



**British Oceanographic
Data Centre**

NATURAL ENVIRONMENT RESEARCH COUNCIL

The route towards a new GEBCO grid

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British Oceanographic Data Centre (BODC)**

GEBCO TSCOM/SCRUM meeting, Monaco, October 2012



The route towards a new GEBCO grid

- Grid updating work
 - Data sets planned for inclusion in the next release of the GEBCO grid
 - GEBCO's base grid
- Compilation and QC of metadata for survey data sets used to generate the GEBCO grid

Grid updating work

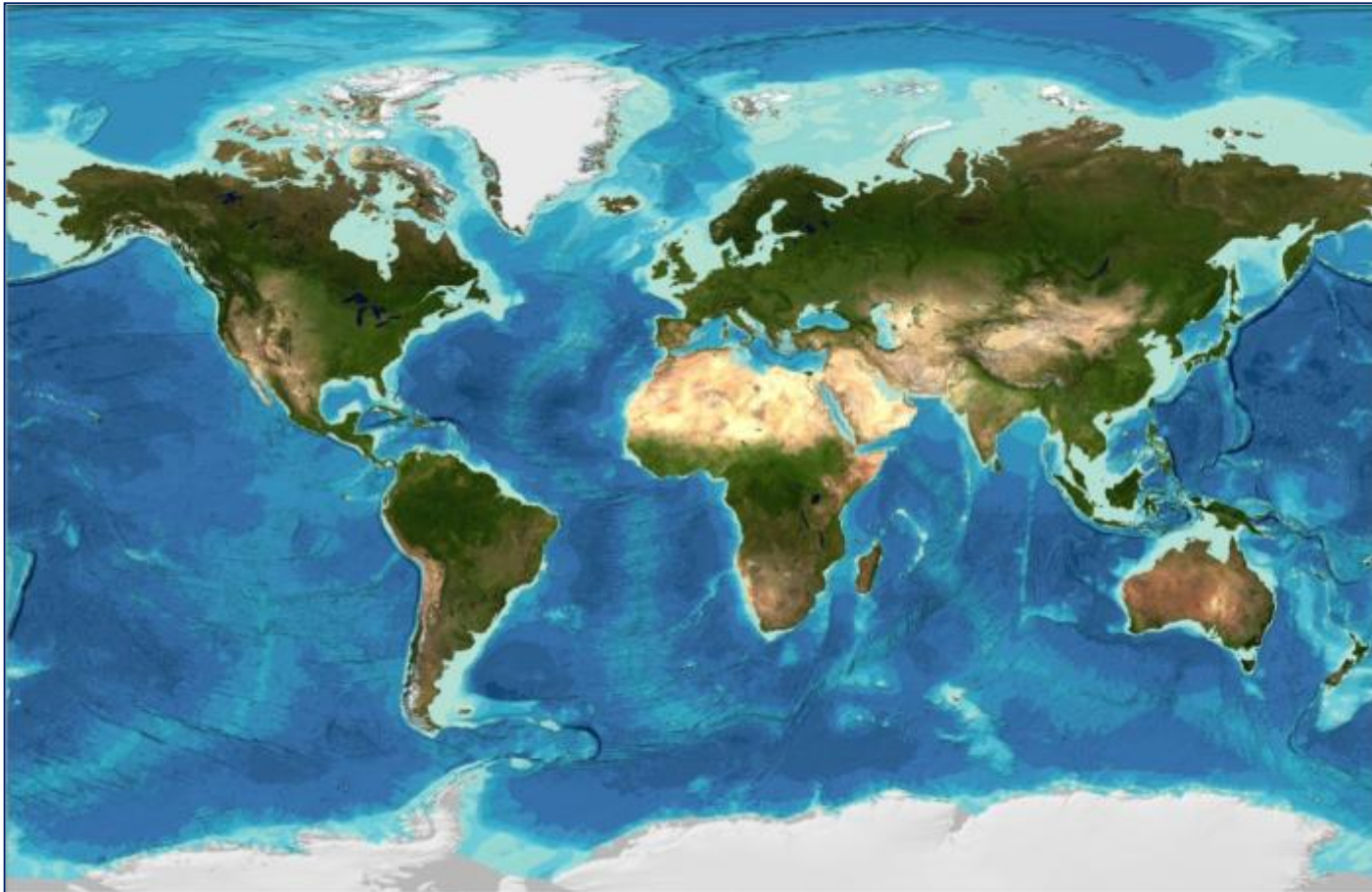
Background to the GEBCO_08 Grid

The GEBCO_08 Grid is a global terrain model at 30 arc-second intervals

- Built from a database of ship track soundings with interpolation between soundings guided by satellite-derived gravity data
- Where they improve on this existing base grid data sets developed by other methods are included
- Accompanied by a Source Identifier (SID) Grid – indicating which cells in the GEBCO_08 Grid are based on soundings or existing grids and which are interpolated

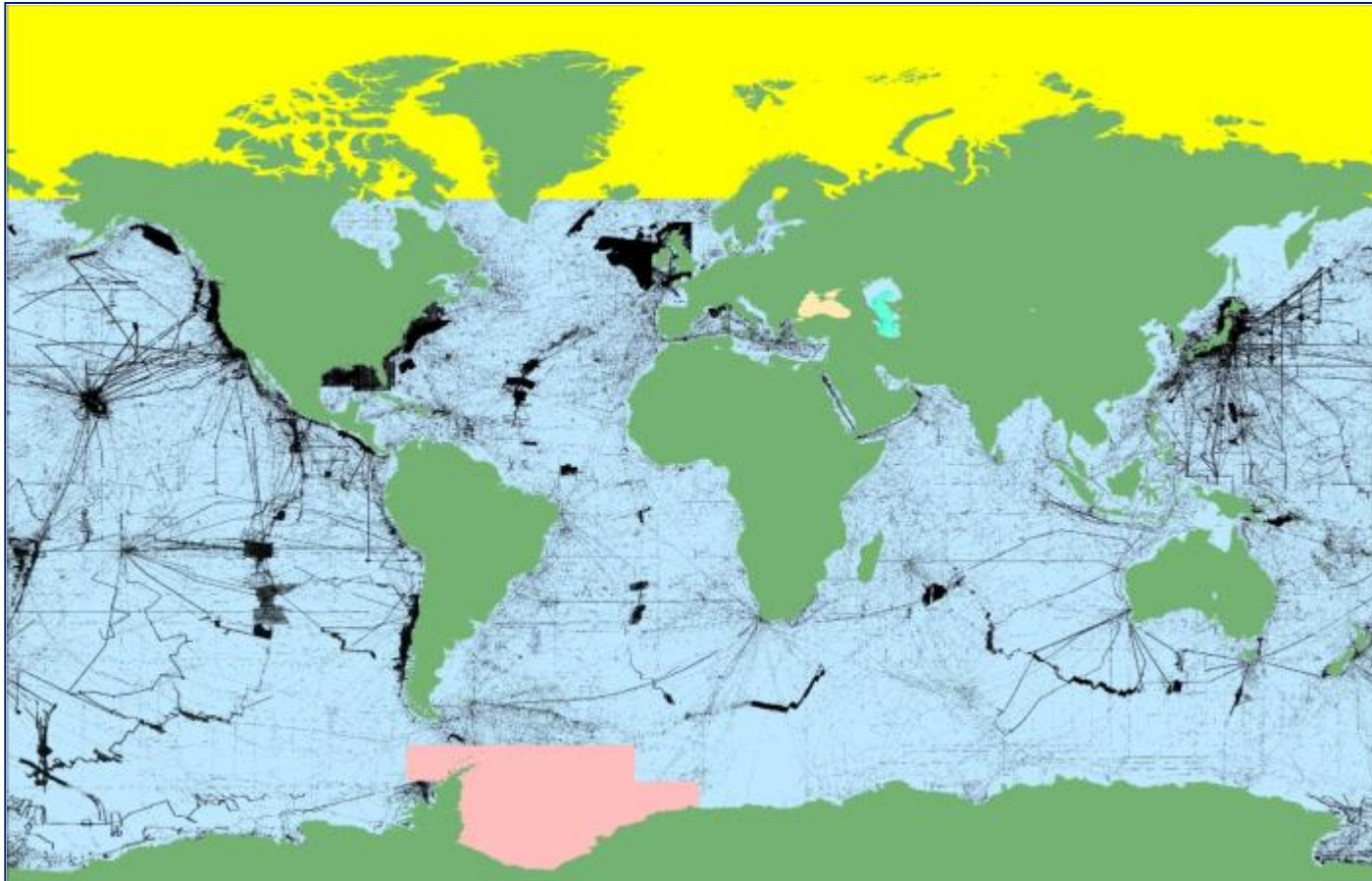
Grid updating work

GEBCO_08 Grid



Grid updating work

GEBCO_08 SID Grid – source data coverage



Grid updating work

The GEBCO grid was originally released in January 2009 with updates published in November 2009 and November 2010

Grid updating work

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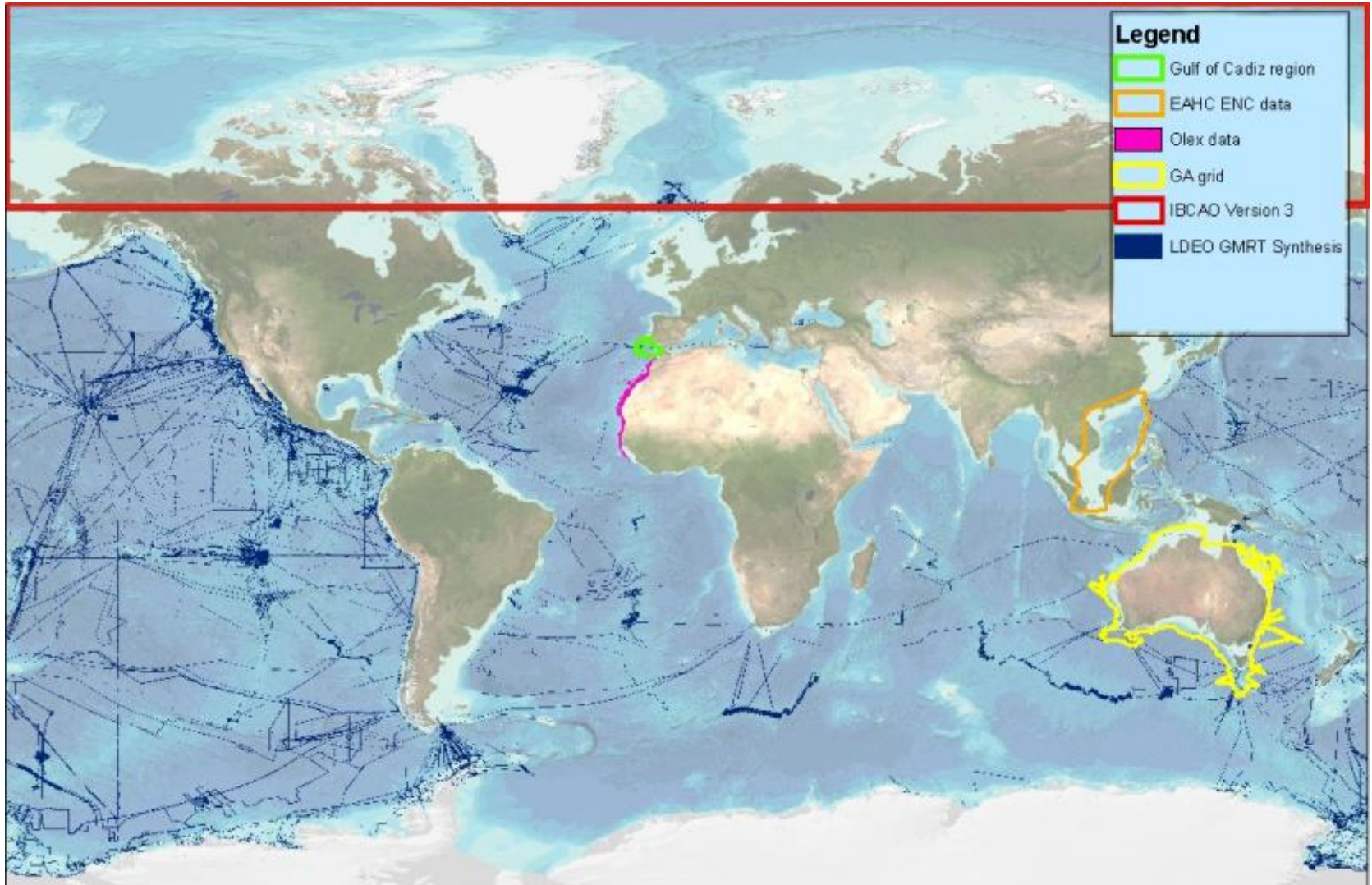
It is planned to release a new version of the data set before the end of 2012

