A world map showing bathymetry, with colors ranging from light blue (shallow) to dark blue (deep). The map is overlaid with a grid of latitude and longitude lines.

**GENERAL BATHYMETRIC CHART
OF THE OCEANS
(GEBCO)**
an IHO-IOC Joint Project

UN-GGIM WGMGI
Busan, Republic of Korea, 7-9 March 2019

What is GEBCO?

The General Bathymetric Chart of the Oceans (GEBCO) (see www.gebco.net)

- Aims to provide the most authoritative, publicly-available bathymetric data sets for the world's oceans
- Operates under the joint auspices of the
 - International Hydrographic Organization (IHO), and
 - Intergovernmental Oceanographic Commission (IOC) of UNESCO
- First GEBCO paper chart series initiated in 1903
- Forum for Future Ocean Floor Mapping (June 2016):
www.iho.int/mtg_docs/com_wg/GEBCO/FOFF/index.html

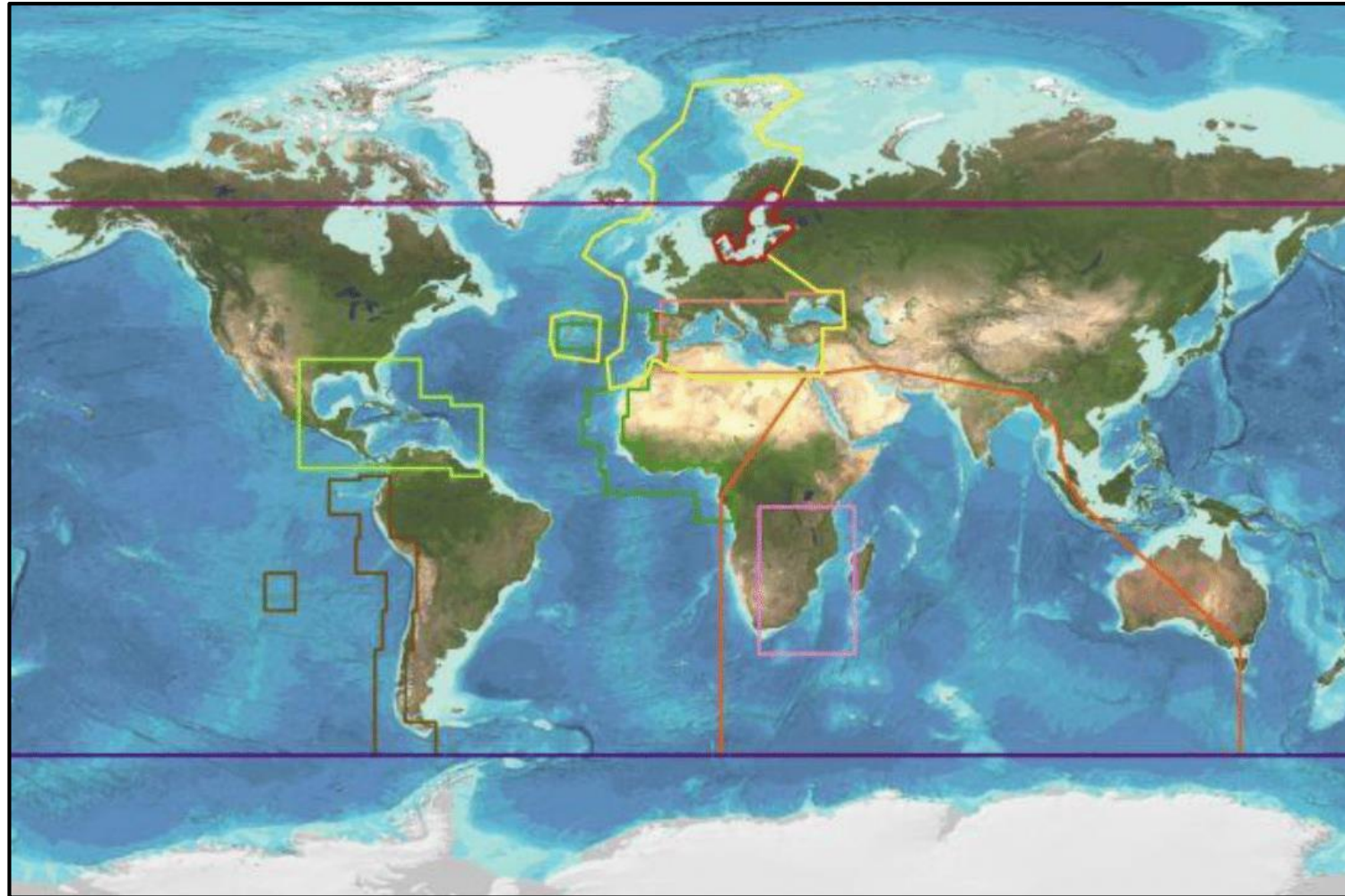
GEBCO Project organisational structure



- GEBCO is led by a Guiding Committee consisting of five IHO-appointed members; five IOC-appointed members; Sub-committee Chairs and the Director of the IHO-DCDB
- It has 4 sub-committees and a number of working groups:
 - Sub-Committee on Undersea Feature Names (SCUFN)
