



Briefing on the work of GEBCO (GENERAL BATHYMETRIC CHART OF THE OCEANS)

17th North Indian Ocean Hydrographic Commission Meeting, Cairo, Egypt
17 - 21 July 2017

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

What is GEBCO?



Imagery developed from the GEBCO global bathymetric grid (showing the shape of the sea floor in the North Atlantic Ocean) and gazetteer of undersea feature names

GEBCO's 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 3 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)
 - Working groups on Outreach and the IHO-IOC GEBCO Cook Book

www.gebco.net/about_us/committees_and_groups/



Regional mapping work

GEBCO has setup the Sub-Committee on Regional Undersea Mapping (SCRUM) to:

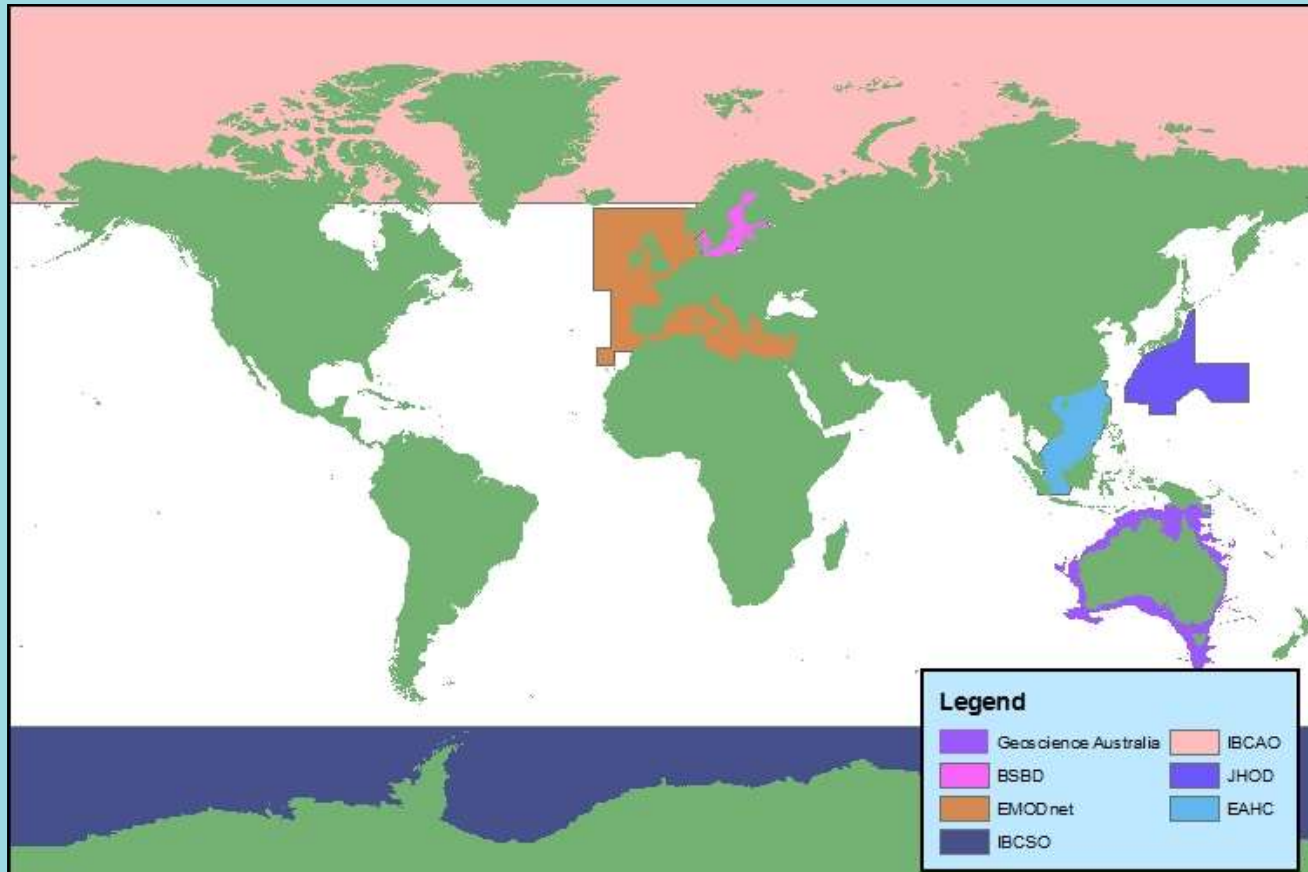
- Build a closer collaboration with regional mapping efforts and coordinate, as well as encourage, the incorporation of their compilations into GEBCO.
- The Global GEBCO grid is continuously updated in part from these regional grids, benefiting greatly from their local knowledge and expertise.

www.gebco.net/regional_mapping/mapping_projects/

Regional mapping projects

Regional mapping work

Coverage of some of the regional compilations included in the current GEBCO Grid



GEBCO's products

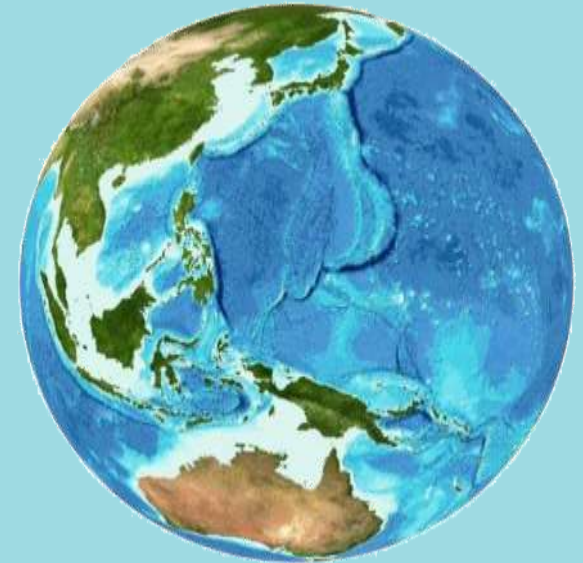
Our bathymetric data sets and products:

- 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

GEBCO's 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



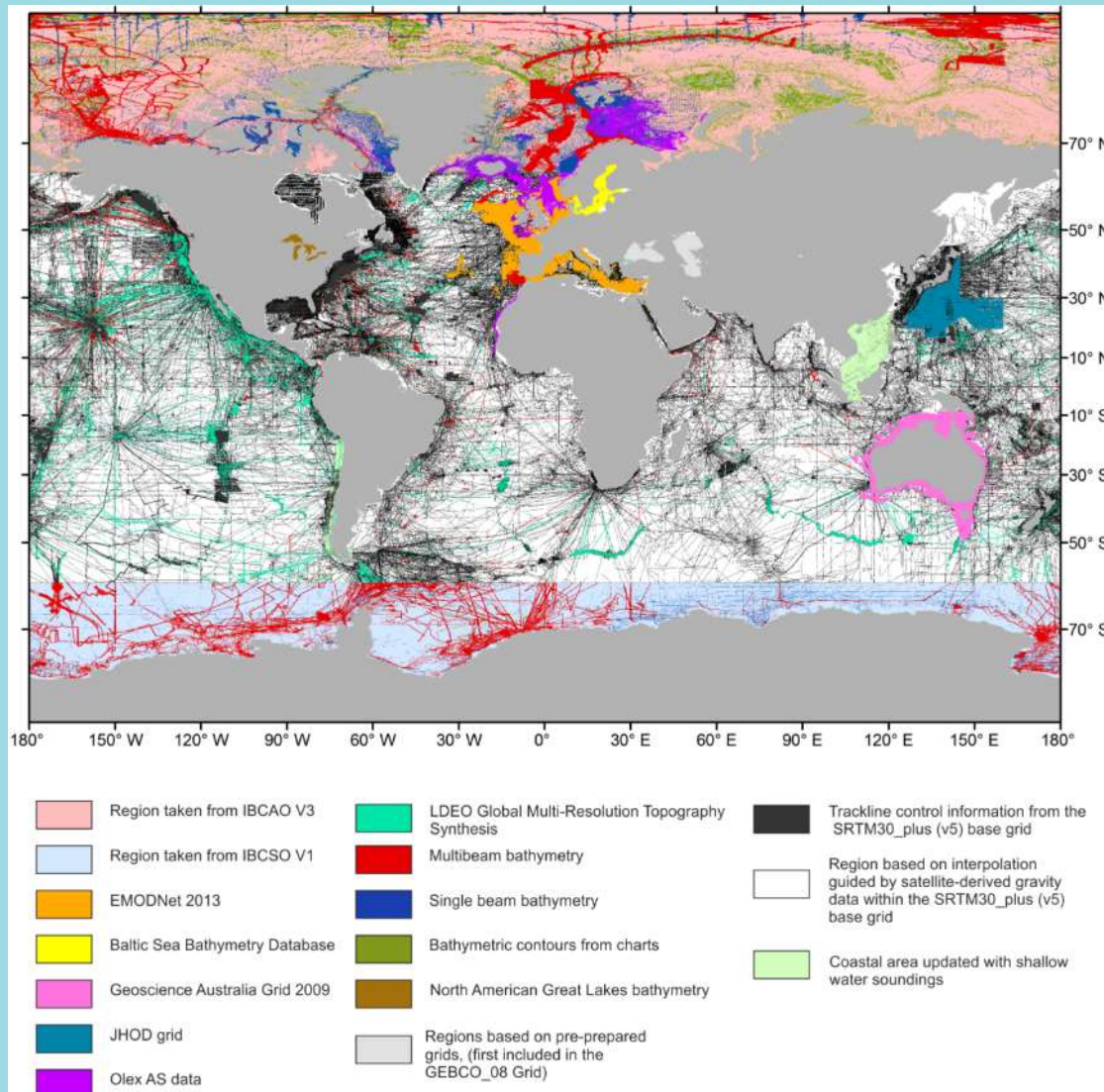
GEBCO's grids are made available for non-navigational purposes:

www.gebco.net/data_and_products/gridded_bathymetry_data/

GEBCO's 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 trackline data; pre-existing grids or if it is based on interpolation