Grid updating work

Planned updates for the next release of the GEBCO_08 Grid include:

- International Bathymetric Chart of the Arctic Ocean (V3)
- Data from Geoscience Australia's Bathymetry and Topography Grid, 2009
- Sub-region from the Olex data set
- ENC-extracted bathymetric soundings for the South China Sea region
- Data from the LDEO Global Multi-Resolution Topography (GMRT) synthesis (400m resolution)
- Gulf of Cadiz region – using a grid based on multibeam data
- Data from surveys such as: RRS Charles Darwin CD168, HMS Scott 2005 (Sumatra subduction zone), RV Sonne SO180

Grid updating work



Grid updating work

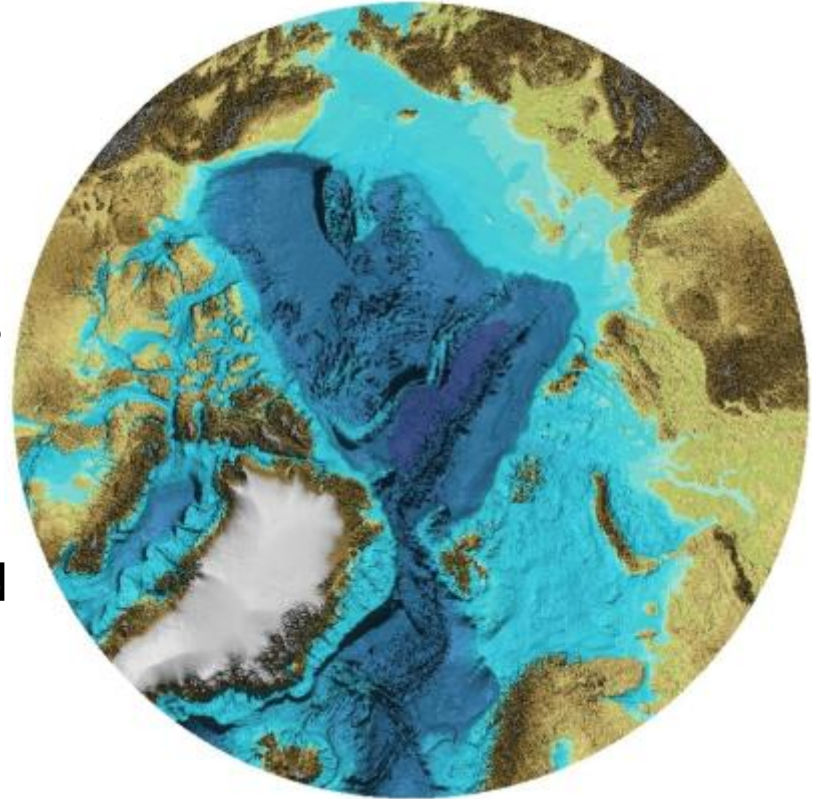
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- Sub-region from the Olex data set
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- Gulf of Cadiz region – using a grid based on multibeam data

Grid updating work

IBACO Version 3

- Covers Arctic waters north of 64N. Version 3 includes new bathymetric data from a number of sources, such as the circum-Arctic nations, fishing vessels, US Navy submarines and research ships from various nations.
- Data from IBCAO V3 has been included in the GEBCO_08 Grid ready for publication in the next release of the data set.



<http://www.ibcao.org/>, doi: [10.1029/2012GL052219](https://doi.org/10.1029/2012GL052219)

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Grid updating work

Geoscience Australia's (GA) Bathymetry and Topography Grid, 2009

The data set covers the area 92°E-172°E; 8°S-60°S.

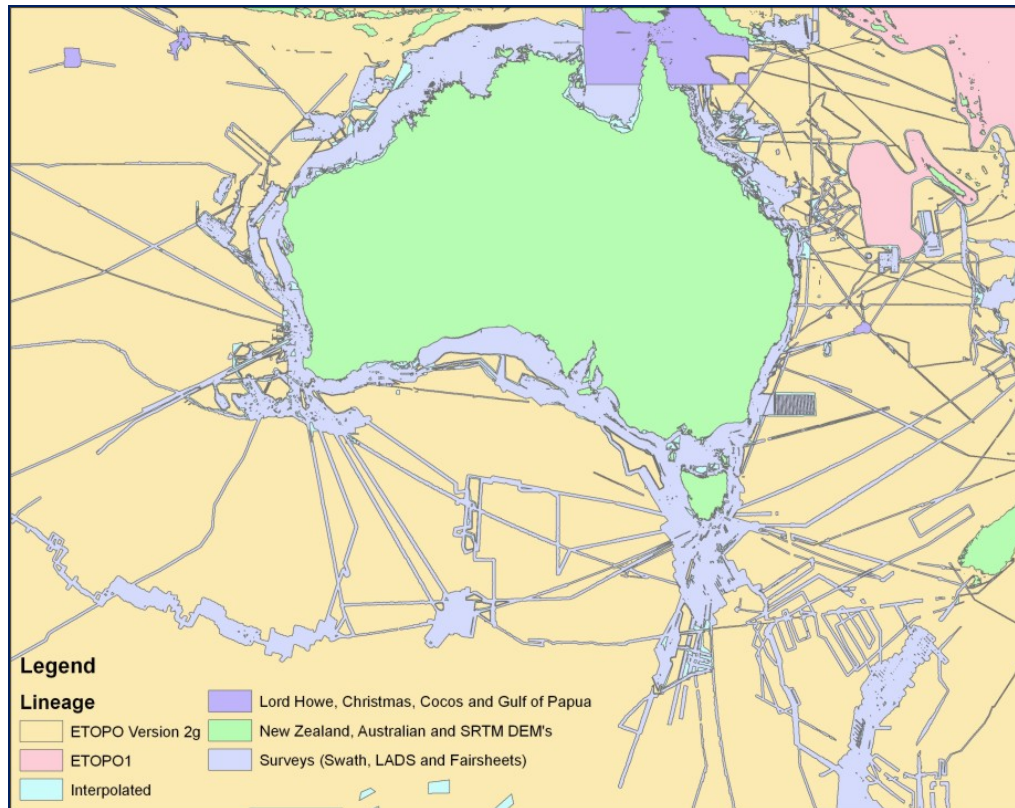
The near-shore data are based on:

- Multibeam data
- Fairsheets (1:250,000 Series)
- Laser Airborne Depth Sounder (LADS) data

Grid updating work

Geoscience Australia's Bathymetry and Topography Grid, 2009

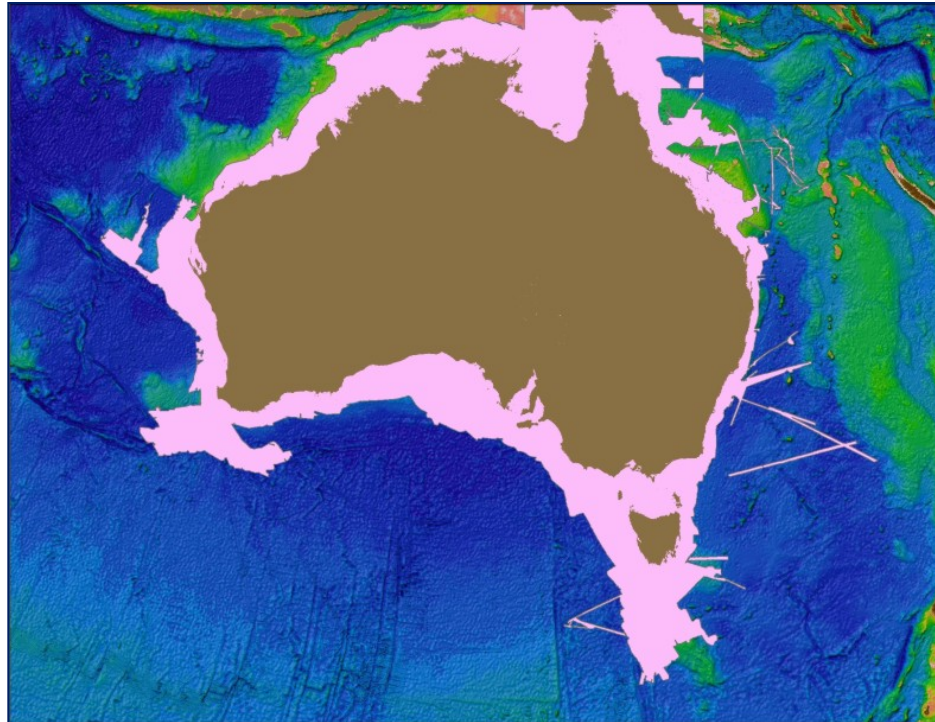
Data set lineage



Grid updating work

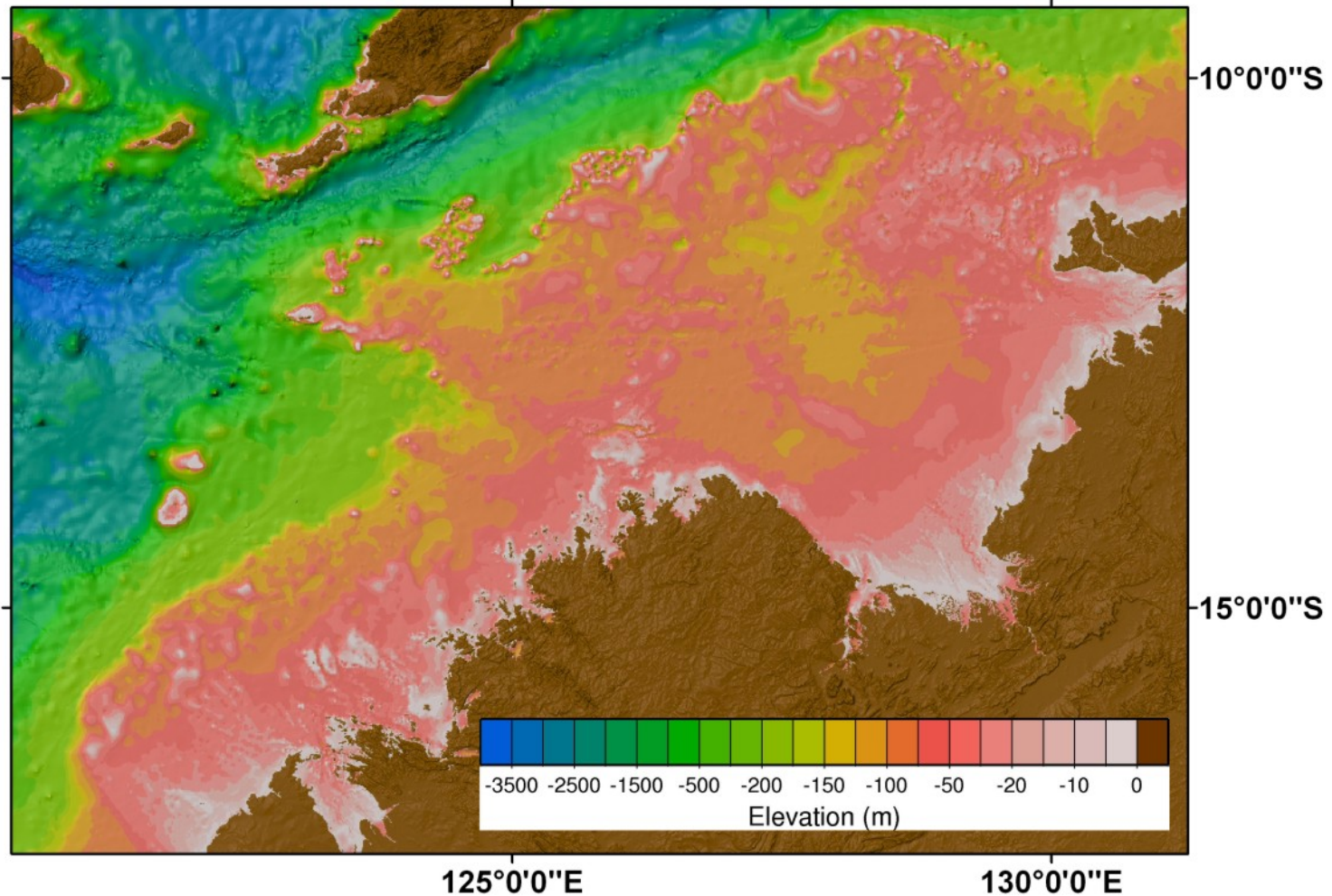
Geoscience Australia's Bathymetry and Topography Grid, 2009

Data from the GA grid for near-shore regions around Australia has been included in the GEBCO_08 Grid ready for publication in the next release of the data set.



