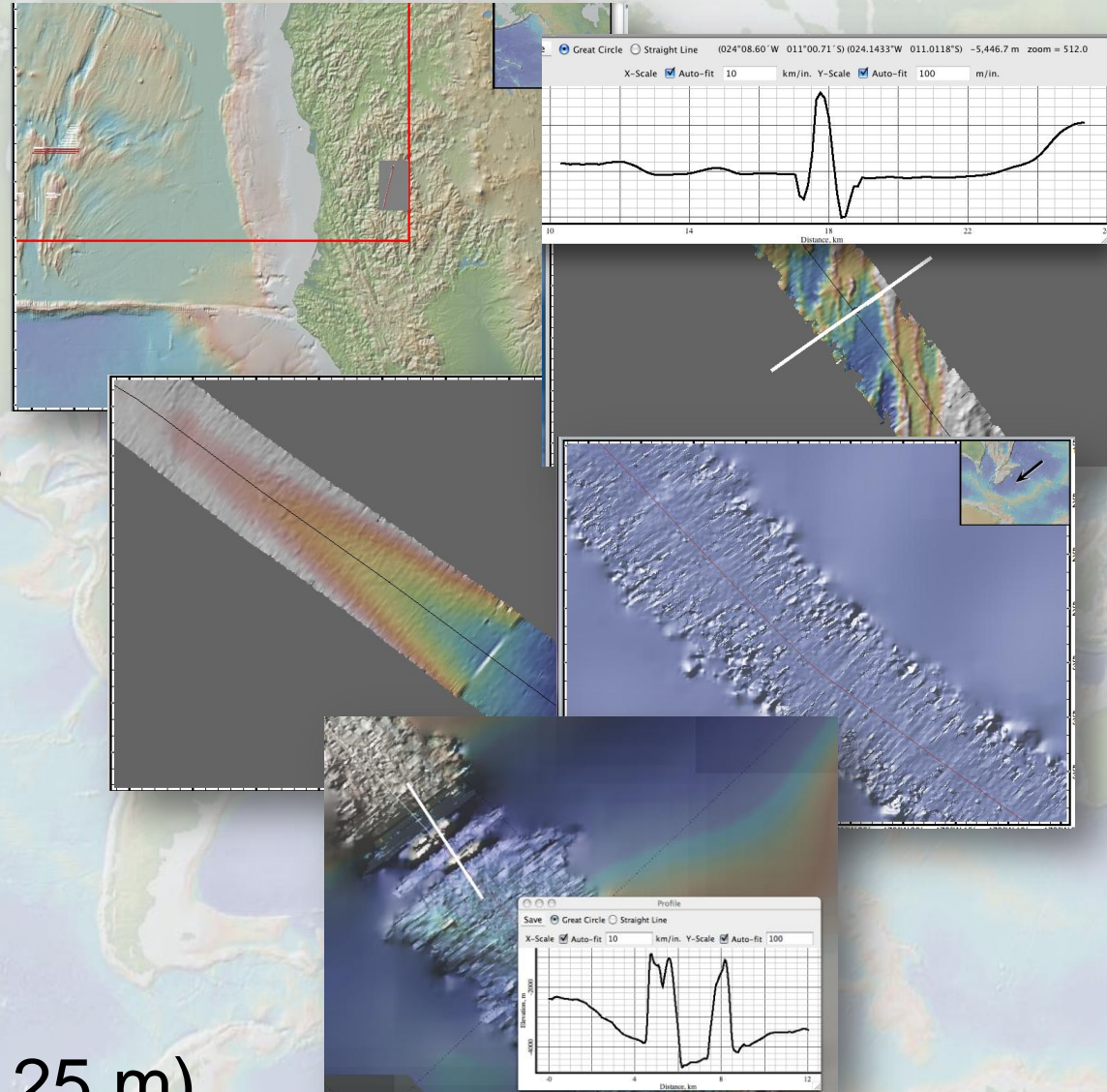
LDEO 100-m MB
compilation*



*LDEO team processes swath files (public domain, primarily US Academic)

