

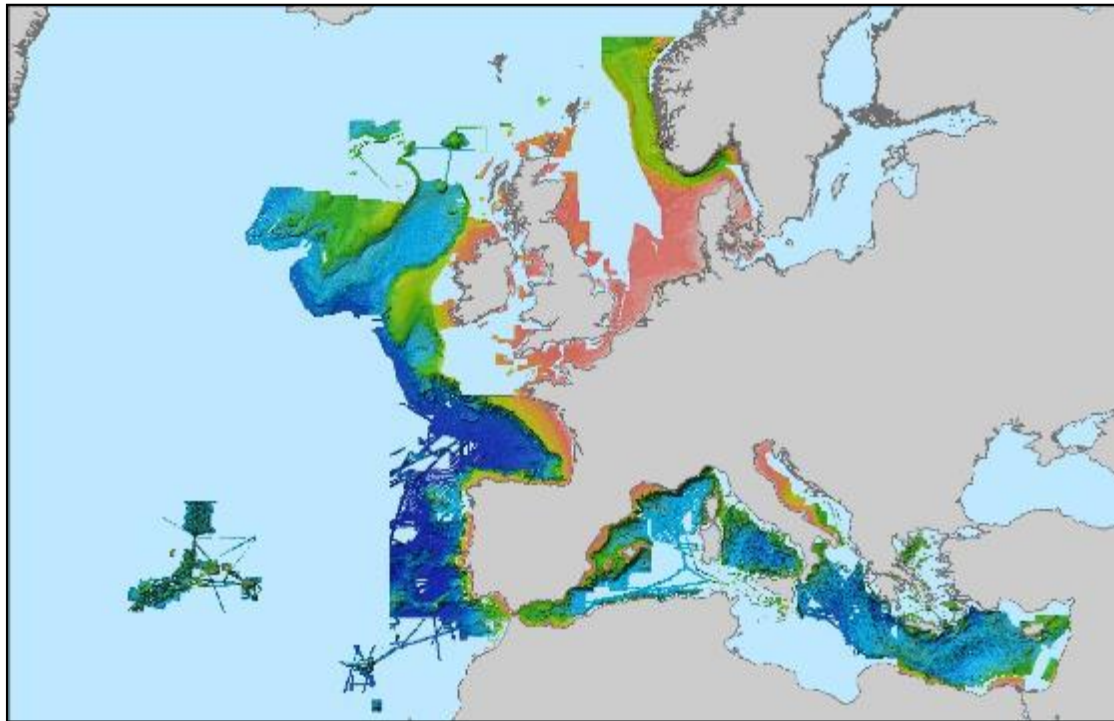
Updating the GEBCO grid using 'remove-restore'

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Grid updating procedure

We sometimes receive data sets for inclusion into GEBCO in the form of pre-existing grids, e.g. EMODnet. The boundary of the data set may not be rectangular and there may be 'holes' in the data sets



Coverage of EMODnet_2013

Grid updating procedure

Aim is to merge the new data set with the GEBCO base grid so that

- discontinuities at the boundaries between the data sets are minimized
- the original grids are preserved