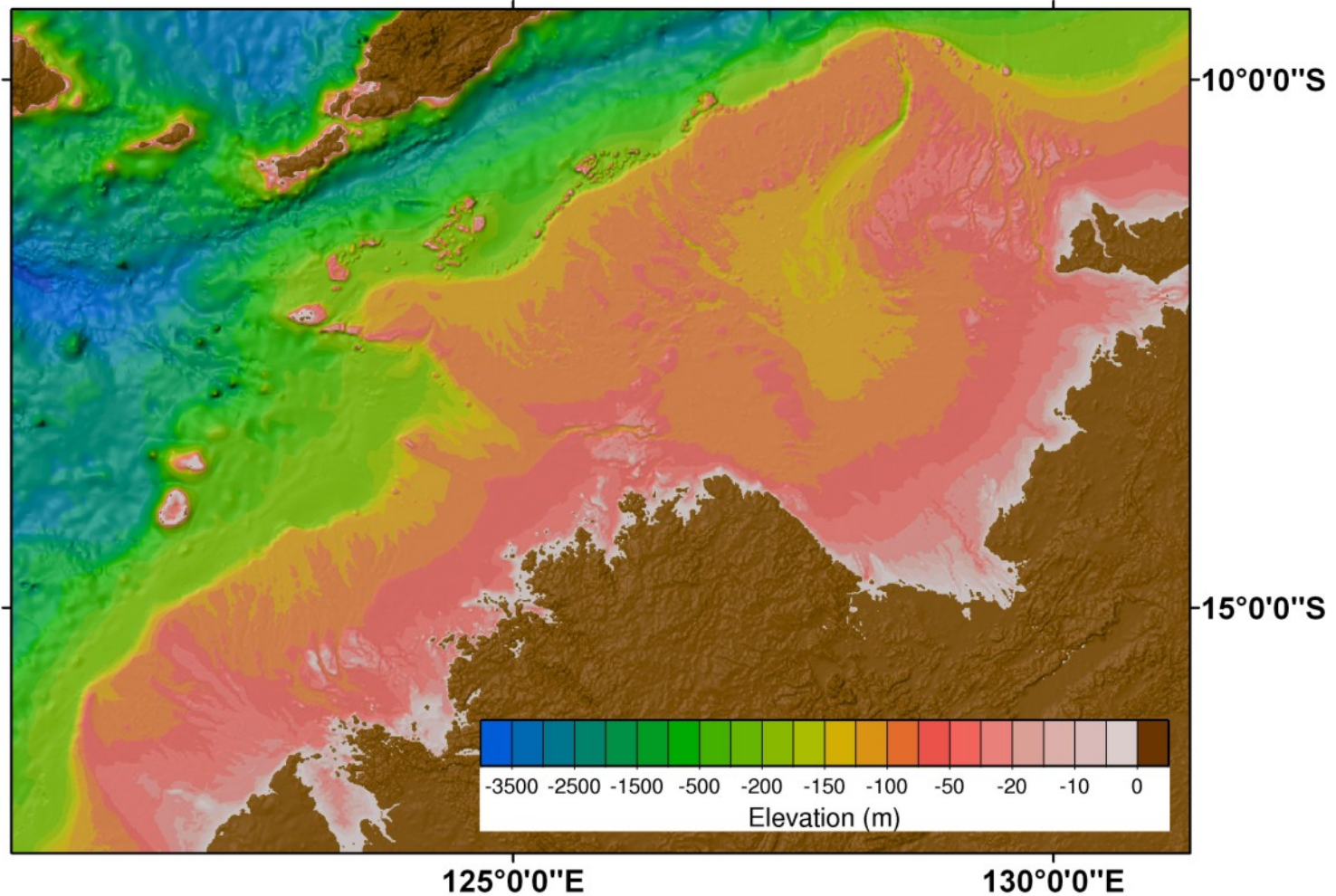
Grid updating work - inclusion of data from the GA Grid

Current GEBCO_08 Grid – off north western coast of Australia



Grid updating work - inclusion of data from the GA Grid

Combined GEBCO_08 and GA grid



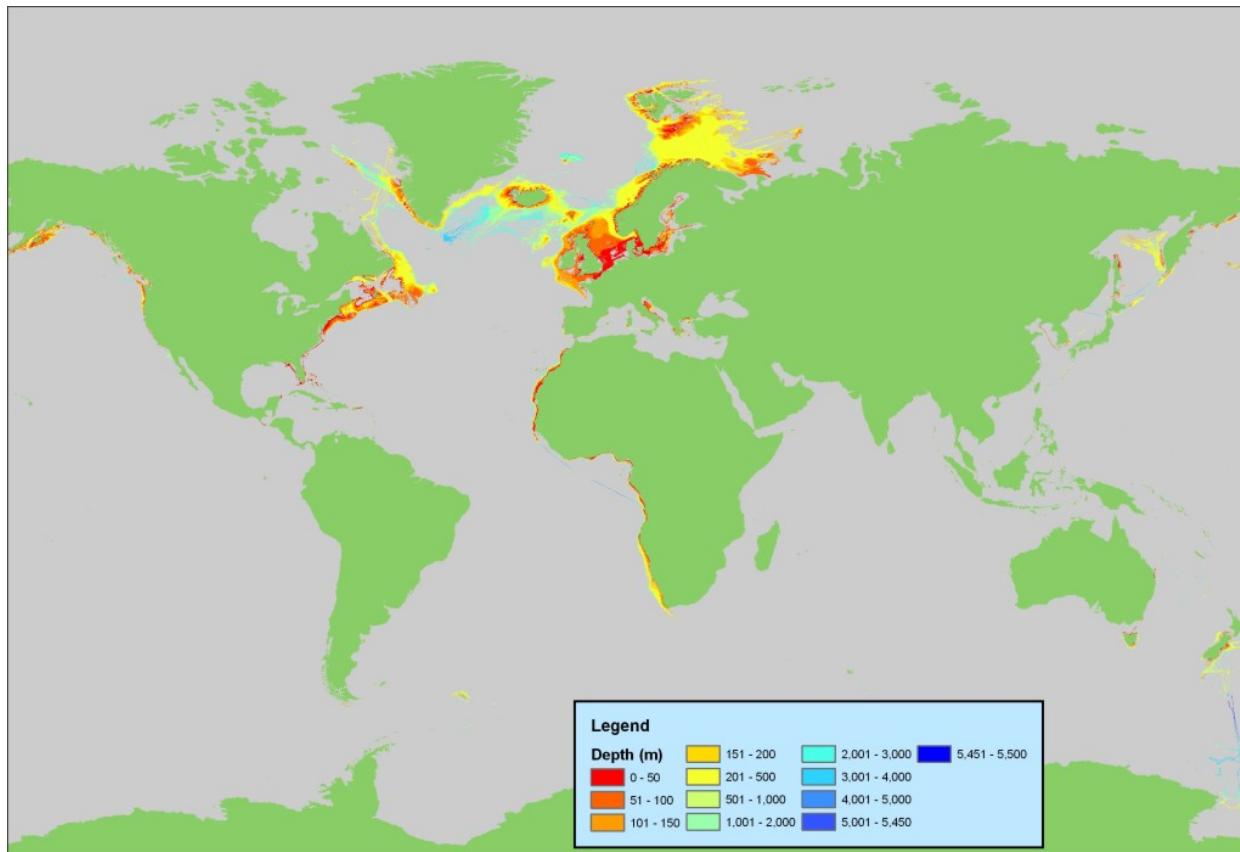
Grid updating work

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Grid updating work

Olex has made available to GEBCO a sub-sample of their global marine soundings database. This data set is largely focused in shallower water regions, mainly in the North Atlantic region.



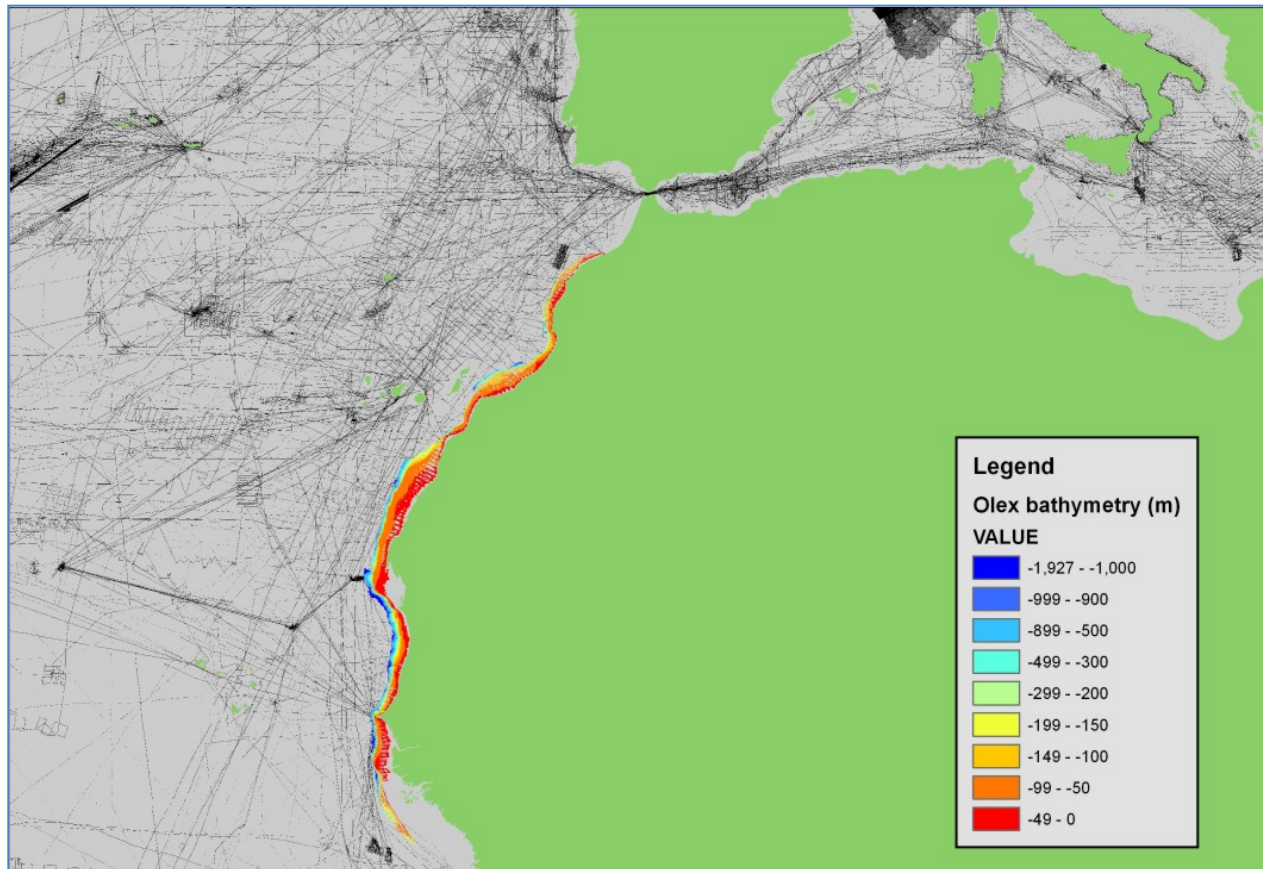
Grid updating work – inclusion of data from the Olex data set