Multibeam Data Preparation

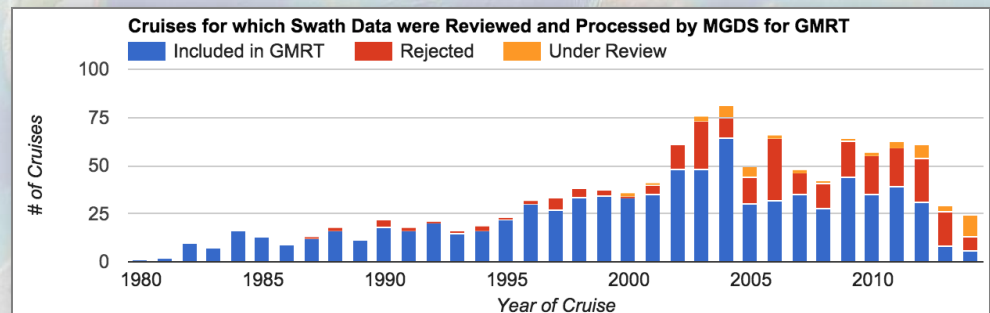
- Bad navigation
- Noisy outer beams
- Attitude problems
- Bad soundings
- Instrument problems
- Bad weather
- Sound velocity
- Attitude Offsets
- Slow speed in turns
- Grid weighting
- Resolution (**100**, 50, 25 m)



Processing done with MB-System

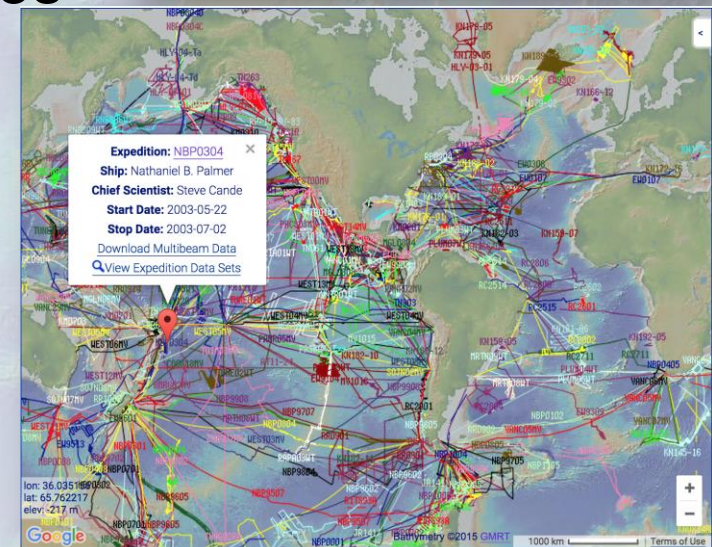
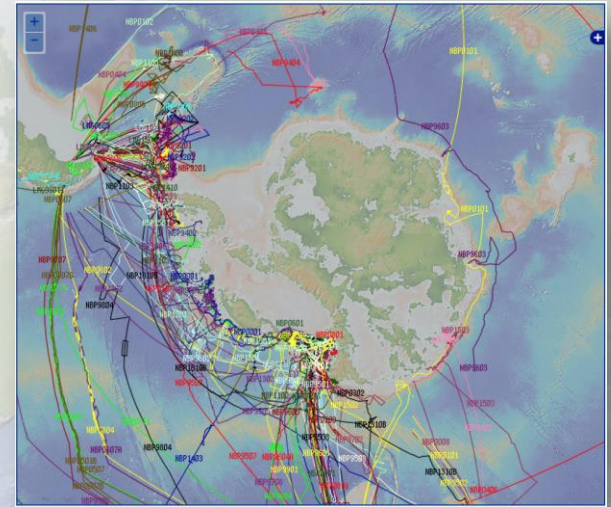
GMRT – 2015 Content Updates

- GMRT v3.0 – *June 2015*
 - Mercator Basemap Upgrade (GEBCO_2014)
 - 38 additional cruises of swath data (844 Total)
 - Updated SP WMS
 - Grid composition enhancements
- GMRT v3.1 - *October 2015*
 - 30+ additional cruises
- New Data Contributors
 - *Falkor*
 - *Okeanos Explorer*



GMRT – Web Services

- Broaden access to GMRT
- Web Map Services
 - Mercator
 - masked, un-masked, track-lines
 - South Polar
 - masked, un-masked, track-lines
- RESTful Web Services
 - GridServer
 - Attribution Service
 - ImageServer