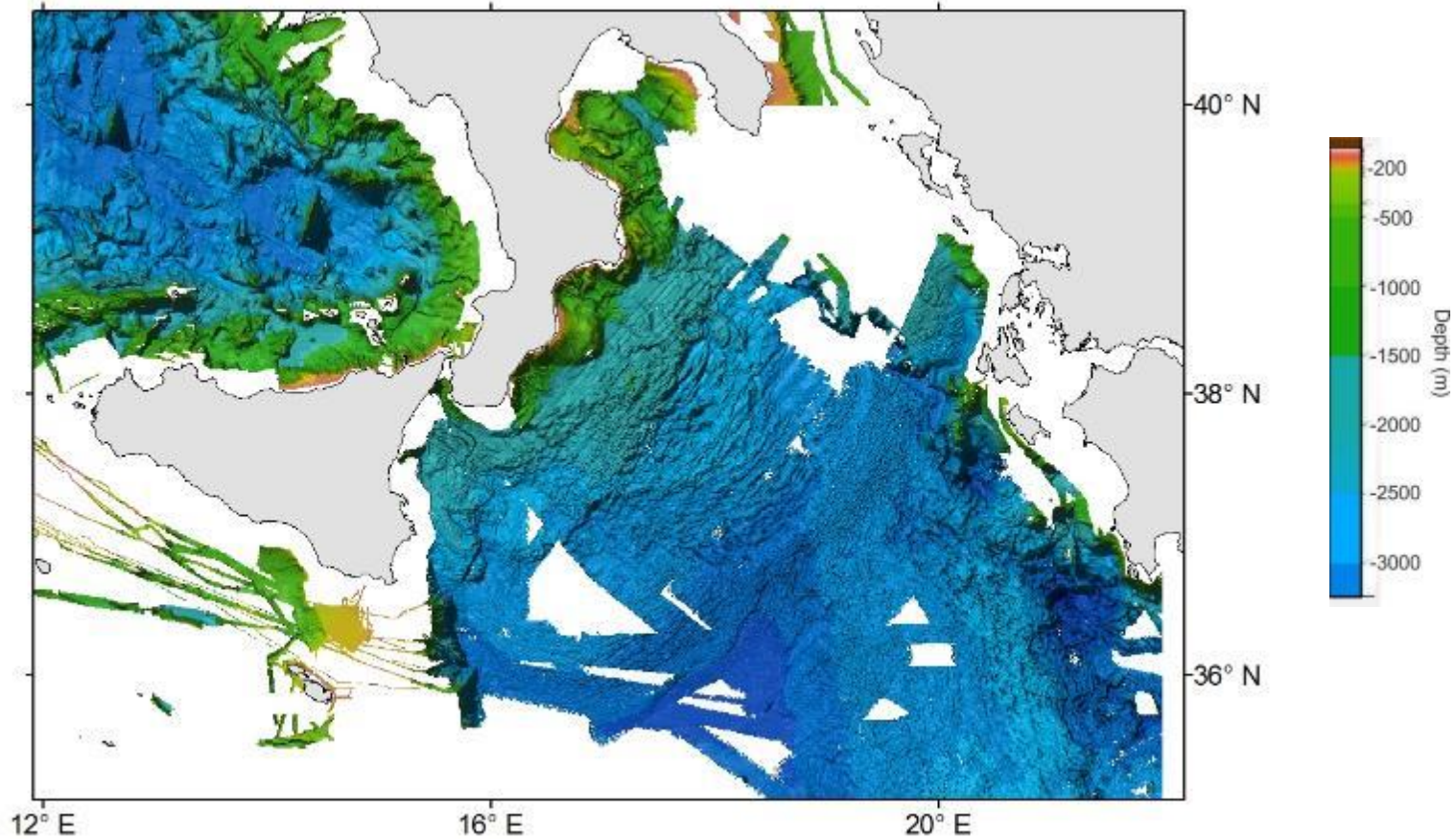
Grid updating procedure

The approach used to combine the GEBCO and EMODnet grids is based on the 'remove-restore' principal. See references and links section (Hell and Jakobsson 2011, Smith and Sandwell 1997)

This involves comparing a new data set (e.g. EMODnet) with an existing 'base' grid (GEBCO)