 - Technical Sub-Committee on Ocean Mapping (TSCOM)
 - Sub-Committee on Regional Undersea Mapping (SCRUM)
 - Sub-Committee on Communications, Outreach and Public Engagement (SCOPE)
 - IHO-IOC GEBCO Cook Book

www.gebco.net/about_us/committees_and_groups/

Regional mapping projects



GEBCO products

Our bathymetric data sets and products:

- Global gridded bathymetric data set (30 arc-second interval)
- GEBCO Gazetteer of Undersea Feature Names
- GEBCO Digital Atlas
- Grid viewing software
- Printable maps
- Web Map Service (WMS)
- IHO-IOC GEBCO Cook Book

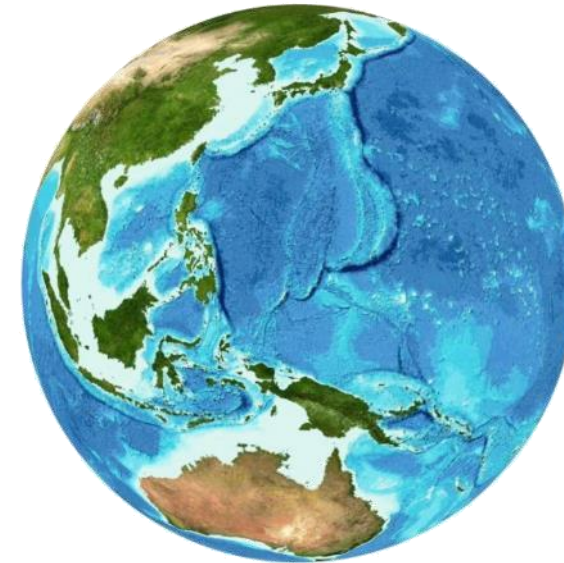
www.gebco.net/data_and_products/

GEBCO products: global bathymetric grid



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

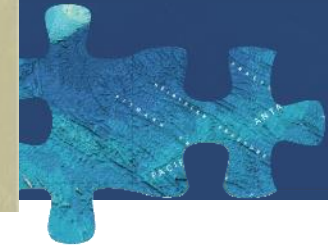
- Largely based on a database of ship-track soundings with interpolation between soundings guided by satellite-derived gravity data
- Includes regional grids which may be based on different interpolation models
- Accompanied by a Source Identifier Grid showing which cells are based on soundings or existing grids and which are interpolated



GEBCO's grids are made available for non-navigational purposes:

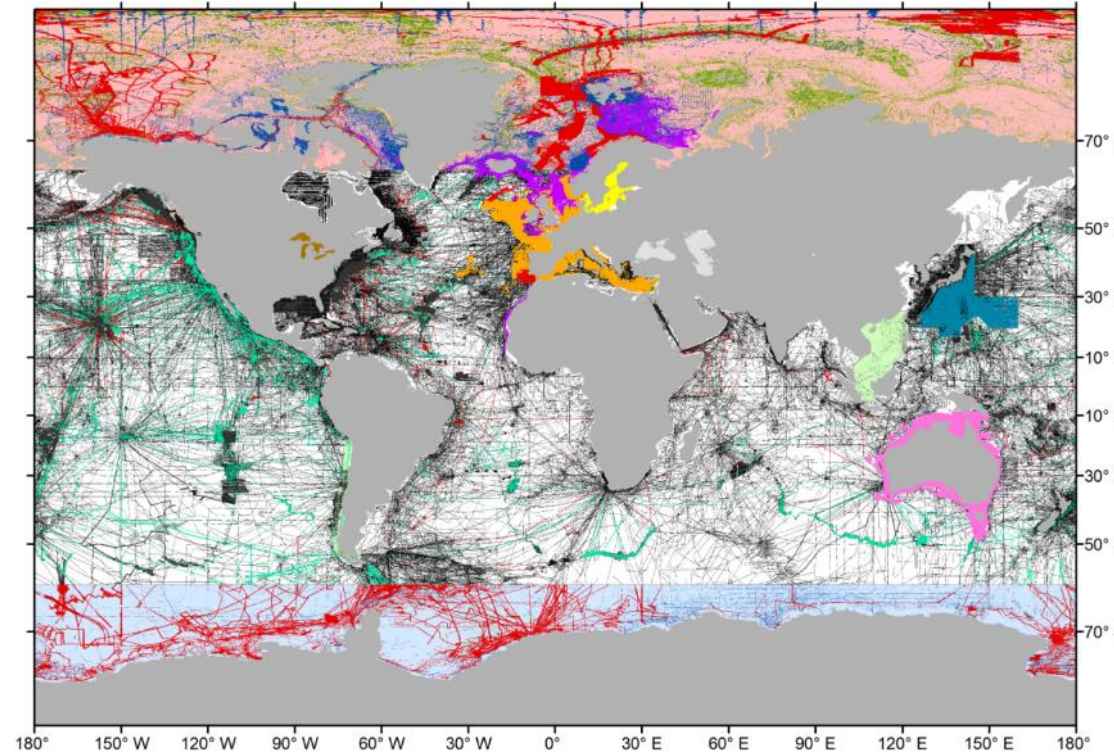
www.gebco.net/data_and_products/gridded_bathymetry_data/

GEBCO products: Source Identifier Grid



The GEBCO Source Identifier (SID) Grid:

Shows the source of depth value in each grid cell, *i.e.* if it is based on track-line data; pre-existing grids or if it is based on interpolation

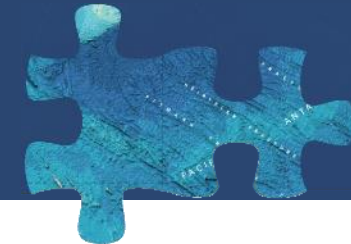


- | | | |
|--------------------------------|--|--|
| Region taken from IBCAO V3 | LDEO Global Multi-Resolution Topography Synthesis | Trackline control information from the SRTM30_plus (v5) base grid |
| Region taken from IBCSO V1 | Multibeam bathymetry | Region based on interpolation guided by satellite-derived gravity data within the SRTM30_plus (v5) base grid |
| EMODNet 2013 | Single beam bathymetry | Coastal area updated with shallow water soundings |
| Baltic Sea Bathymetry Database | Bathymetric contours from charts | |
| Geoscience Australia Grid 2009 | North American Great Lakes bathymetry | |
| JHOD grid | Regions based on pre-prepared grids, (first included in the GEBCO_08 Grid) | |
| Olex AS data | | |

