



GEBCO Report to the IHO Inter-Regional Coordinating Committee

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Dr. Robin Falconer
Chair, GEBCO

The General Bathymetric Chart of the Oceans is a joint Project of Intergovernmental Oceanographic Commission (IOC) and IHO. GEBCO was established in 1903 by Prince Albert I of Monaco. GEBCO became a joint Project of the IHO and the IOC in 1973.

Organization

GEBCO is a non-profit organization that relies largely on the voluntary contributions of an international team of geoscientists and hydrographers who work on the development of a range of global bathymetric data sets and data products. GEBCO's work is directed by a Guiding Committee and supported by the Technical Sub-Committee on Ocean Mapping (TSCOM), the Sub-Committee on Undersea Feature Names (SCUFN), the Sub-Committee on Regional Undersea Mapping (SCRUM), and the Nippon Foundation/GEBCO Training Project Management Committee. Additional ad hoc working groups are convened as necessary. Through the work of its committees and working groups, GEBCO produces and makes available a range of bathymetric data sets and products, including gridded bathymetric data sets, the GEBCO Digital Atlas, the GEBCO world map and the GEBCO Gazetteer of Undersea Feature Names. GEBCO maintains a comprehensive website at <http://www.gebco.net>

Current GEBCO Officers

Chair, GEBCO: Dr Robin K. H. Falconer (IOC appointed)

Vice-Chair, GEBCO: Dr. Christopher G. Fox (IHO appointed)

Permanent Secretary/Treasurer, GEBCO: Mr. David M. Clark

Chair, Technical Sub-Committee on Ocean Mapping (TSCOM): Dr. Walter H.F. Smith

Chair, Sub-Committee on Undersea Feature Names (SCUFN): Dr-Ing. Hans-Werner Schenke

Chair, Sub-Committee on Regional Undersea Mapping: Dr. Martin Jakobsson

Director, IHO Data Centre for Digital Bathymetry: Ms. Lisa A. Taylor

GEBCO Bathymetric Editor: Vacant

GEBCO Digital Atlas Manager: Ms Pauline Weatherall

Full information on current membership can found on the GECBO website.

GEBCO Products and Projects

Bathymetric grids

GEBCO's latest bathymetric product is a global terrain model at 30 arc-second intervals. The bathymetric portion of the GEBCO Grid is largely based on a database of ship-track soundings with interpolation between soundings guided by satellite-derived gravity data, where they improve on the existing grid, data sets developed by other methods have been included.

It is intended to continually update the grid as new data sets become available. In order to do this, regional expertise is required. Through the Sub-Committee on Regional Undersea Mapping, GEBCO is aiming to build on and extend its collaboration with regional mapping groups in order to improve its bathymetric models. http://www.gebco.net/regional_mapping/

The GEBCO Grid was originally released in January 2009, with updated versions made available in November 2009 and November 2010. Details on the updates included in these releases can be found on our web site:

http://www.gebco.net/data_and_products/gridded_bathymetry_data/gebco_08_update_history/

A new release of the GEBCO Grid is planned for late Spring 2013 and it is aimed that it will include the following updates:

- IBCAO V3 (www.ibcao.org)
- IBCSO V1 (www.ibcso.org)
- Data from Geoscience Australia's Australian Bathymetry and Topography Grid, June 2009' (www.ga.gov.au/meta/ANZCW0703013116.html)
- Data from Olex (http://www.olex.no/index_e.html) primarily for shallow water regions off West Africa and the North Atlantic-Arctic shelves
- Shallow water data supplied by the East Asia Hydrographic Commission for part of the South China Sea region
- A grid based on multibeam data from a number of cruises for the Gulf of Cadiz region, west of the Strait of Gibraltar (doi:10.1016/j.epsl.2008.12.005)
- Data from the Lamont-Doherty Earth Observatory (LDEO) Global Multi-Resolution Topography (GMRT) data set (<http://www.marine-geo.org/portals/gmrt/>)

The GEBCO Grid is accompanied by a Source Identifier (SID) Grid. This data set shows which of the corresponding cells in the GEBCO Grid are based on soundings or existing grids and which have been interpolated.

GEBCO's grids can be downloaded from the internet; details are given on GEBCO's web site: http://www.gebco.net/data_and_products/gridded_bathymetry_data/.