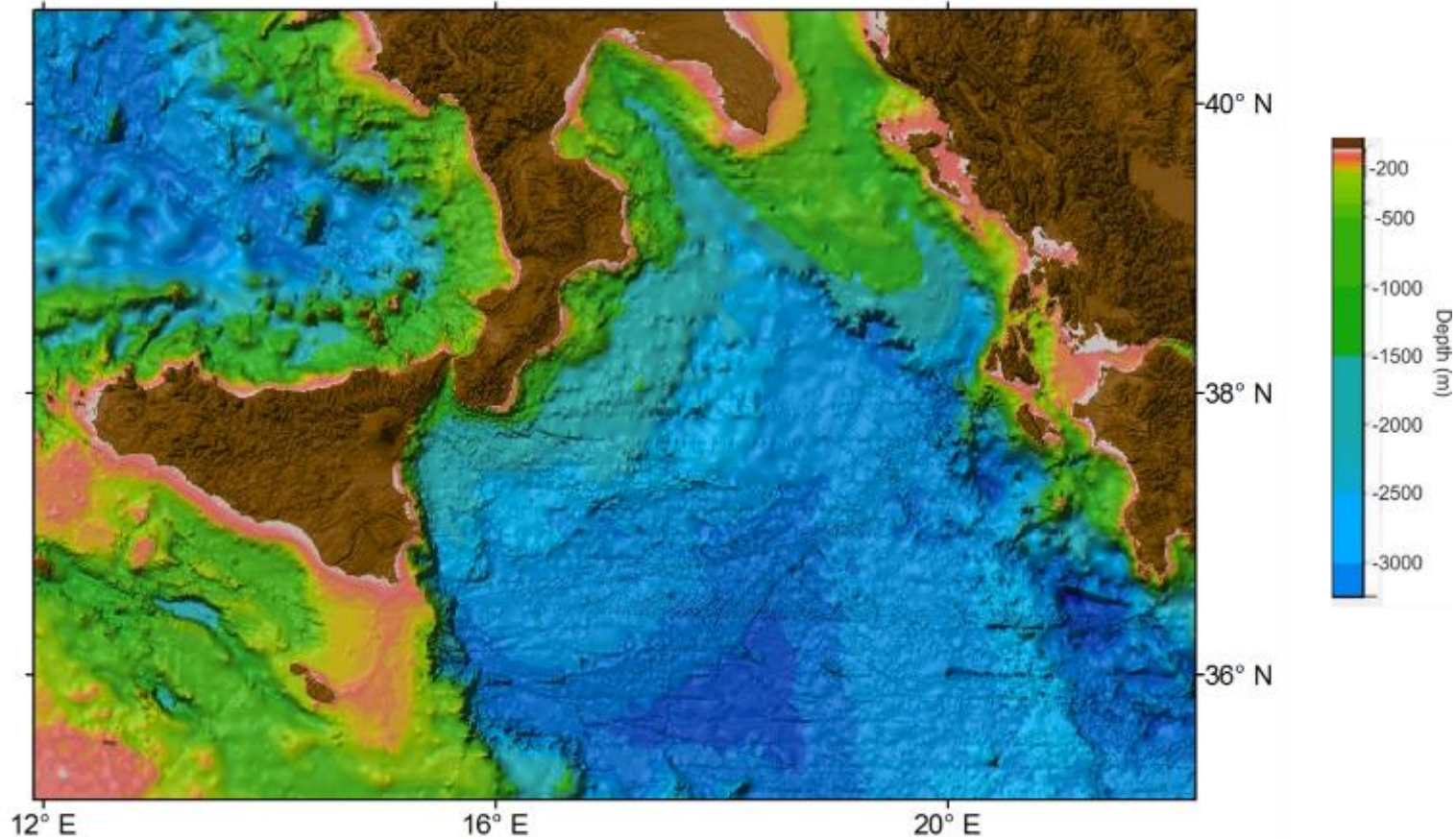
- The first step is to calculate the difference between the two gridded data sets. These difference values are then gridded using an interpolation algorithm and added on top of the base grid. This helps to give a smooth transition between the data sets.
- To help preserve the detail in the new data set, a final step involves re-adding in the data set to the merged grid either using the 'mosaic' tool from Esri's ArcToolbox or using GMT routines. (Based on IBCSO gridding methodology, see Arndt et al. (2013))
- The work is largely carried out using routines from the Generic Mapping Tools (GMT) software tools collection (<http://gmt.soest.hawaii.edu/>)

