British Oceanographic Data Centre
NATURAL ENVIRONMENT RESEARCH COUNCIL

GEBCO grid data compilation

Pauline Weatherall, British Oceanographic Data Centre

GEBCO Data Flow Workshop Presentation, US NGDC, March 2011

Introduction

Through the role of the GEBCO Digital Atlas Manager, BODC acts as a centre/resource for maintaining and updating GEBCO's gridded data sets and for making these grids available.

Introduction

Through the role of the GEBCO Digital Atlas Manager, BODC acts as a centre/resource for maintaining and updating GEBCO's gridded data sets and for making these grids available.

Although we archive data sets on behalf of GEBCO for grid re-generation purposes, we do not act as a public distribution centre for the source data sets used/submitted to generate GEBCO's grids.

Introduction

Through the role of the GEBCO Digital Atlas Manager, BODC acts as a centre/resource for maintaining and updating GEBCO's gridded data sets and for making these grids available.

Although we archive data sets on behalf of GEBCO for grid re-generation purposes, we do not act as a public distribution centre for the source data sets used/submitted to generate GEBCO's grids.

The work carried out for GEBCO at BODC and the National Oceanography Centre (NOC) is funded by the UK Natural Environment Research Council (NERC).

GEBCO’s bathymetric products

The GEBCO Digital Atlas (GDA) was initially released in early 1990s, containing GEBCO’s global bathymetric contour data set.

GEBCO’s bathymetric products

The GEBCO Digital Atlas (GDA) was initially released in early 1990s, containing GEBCO’s global bathymetric contour data set.

The GEBCO One Minute Grid, developed by the then GEBCO gridders group, was released in 2003. The grid is largely based on GEBCO’s bathymetric contours.

GEBCO’s bathymetric products

The GEBCO Digital Atlas (GDA) was initially released in early 1990s, containing GEBCO’s global bathymetric contour data set.

The GEBCO One Minute Grid, developed by the then GEBCO gridders group, was released in 2003. The grid is largely based on GEBCO’s bathymetric contours.

The GEBCO_08 Grid was released in 2009. It was developed by a number of agencies and is largely based on ship-track soundings with interpolation between soundings guided by satellite-derived gravity data. The grid was recently updated with contributed regional gridded data sets. It is accompanied by a Source Identifier (SID) Grid.

GEBCO Grid Data Compilation

This presentation outlines the current management and flow of data into GEBCO at BODC for updating the GEBCO_08 Grid. Covering:

- Sources of data contributions and ‘types’ of data sets received
- Updating the GEBCO_08 grid and grid evaluation work
- Limitations of current methodologies used
- Capabilities ‘wish list’
- Future directions

Sources of data contributions

To date, since the development of the GEBCO_08 Grid, contributions for updating the data set have come from a number of sources, for example:

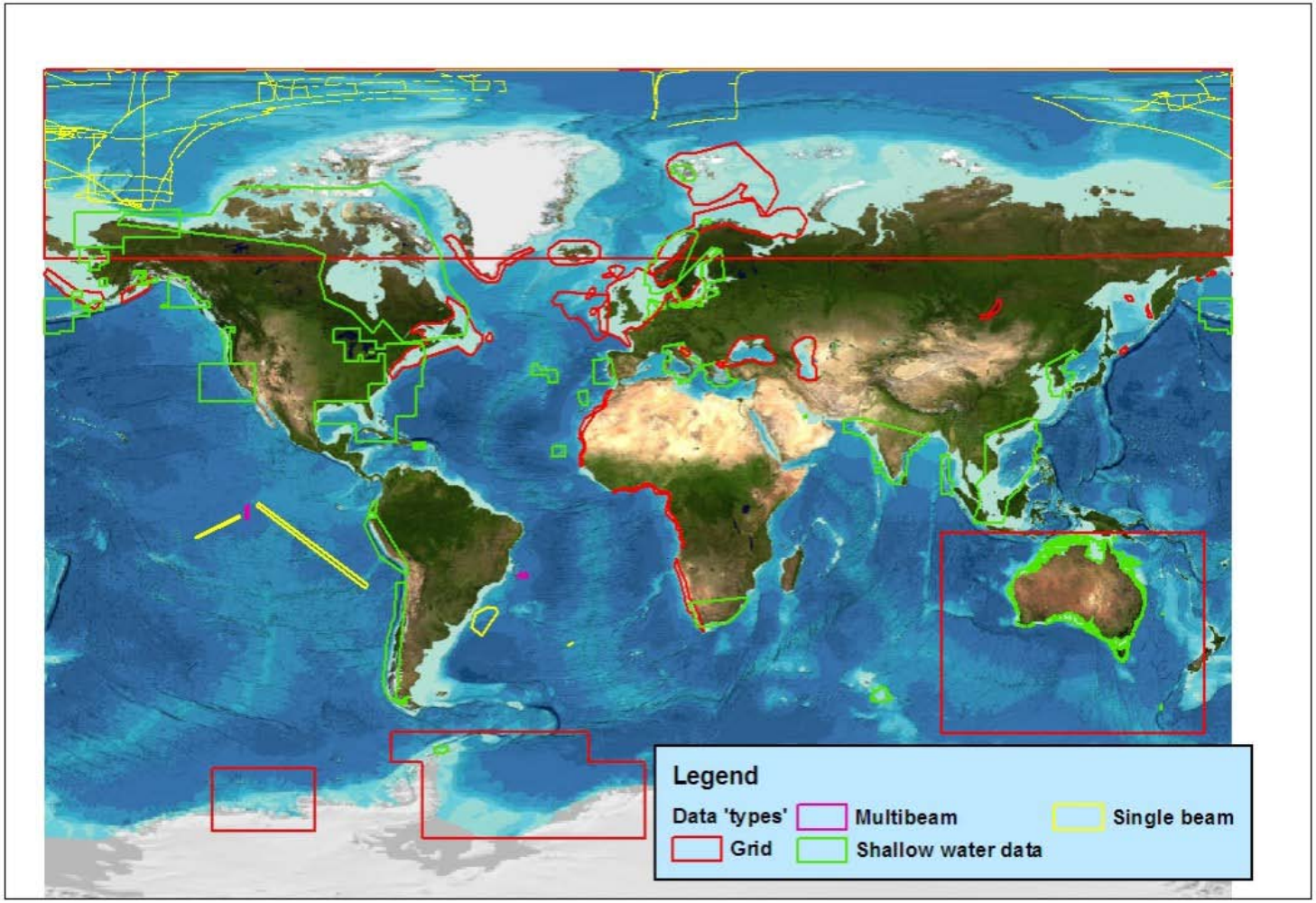
- The GEBCO community – e.g. Weddell Sea grid from AWI
- Regional mapping projects – e.g. IBCAO
- Contributions from scientific institutions/government bodies – e.g. Geological Survey of Ireland (Irish designated waters grid)
- 'Targeted' projects – e.g. ENC harvesting for shallower water areas
- Occasionally from commercial companies – e.g. grids from Olex AS

Contributed data types

Data sets are supplied in a number of forms:

- ‘Processed’ bathymetric grids – e.g. Weddell Sea grid
- Soundings – e.g. ENC surveys
- To date, a small number of multibeam and single beam surveys

Contributed data types



Data management and quality control

For grid re-generation purposes, we hold the data sets submitted to us for updating the GEBCO_08 Grid in BODC's archive system along with accompanying metadata including information on:

- Who the data provider is
- The geographic coverage of the data set
- How it was collected/generated
- When it was collected/generated

Data management and quality control

Before new data sets are used to update the GEBCO_08 Grid, we carry out a review process. Quality control checks on contributed grids and data sets, include:

- ‘Blunder checks’ – e.g. checking x, y, z ranges
- Visual checks – e.g. Producing terrain models and shaded relief images, etc. for grids to help identify any artifacts/errors in the data sets
- Comparing submitted grids with their source soundings
- Comparison with the existing GEBCO_08 Grid and other data sources, e.g. other grids or source sounding data sets
- Comparing source data coverages, i.e. the coverage of source data used in the development of the existing GEBCO_08 Grid and that in the submitted data set