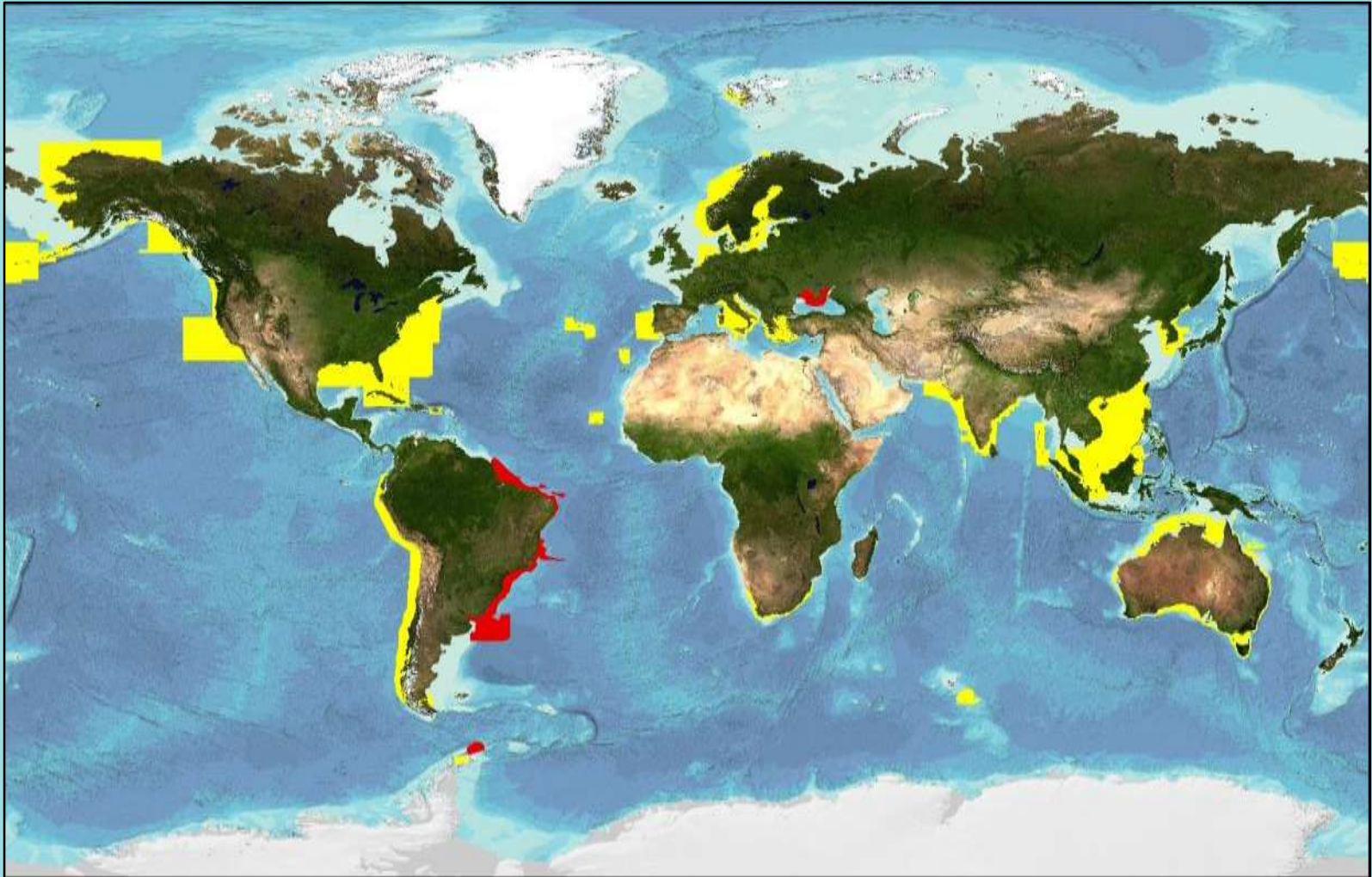
Filling the data gaps

- 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)
- Crowd-sourced 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

Shallow water bathymetry data

- To more accurately model the shape of the ocean floor in all areas and serve a wider user community, GEBCO is striving to improve its gridded bathymetric datasets in shallower waters
- In 2006 a request was made to IHO Member States to provide ENC data (usage bands 2 and 3) to GEBCO to help update its global model
- New request to IHO MS for ENC data sent out in March 2016 (circular letter 11/2016)

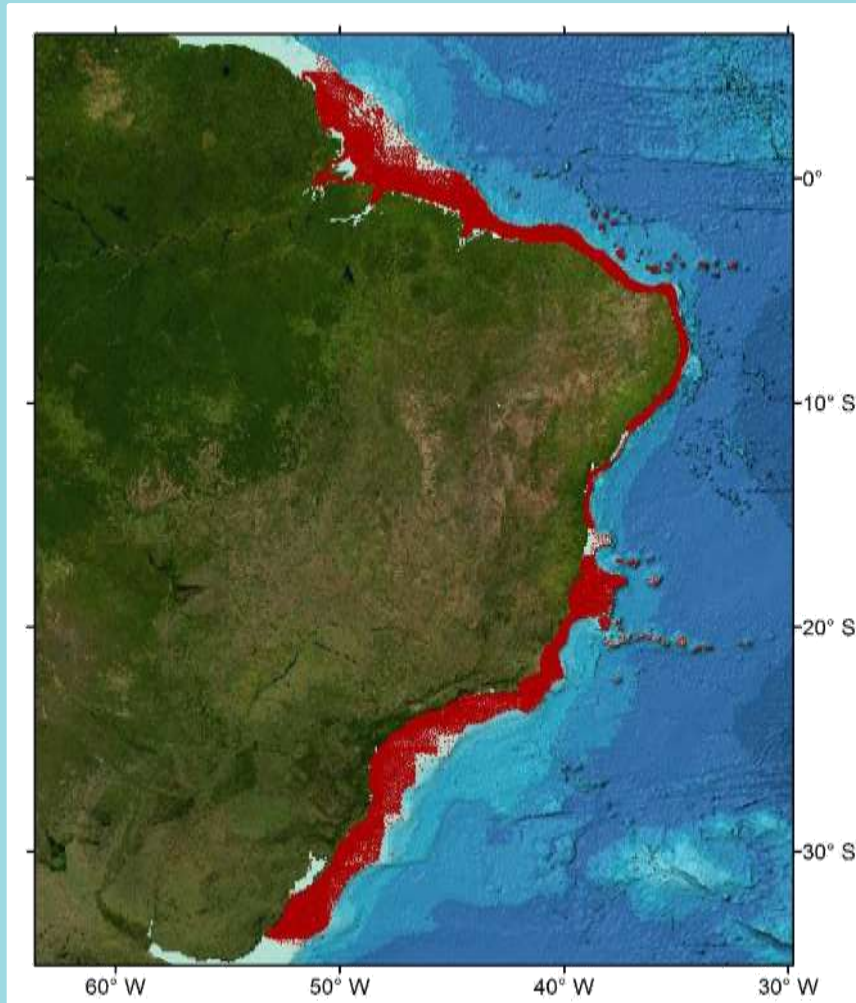
Shallow water bathymetry – ENC data



ENC data coverage (usage bands 2 & 3) provided by IHO MS and organizations, to date, to GEBCO for grid updating work after calls in 2006 (yellow) and 2016 (red),