Grid updating procedure



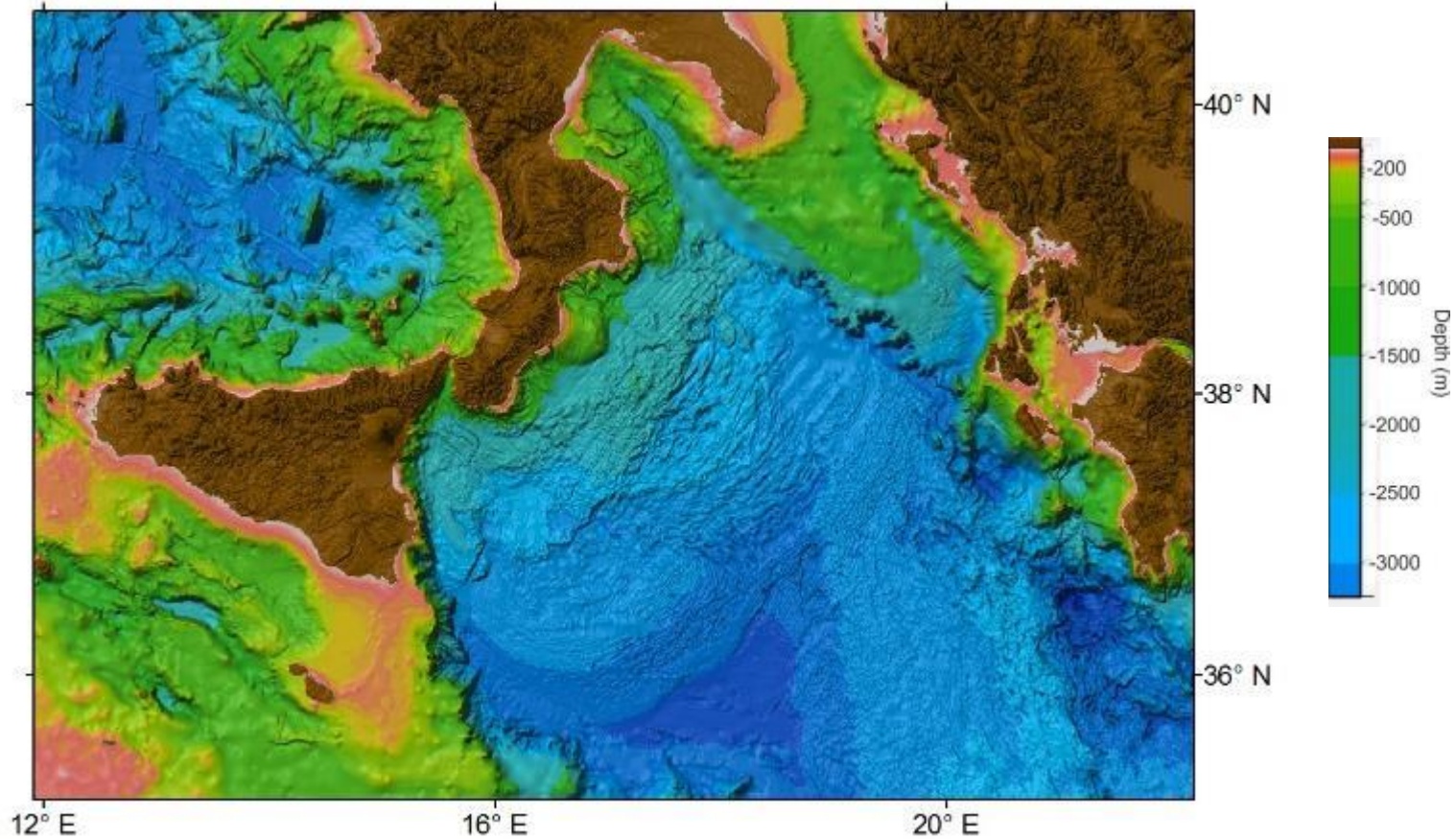
EMODnet grid

Grid updating procedure



GEBCO_08 grid

