GEBCO
and
Nippon Foundation Projects

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What is GEBCO?

United Nations Educational, Scientific and Cultural Organization

Intergovernmental Oceanographic Commission

The General Bathymetric Chart of the Oceans (GEBCO)

operates under the joint auspices of the International Hydrographic Organization (IHO) and Intergovernmental Oceanographic Commission (IOC) of UNESCO

- Aims to provide the most authoritative, publicly-available bathymetric datasets for the world's oceans
- Maintains and makes available a gazetteer of undersea feature names

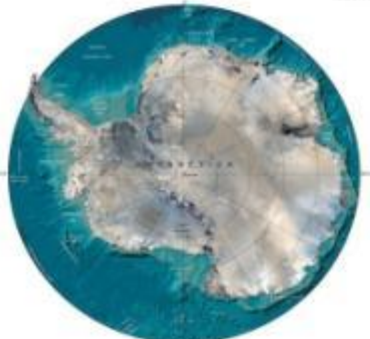
www.gebco.net

GEBCO History

- The birth of GEBCO followed from efforts by His Serene Highness Prince Albert I of Monaco and Professor Julien Thoulet, University of Nancy, who both shared a strong passion for the ocean.
- April 1903 His Serene Highness Prince Albert I of the Principality of Monaco (1848-1922) offered to finance the production of the General Bathymetric Chart of the Oceans

GENERAL BATHYMETRIC CHART OF THE OCEANS (GEBCO)
WORLD OCEAN BATHYMETRY

GEBCO World Map Cartographic Editorial Board (established December 2004)