Shallow water bathymetry – ENC data

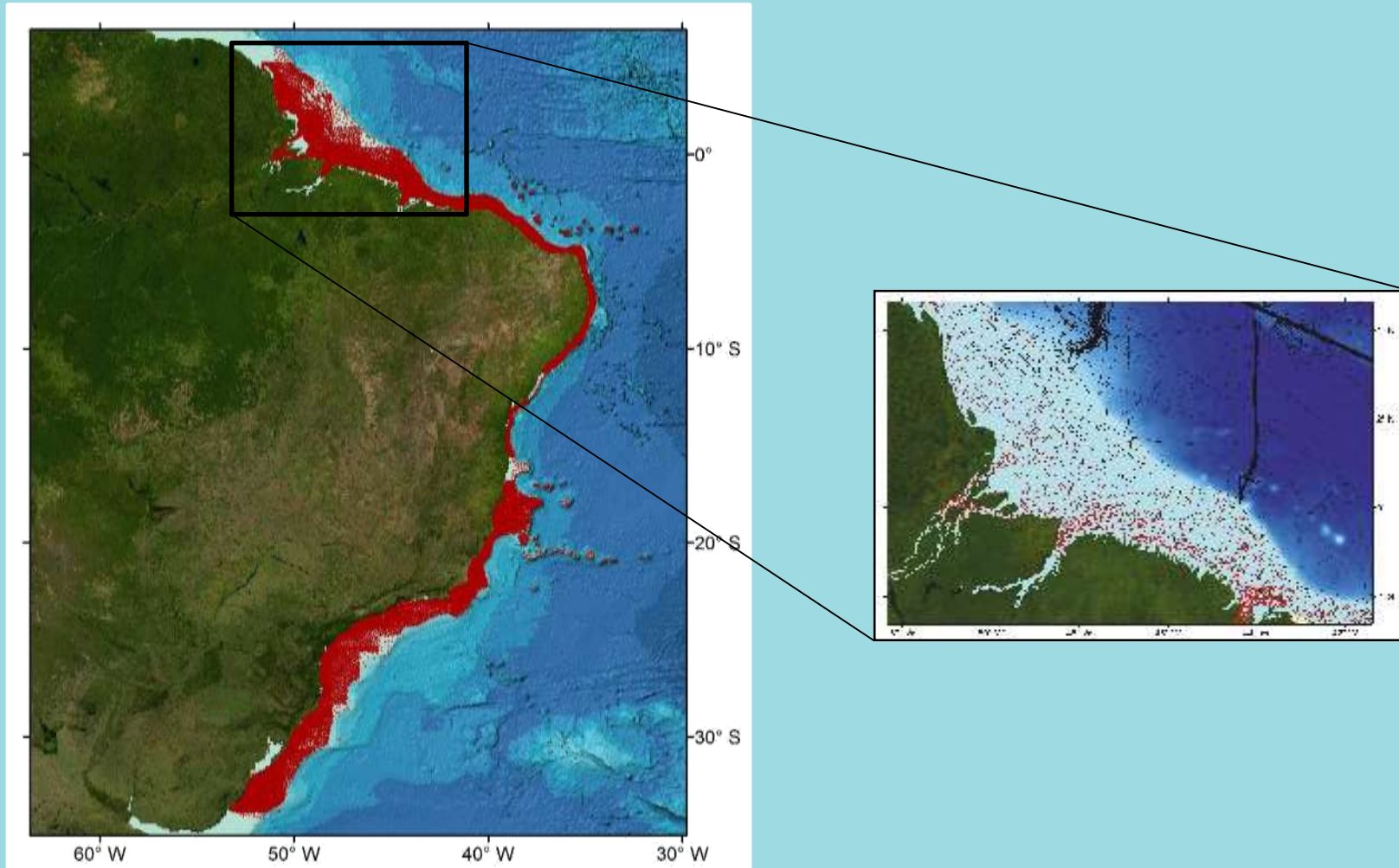
Data for waters off Brazil



Soundings points extracted from ENCs recently supplied to GEBCO for the waters off Brazil

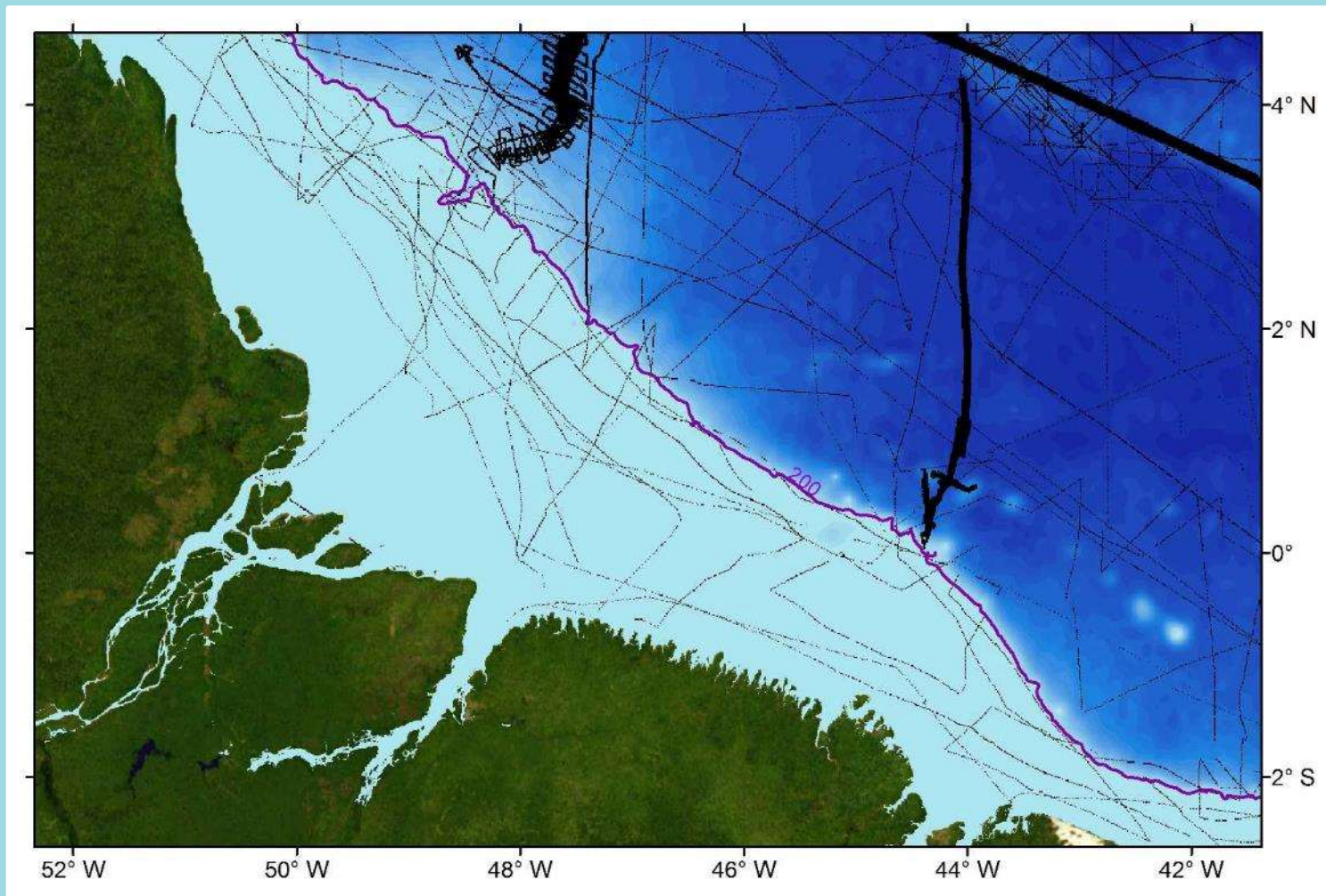
Shallow water bathymetry – ENC data

Data for waters off Brazil



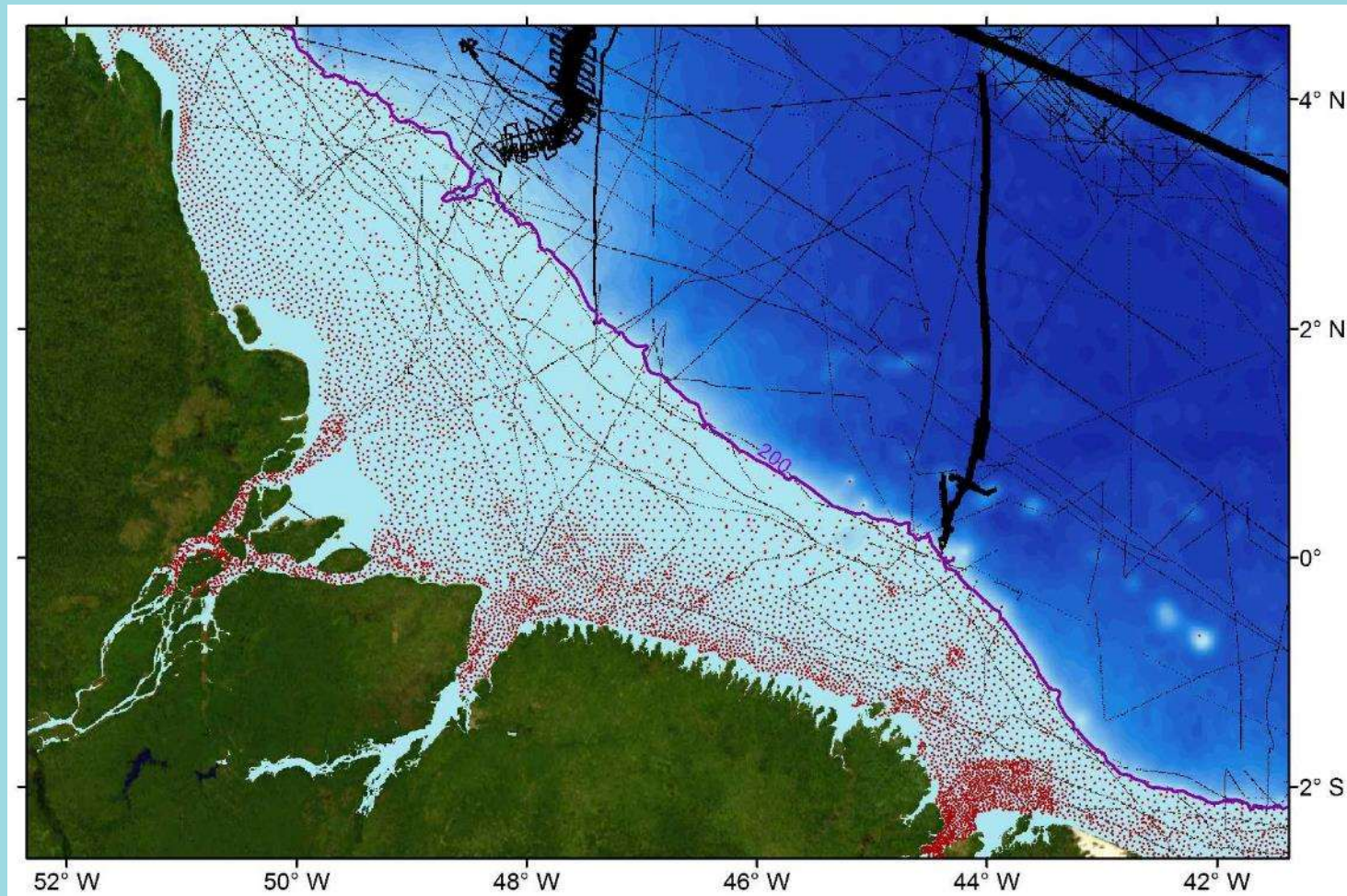
Shallow water bathymetry data

Current GEBCO trackline coverage (black lines)