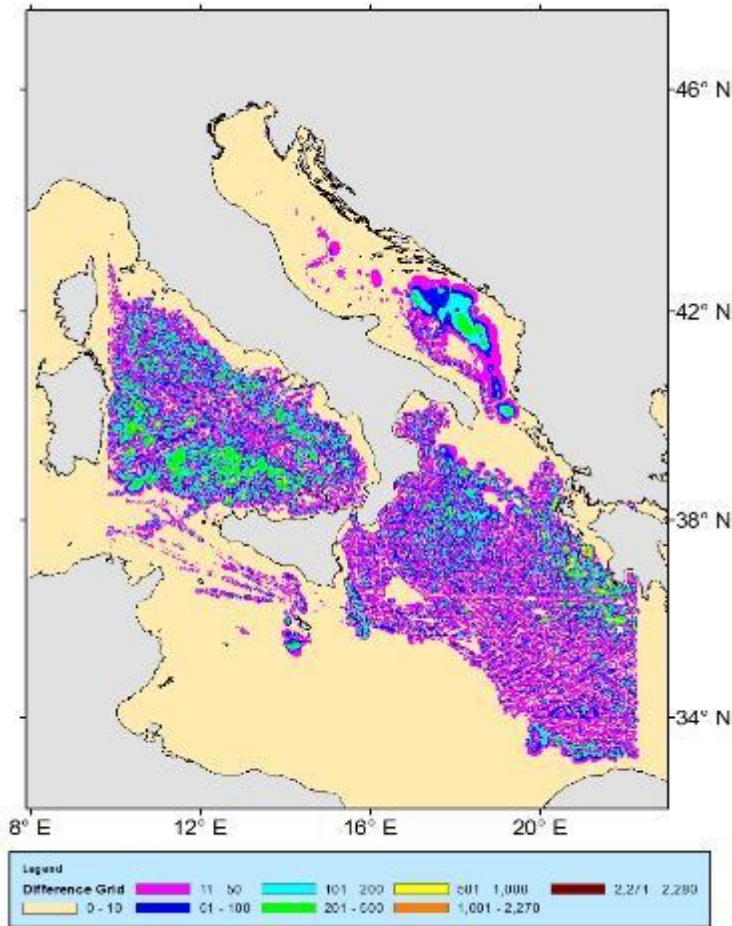
Grid updating procedure



Merged GEBCO and EMODnet grids

Grid updating procedure

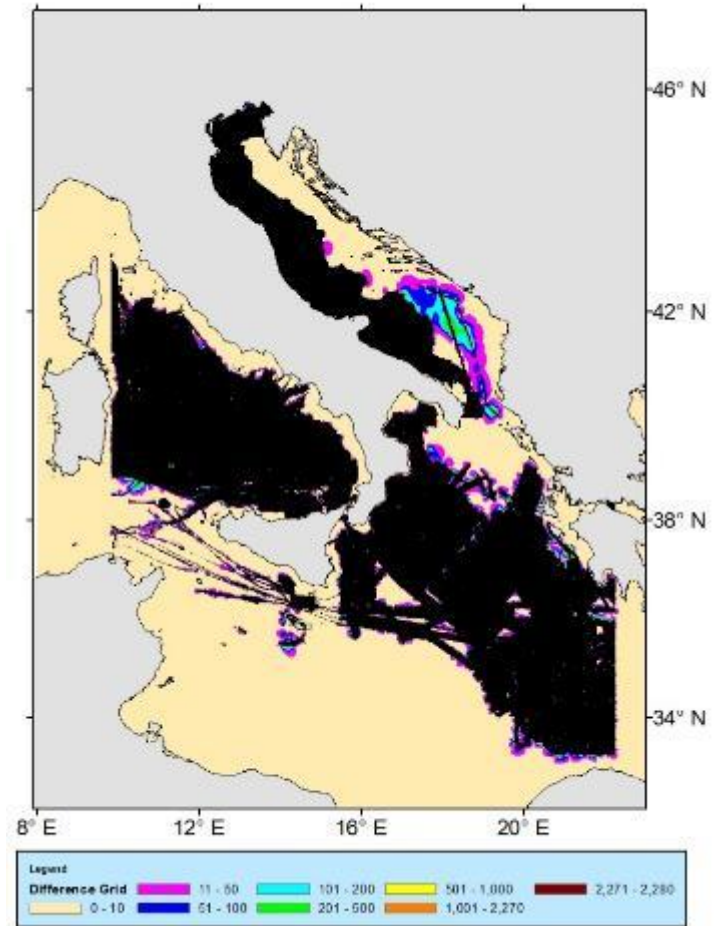