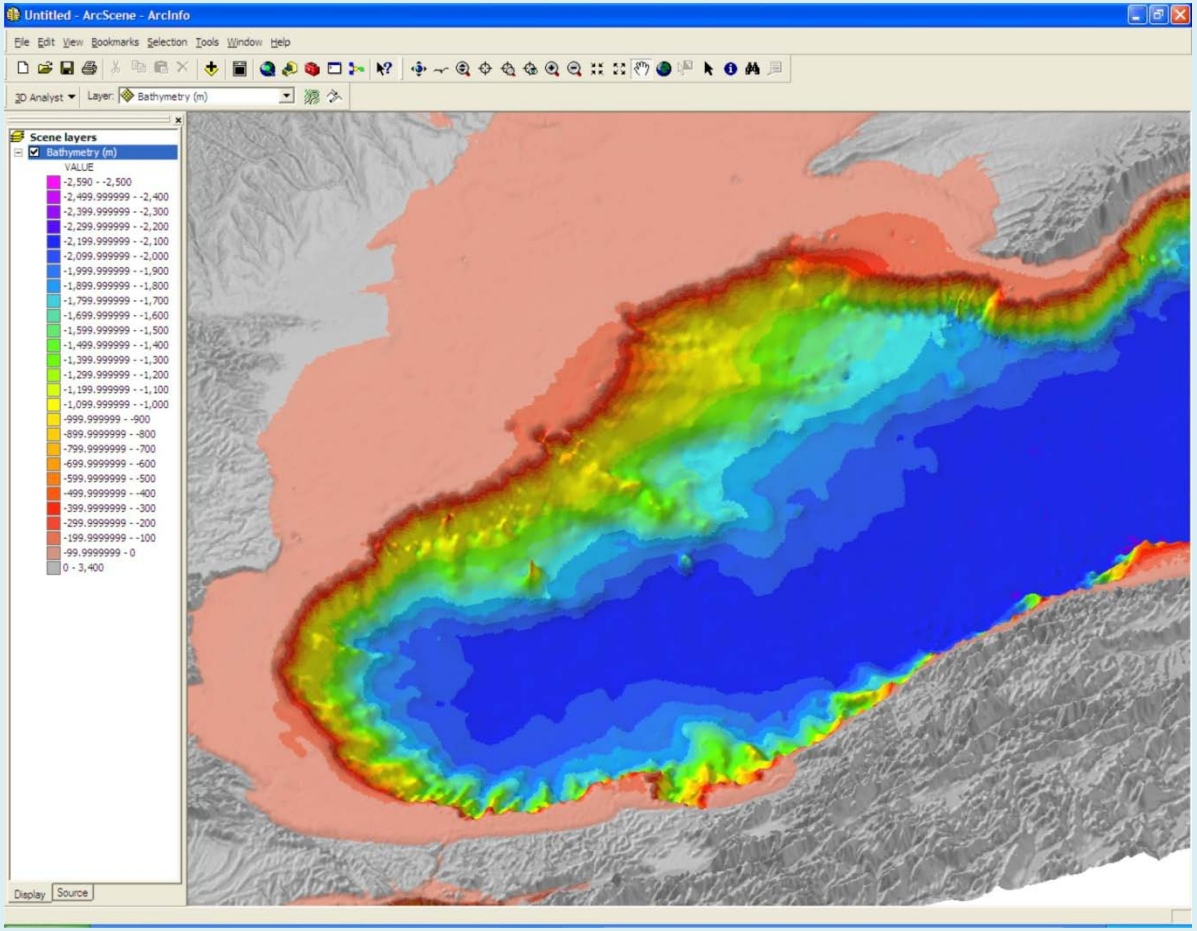
Data management and quality control

Software packages used for quality control procedures:

- ESRI ArcDesktop GIS, packages such as: ArcMap, Arc 3D Analyst, ArcToolbox, ArcScene
- Generic Mapping Tools (GMT)
- IVS 3D's Fledermaus