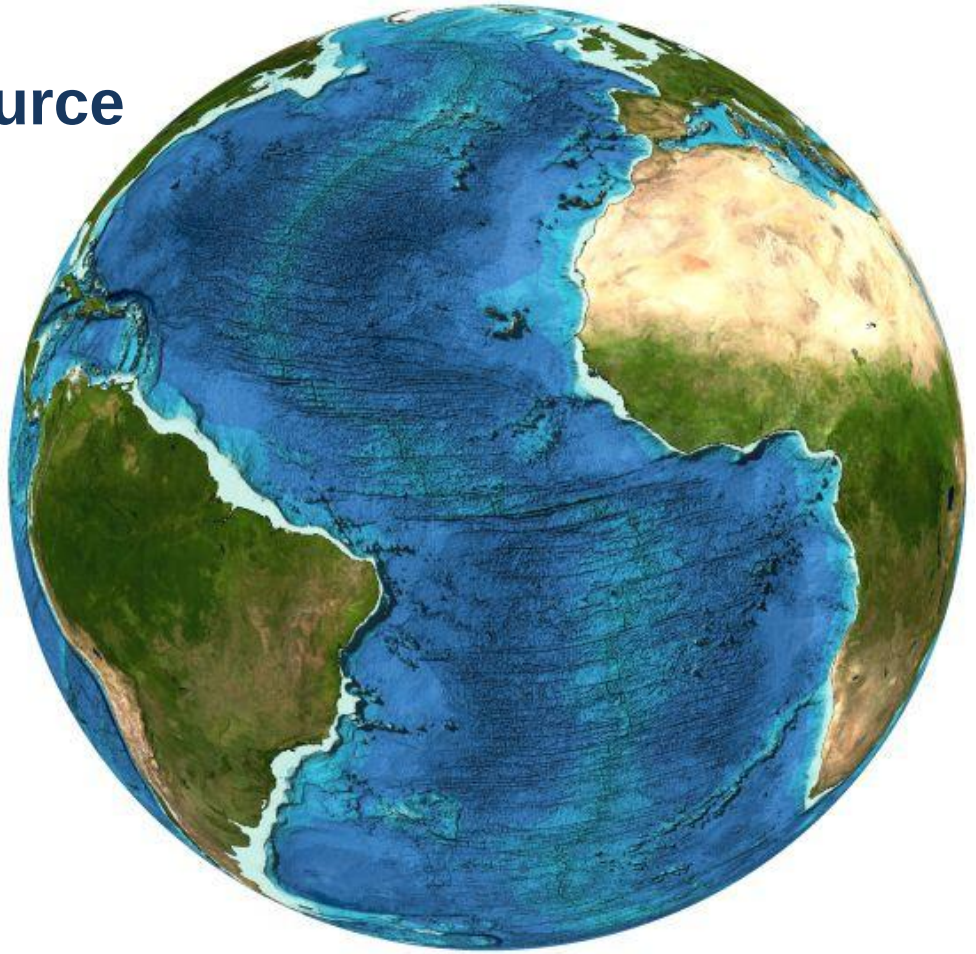


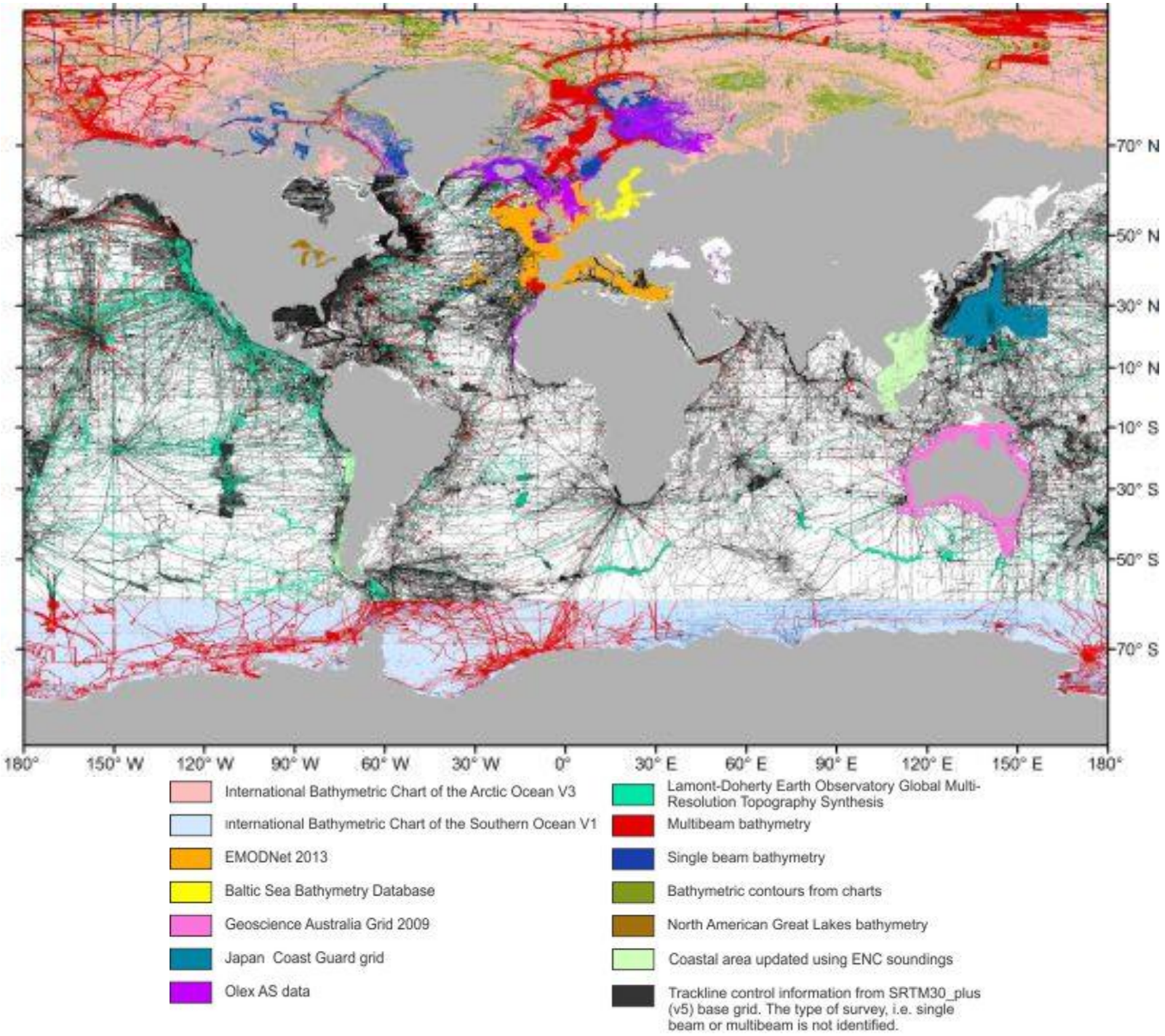
What is new in GEBCO-2014

- **The grid is a continuous terrain model for ocean and land with a spatial resolution of 30 arc seconds**

- **Associated with GEBCO Source Identifier (SID) Grid**
  information on ship measurement vs. interpolated depths)

- **GEBCO Sub-Committee on Undersea Feature Names (SCUFN) digital gazetteer of the names, is available via a webmap application (IHO DCDB hosted by NCEI)**
  http://www.ngdc.noaa.gov/gazetteer




70° N
50° N
30° N
10° N
10° S
30° S
50° S
70° S
180°
150° W
120° W
90° W
60° W
30° W
0°
30° E
60° E
90° E
120° E
150° E
180°
International Bathymetric Chart of the Arctic Ocean V3
international Bathymetric Chart of the Southern Ocean V1
EMODNet 2013
Baltic Sea Bathymetry Database
Geoscience Australia Grid 2009