Filling the data gaps

- Raising awareness of the ‘data gaps’ to encourage data collection in these regions
- Encouraging organizations to make their bathymetric data sets easily discoverable and accessible, either directly or by contributing data to international publically-available databases such as the IHO Data Center for Digital Bathymetry (IHO-DCDB)
- Crowdsourced bathymetry (CSB) initiatives – such as the IHO CSB Working Group
- GEBCO initiative to request shallow water bathymetry data extracted from Electronic Navigation Charts from the Hydrographic Community

Seabed 2030



Seabed 2030 is a global initiative to cooperatively work towards creating a high resolution complete map of the world's ocean floor by 2030.



United Nations
Educational, Scientific and
Cultural Organization



Intergovernmental
Oceanographic
Commission

-The **Nippon Foundation** is a private Japanese-based, non-profit grant-making organization with a mission based around philanthropic activities to pursue global maritime development and assistance for humanitarian work.

-The **General Bathymetric Chart of the Oceans (GEBCO)** organization operates under the joint auspices of the International Hydrographic Organization (IHO) and the Intergovernmental Oceanographic Commission (IOC) of UNESCO



Empower the world to *make policy decisions, use the ocean sustainably*, and *undertake scientific research* that is informed by a detailed understanding of the global ocean floor.

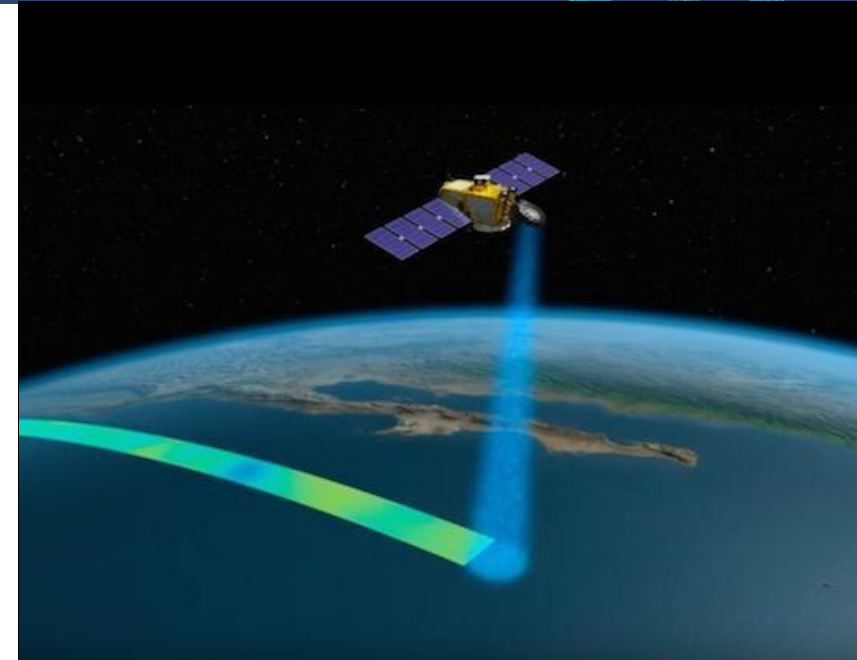
*Only a small portion of the ocean has been mapped with direct measurement.
~ 50% of the world's coastal waters remain unsurveyed*

As of GEBCO 2019 - only 6% of our global goal is met

What can depth information be used for?