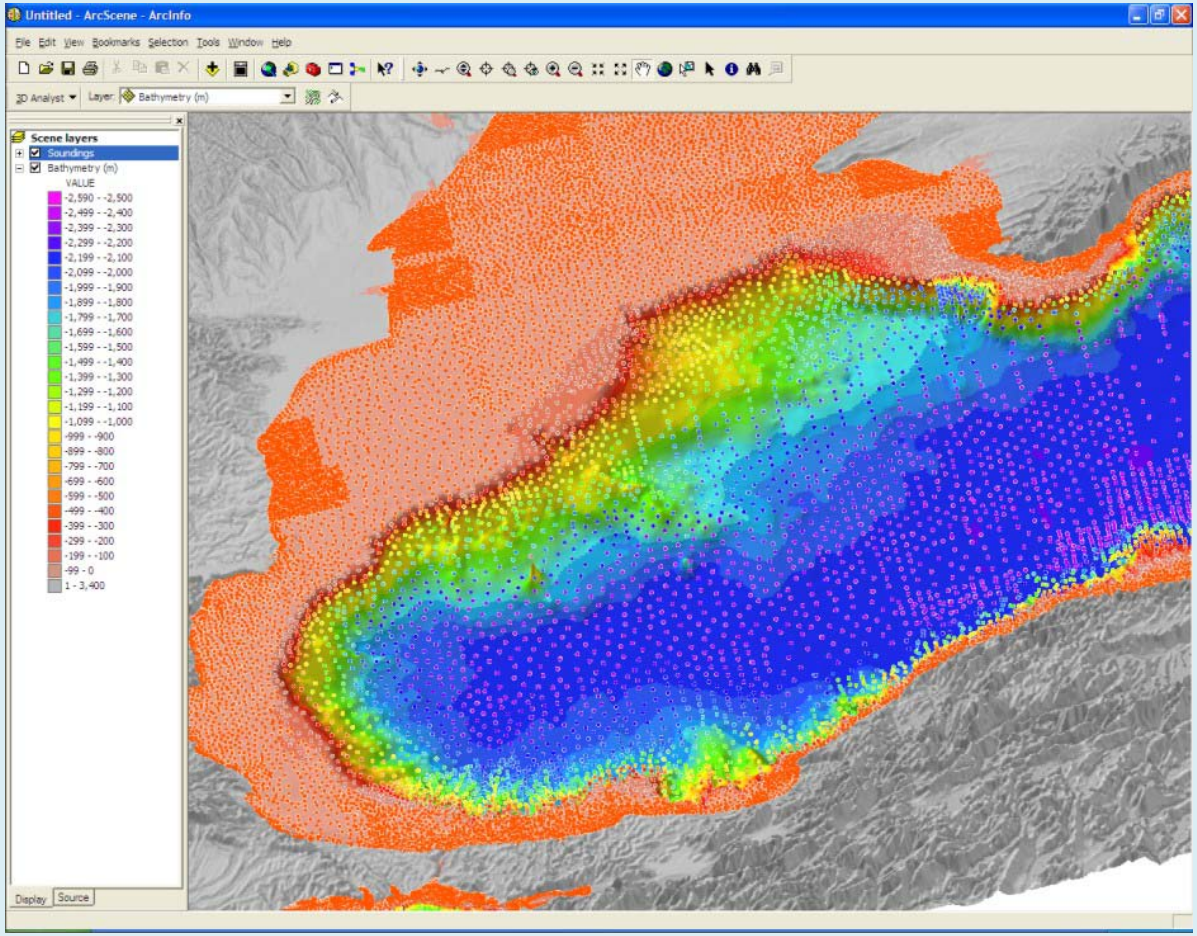
Data management and quality control

Example quality control of a submitted gridded data set: 3D terrain model of a grid displayed in ArcScene



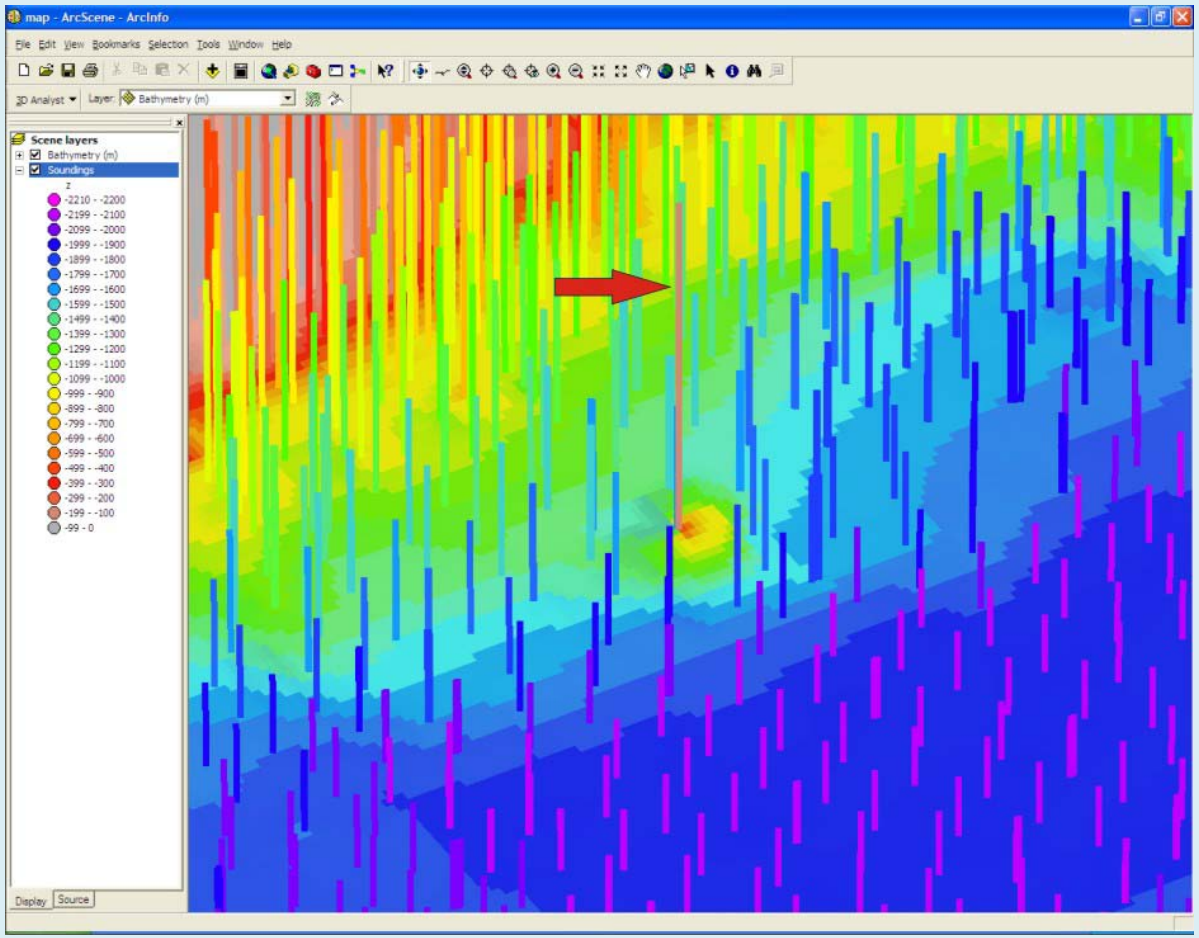
Data management and quality control

Example quality control of a submitted gridded data set: 3D terrain model of a grid (overlain by source soundings) displayed in ArcScene