Japan Coast Guard grid
Olex AS data
Lamont-Doherty Earth Observatory 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
Trackline control information from SRTM30_plus (v5) base grid. The type of survey, i.e. single beam or multibeam is not identified.

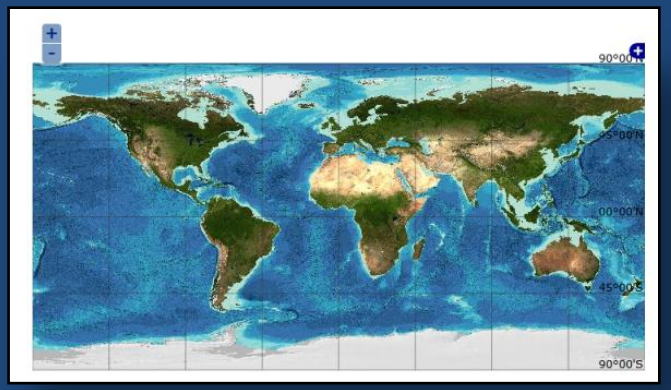
GEBCO's products

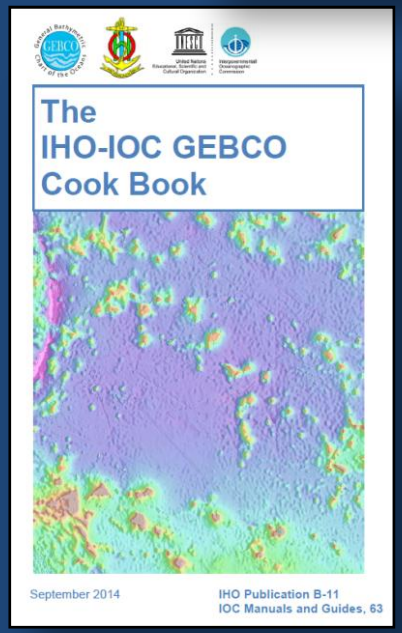
United Nations Educational, Scientific and Cultural Organization

Intergovernmental Oceanographic Commission

FREELY-AVAILABLE bathymetric data sets and products:

- Global gridded bathymetric data sets
- Global set of digital bathymetric contours
- GEBCO Gazetteer of Undersea Feature Names
- GEBCO Digital Atlas
- GEBCO world map
- Web Map Service (WMS)
- IHO-IOC GEBCO Cook Book





www.gebco.net/data_and_products/

Where should GEBCO head into the future?