Standardization of Undersea Feature Names

Main task of the IHO-IOC GEBCO Sub-Committee on Undersea Feature Names (SCUFN) is to evaluate and select names for undersea features, on the principles contained in the IHO Publication B-6 "Standardization of Undersea Feature Names". Proposal for undersea feature names can be submitted to GEBCO or its parent organizations IHO and IOC, by national and international authorities, individuals and scientific organizations. Based on the accepted undersea feature names, SCUFN compiles and maintains, as major product, the global GEBCO-Gazetteer of Undersea Feature Names (IHO Publication B-8). As of 2012, the IHO-IOC Publication B-6 is published in six separate translations from the English version (Chinese, French, Japanese, Korean, Russian, and Spanish).

The 25th meeting of SCUFN was conducted in Wellington, New Zealand from 22 to 27 October 2012 and was hosted by the Land Information New Zealand (LINZ). Ten of the twelve SCUFN-Members, the SCUFN Secretary and 15 national and international observers and specialists attended the meeting. At the meeting 137 undersea feature name proposals from Argentina, Brazil, China, Germany, Italy, Japan, Rep. of Korea, New Zealand, Russia, United Kingdom, United States, were discussed of which 126 new names of undersea features were accepted. The GEBCO-Gazetteer, after the SCUFN-25 Meeting, includes almost 4000 undersea feature names.

After extensive work of SCUFN Members and a special SCUFN Working Group, the new Edition 4.1.0 of Publication B-6, "Standardization of Undersea Feature Names" has been finalized. SCUFN is seeking endorsement of the revised B-6 by the IRCC