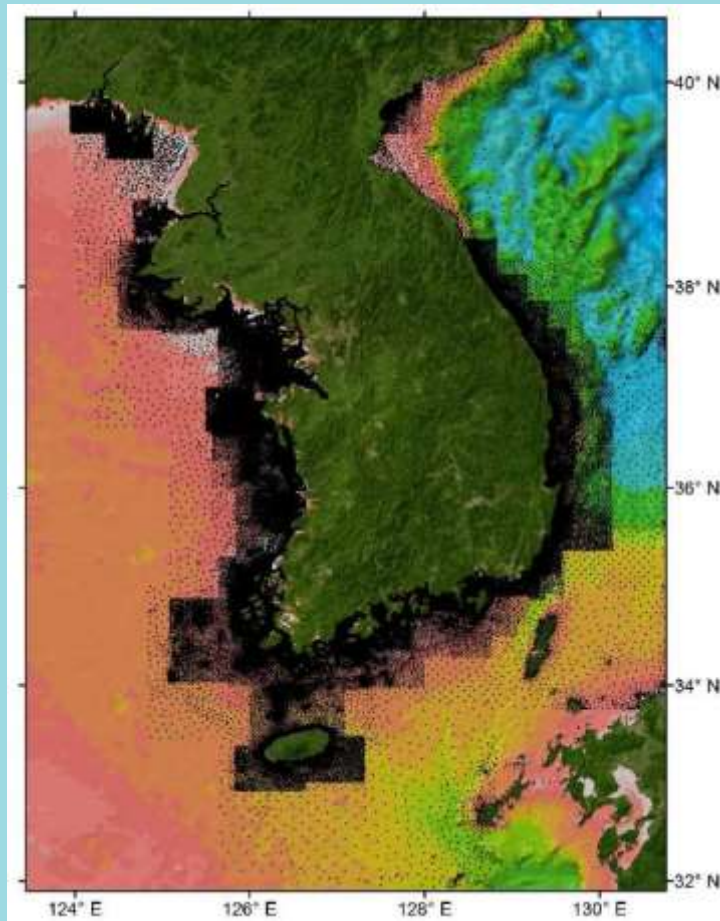
Shallow water bathymetry data

GEBCO trackline coverage (black lines), plus ENC soundings (red)

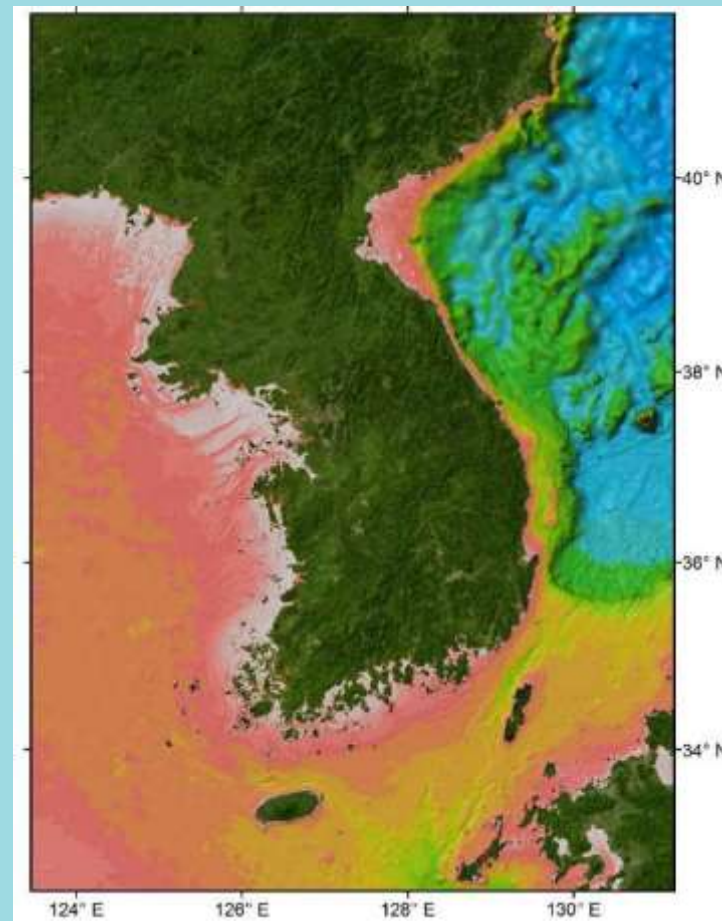


Shallow water bathymetry data

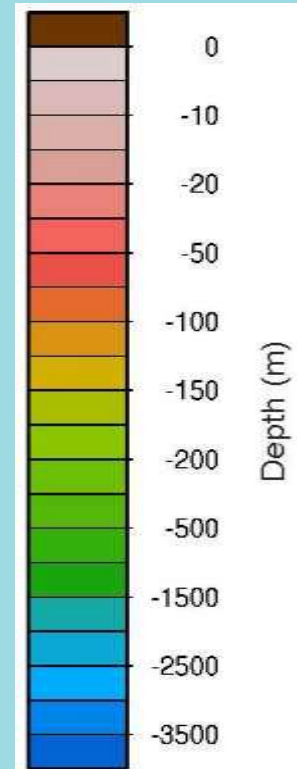
Region off the Korean Peninsula



Coverage of ENC soundings supplied to GEBCO

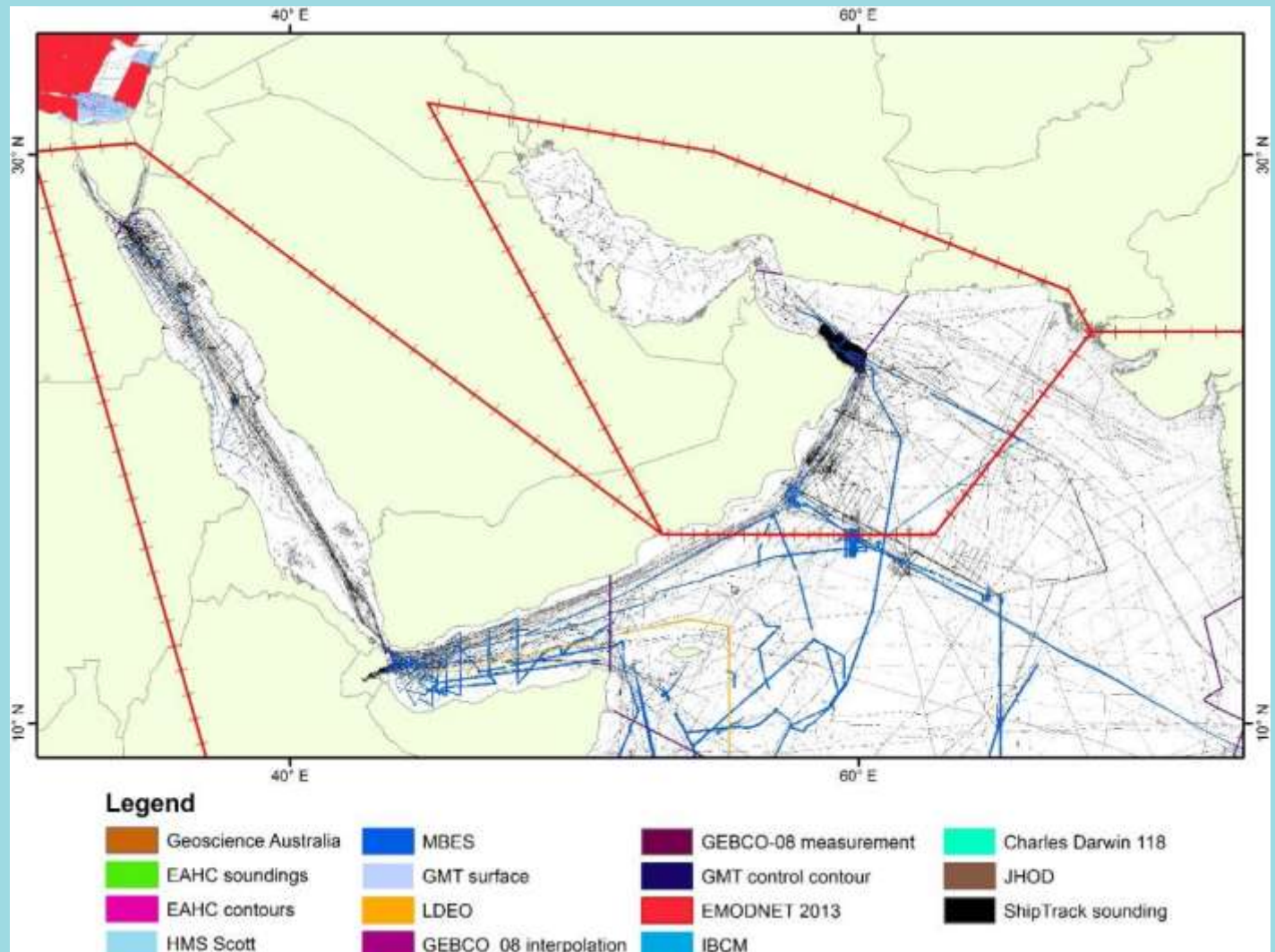


GEBCO_2014 Grid



GEBCO_2014 Grid

- GEBCO Source Identifier Grid in part of the NIOHC area → showing the coverage of data sets contributing to the GEBCO_2014 Grid