GEBCO believes it is time to assess its vision and its role as a producer of global bathymetric grids:

1. Understanding needs of international community
2. Understanding what GEBCO community thinks about its future
3. Building capacity to reach these objectives

Forum for Future of Ocean Floor Mapping

15 to 17 June 2016 in the Principality of Monaco

DAY 1: Opening day with series of keynote speakers invited (Bob Ballard, Larry Mayer, Simon Winchester, David Heydon, Jyotika Virmani & Kristina Gjerde)

DAY 2: Panel discussions to explore series of topics

- Panel 1 - Use of bathymetry: The deep ocean perspective
- Panel 2 - Use of bathymetry: The coastal perspective
- Panel 3 - New tools and techniques in ocean mapping
- Panel 4 - Mapping the world ocean floor

DAY 3: Aim to produce a “Roadmap for Future Ocean Floor Mapping” based on outcomes from Day 1 & 2

Capacity-building initiative: postgraduate training course

United Nations Educational, Scientific and Cultural Organization

Intergovernmental Oceanographic Commission

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**

Nippon Foundation

Charitable organization since 1962 that has a central goal to help build a society where all people support one another

THE NIPPON FOUNDATION
For Social Innovation

Guiding Principles:

*** Discover * Prioritize * Be creative ***
*** Do it now * Be open * Grow ***
*** Expand networks ***

"THE FUTURE OF OUR OCEAN"

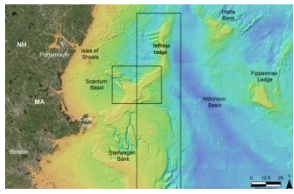
- ***1 of 8 main activity focuses***
- ***10 funded programs under this banner in 2015***

Center for Coastal and Ocean Mapping / Joint Hydrographic Center of the University of New Hampshire

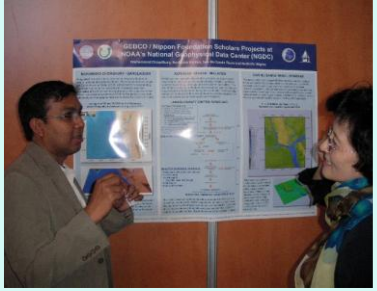
RESEARCH THEMES:

- Development that supports the concept of **"map once – use many times"** i.e., integrated coastal and ocean mapping
- Improving the sensors
- New approaches to **data processing**
- New approaches for **visualization** of data
- Tools and approaches for the **adaptation of technologies** (benthic habitats / water-column)
- Innovative approaches and concepts for the **electronic chart of the future** and e-navigation
- National leaders in Bathymetric data for potential US **LOS submissions**