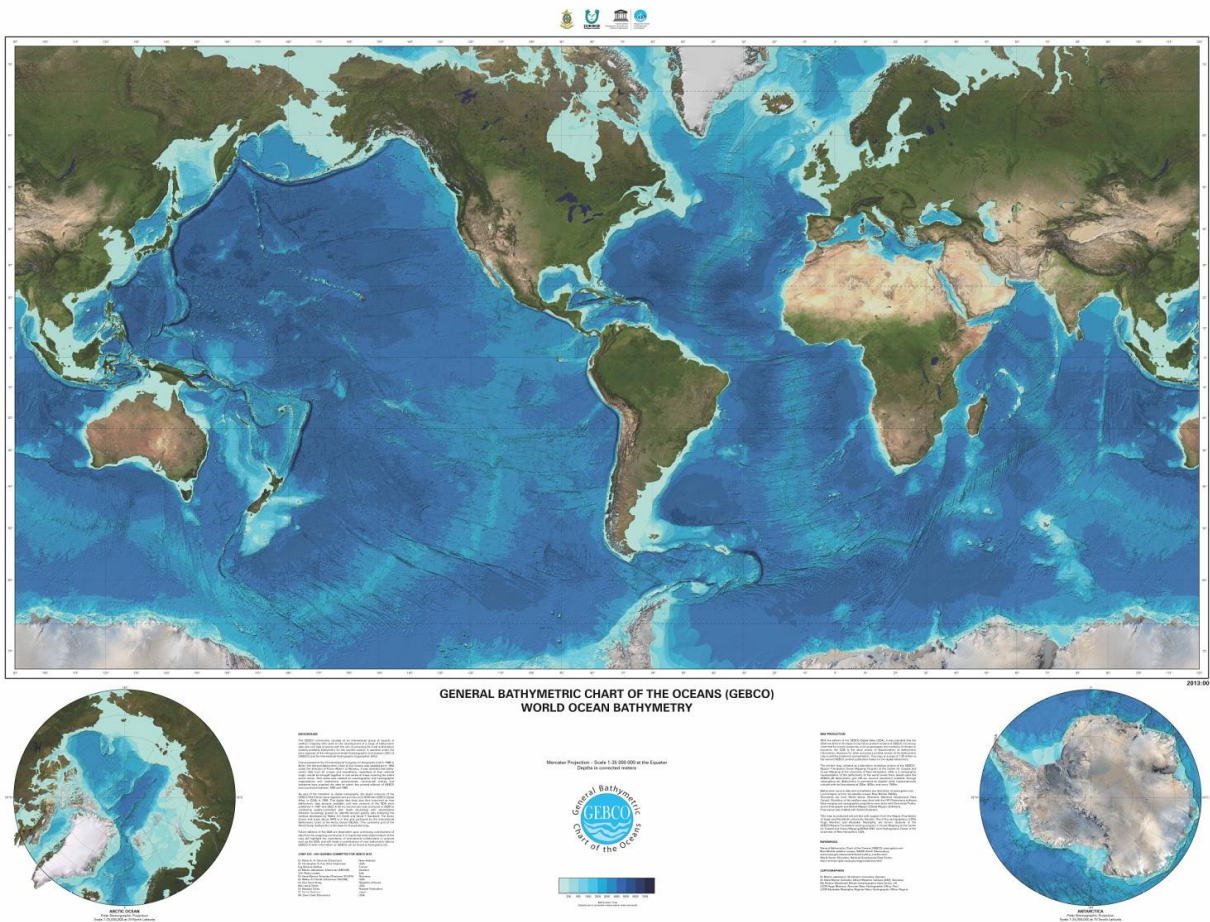
Capacity Building

The Nippon Foundation of Japan has provided funding for GEBCO to train a new generation of scientists and hydrographers in ocean bathymetry. The 12-month course, leading to a Postgraduate Certificate in Ocean Bathymetry (PCOB), has been held at the University of New Hampshire, USA since 2004. Students are taught theoretical and practical aspects of ocean mapping, work on a team project, spend time at another ocean mapping institute and participate in a deep sea mapping cruise. The Nippon Foundation funding for the UNH program, of about US\$540,000 per year, pays all tuition and expenses for the students and a modest stipend

There are now 46 course graduates working back in their home country organizations, two in international industry and six currently at UNH. The new group of Nippon Scholars begin in August 2013.

GEBCO World Map

A wall poster size world map was produced in 2008 based on the GEBCO 1 min grid. With the support of the Nippon Foundation, The Margaret Blodgett Foundation and Stockholm University, 5000 copies were printed and all were distributed. The World map has now been updated using the new GEBCO_08 grid as the main bathymetric source. The map is available for download from the GEBCO web site. http://www.gebco.net/data_and_products/gebco_world_map/ Printing is planned to take place by setting up several print shops in different countries in order to avoid the large cost of shipping maps across the World. A version with undersea feature names from the GEBCO SCUFN gazetteer is in preparation



Regional Mapping

Improving bathymetry of all the world oceans is important but in practice significant progress will be made only through addressing it on a regional basis. Regional projects also provide opportunity for capacity building and data sharing between countries and organizations.

The International Bathymetric Chart of the Arctic Ocean (IBCAO) Version 3.0 was completed at the end of 2012. The International Bathymetric Chart of the Southern Ocean Version 1.0 was completed at the beginning of 2013. Both these IBCs followed a workshop on “Arctic and Antarctic Seafloor Mapping” organized at Stockholm University May 3-5, 2011. At the workshop a new Editorial Board was established for IBCAO and new data were gathered from both the Arctic and Antarctic regions among the participants who came from 15 countries.

Indian Ocean Bathymetric Compilation Project is now beginning and will result in a new bathymetric map and grid of the Indian Ocean, north of -60° S, the east-west extent will probably extend from 10° E (to include information available around South Africa) to 147° E (to the IHO S23 defined edge of Indian Ocean south of Australia). Data will be collated from all available sources, utilizing the contacts generated through GEBCO members, including the Nippon Scholar networks, to access data. The produced map and grid will be constructed from scientific cruise data

obtained in both shallow and deep water, as well as hydrographic survey data in shallow water, combined with satellite altimetry as required, to complete the grid at the highest possible resolution.

The first Indian Ocean Bathymetric Compilation Project meeting was held in Chittagong, Bangladesh, from 20-22 January 2013. Six GEBCO Nippon scholars attended this inception meeting. The project director attended the North Indian Ocean and Middle East regional hydrographic commission meetings to request data and to emphasize the importance of the shallow water bathymetric data from hydrographic offices in order to ensure best possible seamless GEBCO dataset

A new regional mapping project has been initiated under the auspices of the Baltic Sea Hydrographic Commission. The project has been established with strong links to GEBCO and the primary goal is to create a digital gridded model representing the bathymetry of the entire Baltic Sea

GEBCO Cook Book

The IHO-IOC GEBCO Cook Book provides an educational resource for preparing gridded datasets and bathymetric data. It contains chapters that span basic to advanced topics, written by expert GEBCO contributors from international research organizations, universities, governments, and companies. It is a “living document” this is continuously updated and expanded as new or amended techniques and software become available.

Started in 2009, the IHO-IOC GEBCO Cook Book was published in 2012 as IHO Publication B-11 and IOC Manuals and Guides 63. It is available for free download from the GEBCO website:

<http://www.gebco.net>

An announcement for the availability of the IHO-IOC GEBCO Cook Book was published as an EOS News Brief in EOS, Trans. AGU, V. 94, No. 9, 26 Feb. 2013, pg. 88.

Shallow water bathymetry

Knowledge of the bathymetry of shallow water areas is important for coastal zone development and management, maritime safety and marine hazards. The impact of tsunamis in particular is strongly influenced by shallow water bathymetry. Modelling of tsunami run up for mitigation and preparation requires detailed shallow water bathymetric data.