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/

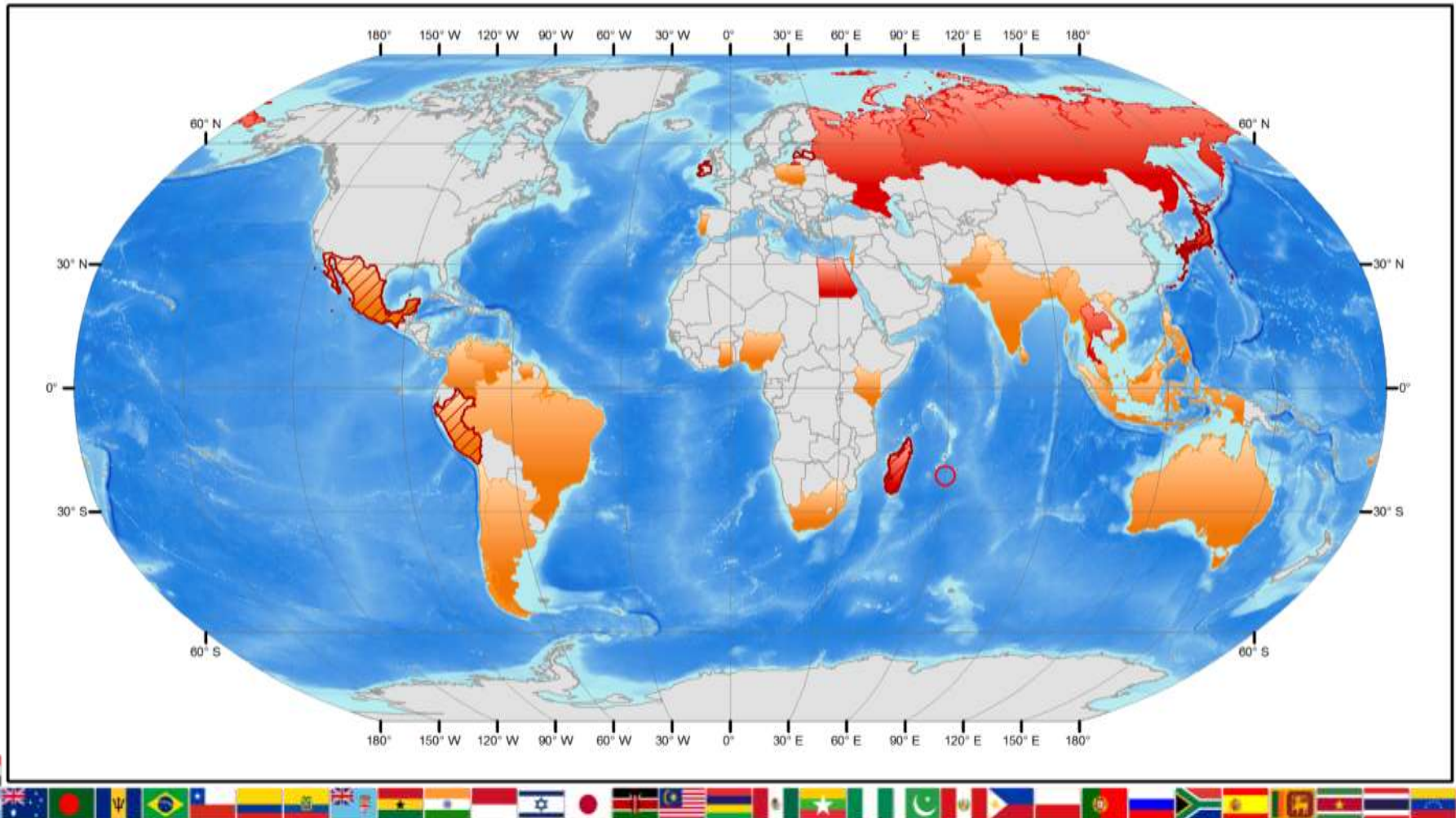
and taught at:

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

SEE CIRCULAR LETTER 13/2017 - 09 February 2017



with the current class coloured red
Add incoming Year 14 class (hatch)
(84 people from 37 coastal states)



Training Program Content

Fall Semester (August-December)

- Fundamentals of Ocean Mapping I
- Applied Tools in Ocean Mapping
- Geological Oceanography
- Elective (Math for Mapping etc.)

J-term

- Visit NGDC in Boulder, Co.
- Software training (e.g. Fledermaus & QInSy)

Spring Semester (January-May)

- Fundamentals of Ocean Mapping II
- Bathymetric Spatial Analysis
- Geodesy and Positioning for Ocean Mapping
- Seamanship and Marine Weather
- Electives (LOS, Coastal Processes etc.)

Summer (June-August)

- Students will take the Hydrographic Field Course

Lab Visit & Cruise

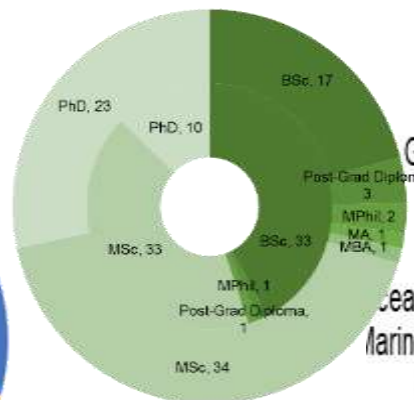
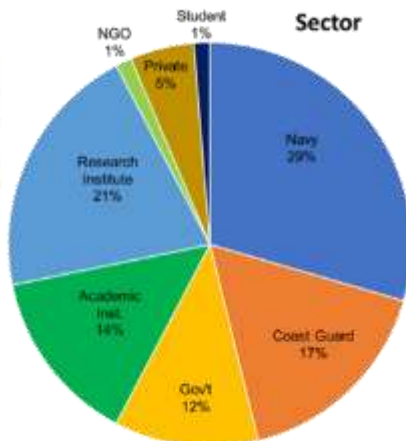
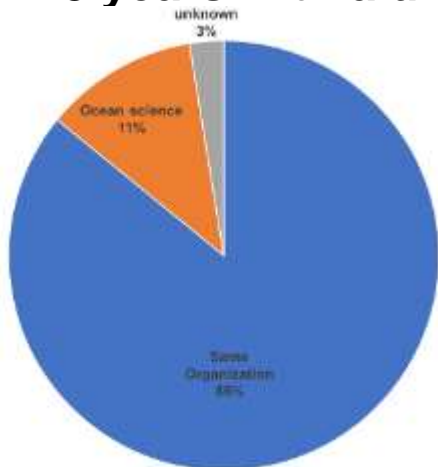
- The working visit to a research organization and / or a cruise over the summer is selected by student and their home organization in a field of mutual interest.
- The visit aims to round out the students training, to help them build networks and to deepen some of their newly-acquired theoretical knowledge. This training includes familiarization with the programs the visited organization is engaged in, as well as some directed work under supervision.



Measure our success?