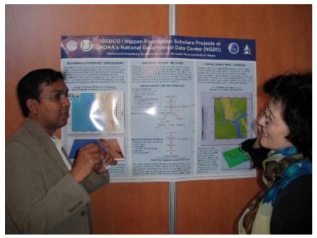



Gulf Surveyor

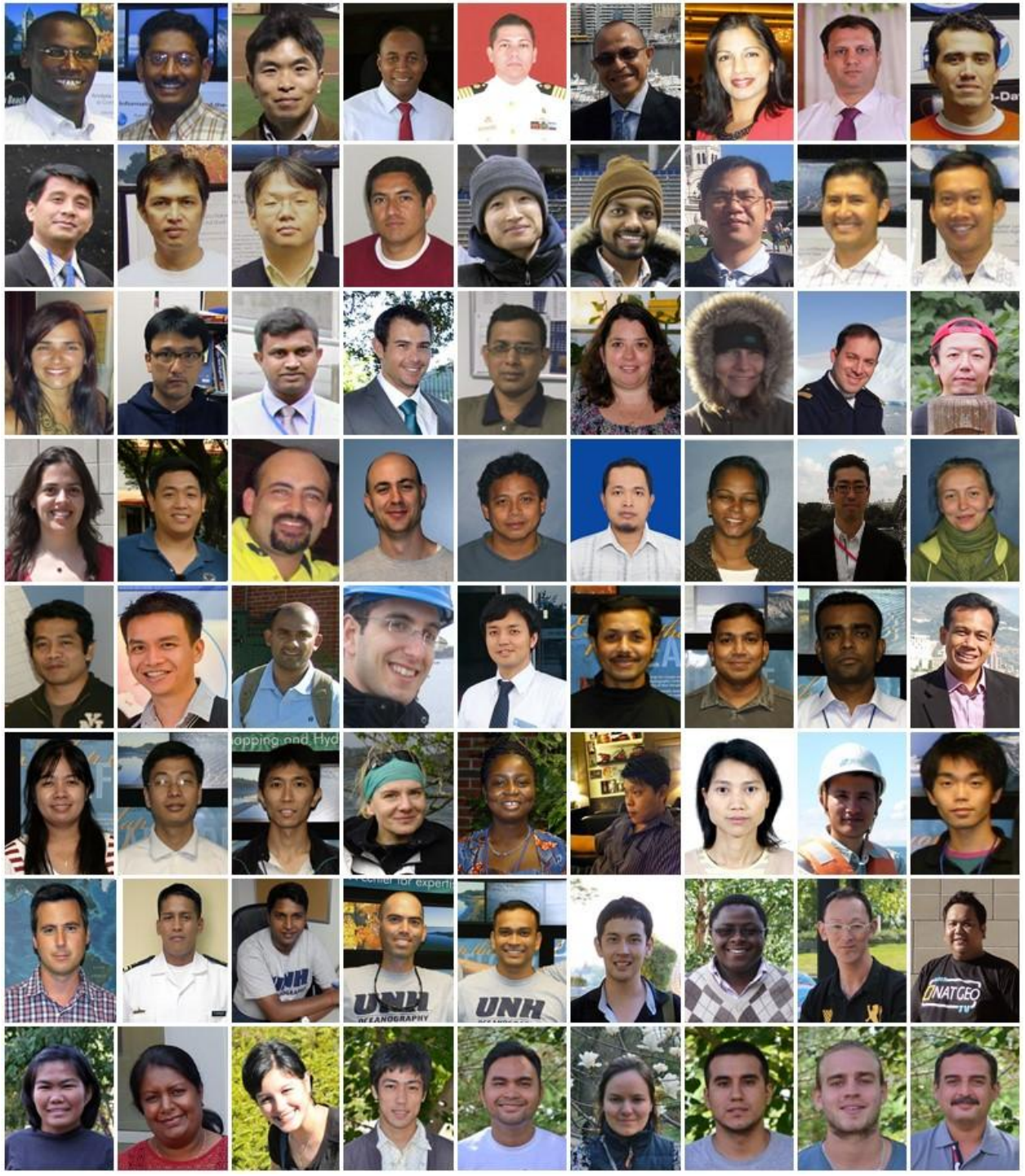




The aim of the Nippon Foundation / GEBCO training program is to build a global network of young ocean mappers, who can use the skills, knowledge and network of contacts they acquired during their training to build capacity within their own country and to keep the Nippon Foundation / GEBCO community growing.

This will ensure that a new generation of ocean mappers will continue to build on our knowledge of the world's oceans.