Example area off West Africa - GEBCO_08 Grid source data coverage (SID Grid)



Grid updating work – inclusion of data from the Olex data set

Example area off West Africa – coverage of Olex data included in GEBCO_08 Grid ready for publication in the next release of the data set

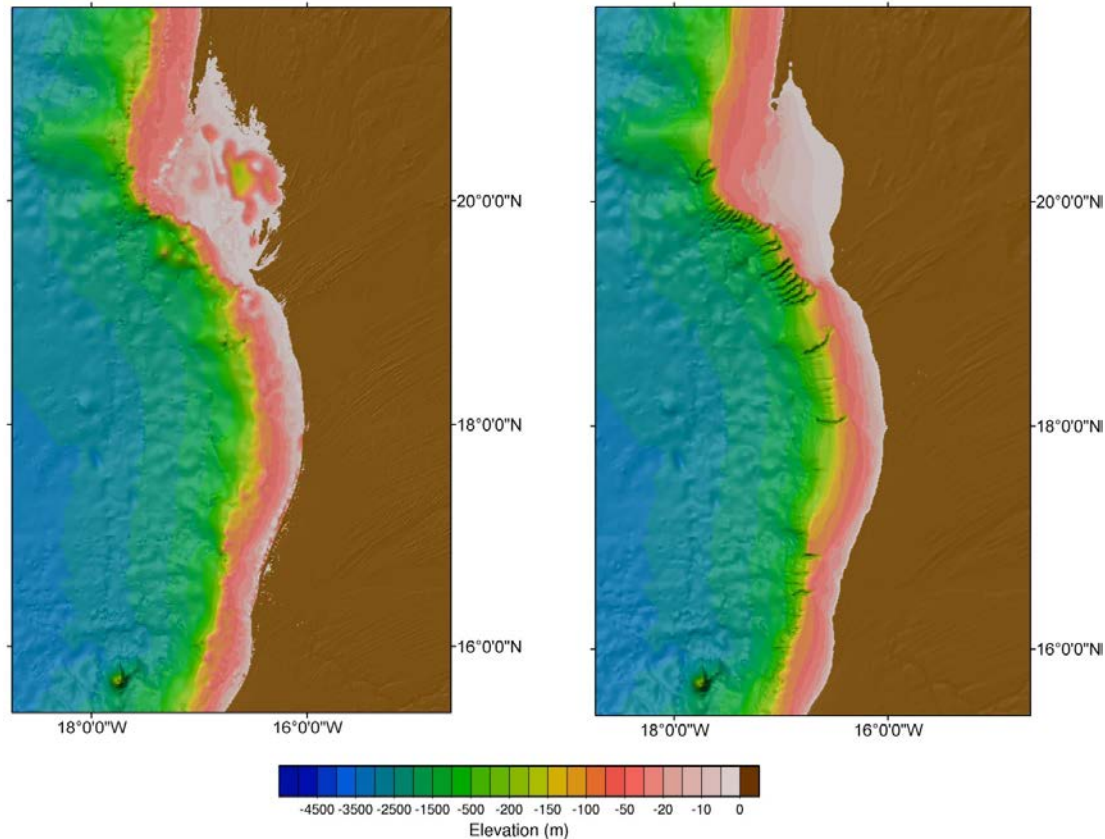


Grid updating work – inclusion of data from the Olex data set

Example area off West Africa

Current GEBCO_08 Grid

Grid updated using Olex data



Grid updating work

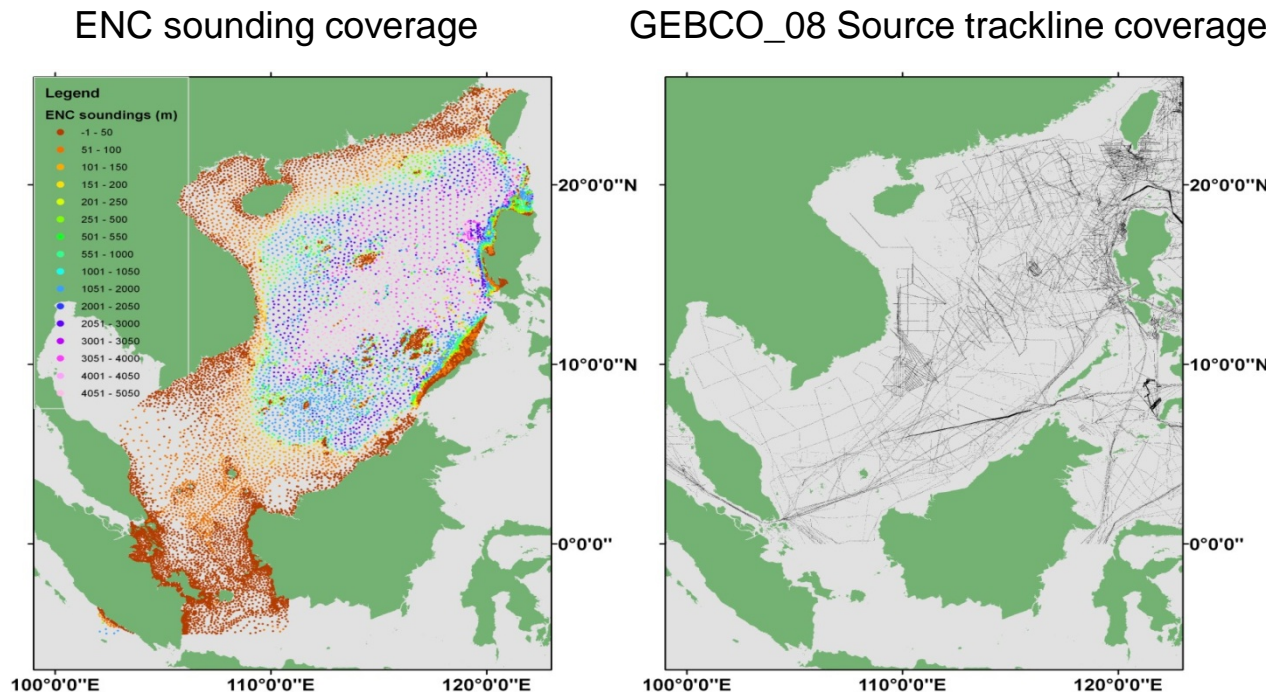
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Grid updating work – ENC soundings in the South China Sea region

- Data supplied by East Asia Hydrographic Commission for part of the South China Sea region (101°E-122°E; 5° 22'S-26°N).
- Over 8,500 soundings in waters of a depth of 200m or shallower.

Data for shallow water regions has been included in the GEBCO_08 Grid ready for publication in the next release of the data set.



Grid updating work

Planned updates for the next release of the GEBCO_08 Grid include:

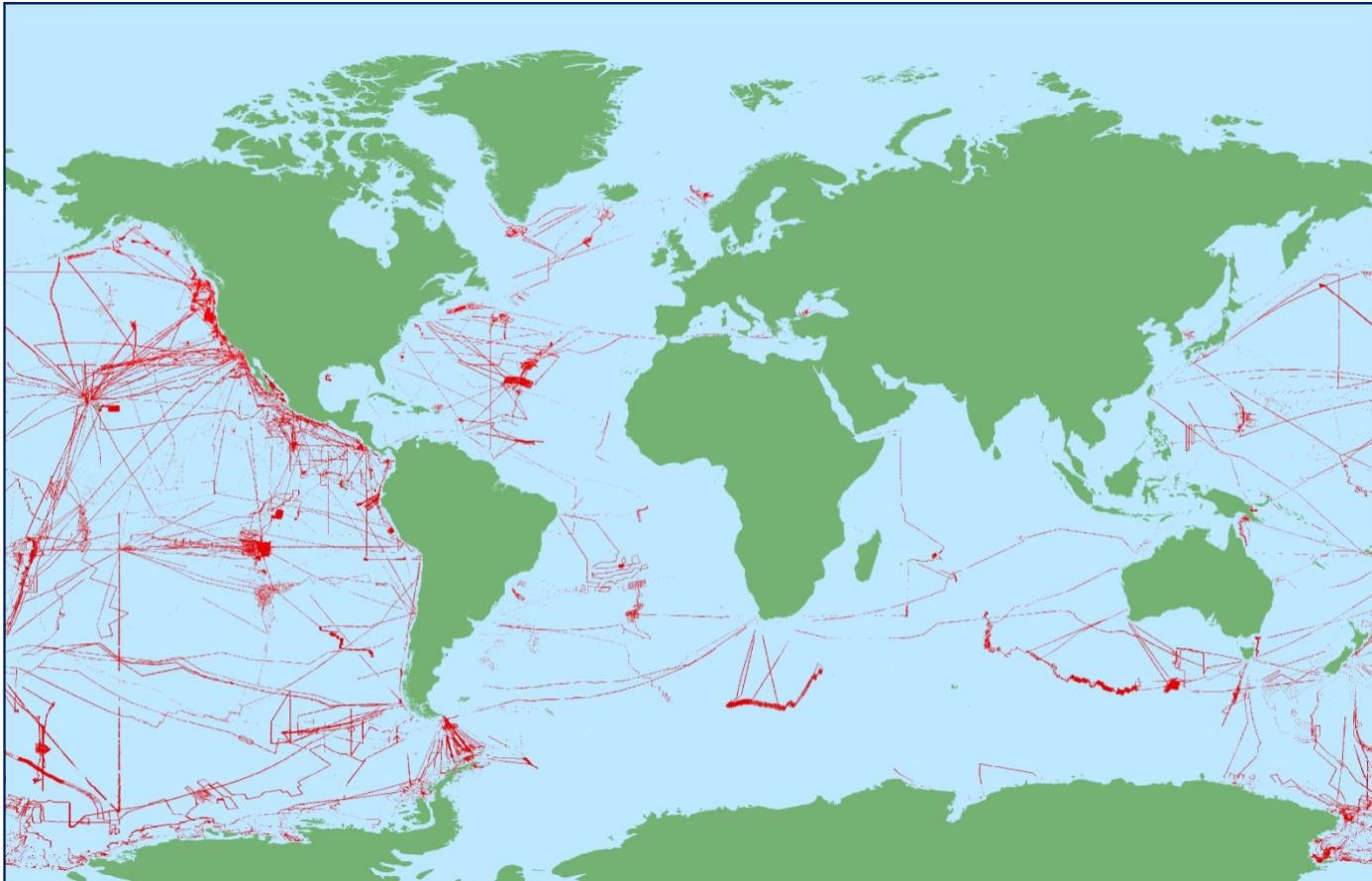
- International Bathymetric Chart of the Arctic Ocean (V3)
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Grid updating work – LDEO GMRT Synthesis

- LDEO have provided over 9,600 data tiles from their Global Multi-Resolution Topography (GMRT) synthesis (400m resolution) for updating GEBCO's grid.
- The data set contains significant data contributions in all ocean regions.
- The LDEO GMRT synthesis makes use of sonar data collected by scientists and institutions worldwide, merging them into a single, continuously-updated compilation of high-resolution seafloor topography.