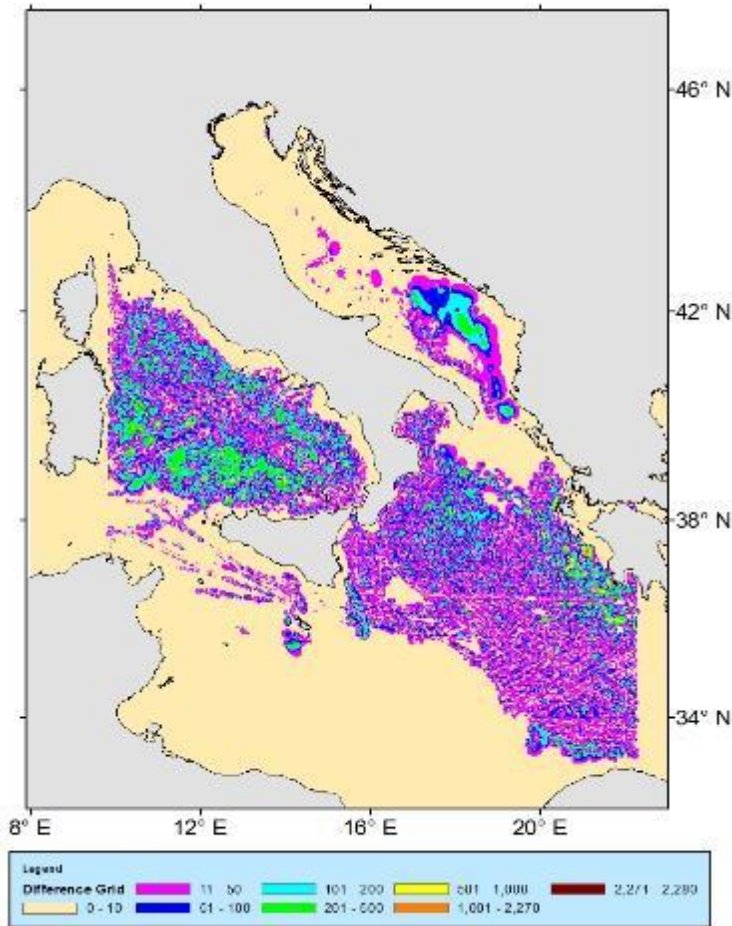
Difference between the GEBCO base grid
and combined EMODnet-GEBCO grid