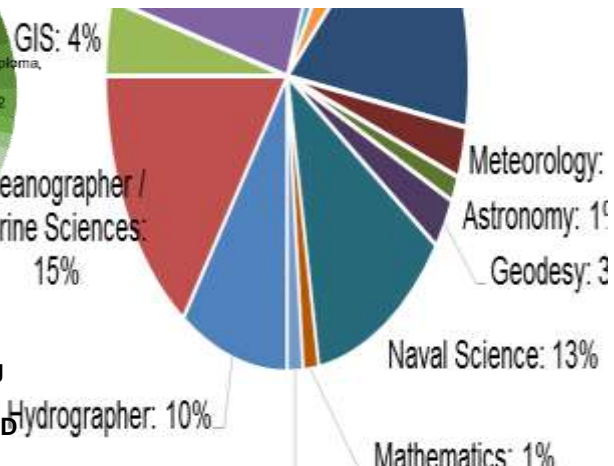


13 years with alumni from 48 Different Organizations from 35 Coastal States



Note:
Inner values: Pre-Training
Outer values: Post-Training

12 MSc (6 at UNH) and 13 PhD



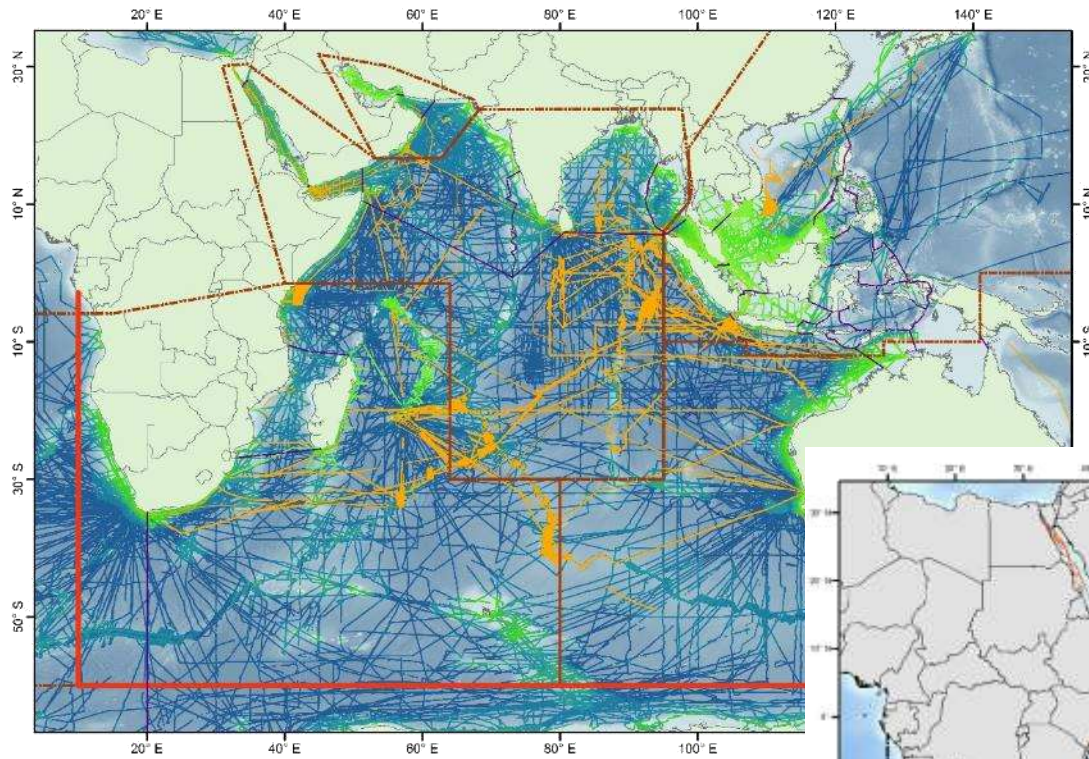
Nippon Foundation / GEBCO Indian Ocean Bathymetric Compilation

- Assemble all available bathymetric data from the different research cruises and hydrographic surveys undertaken in the Indian Ocean
- Publish a regional bathymetric grids that will also be integrated into the next world ocean map and grid by GEBCO
- **UTILISE SCHOLARS NETWORKS**
(39 alumni from relevant states)

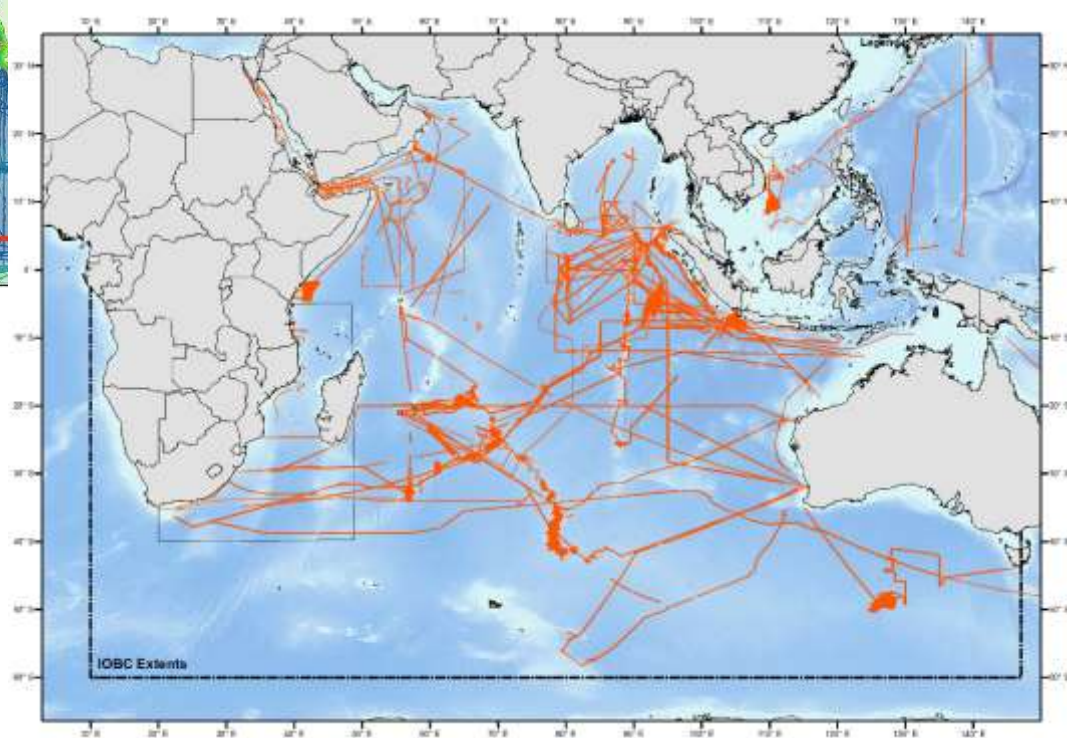


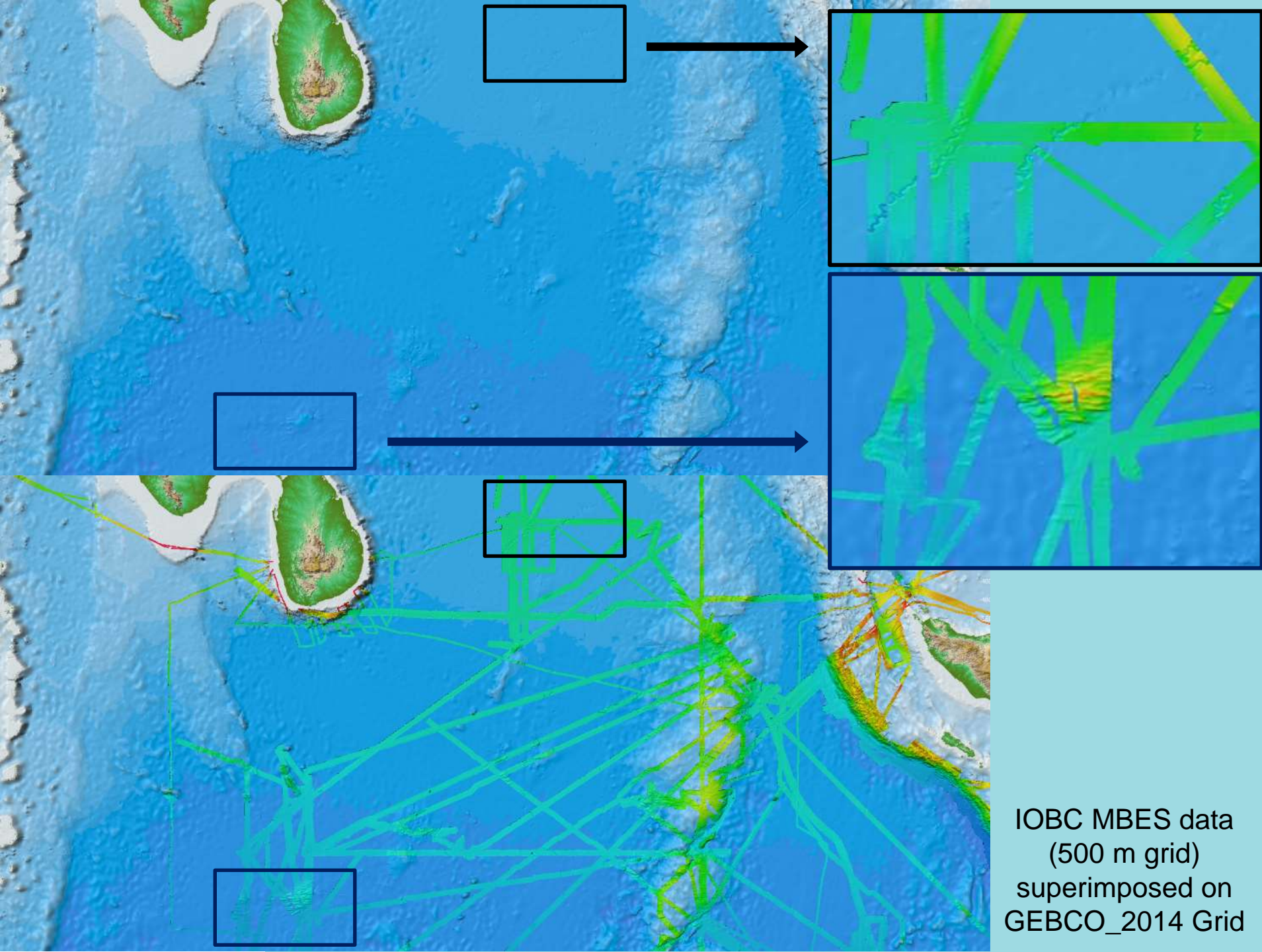
Current status of Indian Ocean Bathymetric Compilation:

>95 MBES surveys and gridded compilations & > 550 SBES surveys



MBES/high-resolution data coverage is very poor





Nippon Foundation - GEBCO Forum for Future of Ocean Floor Mapping 15 to 17 June 2016 in the Principality of Monaco



Forum for Future of Ocean Floor Mapping

Monaco - June 2016

- Meeting of 200 individuals from 45 countries
- Experts on ocean mapping to stakeholders and users of bathymetric information
- Participants from academia, industry, governmental institutions, international and national organizations with interests in the ocean
- Plenary presentations + 2 days of intensive panel discussions and breakout sessions