Traditionally GEBCO had been focused on waters deeper than about 200m but that has changed. Firstly because of the importance of the coastal zone but secondly because bathymetric grids used by modellers, even on a global scale, have to be complete and consistent up to the coastline. GEBCO has therefore increased its work on shallow water areas. Through the IHO, data has been sought from coastal countries, a special project was initiated to extract data from Electronic Navigation Charts (ENCs) and fishing industry data has been obtained. Special products are being considered for regional areas. There are however many areas in which there is valuable data but nations or organizations do not make it available.

Globes

In 2009, GEBCO initiated a project to produce a terrestrial globe featuring GEBCO bathymetry. All flat map projections suffer distortion since they are an attempt to portray a three dimensional data base in two dimensions. The larger the area portrayed, the greater is the distortion. A terrestrial globe is a map of the earth printed onto a sphere, which closely approximates the true shape of the earth. As such, a map of the earth presented as a globe suffers no distortion.

As of October 2012, GEBCO has worked with a globe company in China to produce the GEBCO globes. The seafloor data portrayed on the globes is derived from the GEBCO one-half-arc-minute digital data base; the land areas portrayed on the globe are NASA's Blue Marble Next Generation cloud free photo mosaics. The GEBCO Globes have been well received by academia (primary schools through university), government organizations, Non-government organizations and commercial companies. The GEBCO Globes will be a good addition to the IHO suite of educational materials. The globes come in sizes of 14cm, 32cm and 64cm.

IHO Data Center for Digital Bathymetry

Since 1990, the U.S. National Geophysical Data Center (NGDC) in Boulder, Colorado, has operated the IHO Data Centre for Digital Bathymetry (DCDB) on behalf of the Member Countries of the International Hydrographic Organization (IHO). The IHO DCDB:

- Focuses on oceanic regions with depths greater than 100 meters.
- Provides IHO Member Countries bathymetric data free of charge for their national and international projects.
- Maintains a quality control facility whereby data provided to the IHO DCDB are checked for violation of physical principles (e.g., instantaneous changes in ship position, high ship speeds, etc.) and completeness of metadata.
- Maintains digital inventories of all the digital bathymetric data it holds.
- Collaborates with various international organizations in the development of exchange formats and standards to expedite bathymetric data exchange.

Online Interface to GEBCO Gazetteer of Undersea Feature Names

In 2013, the IHO DCDB migrated the GEBCO Gazetteer of Undersea Feature Names to a geospatially enabled database. Working closely with the IHB and the GEBCO Sub Committee on Undersea Feature Names, the IHO DCDB performed data quality control, enhanced feature geometries, and developed an online interface for public and administrative access. The Gazetteer is now available as a web service so that other organizations can programmatically access the feature names and attributes for use in their specific applications (e.g., Google Earth, ESRI base maps, Marine Regions interface, etc.).

Technology - Data and Information Distribution

New technology for disseminating information is proliferating: Internet, websites, cell phones, Wikipedia, Google, blogs, Facebook, Twitter etc. GEBCO has to embrace those that are relevant but that can raise issues with respect to copyright, quality control, timeliness, "brand", revenue, scale and users understanding the limitations of the data. One of our mandates is to be an authoritative source of bathymetry and undersea feature information. Many users rely on that stamp of authority and associated quality. GEBCO's role is to facilitate knowledge of the oceans and that means getting data information out. Increasingly we need to get data and information out free or at very low cost or users will go to other sources. We have to balance reward, recognition and relevance.

The GEBCO's web site provides access to information about GEBCO's products and work. Since its launch in July 2008, there have been over 929,000 pages viewed on the web site. The GEBCO Digital Atlas (GDA) contains a collection of GEBCO's bathymetric data sets (grids and contours) and is made available on DVD. It includes software for viewing and accessing the data sets in a variety of formats. http://www.gebco.net/data_and_products/gebco_digital_atlas/

GEBCO's data sets are accessed and used by a wide user community from the commercial and academic sectors and also by the general public. A number of copies of the GDA are regularly made available to participants on IODE training courses. GEBCO makes available its bathymetric grids either via the internet or on DVD as part of the GDA. The following summaries access to GEBCO's data sets:

Downloads of data from GEBCO's global 30 arc-second interval grid since its release in January 2009: 22,464

Downloads of data from the GEBCO SID Grid since its release in November 2009: 5,259

Number of copies of the GDA distributed since 2003: 1,630

The GEBCO Web Map Service provides a means of accessing geo-referenced map images over the internet. It is based on the GEBCO grid and was released in 2011.

http://www.gebco.net/data_and_products/gebco_web_services/web_map_service/

Google Earth has produced a large increase in interest and understanding of the world's ocean. GEBCO has provided its data to Google for its all important bathymetric base and we are also working with them on feature names and the mechanisms for update. Update at the global scale is not a trivial issue even for powerful systems. GEBCO has also provided data to a mobile phone company for cell phone applications and we supply conventional book and map publishers, software system manufacturers and education product suppliers.