Grid updating procedure

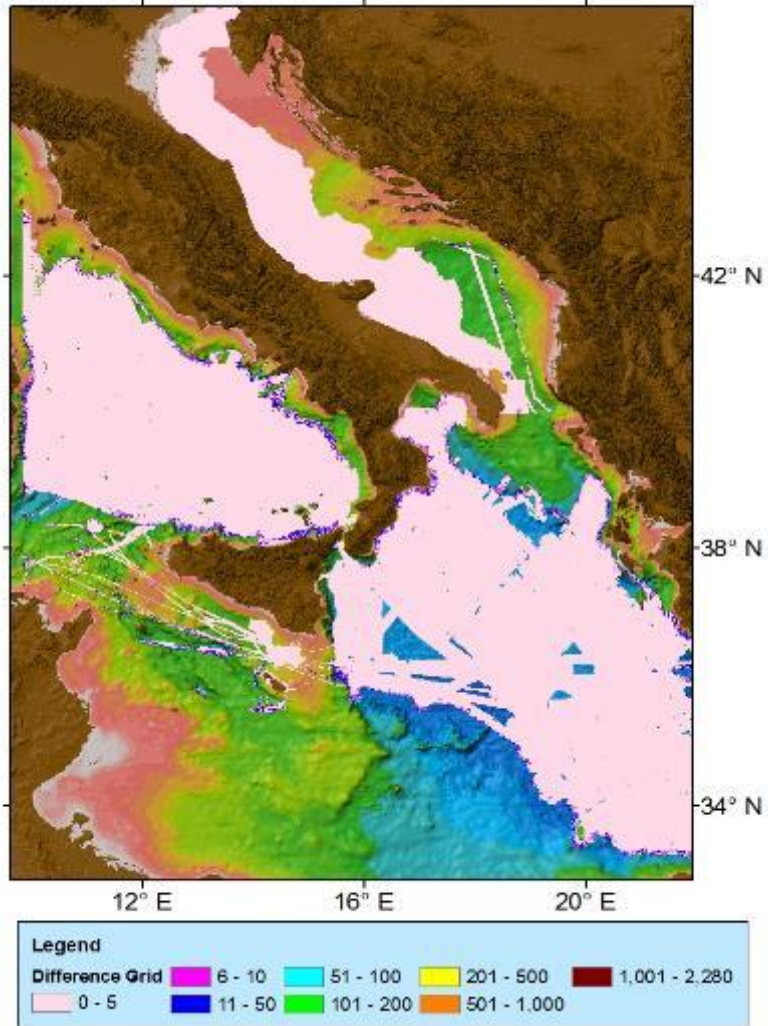
Difference between the GEBCO base grid and combined EMODnet-GEBCO grid

Difference grid overlain by EMODnet grid coverage (black)



Grid updating procedure

Difference between the EMODNet grid and the combined GEBCO-EMODnet grid



Useful references and links

The IHO-IOC GEBCO Cook Book

www.gebco.net/data_and_products/gebco_cook_book/ for information on 'remove-restore':

- **The procedure used to generate the IBCAO:** Chapter 8.2.11: Gridding the International Bathymetric Chart of the Arctic Ocean (IBCAO) Version 3.0: Workflow overview
- **Information on grid updating routines:** Chapter 8.4: Other routines for use on gridded data
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- **Preparation of the IBCSO:** Arndt, J. E., et al. (2013), The International Bathymetric Chart of the Southern Ocean (IBCSO) Version 1.0—A new bathymetric compilation covering circum-Antarctic waters, *Geophys. Res. Lett.*, 40, 3111–3117, doi:[10.1002/grl.50413](https://doi.org/10.1002/grl.50413).

Useful references and links

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

Hell, B., and Jakobsson, M., 2011, Gridding heterogeneous bathymetric data sets with stacked continuous curvature splines in tension: *Marine Geophysical Research*, v. 32, no. 4, p. 493-501

Becker, J. J., D. T. Sandwell, W. H. F. Smith, J. Braud, B. Binder, J. Depner, D. Fabre, J. Factor, S. Ingalls, S-H. Kim, R. Ladner, K. Marks, S. Nelson, A. Pharaoh, R. Trimmer, J. Von Rosenberg, G. Wallace, P. Weatherall., *Global Bathymetry and Elevation Data at 30 Arc Seconds Resolution: SRTM30_PLUS*, *Marine Geodesy*, 32:4, 355-371, 2009.

Arndt, J. E., et al. (2013), The International Bathymetric Chart of the Southern Ocean (IBCSO) Version 1.0—A new bathymetric compilation covering circum-Antarctic waters, *Geophys. Res. Lett.*, 40, 3111–3117, doi:10.1002/grl.50413.