GMRT RESTful Web Services

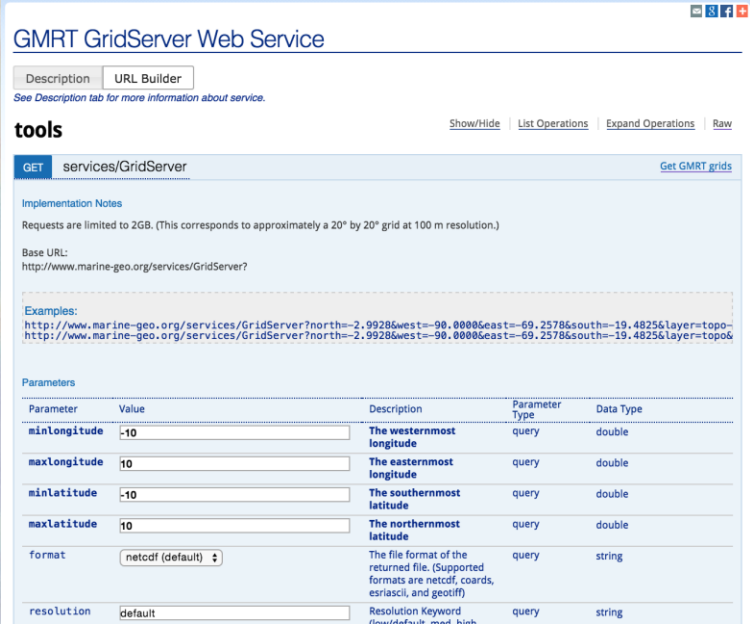
- Improve programmatic access to GMRT grids and images
 - Simple, lightweight, maintainable, scalable services
 - Integrate into GMRT web-apps
- Developed as part of broad community initiative to develop standard “building block” web services
 - Service Parameters
 - Response codes
 - Documentation standards (html, xml) + URL builder



EARTH CUBE

GMRT GridServer

- Bounding Box
- Multiple Format Options
 - GMT NetCDF
 - Coords NetCDF
 - ArcASCII
 - GeoTIFF
- Resolution Options
 - Dependent on size of area selected
 - 2GB file size limit
 - Max res 50m (higher res exists in some places)
- Complementary Attribution Service
 - Cruises, Swath Files, Contributed Grids



GMRT GridServer Web Service

Description URL Builder
[See Description tab for more information about service.](#)

tools [Show/Hide](#) [List Operations](#) [Expand Operations](#) [Raw](#)

GET services/GridServer [Get GMRT grids](#)

Implementation Notes
Requests are limited to 2GB. (This corresponds to approximately a 20° by 20° grid at 100 m resolution.)

Base URL:
<http://www.marine-geo.org/services/GridServer?>

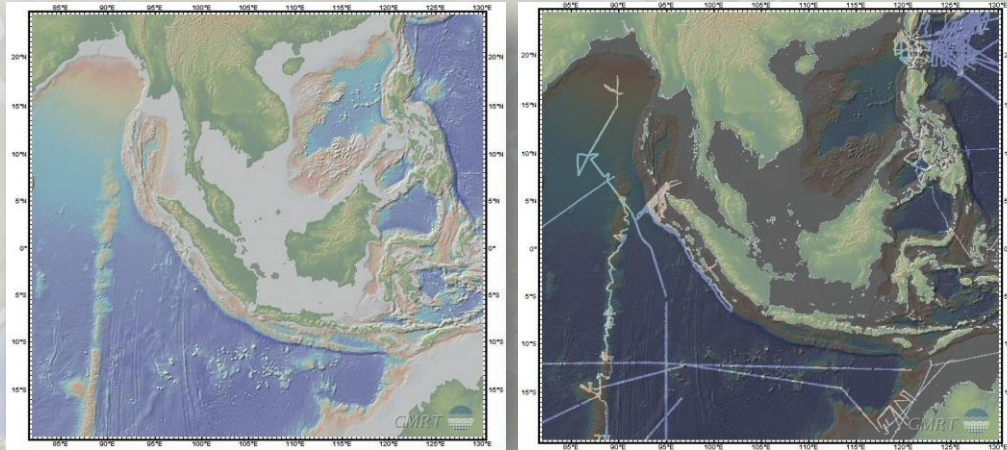
Examples:
<http://www.marine-geo.org/services/GridServer?north=-2.9928&west=-90.0000&east=-69.2578&south=-19.4825&layer=topo6>
<http://www.marine-geo.org/services/GridServer?north=-2.9928&west=-90.0000&east=-69.2578&south=-19.4825&layer=topo6>