Seabed 2030: How we got here



June 2016



Mr Sasakawa, Chairman of the Nippon Foundation Proposed ‘...to map 100% of the topography of the World Ocean by 2030’

18% of ocean accurately mapped in GEBCO grid



June 2017

**Nippon Foundation - GEBCO
Seabed 2030 Project
announced**



*Mr Sasakawa – 1 of 8 IOC-UNESCO
“Champions of Global Ocean Science”*



Project start



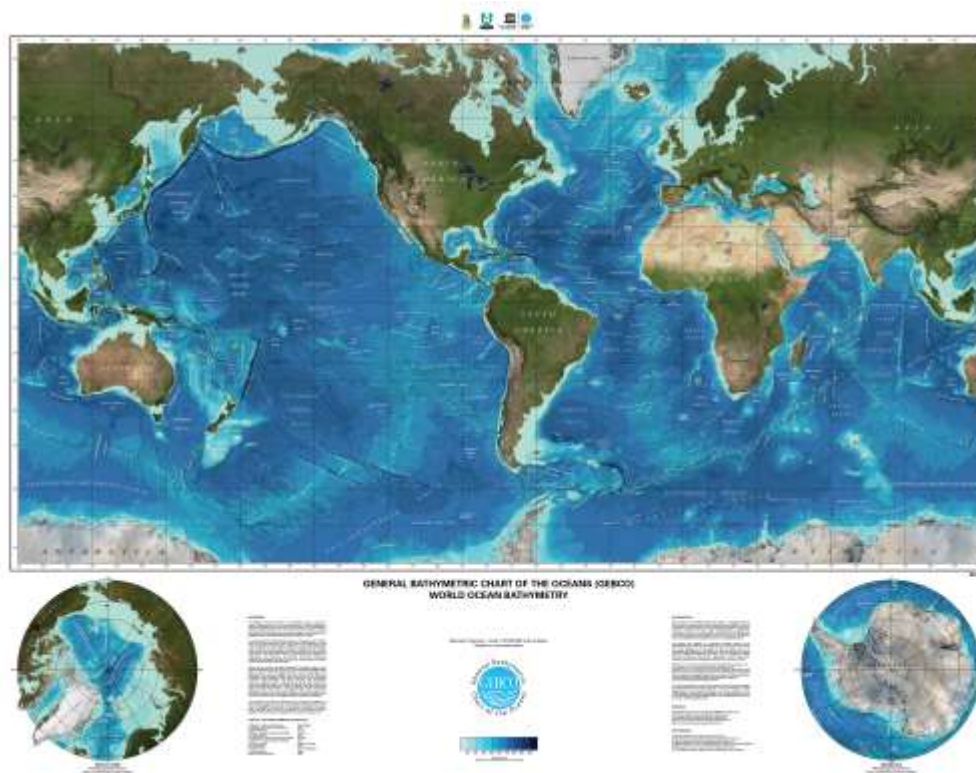
1st August 2017



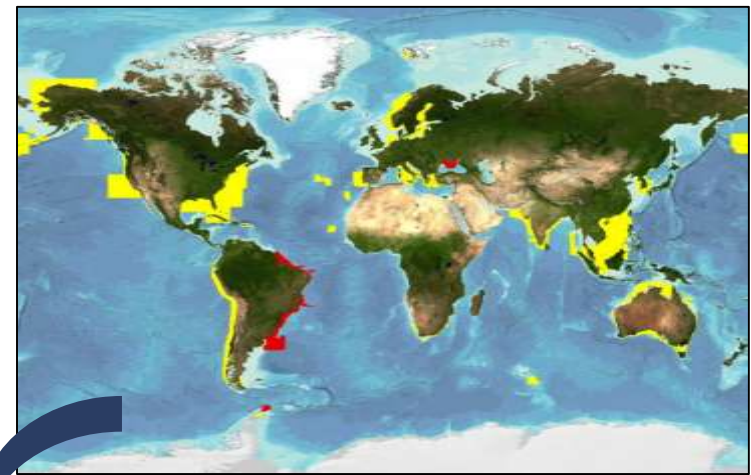
2030

100% of ocean accurately mapped

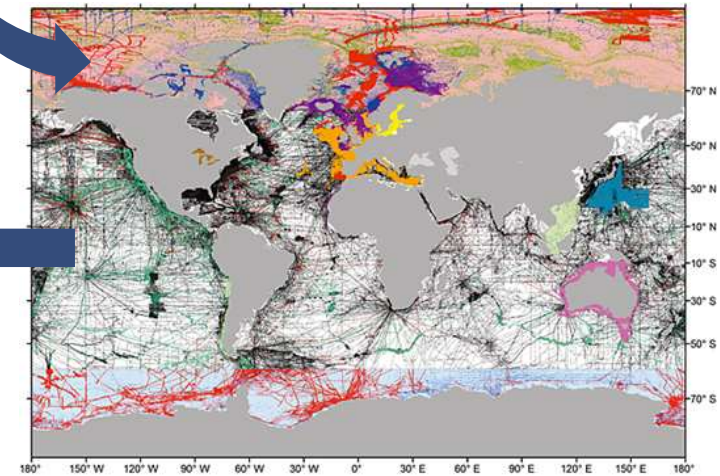
The need for Seabed 2030



GEBCO_2014 bathymetric grid
18% based on *in-situ* data



ENC data provided to GEBCO after requests in 2006 (yellow) and 2016 (red)



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

The GEBCO_2014 Source Identifier (SID) grid identifies which grid cells in the are based on soundings and which cells contain predicted depth values



- 70% of the Earth's surface is covered by ocean. Approximately 85% of the world's oceans (shallow and deep water) are yet to be mapped using modern survey techniques.
- Global baseline bathymetry data will help inform ocean policy, guide sustainable use, improve ocean/weather models, and identify future research, exploration, and development needs.
- Beneficiaries of these data will include:
 - Oil and gas industry
 - Deep sea mining industry
 - Marine shipping industry
 - Cruise line industry
 - Commercial fishing industry
 - Telecommunications industry
 - Coastal infrastructure (ports & harbors)
 - First responders
 - National defense
 - Coastal communities
 - Scientific research communities



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

Three Pillars of Seabed 2030

1. Gathering, compiling and publishing bathymetric data

The regional teams will be responsible for championing regional mapping activities as well as assembling and compiling bathymetric information within their prescribed region from hydrographic offices, industry, research organizations and individual mariners. Form strong regional partnerships.

2. Development of bathymetric data and assembly tools

Provide greater access to tools and technology (through capacity building) for developing coastal nations

3. ‘Technology innovation’ and ‘Mapping the Gaps’

The Seabed 2030 definitive view of the state of seabed mapping, will be used to identify gaps in data coverage, prioritize and champion future survey operations to map the gaps.



Seabed 2030

MISSION:

To empower the world to make policy decisions, use the ocean sustainability and undertake scientific research based on detailed bathymetric information of the Earth's seabed