Resources

GEBCO relies largely on the voluntary efforts of an international community of scientists and hydrographers supported by their organizations or personally.

The UK Natural Environment Research Council provides 0.5 man years of personnel at the British Oceanographic Data Centre supporting data base editing and updating, data delivery, web site maintenance and support for other groups worldwide.

The USA National Ocean and Atmospheric Administration maintains the IHO Data Centre for Digital Bathymetry (DCDB) and contributes 0.5 man yrs for that and other GEBCO activities.

The IHO supports the SCUFN secretariat, some regional projects and some data compilation. It provided 20,000 Euros for 2008 – 2012 for special projects and education and outreach.

The IOC previously supported some regional mapping projects.

The Nippon Foundation of Japan has, for ten years, provided US\$540,000 per year for the training of six students each year in the GEBCO ocean mapping course at the University of New Hampshire (UNH). In 2010 Nippon also provided additional funds of US\$400,000 for capacity building of existing UNH scholars and other development and outreach programs.

2012 GEBCO MEETINGS

The GEBCO Guiding Committee, Technical Sub-Committee on Ocean Mapping (TSCOM), Sub-Committee on Regional Undersea Mapping (SCRUM) and Nippon Foundation/GEBCO Training Project Management Committee met at the International Hydrographic Bureau in Monaco, October 1-5, 2012. The meeting site and dates were selected to meet the new newly appointed IHB Directors

and to meet in conjunction with the Advisory Board on the Law of the Sea (ABLOS) meetings taking place on October 3 – 5. GEBCO attendees we invited to the first day of the ABLOS sessions, and ABLOS attendees are invited to participate in the GEBCO Bathymetric Science Day on October 2.

The GEBCO Sub-Committee on Undersea Feature Names (SCUFN) held its annual meeting in Wellington, New Zealand on October 22 – 26, 2012.

2013 GEBCO MEETINGS

The GEBCO Guiding Committee, Technical Sub-Committee on Ocean Mapping (TSCOM), Sub-Committee on Regional Undersea Mapping (SCRUM) and Nippon Foundation/GEBCO Training Project Management Committee will meet at the Istituto di Scienze Marine in Venice, Italy, October 7-11, 2013. The GEBCO Bathymetric Science Day will also be held this week at this venue.

The GEBCO Sub-Committee on Undersea Feature Names (SCUFN) will hold its annual meeting in Toyko, Japan, September 23-27, 2013. information of these upcoming events can be found on the GEBCO website: http://www.gebco.net/about_us/meetings_and_minutes/.

GEBCO actions from IRCC4

ACTION: IRCC4/07: Invite GEBCO Guiding Committee / Bathymetric Regional Project Chairs to attend corresponding RHCs meetings, aiming at strengthening collaboration with a priority on improving high resolution shallow water bathymetry at the regional level

As part of the IHO Workplan for 2013 - 2017, GEBCO proposed a task (and was approved) to proactively enhance GEBCO participation in regional mapping activities. GEBCO Task 3.8.3 in the IHO 2013-2017 workplan states "A representative of GEBCO will actively participate in selected RHC meetings (of current interest are the SEPHC, and RHC in the Indian Ocean). In addition, there will be a concerted effort to have the GEBCO Nippon Foundation Scholars participate in appropriate regional mapping meetings. The Nippon Scholars are from various parts of the world and would potentially make valuable contributions to the regional mapping projects. Their participation would be supported by the Nippon Foundation GEBCO Scholar's program."

In 2012 GEBCO participation in regional mapping activities included projects in the Arctic and Antarctic, Indian Ocean and a new start in the Baltic. GEBCO representatives attended several RHC meetings including the NIOHC meeting in Yangon, the RSAHC meeting in Riyadh and the EAHC meeting in Chiang Mai. GEBCO will make an effort to attend more RHCs in the upcoming year.

Action Required of IRCC

The IRCC is invited to

- note this report.
- endorse the continuation of GEBCO to pursue its work under its existing Terms of Reference.
- urge Regional Hydrographic Commissions to support GEBCO regional projects"
- encourage Regional Hydrographic Commission member states to submit data to GEBCO.
- endorse B-6 edition 4.1.0.
- recommend to MS that B-6 edition 4.1.0 be adopted forthwith to replace the existing 4th edition dated November