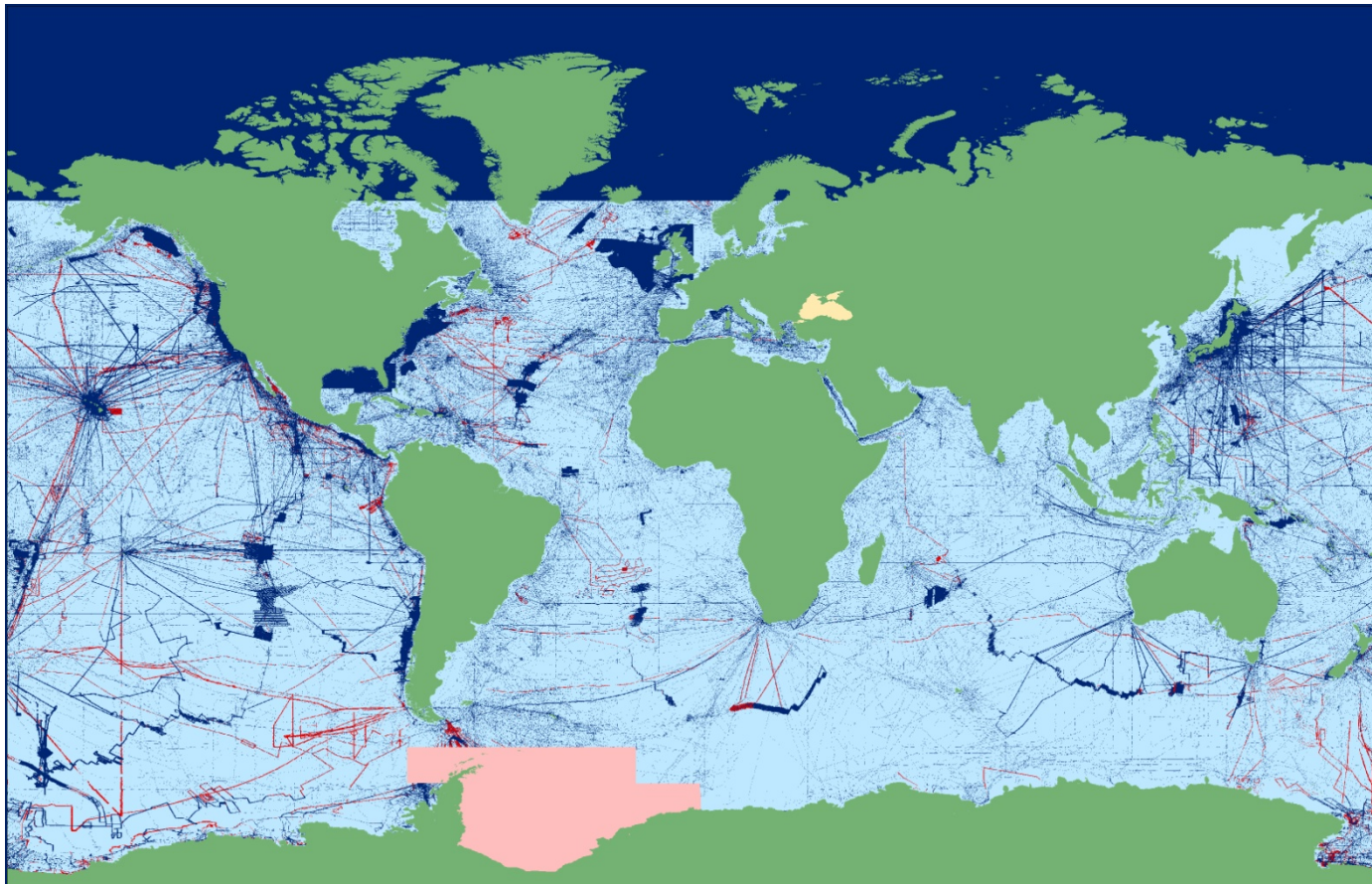
Grid updating work – LDEO GMRT Synthesis

Coverage of LDEO GMRT tile set



Grid updating work – LDEO GMRT Synthesis

Coverage of LDEO GMRT tile set (red) and GEBCO SID (dark blue)

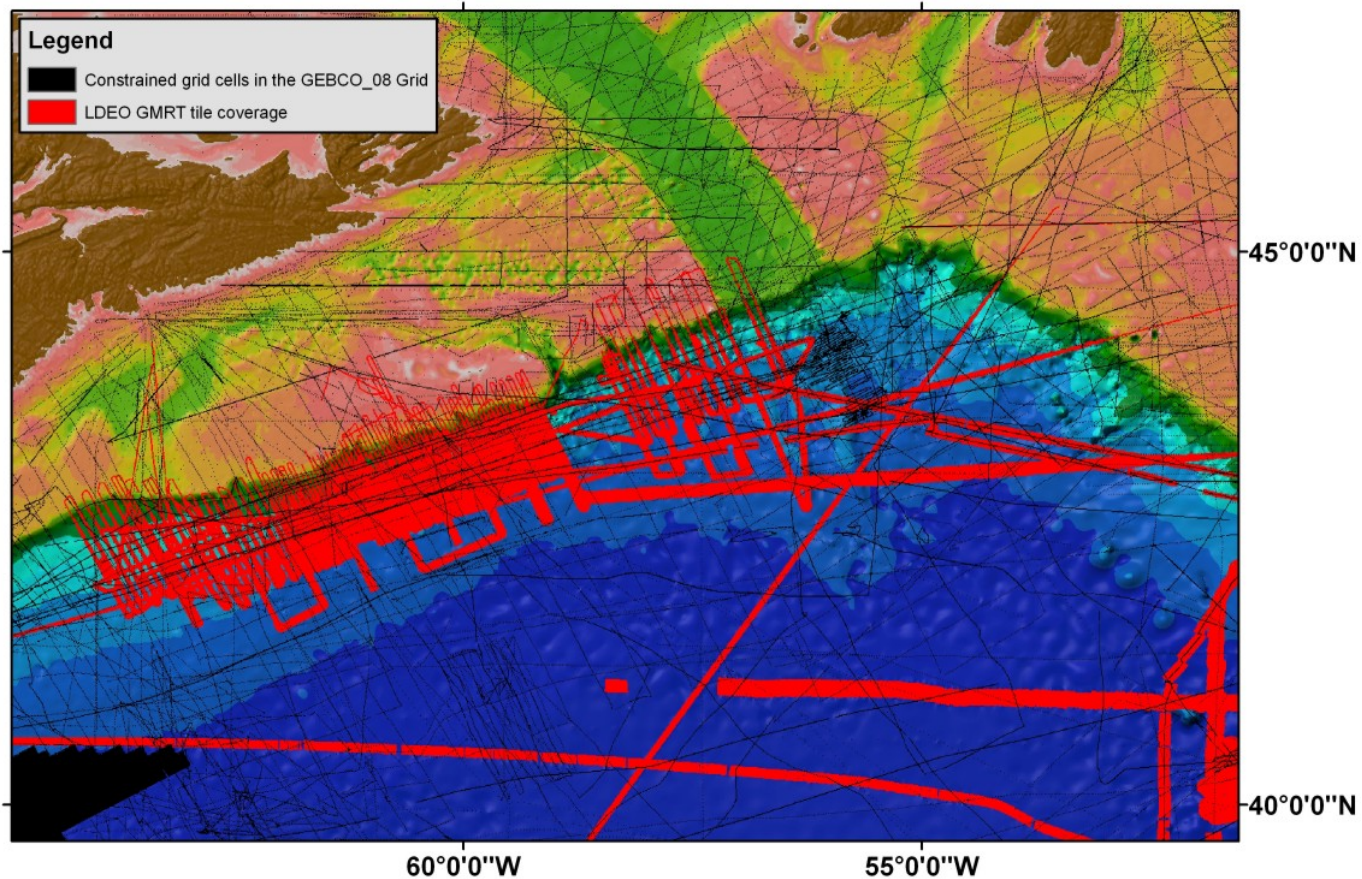


Grid updating work – LDEO GMRT Synthesis

- Work has been done to include the data into the existing GEBCO.
- Final quality control checks, for example to look for edgematching artifacts, need to be carried out before this update can be finalized.

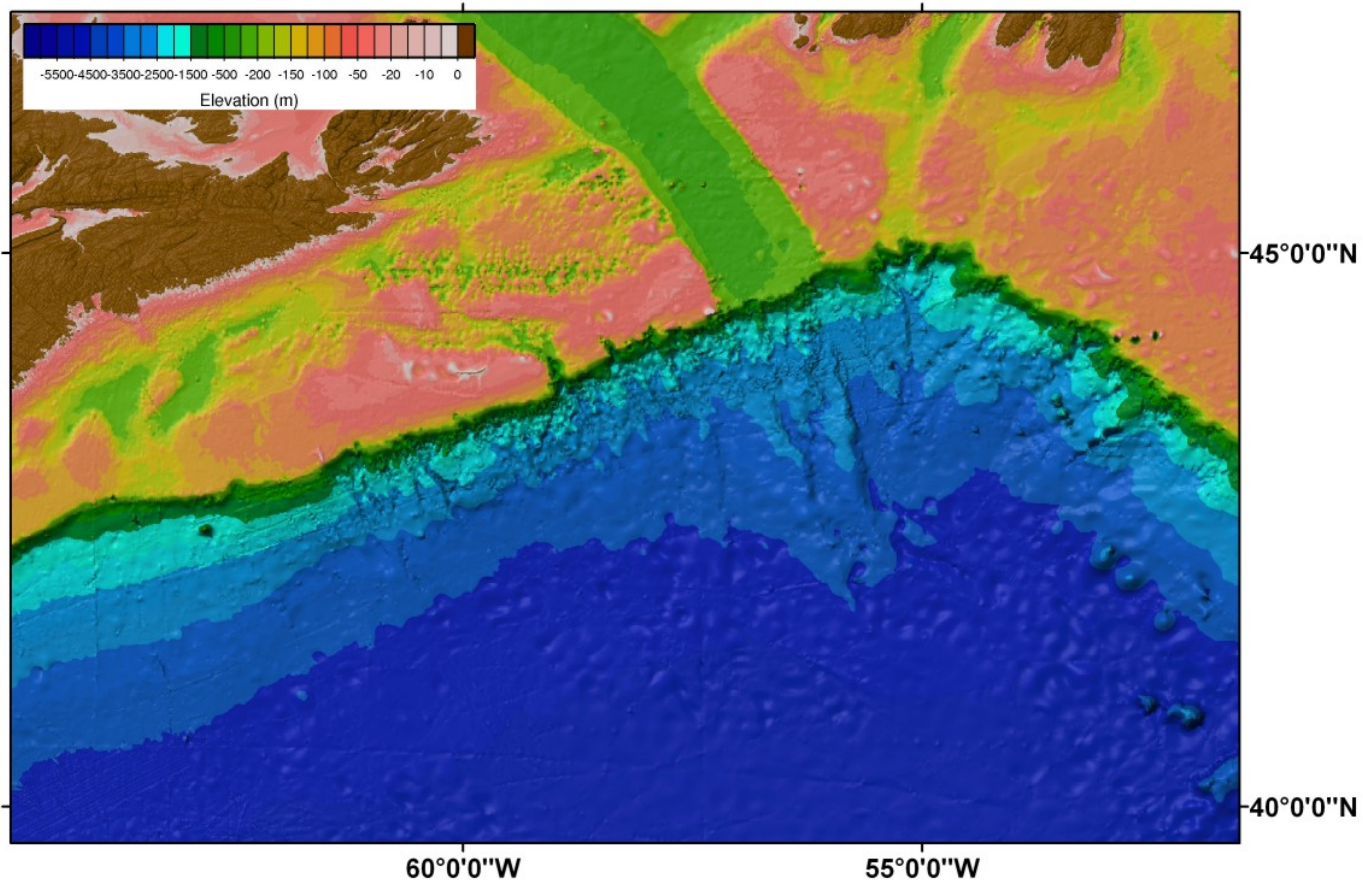
Grid updating work – LDEO GMRT Synthesis