Parameters

Parameter	Value	Description	Parameter Type	Data Type
minlongitude	<input type="text" value="-10"/>	The westernmost longitude	query	double
maxlongitude	<input type="text" value="10"/>	The easternmost longitude	query	double
minlatitude	<input type="text" value="-10"/>	The southernmost latitude	query	double
maxlatitude	<input type="text" value="10"/>	The northernmost latitude	query	double
format	<input type="text" value="netcdf (default)"/>	The file format of the returned file. (Supported formats are netcdf, coords, esriascii, and geotiff)	query	string
resolution	<input type="text" value="default"/>	Resolution Keyword (default: med, high)	query	string

GMRT ImageServer

- Bounding Box
- Masked/Un-masked
- Format
 - JPG only
- Resolution Options
 - 8000 x 8000 pixels
 - Higher res available upon request



GMRT ImageServer Web Service

Description URL Builder

See Description tab for more information about service.

tools

[Show/Hide](#) [List Operations](#) [Expand Operations](#) [Raw](#)

GET services/ImageServer

[Get GMRT Images](#)

Implementation Notes

Requests are limited to 8000 pixels in width or height.

Base URL:
<http://www.marine-geo.org/services/ImageServer?>

Examples:

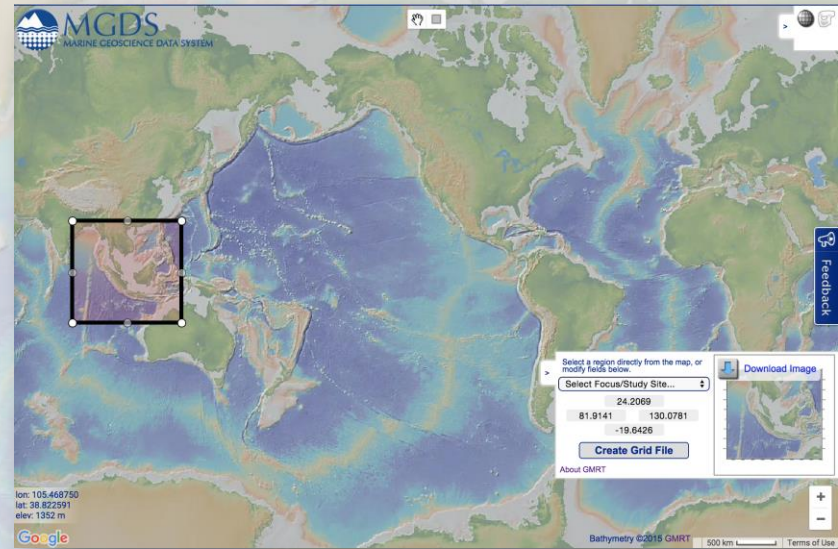
<http://www.marine-geo.org/services/ImageServer?maxlatitude=-2.9928&minlongitude=-90.0000&maxlongitude=-69.2578&minl>
<http://www.marine-geo.org/services/ImageServer?maxlatitude=-2.9928&minlongitude=-90.0000&maxlongitude=-69.2578&minl>

Parameters

Parameter	Value	Description	Parameter Type	Data Type
minlongitude	<input type="text" value="-10"/>	The westernmost longitude	query	double
maxlongitude	<input type="text" value="10"/>	The easternmost longitude	query	double
minlatitude	<input type="text" value="-10"/>	The southernmost latitude	query	double
maxlatitude	<input type="text" value="10"/>	The northernmost latitude	query	double
width	<input type="text" value="1000"/>	Nearest pixel width desired. Maximum value is 8000; higher values will be ignored.	query	integer
mask	<input type="text" value="false (default)"/>	True = highlight high-resolution data	query	string

GMRT MapTool

- Web App/UI
- Google Maps
- Leverage Web Services
 - WMS
 - GridServer
 - ImageServer
 - Elevation Point Service
- Coming Soon
 - Profile Service
 - Attribution Service



Grid Download

Citation Information

Ryan, W.B.F., S.M. Carbotte, J.O. Coplan, S. O'Hara, A. Melkonian, R. Arko, R.A. Weissel, V. Ferrini, A. Goodwillie, F. Nitsche, J. Bonczkowski, and R. Ziemsky (2009). Global Multi-Resolution Topography synthesis, *Geochem. Geophys. Geosyst.*, 10, Q03014, doi: [10.1029/2008GC002332](https://doi.org/10.1029/2008GC002332)

File Format

- GMT v3 Compatible NetCDF (GMT id:cf) ?
- Coards/CF Compliant NetCDF (GMT id:nd) ?
- GeoTIFF ?
- ArcASCII ?