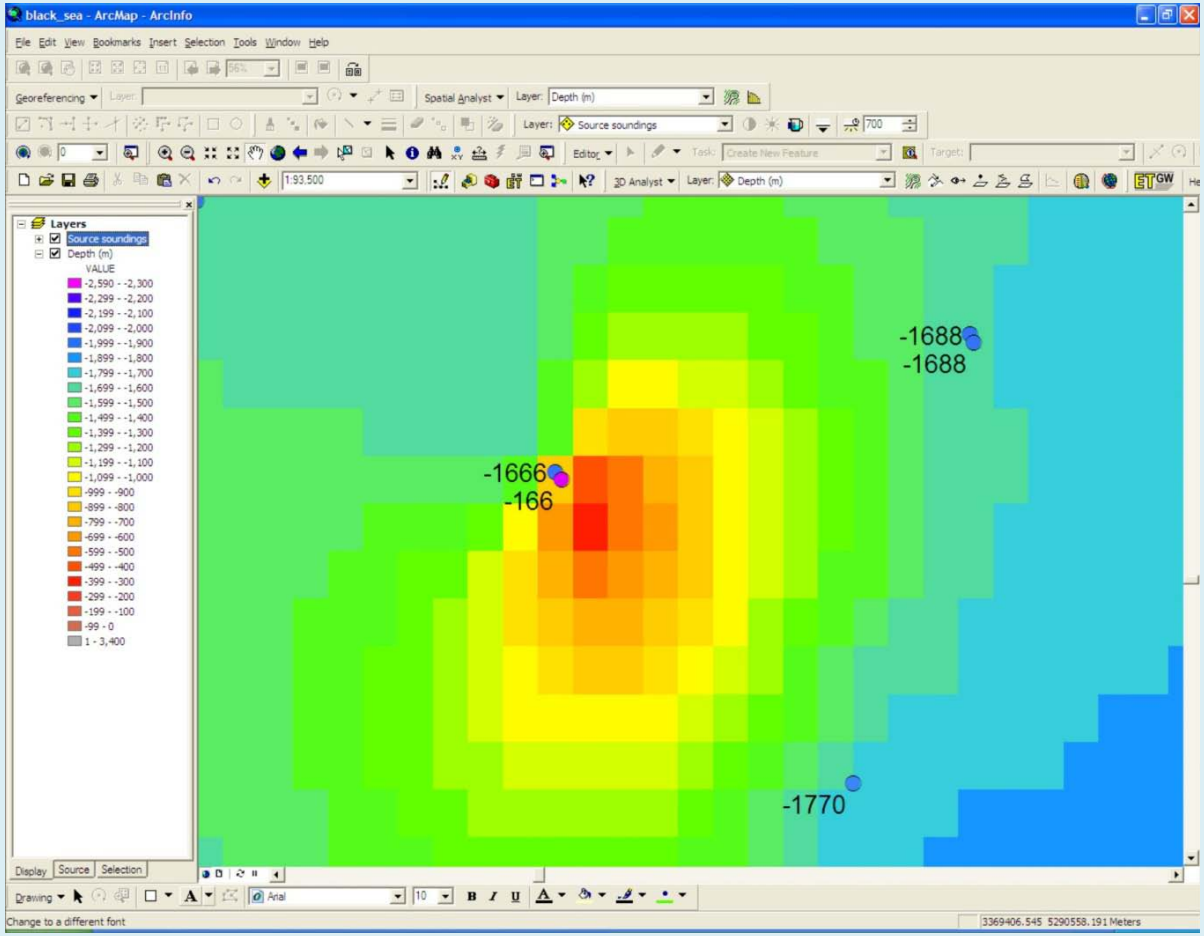
Data management and quality control

Example quality control of a submitted gridded data set: Grid overlain by source soundings, extruded for height, to help identify data spikes.



Data management and quality control

Example quality control of a submitted gridded data set: Grid (overlain by source soundings) displayed in ArcMap



Global grid file updating and evaluation

To date, the GEBCO_08 has been updated by ‘merging’ in newly-contributed gridded data sets, e.g. the recent IBCAO, Weddell Sea, Black Sea and Caspian Sea grid updates. The following details this process and outlines the methods used for evaluating grids.