Example area: Coverage of LDEO tiles – red and GEBCO_08 source data - black



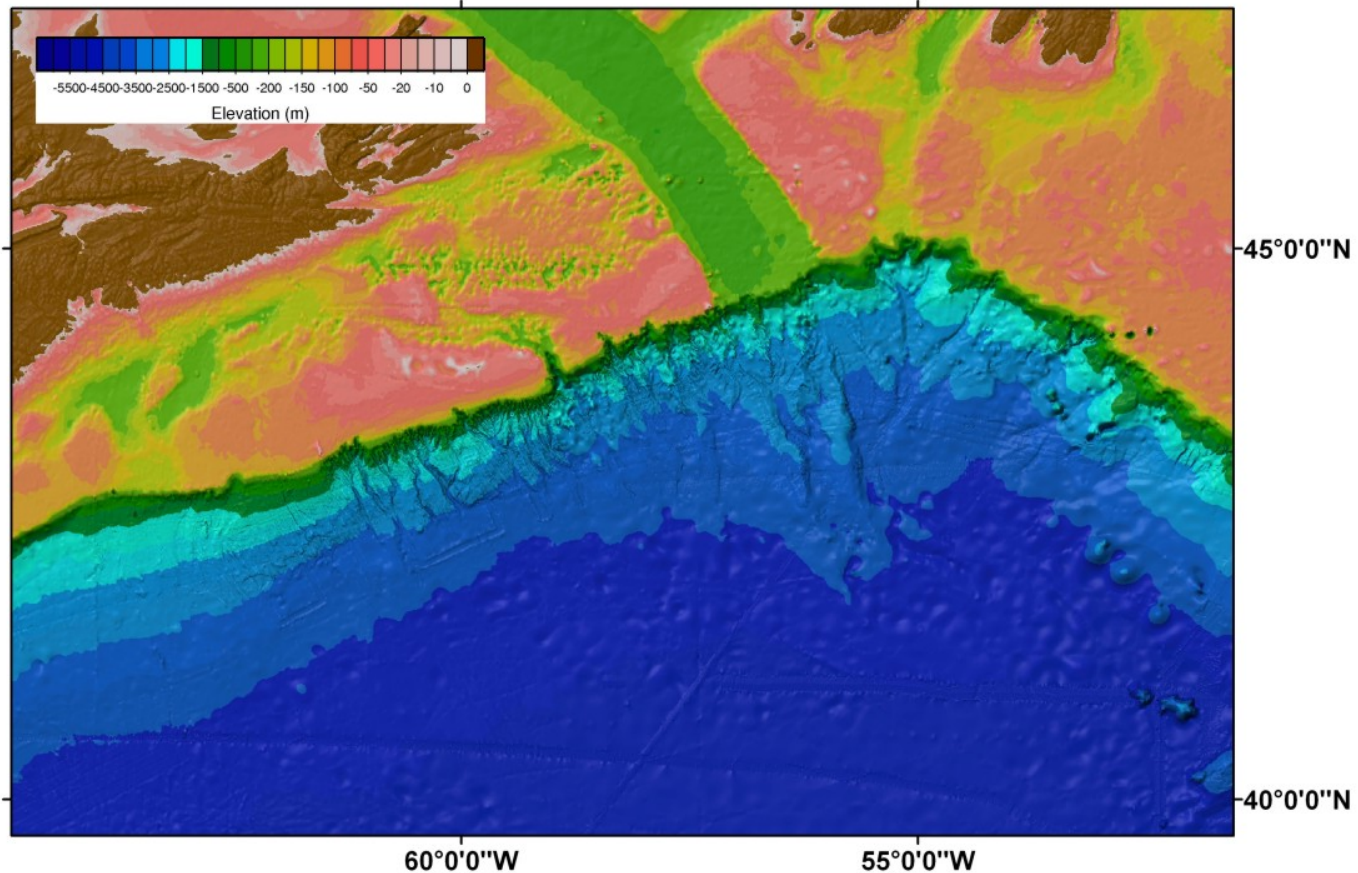
Grid updating work – LDEO GMRT Synthesis

Current GEBCO_08 Grid



Grid updating work – LDEO GMRT Synthesis

Combined GMRT data and GEBCO_08 Grid



Grid updating work

Planned updates for the next release of the GEBCO_08 Grid include:

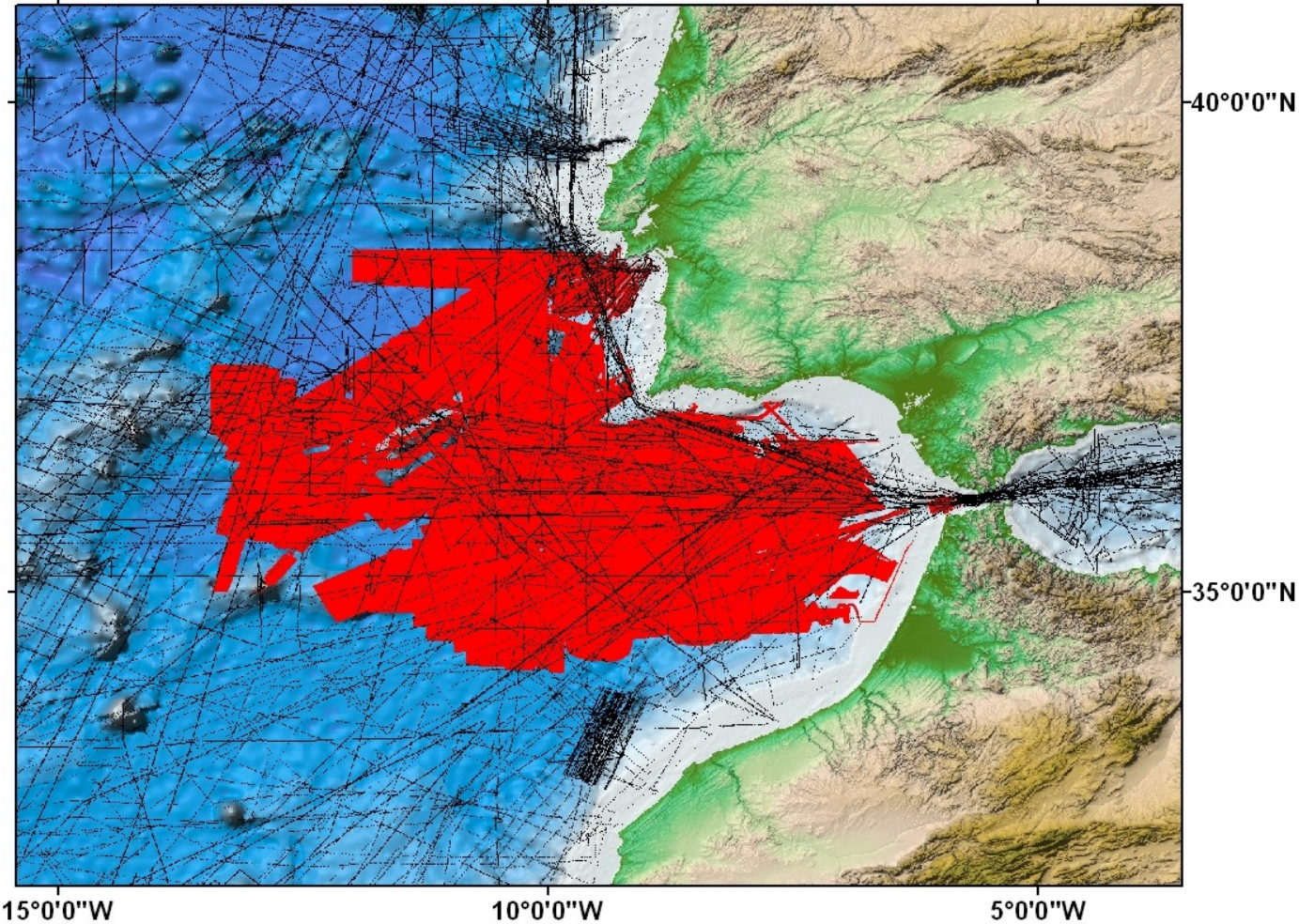
- International Bathymetric Chart of the Arctic Ocean (V3)
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- Gulf of Cadiz region – using a grid based on multibeam data

Grid updating work – Gulf of Cadiz region

- A bathymetric grid, based on multibeam data for the Gulf of Cadiz region, west of the Strait of Gibraltar has been incorporated into the GEBCO grid.
- The data set has been developed as part of a study into the fault system at the plate boundary between Eurasia and Africa in the central Atlantic.
- Reference: The quest for the Africa–Eurasia plate boundary west of the Strait of Gibraltar: Zitellini, N., Gràcia, E., Matias, L., Terrinha, P., Abreu, M.A., DeAlteriis, G., Henriët, J.P., Dañobeitia, J.J., Masson, D.G., Mulder, T., Ramella, R., Somoza, L. and Diez, S. (2009). *Earth and Planetary Science Letters*, 280, (1-4), 13-50. (doi:10.1016/j.epsl.2008.12.005)”.

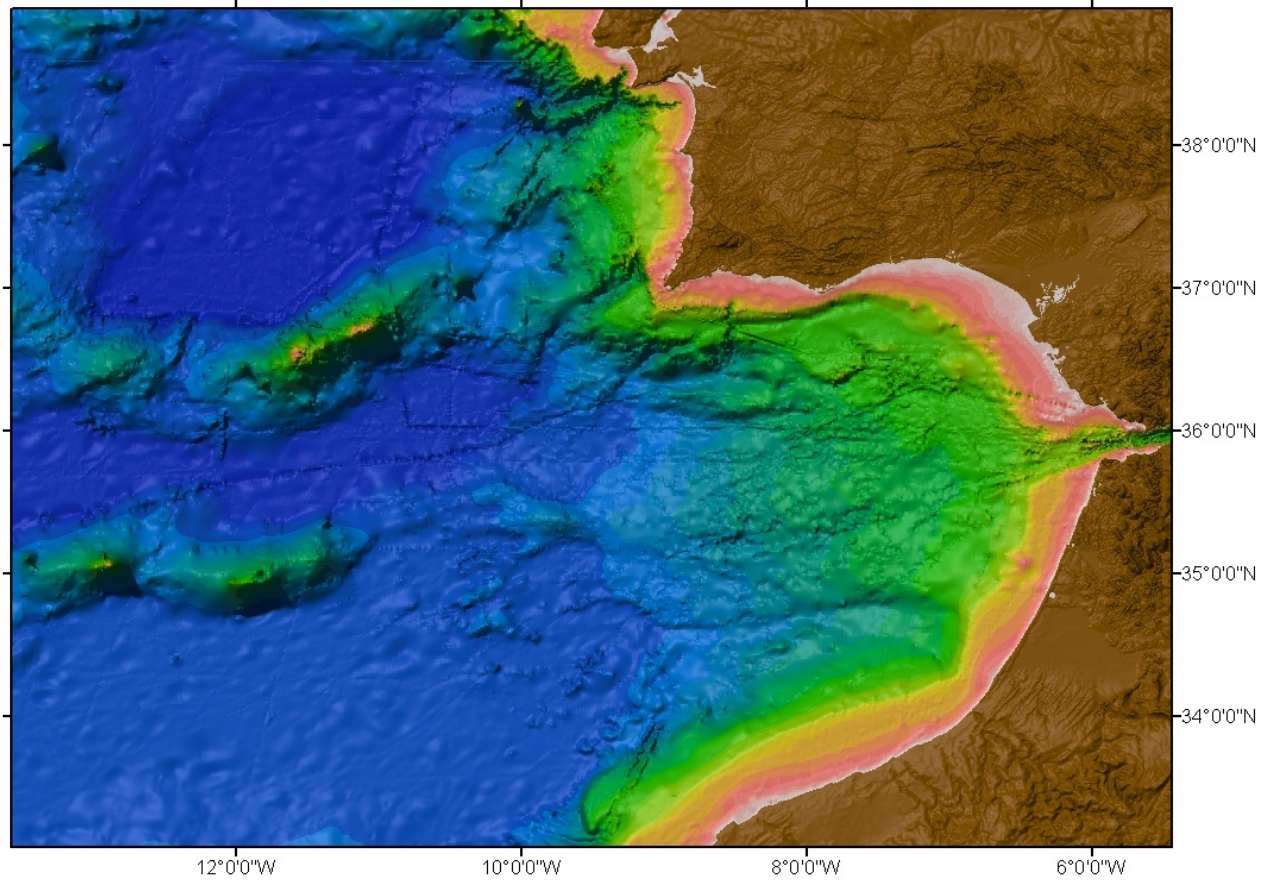
Grid updating work – Gulf of Cadiz region