- Nautical charts
- Oil and gas exploration
- Safety and storm surge/tsunami inundation models
- Ecosystem identification and management
- Emergency response
- Satellite verification models
- Coastal and Marine Spatial Planning
- Coastal Hazard Assessment
- Ocean Exploration
- Coastal Change Analysis
- Sea Level Rise Mitigation
- New Energy Siting
- Marine heritage



The UN Decade of Ocean Science for Sustainable Development (2021-2030)



CONSERVE AND SUSTAINABLY USE THE OCEANS, SEAS AND MARINE RESOURCES FOR SUSTAINABLE DEVELOPMENT

14 LIFE BELOW WATER

A Vision for the Decade

Develop scientific knowledge, build infrastructure and foster partnerships for a sustainable and healthy ocean



Seabed 2030 Regional Data Assembly



Seabed 2030: Regional Centers



- Coordinate with stakeholders
- Build upon ongoing regional efforts including IBCs
- Develop mechanisms for attribution
- Assemble regional data products

■ North Pacific-Arctic Ocean ■ South and West Pacific Ocean
■ Atlantic-Indian Ocean ■ Southern Ocean

Coordinating with IBCs



- Seabed 2030 Atlantic/Indian Oceans RDACC
 - IBC of the Caribbean Sea & Gulf of Mexico (IBCCA)
 - IBC of the Central Eastern Atlantic (IBCEA)
 - IBC of the Mediterranean (IBCM)
 - IBC of the Western Indian Ocean (IBCWIO)
- Seabed 2030 South & West Pacific RDACC
 - IBC of the South Eastern Pacific (IBCSEP)
- Seabed 2030 Arctic/North Pacific RDACC
 - IBC of the Arctic Ocean (IBCAO)
 - IBC of the Caribbean Sea & Gulf of Mexico (IBCCA)
- Seabed 2030 Southern Ocean RDACC
 - IBC of the Southern Ocean (IBCSO)