Global grid file updating

The merging work has been done using ‘feather blending’ routines from GlobalMapper. This produces a merging of the two data sets within a boundary of a user-specified number of pixels.

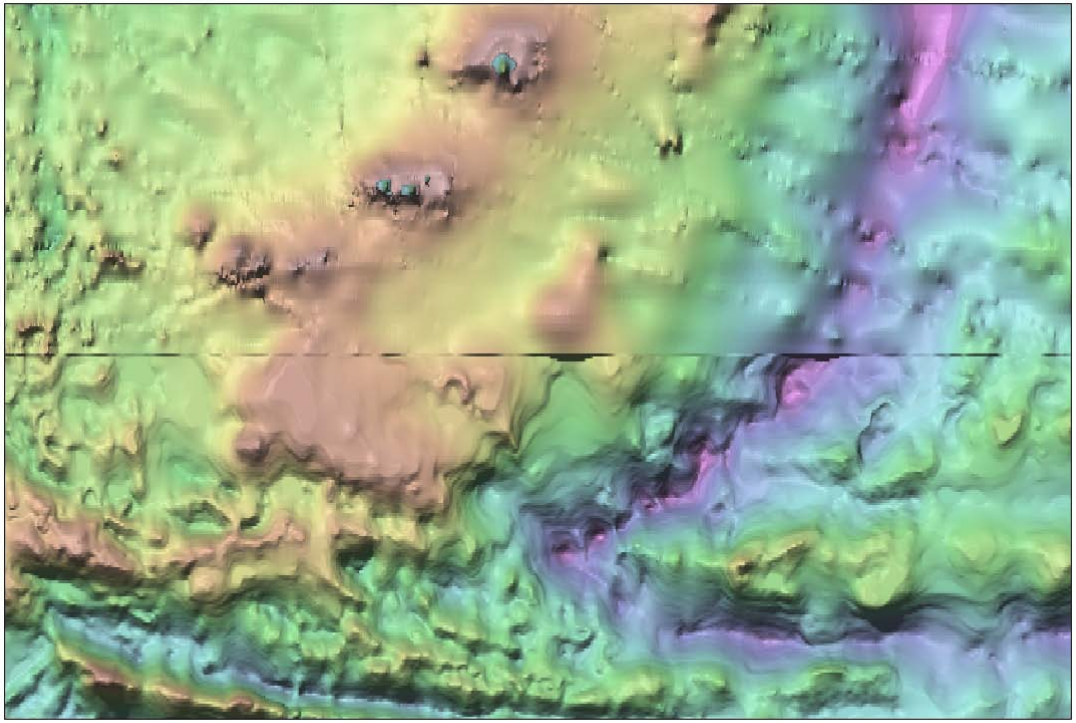
This approach has been used to try to avoid introducing discontinuities and artifacts into the global grid along the boundary of the updated area.

Other methods, using the ‘blend’ algorithm from GMT and re-gridding boundary areas using GMT, have also been tried.

An updated version of the Source Identifier (SID) Grid is also produced.

Global grid file updating

Example discontinuity between two data sets



Grid evaluation

Following on from the procedures used to evaluate submitted data sets, grid evaluation checks are carried out on the updated global grid file:

- Visual – producing 3D terrain models and colour shaded relief images of the grid and looking for any anomalous features in the grid, artifacts at boundaries etc.
- Comparing the grid with the existing GEBCO_08 Grid – i.e. generating a difference grid, using GMT or ESRI ArcToolbox routines
- Comparing the updated grid with the source grid, again, creating a difference grid
- The process should include feedback from the data provider if necessary

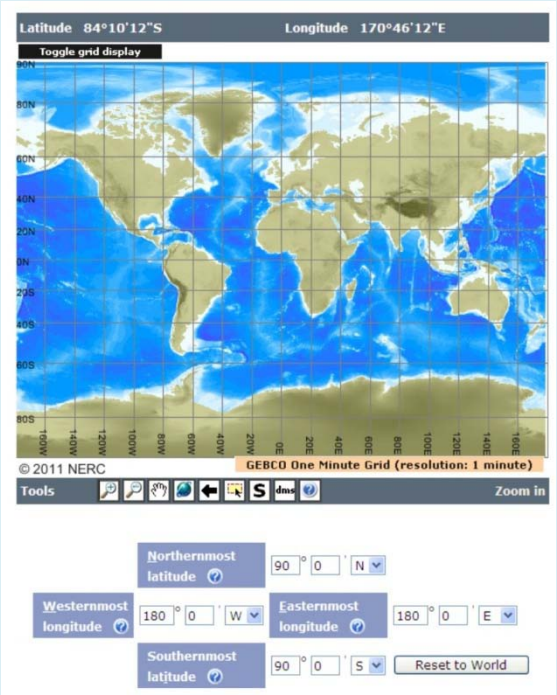
Global grid file updating - documentation

- The updated GEBCO_08 Grid is given a new version number which reflects its release date
- Updates included in new grid releases are recorded in the documentation which accompanies the grid and also on GEBCO's web site
- The updated global grid and data sets used to generate the update are archived at BODC

Data delivery

The GEBCO_08 Grid and accompanying Source Identifier (SID) Grid are made available via the internet.