GEBCO_08 Grid source data coverage (black), contributed grid (red)



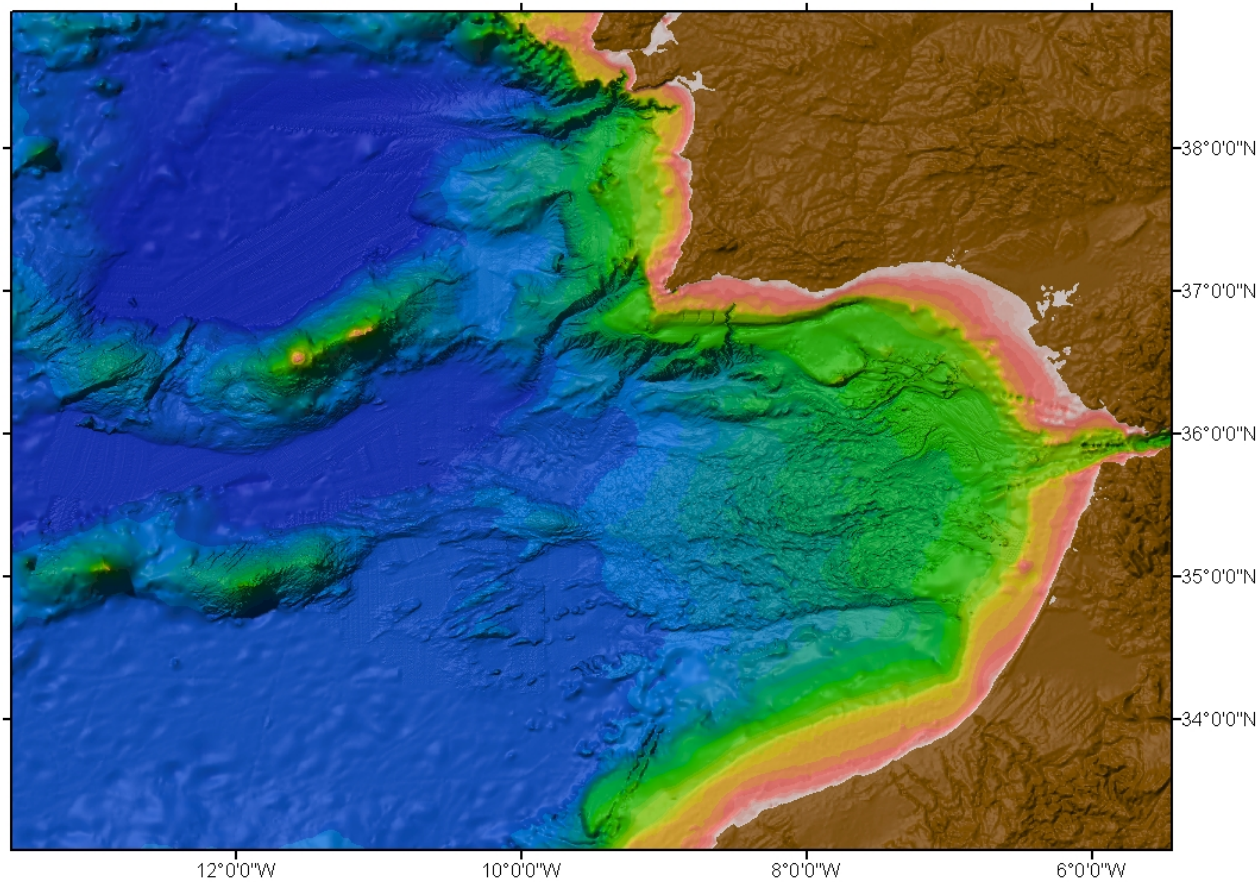
Grid updating work – Gulf of Cadiz region

GEBCO_08 Grid



Grid updating work – Gulf of Cadiz region

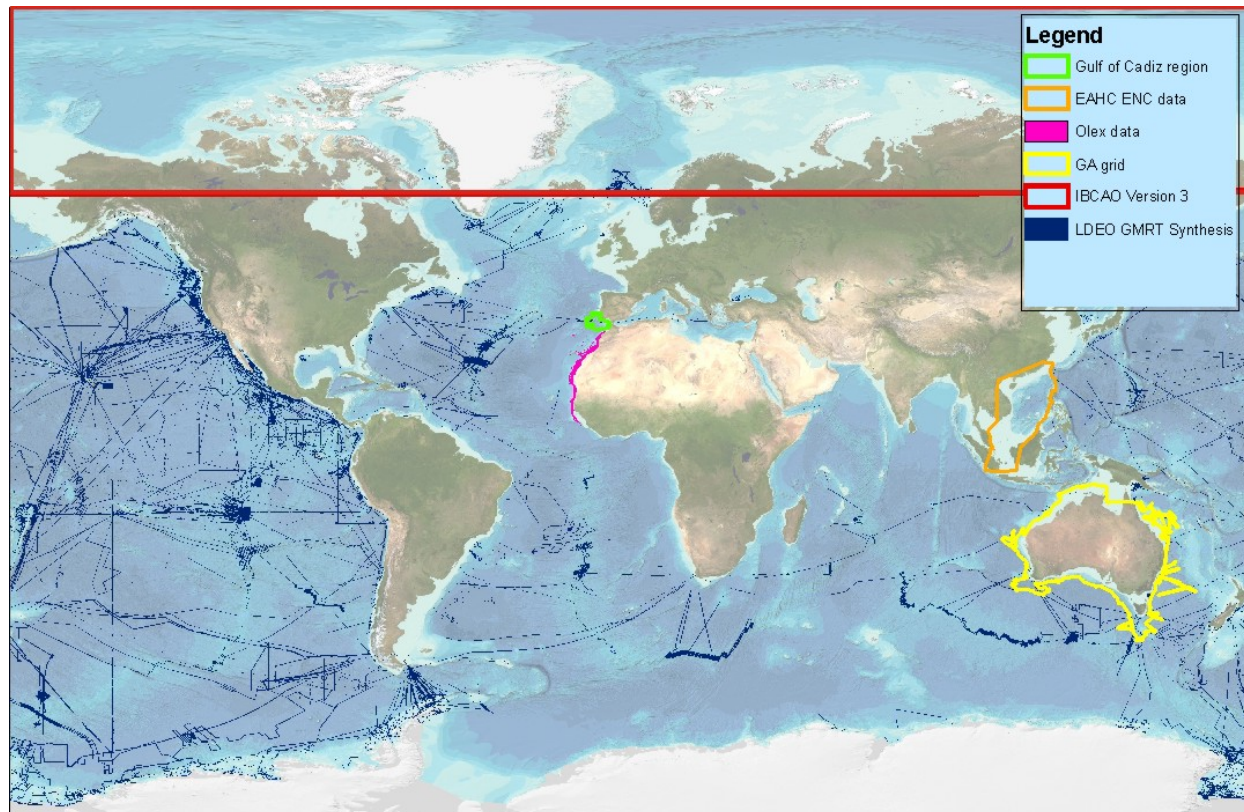
GEBCO_08 Grid combined with new data set



Grid updating work

Summary: A number of new data sets are planned for inclusion in the next release of the GEBCO_08 Grid.

It is aimed to publish the next release by the end of 2012



GEBCO's base grid

- As part of the work towards developing a new GEBCO grid, work has been done to investigate if the 'base' grid that we currently use should be 'updated'
- The GEBCO_08 uses as a base the SRTM30_plus (version 5) global terrain model developed at Scripps Institution of Oceanography (SIO). This is a global grid generated from a database of ship-track soundings with interpolation between soundings guided by satellite-derived gravity data
- Additional regional grids and survey data sets are included on top of this base grid to create the GEBCO_08 Grid

GEBCO's base grid

- We have looked at using version 7 of SRTM30_plus as a new base grid for GEBCO
- This data set was released in December 2011 and includes a larger number of soundings data sets compared with version 5 and uses an updated bathymetric model that combines depth estimates from altimetric gravity with ship soundings

GEBCO's base grid

- Initial investigations have been carried out to looking at the differences between the two grids
- As part of this work, a study was done to compare the regions that are based on interpolation in both grids with multibeam data sets that are not included in either grid
- The comparison work was carried out by Karen Marks from NOAA's Laboratory for Satellite Altimetry for two study areas: in the Pacific Ocean and near to the Cape Verde Islands in the North Atlantic
- Further details on the Science Day poster: "Comparisons of GEBCO_08 and SRTM30_Plus V7 Grids in Regions of Interpolated Bathymetry"; Karen Marks and Pauline Weatherall

GEBCO's base grid

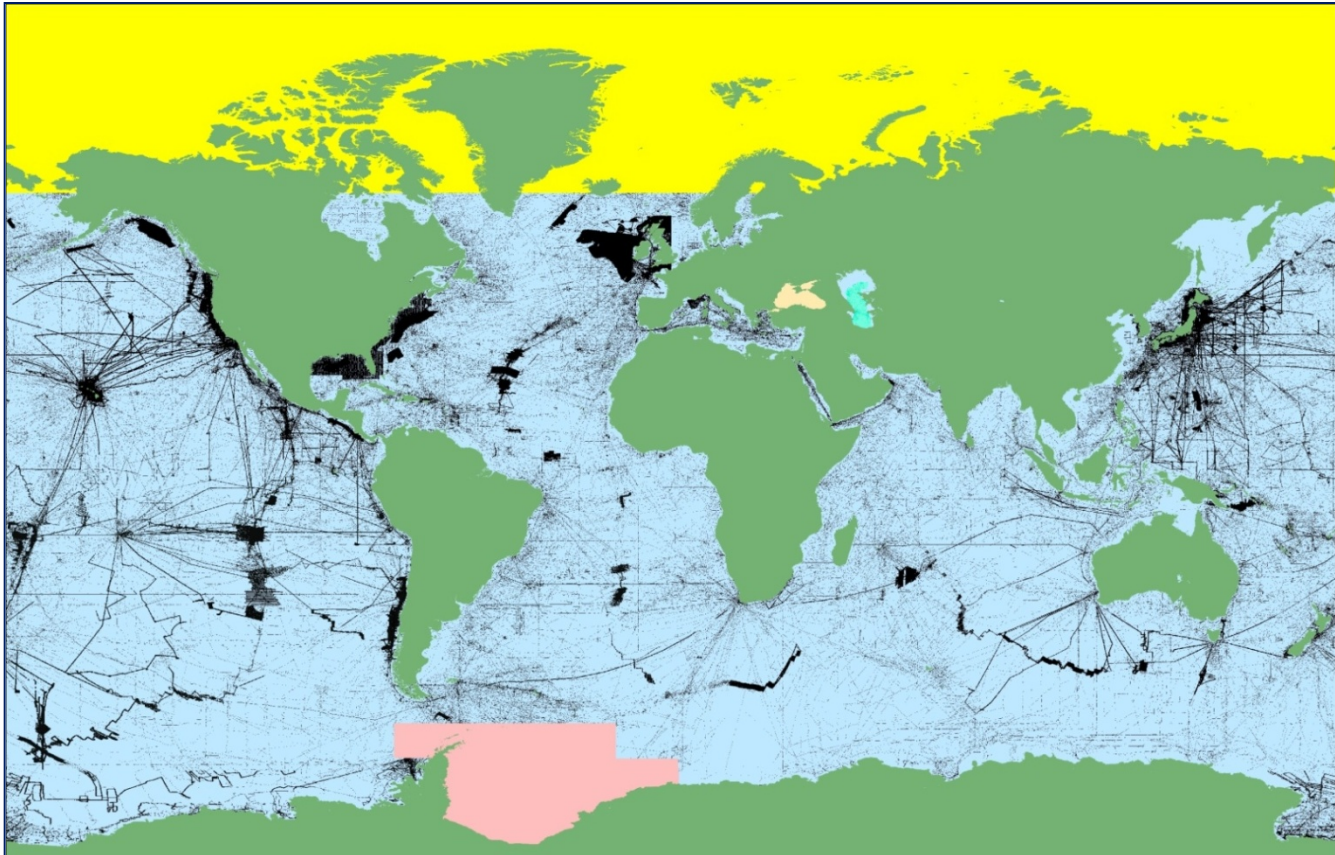
- The comparison work and discussions over the use of the data set by GEBCO are currently ongoing.
- It is planned to continue to use and update the existing GEBCO base grid at present with new surveys and bathymetric compilations while this matter is investigated further.