Seabed 2030 Status & Next Steps

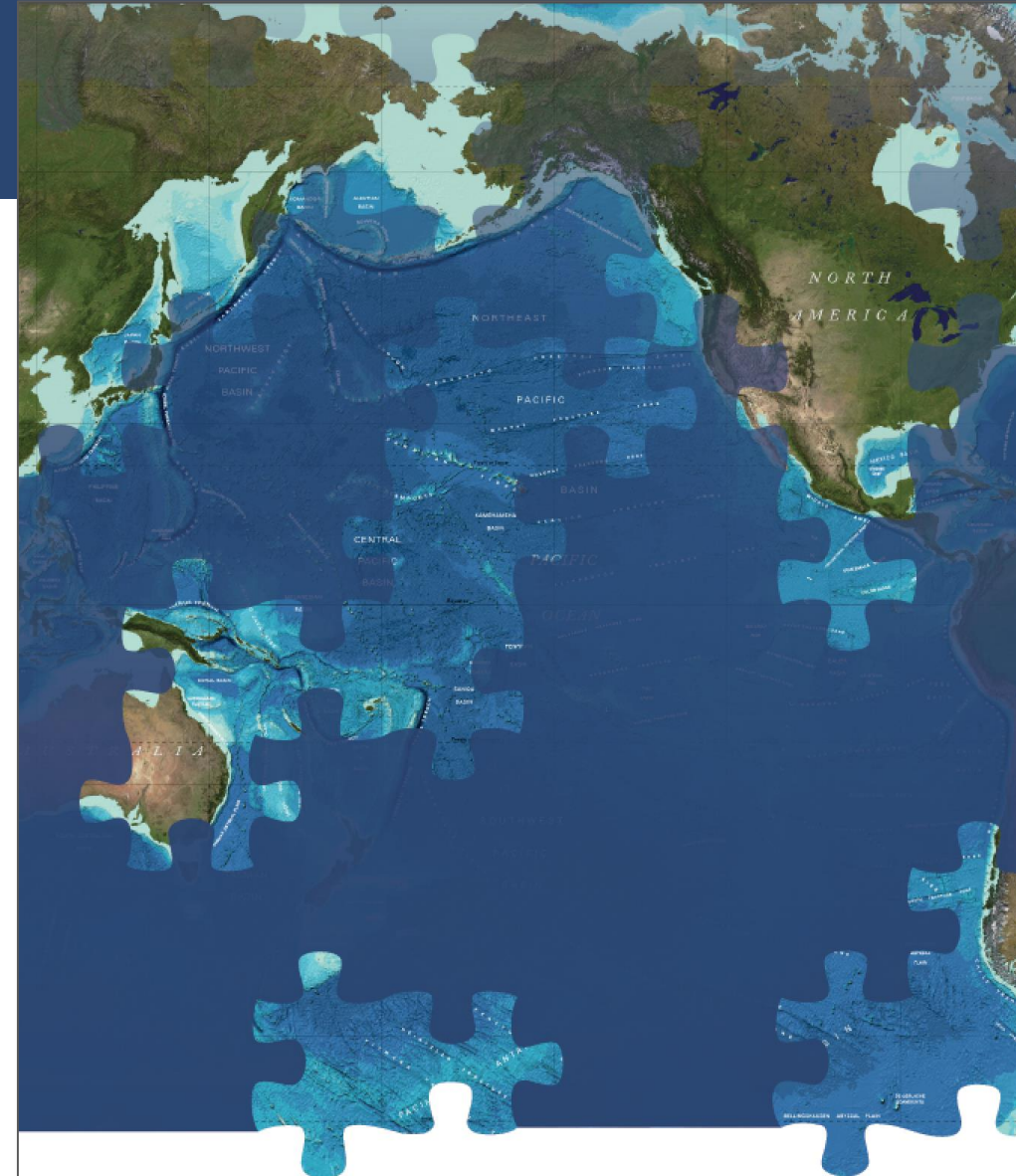


- ✓ Data centers established 2018
- ✓ Initial regional data products generated and passed to Global Center
- New GEBCO grid to be released at spring of 2019
- Establishing connections with regional stakeholders



How to participate

- Contribute information about existing data coverage
- Contribute data
 - Gridded data products
 - Points from ENCs
- Share information about future mapping plans
- Participate in 2019 Regional Mapping Meetings & GEBCO Meetings



The Nippon Foundation – GEBCO – Seabed 2030
Roadmap for Future Ocean Floor Mapping



Capacity-building initiative: The Postgraduate Certificate in Ocean Bathymetry

Designed to train a new generation of scientists and hydrographers in ocean bathymetry

is funded by:



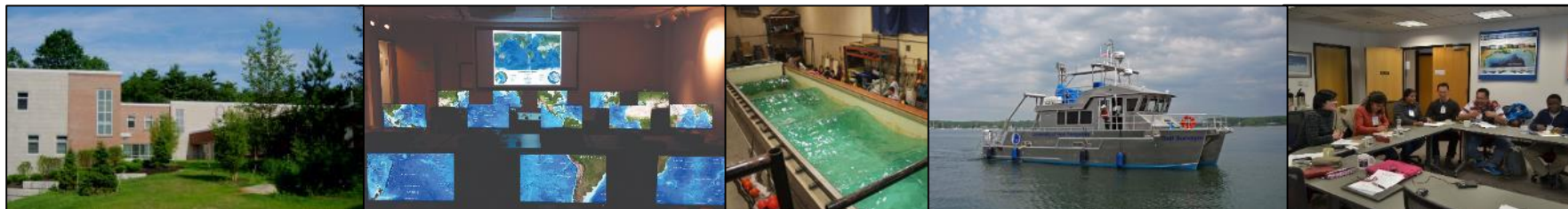
The Nippon Foundation of Japan

www.nippon-foundation.or.jp/en/

and taught at:

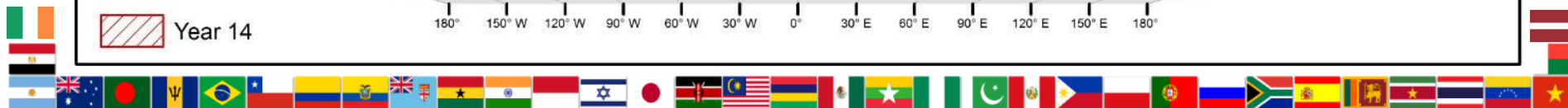
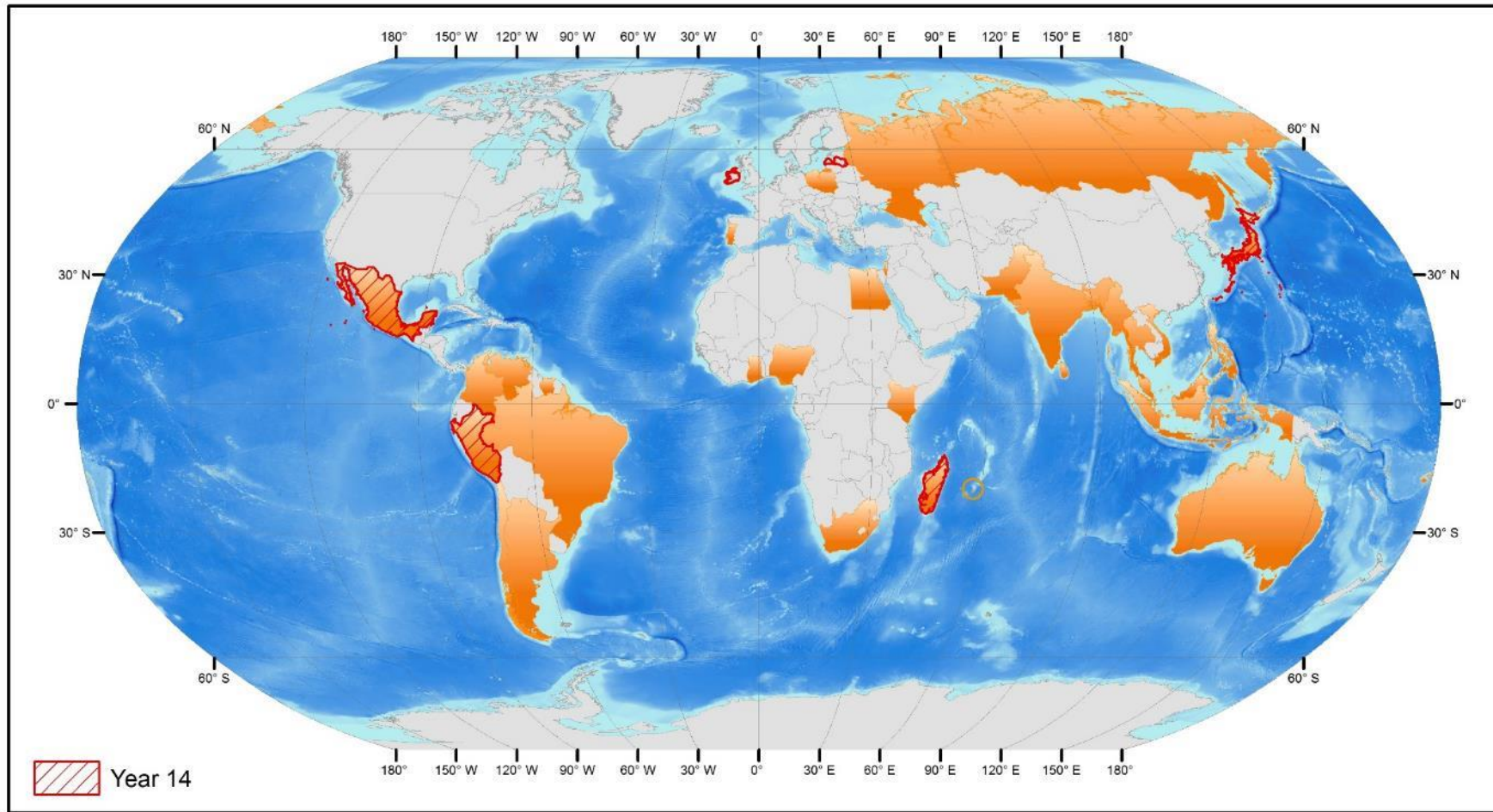
**The Center for Coastal and Ocean Mapping /
Joint Hydrographic Center; University of New Hampshire, USA**