The SID file currently has limited attribution for the source data sets used to generate the grid.

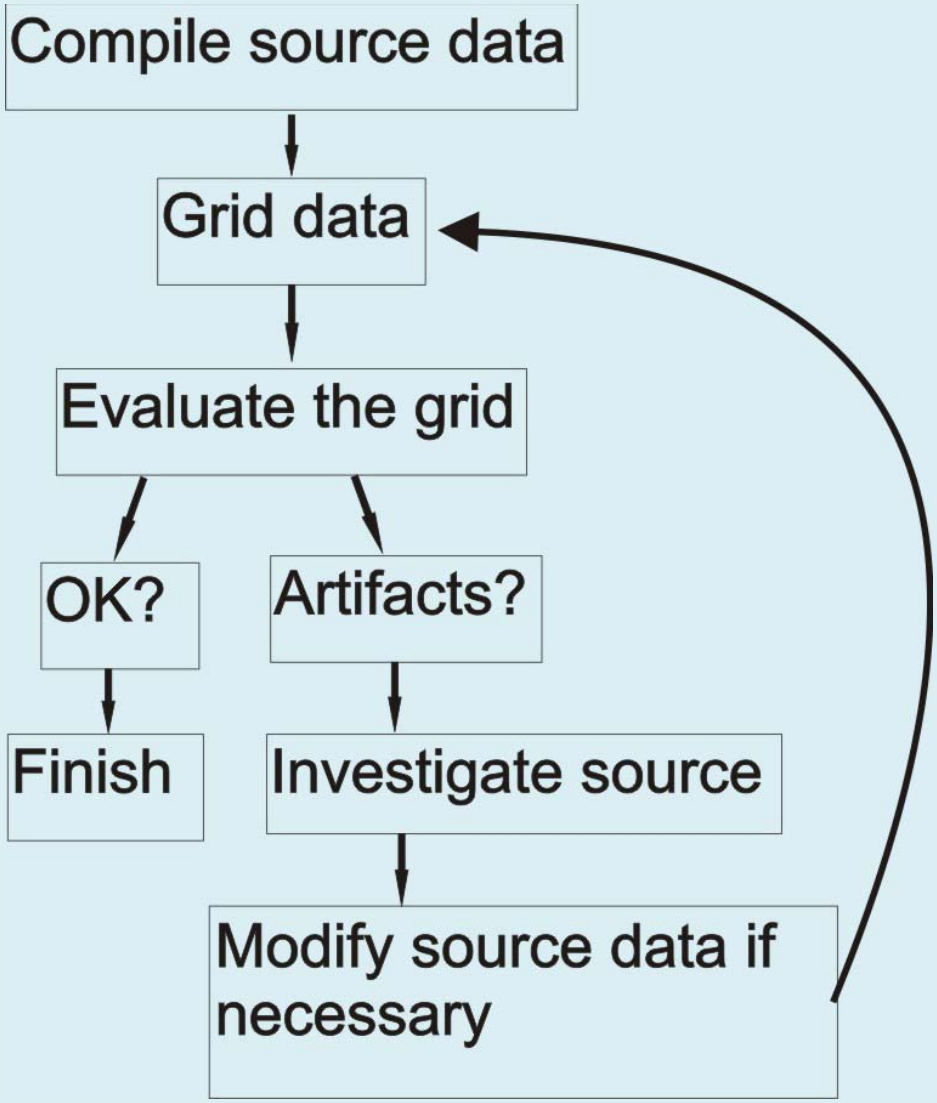


Grid generation

As detailed above, to date the GEBCO_08 Grid has been updated with existing gridded data sets. However, for completeness, I've included the general method that I use for developing grids from source sounding data:

- Compile together quality-controlled data sources
- Use Generic Mapping Tools (GMT) – 'surface', adjustable tension continuous curvature surface gridding algorithm
- Evaluate the grid, comparing it with the source data and with other sources looking for any anomalous features
- Carry out any necessary quality control of the source data and re-grid

Grid generation and evaluation



Limitations of the methodologies and tools currently used?

Limitations of the methodologies and tools currently used?