Metadata work

- The GEBCO_08 Grid is accompanied by a Source Identifier (SID) Grid. This shows which cells in the grid are based on surveys or existing grids and which are interpolated.
- At present this is of the form of a 'yes'/'no' grid – i.e. a cell is marked as constrained or unconstrained by survey/gridded data.
- It is aimed to make available to users information on these source surveys and grids.

Metadata work

GEBCO_08 SID Grid



Metadata work

- GEBCO has adopted the SID grid, numbering system and associated metadata records used by the SRTM30_plus team. The data set contains over 8,000 records.
- Since the last GEBCO meeting work has been done in collaboration with colleagues at SIO to quality control the SID metadata
- This quality control work is ongoing.

Metadata work

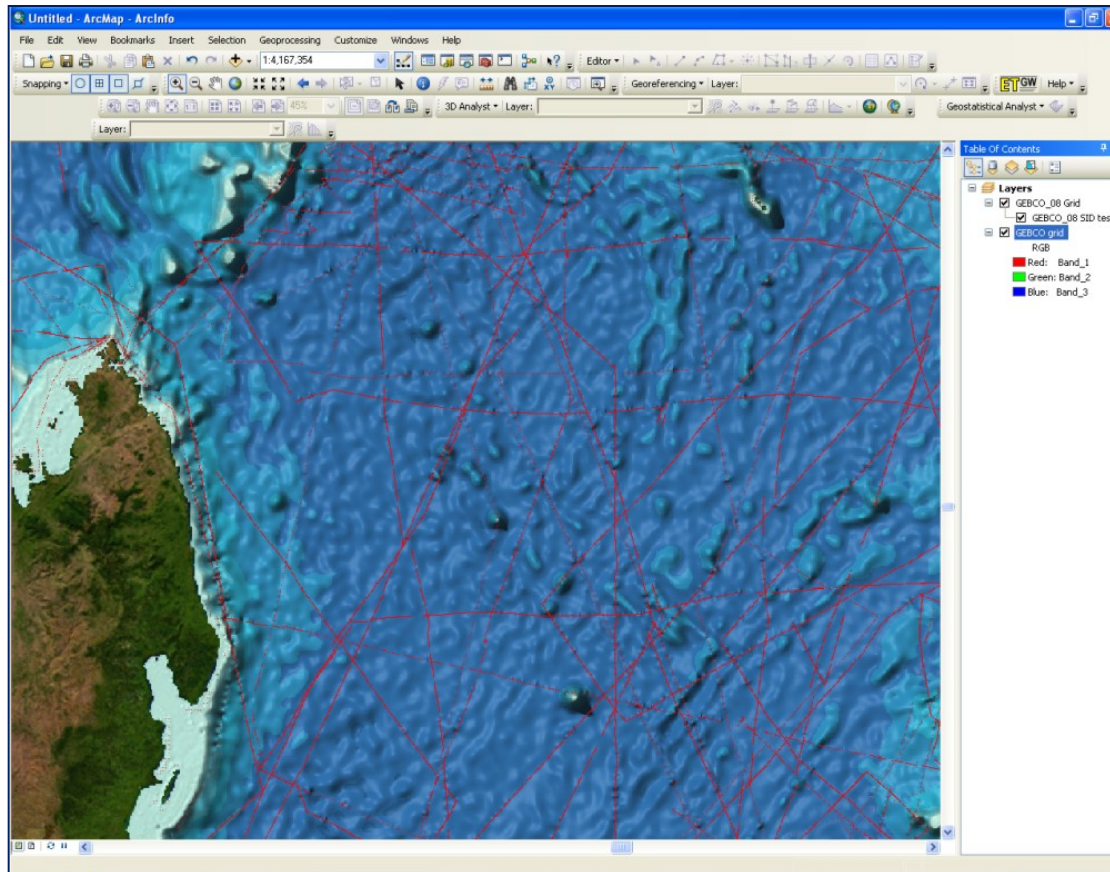
GEBCO has defined a set of attribute fields for the source survey data sets that it would like to be able to deliver metadata for.

Proposed SID file attribute fields for survey data sets:

- Cruise ID
 - Chief Scientist or Investigator
 - Contributing organisation
 - Country
 - Platform
 - Device Type e.g. multibeam, singlebeam
 - Device name (if known)
 - Cruise Dates (start date and end date)
 - URL of original dataset at repository (can be multiple)
 - URL of the original metadata
-
- Work is underway to populate these fields
-
- Further QC work is needed to standardize the information in the attribute fields, e.g. through the use of controlled vocabularies
-
- Delivery of the metadata via a Web Map Service (WMS) is being investigated

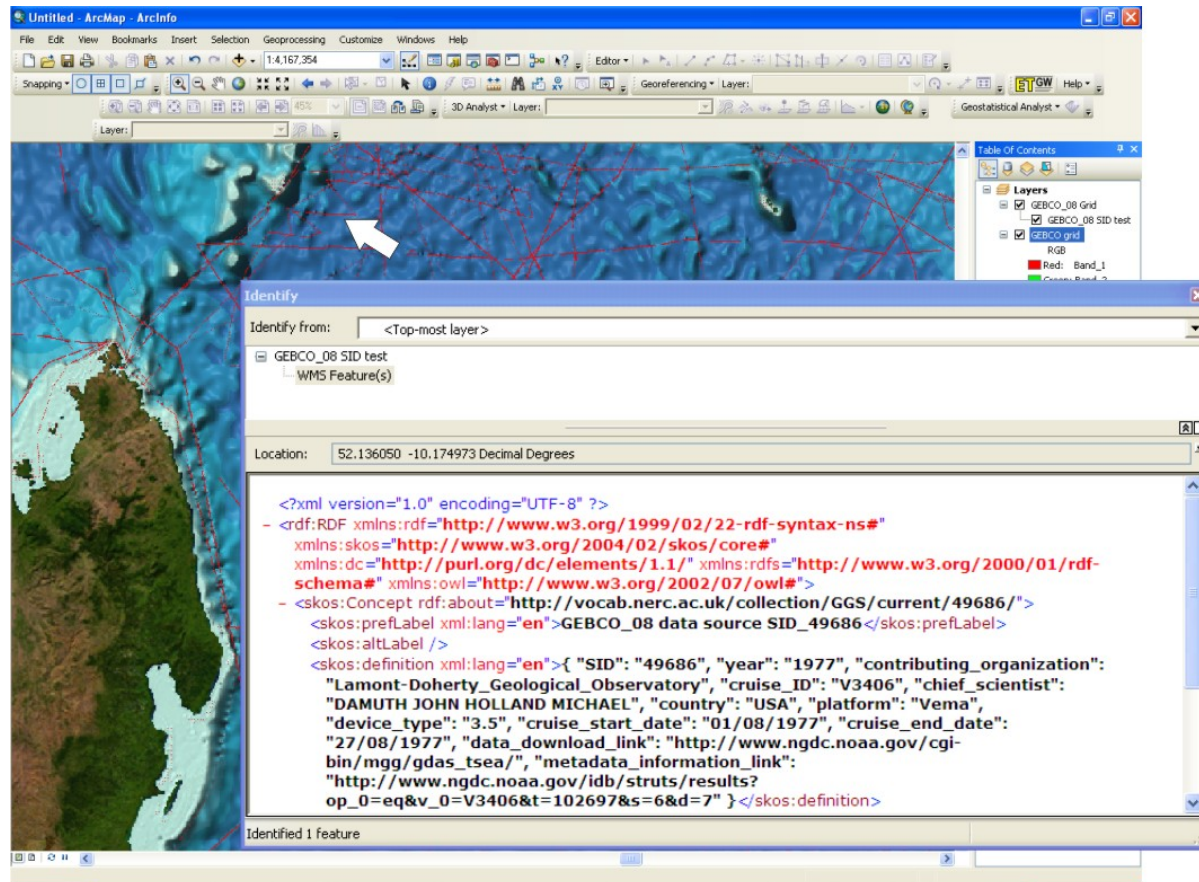
Metadata work

Example - displaying the SID grid (source survey data coverage) through a WMS (red lines) overlain on the GEBCO grid



Metadata work

Querying information about the source survey data through the WMS



The screenshot shows the ArcMap interface with a map of the North Atlantic region. A red grid is overlaid on the map, and a white arrow points to a specific feature. The Identify window is open, showing the following XML metadata:

```
<?xml version="1.0" encoding="UTF-8" ?>
- <rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:skos="http://www.w3.org/2004/02/skos/core#"
  xmlns:dc="http://purl.org/dc/elements/1.1/" xmlns:rdfs="http://www.w3.org/2000/01/rdf-
  schema#" xmlns:owl="http://www.w3.org/2002/07/owl#">
- <skos:Concept rdf:about="http://vocab.nerc.ac.uk/collection/GGS/current/49686/">
  <skos:prefLabel xml:lang="en">GEBCO_08 data source SID_49686</skos:prefLabel>
  <skos:altLabel />
  <skos:definition xml:lang="en">{ "SID": "49686", "year": "1977", "contributing_organization":
  "Lamont-Doherty_Geological_Observatory", "cruise_ID": "V3406", "chief_scientist":
  "DAMUTH JOHN HOLLAND MICHAEL", "country": "USA", "platform": "Vema",
  "device_type": "3.5", "cruise_start_date": "01/08/1977", "cruise_end_date":
  "27/08/1977", "data_download_link": "http://www.ngdc.noaa.gov/cgi-
  bin/mgg/gdas_tsea/", "metadata_information_link":
  "http://www.ngdc.noaa.gov/idb/struts/results?
  op_0=eq&v_0=V3406&t=102697&s=6&d=7" }</skos:definition>
```


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- Work is ongoing to investigate how we update GEBCO's 'base' grid

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- It is aimed to release a new version of the GEBCO_08 Grid by the end of 2012
- Work is ongoing to investigate how we update GEBCO's 'base' grid
- Progress has been made in delivering metadata for the source data sets used to generate GEBCO's grids but further work is needed to complete this task

Thank you !