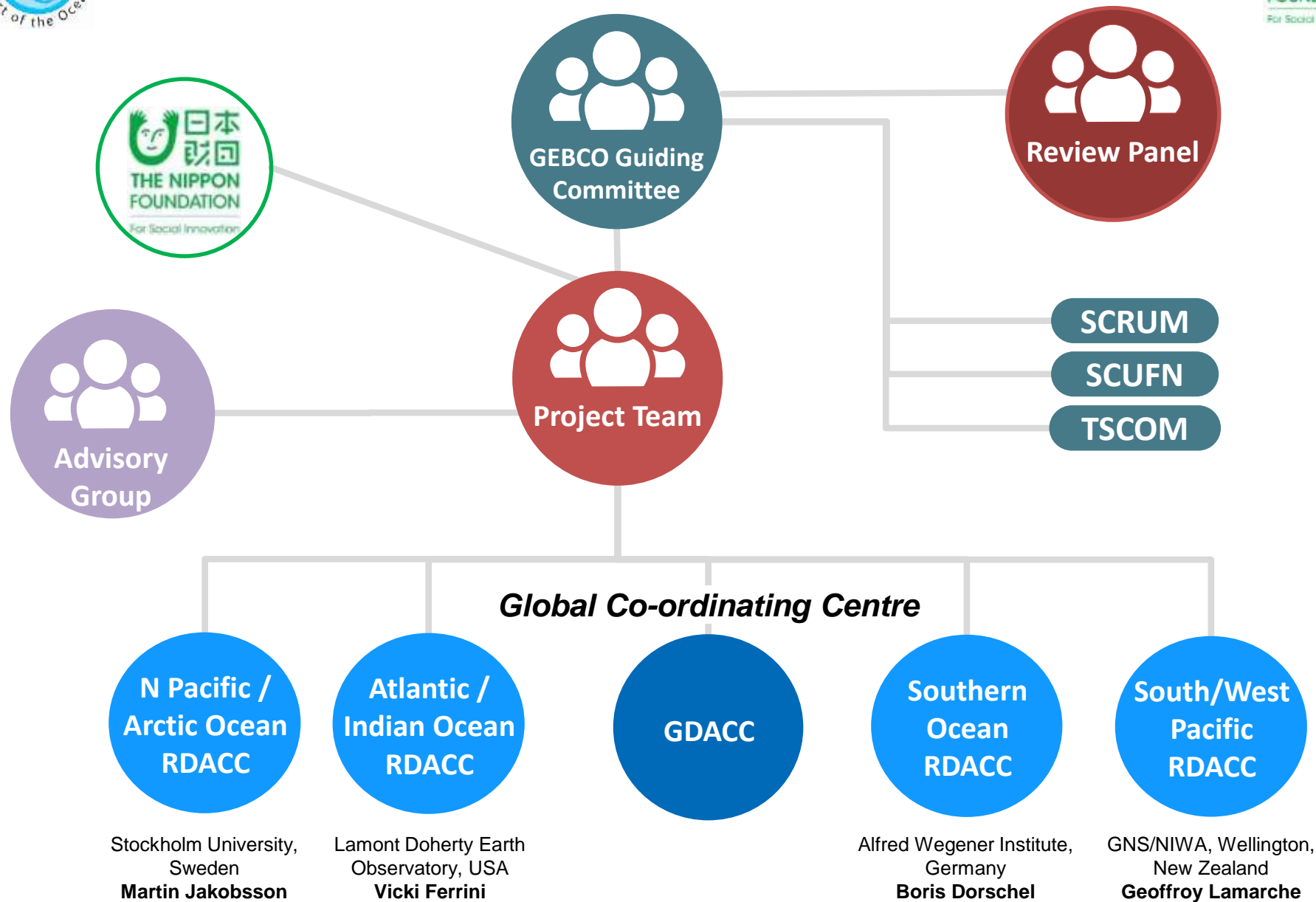
<https://seabed2030.gebco.net/>



Supports United Nations Sustainable Development Goal 14:
to conserve and sustainably use the world's oceans, seas and marine resources

**SDG14 will be impossible to achieve without a
comprehensive map of world's ocean floor**

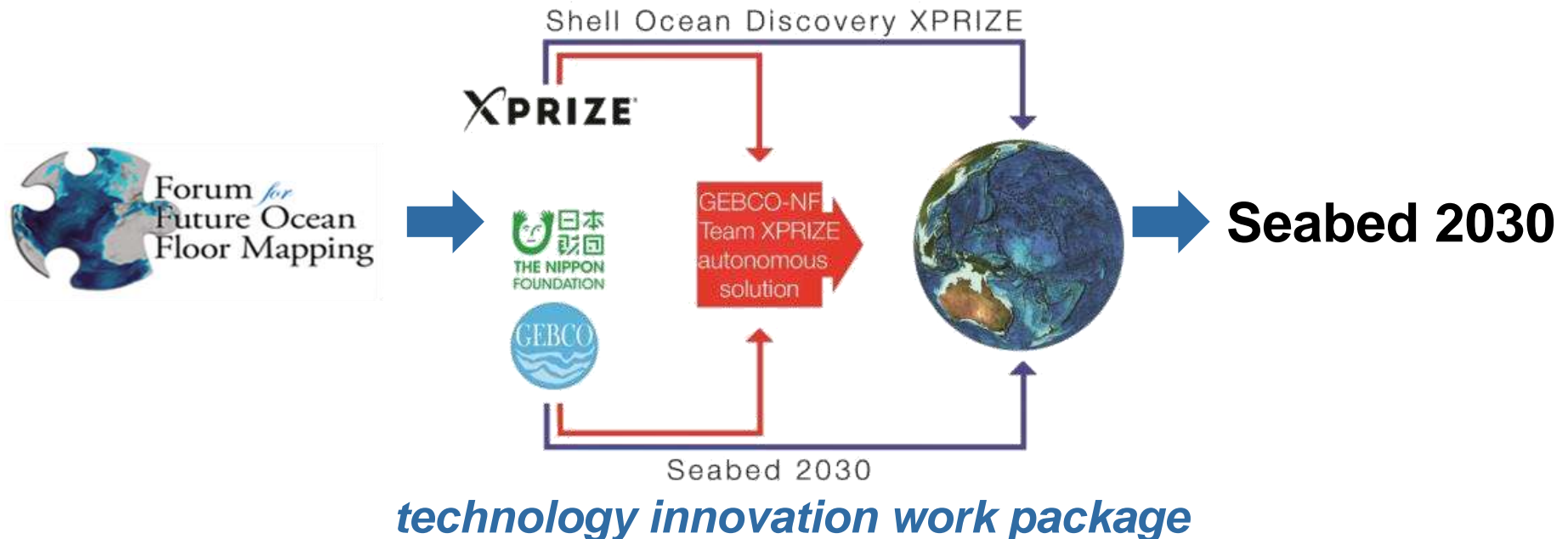
NF- GEBCO Seabed 2030 Project Structure



4 Regional Data Assembly & Co-ordination Centres

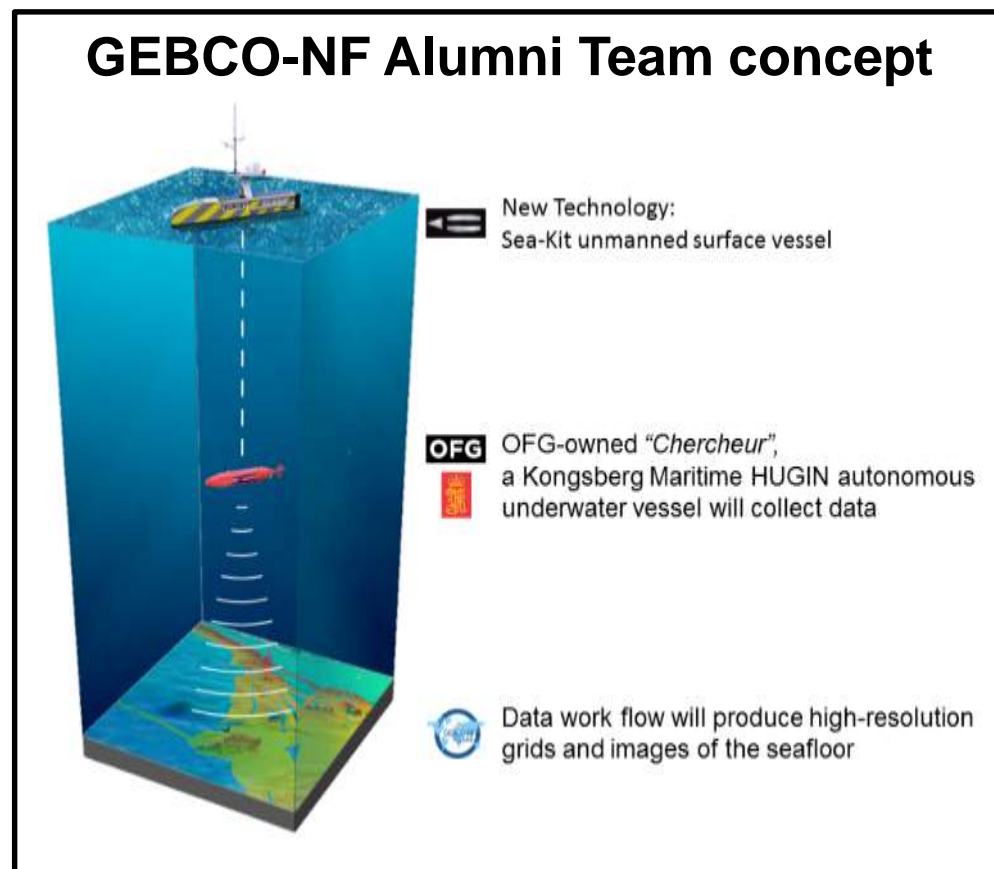
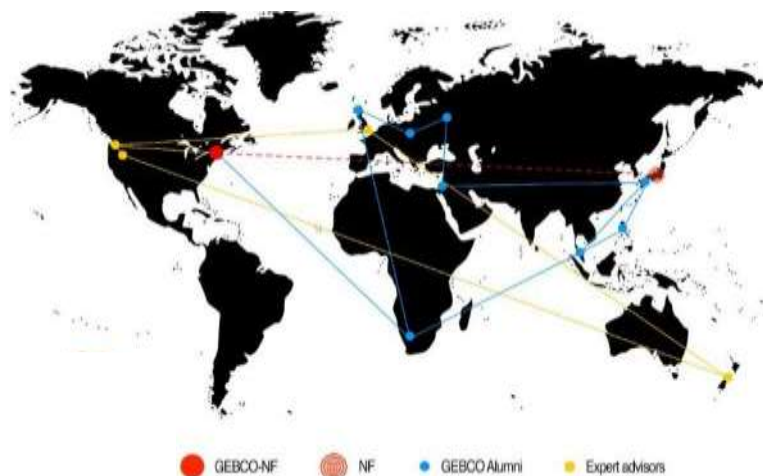
The inspiration to enter a team for the challenge:

- Opening speech by Mr Sasakawa at the NF-GEOBCO Forum for Future Ocean Floor Mapping
- Jyotika Virmani of XPRIZE said at Forum “*GEOBCO training program is probably the most-successful unknown capacity-building global initiative*”



GEBCO-NF Alumni Team comprised of:

- 9 active alumni
(8 different coastal states & 7 years of training program)
- 4 technical advisors from with GEBCO
- Industry Partners:
 - Kongsberg Maritime
 - Ocean Floor Geophysics
 - Hushcraft Ltd
- Technical advisers



Summary

GEBCO aims to:

- Continually update and improve its global bathymetric model and collaborate with regional mapping groups to help achieve this
- Encourage (where possible) the contribution of bathymetry data to publicly-available national or international databases

How to contribute data to help update GEBCO's global grid:
www.gebco.net/about_us/contributing_data/

Thank you

Any questions?