Mask

- Unmasked
- Masked

Unmasked grids are filled with *GEBCO_08* where high-resolution data do not exist in the ocean.

File Size:

1.7MB

Grid Resolution:

7820.94 m/node

Grid Width:

685 nodes

Grid Height:

642 nodes

Bounds:

West: 81.914062

East: 130.078125

South: -19.642588

North: 24.206890

Projection:

Cylindrical Equidistant

(WGS84 spheroid)

GMRT Version:

3.0

(Released June 2015)

Grid Resolution

dependent on size of selected area

- Low** 7820 m/node
File size: ~2MB
- Medium** 3910 m/node
File size: ~7MB
- High** 1955 m/node
File size: ~27MB
- Maximum** 488 m/node
File size: ~27MB

Download Grid

Cancel

Data Processing Reports



Data Acquisition

Data Documentation & Preservation

Data Reduction & Synthesis

GMRT Multibeam Data Report

MGL1211 (2012)

R/V Marcus G. Langseth
Kongsberg EM122
Chief Scientist: Suzanne Carbotte
[Related Information at MGDS](#)

Data Summary

1114 Data Files Processed (1201 Reviewed)
93% of swath files were included in GMRT
Ship-Track Coverage: 4822.4 km

Rolling Deck to Repository (R2R)

- Data Set Quality Rating
- percent pings valid altitude
- percent pings valid water depth
- percent files all valid sonar draft
- percent files with bathymetry
- has surface sound velocity
- mean across track slope
- acrosstrack beam noise
- percent good bathymetry variance beams

Total number of raw swath files: 1201

[View R2R QA Dashboard for MGL1211](#)

[View R2R QA Certificate \(XML\)](#)

[Download Raw Swath Files](#)

Multibeam Advisory Committee (MAC)

[MAC Resources](#)



[<< Back](#)

- GMRT Metadata
 - Chief Scientist
 - Country
 - Device Info
 - Links to related data
 - Processing summary
- R2R QA (Quality Assessment) results
- MAC related resources & reports

Improving Swath Geometries

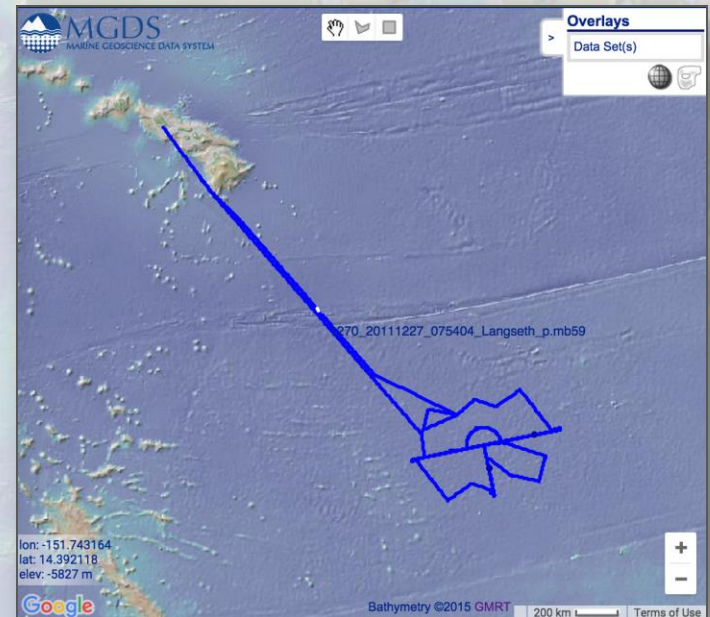
- Track-line Geometries

- Used to approximate extent of coverage (WMS)
 - Relational Database (PostgreSQL, PostGIS)
 - Complements mask
- Ship-track length covered for each cruise/release
- Select file functionality
- Attribution service

- Polygon Geometries



- Precise extent of coverage
- Compute area mapped
 - Per file, cruise, GMRT release
- Outreach (e.g. Google Tour, ESRI Story Board?)



Next Steps...

- Publish Attribution, Point and Profile Web Services (Dec 2015)
 - Abstracts, URL Builder
- Integrate Attribution + Profile Services into GMRT MapTool (Dec 2015)
- Augment Data Processing Reports (Dec 2015)
 - Polygon geometries
 - Area mapped for each cruise
- Rebuild SP base map (Jan 2016)
- Develop/Launch NP WMS (2016)

<http://gmrt.marine-geo.org>