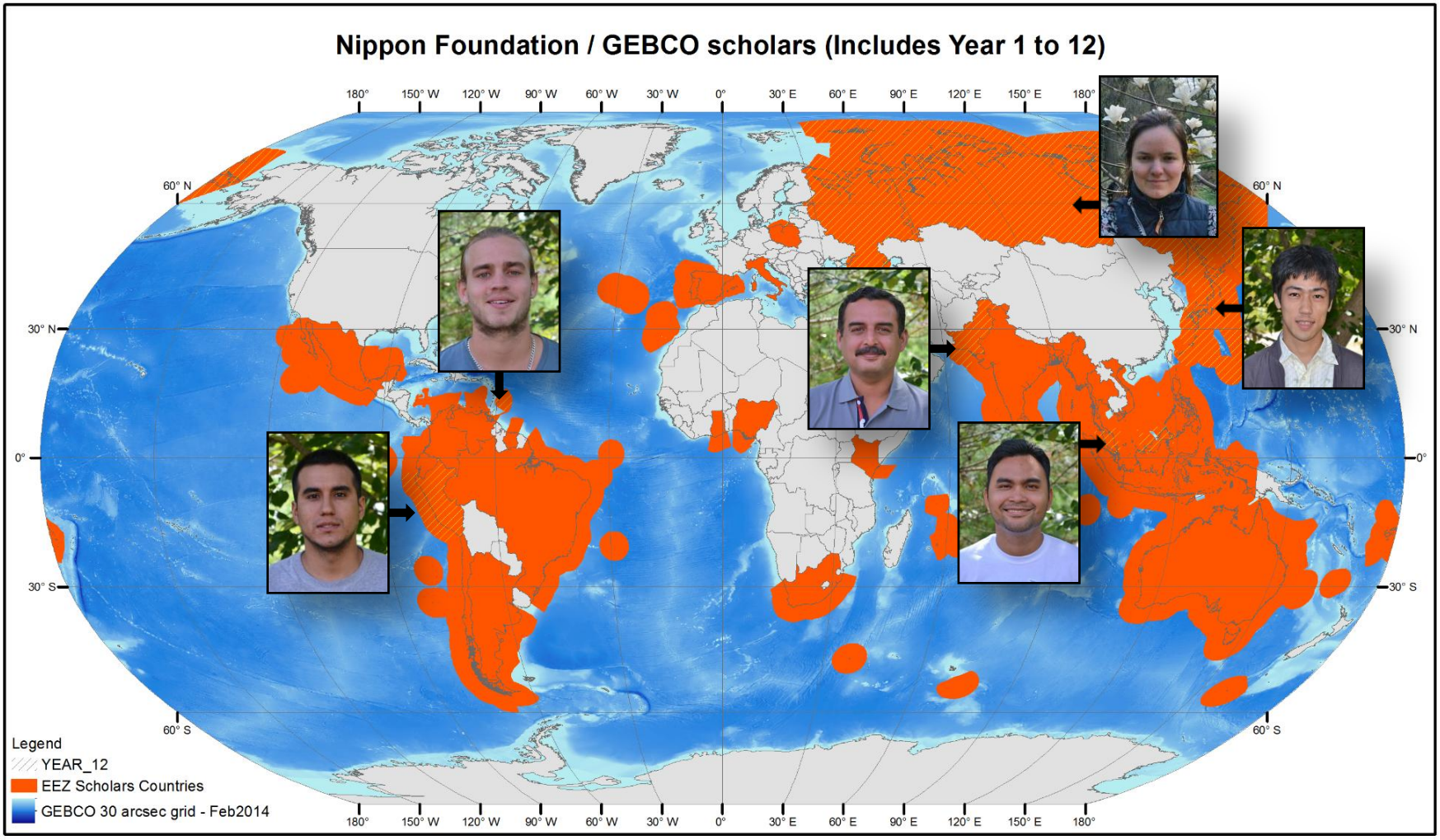






Capacity-building initiative: GEBCO Scholars

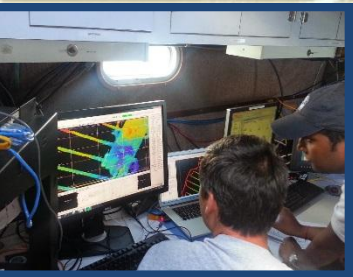


72 scholars from 33 coastal states over last 12 years

Training Program Content

United Nations Educational, Scientific and Cultural Organization

Intergovernmental Oceanographic Commission



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

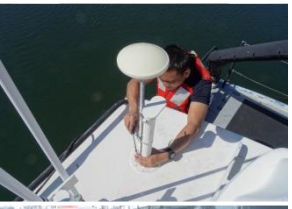
- The working visit to a research organization and / or a cruise over the summer is selected by student and their home organization in a field of mutual interest.