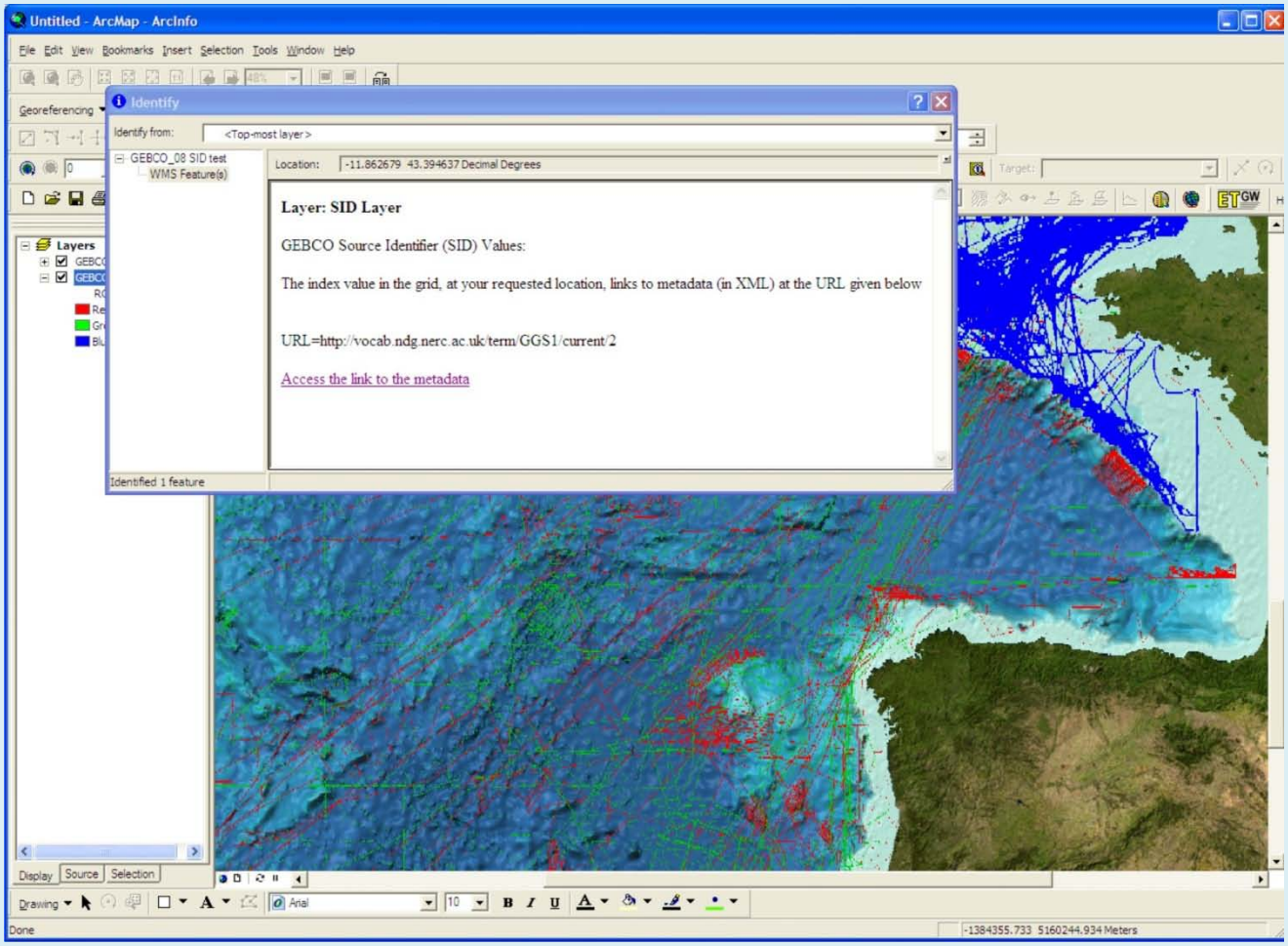
- Improve how we currently update the GEBCO_08 Grid?
- Use satellite-derived gravity data to help with the interpolation between soundings?

Capabilities and functionality ‘wish list’

- Defined/agreed methodologies for updating the GEBCO_08 Grid
- Defined metadata items/standards for contributed data sets
- methodologies for delivering metadata for the GEBCO_08 SID Grid (i.e. Information on the source data sets used to develop the grid) – for information, a demonstration Web Map Service (WMS) for delivering the SID Grid metadata has been developed

Capabilities and functionality ‘wish list’

Demonstration WMS serving SID grid metadata, displayed in ArcMap



What issues complicate your effort?

What issues complicate your effort? – more of a wish list for the way forward

‘Wish list’ for the way forward

- Defining procedures for updating the GEBCO_08 Grid will help to speed up the global grid update process
- Avoid duplication of effort – ‘joined-up’ mapping where possible

Future directions

- In collaboration with colleagues, continue work on maintaining and updating GEBCO's grids
- Continue with support for GEBCO's mapping efforts
- Continue development of web services for delivering GEBCO's data sets and metadata

Thank you for listening

Any questions?