SEE CIRCULAR LETTER 12/2019 - 11 February 2019





84 scholars from 37 coastal states over last 14 years



Postgraduate Certificate in Ocean Bathymetry Training Programme content



Fall Semester
(August-December)

- Fundamentals of Ocean Mapping I
- Applied Tools in Ocean Mapping
- Math for Mapping etc

J-term

- Visit NGDC in Boulder, Co.
- Physical Oceanography for Hydrographers
- Software training (QinSy/CARIS/Hypack)

Spring Semester
(January-May)

- Fundamentals of Ocean Mapping II
- Bathymetric Spatial Analysis
- Geodesy & Positioning for Ocean Mapping
- Seamanship and Marine Weather
- Physical Oceanography for Hydrographers

Summer
(June-August)

- Students will take the Hydrographic Field Course

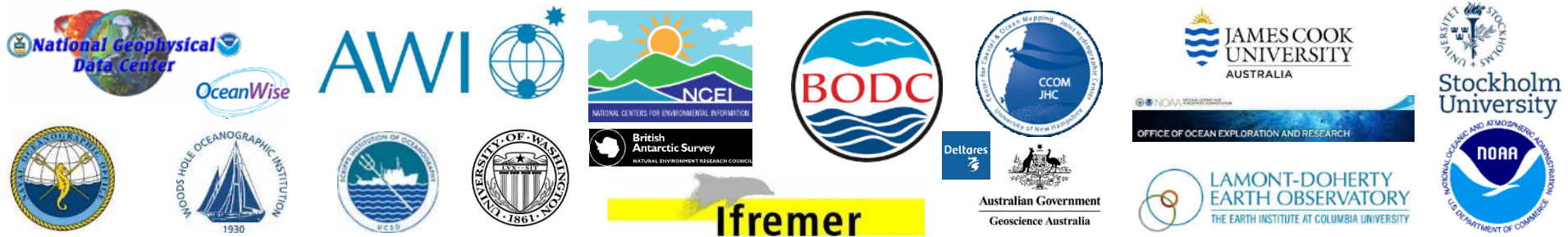
Lab Visit & Cruise

- The working visit to a research organization and / or a cruise is selected by student and their home organization in a field of mutual interest.

Nippon Foundation / UNH Training programme



- Students **MUST** also undertake a working visit to another research organization and a research cruise over the summer (selected by student and home organization in field of interest)
- The lab is included to round out the students training, to help them build their new make new contacts and to deepen some of their newly-acquired theoretical knowledge.
- This training includes familiarization with the programs the visited organization is engaged in, as well as some directed work under supervision.
- **BUILDS ALUMNI NETWORK**



Qualifications attainable



- *Postgraduate certificate in Ocean Bathymetry*
- *UNH Graduate Certificate in Ocean Mapping*
- *FIG/IHO/ICA Category A hydrography (theory)*
- **Networks they develop are most significant**
 - amongst GEBCO scholars and CCOM graduate students as well as other alumni of the training programme
 - through interactions with academic, scientific and business leaders at CCOM through lab visits, internships, cruises and other GEBCO meetings and projects



A world map showing a dense network of blue and purple lines representing survey tracks. The tracks are most concentrated in the North Atlantic and North Pacific, with some tracks extending into the Indian and Southern Oceans. The map is overlaid with a grid of latitude and longitude lines. Labels for continents and oceans are visible, such as 'NORTH AMERICA', 'SOUTH AMERICA', 'Gulf of Mexico', 'INDIAN OCEAN', and 'SOUTH PACIFIC OCEAN'.

Thank you!

David Wyatt

Assistant Director, Survey and Operations

IHO Secretariat

Presented by AD Alberto Costa Neves

<https://seabed2030.gebco.net>