- The visit aims to round out the students training, to help them build networks and to deepen some of their newly-acquired theoretical knowledge.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

Hydrographic Field Course (Summer Hydro)

United Nations Educational, Scientific and Cultural Organization

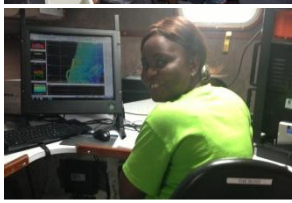
Intergovernmental Oceanographic Commission



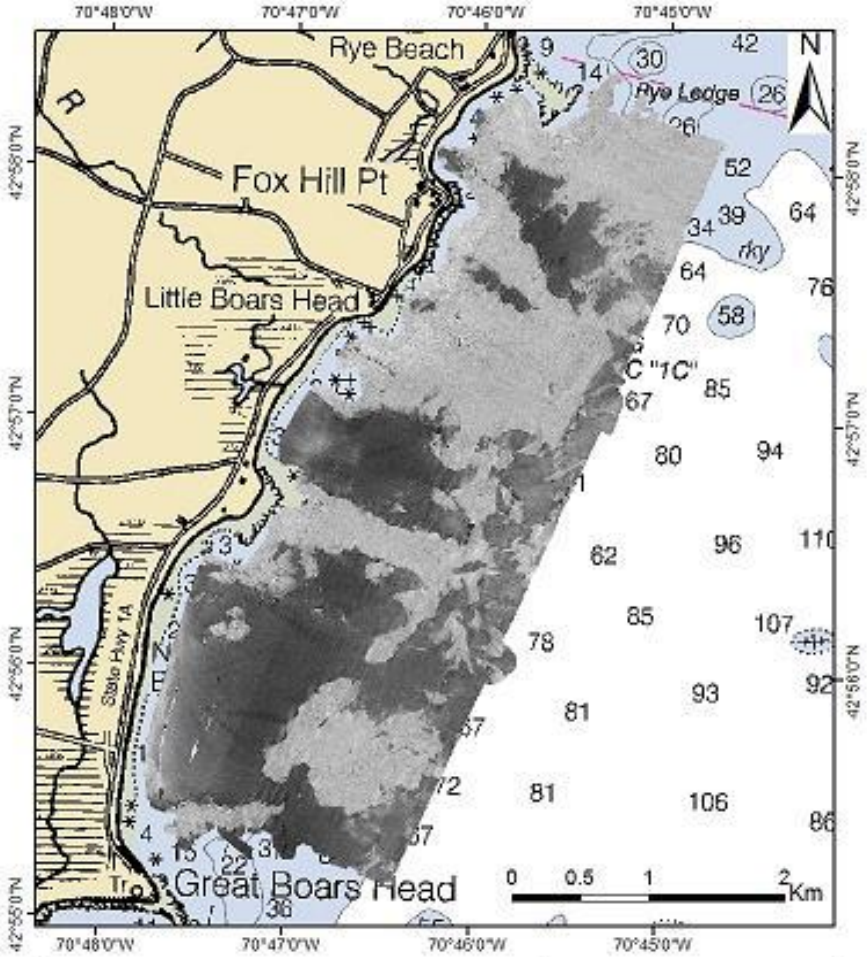



- Budgeting
- Instrument Inventory
- Reconnaissance
- Positioning
- Survey
- On-board processing
- Post-processing
- Products production



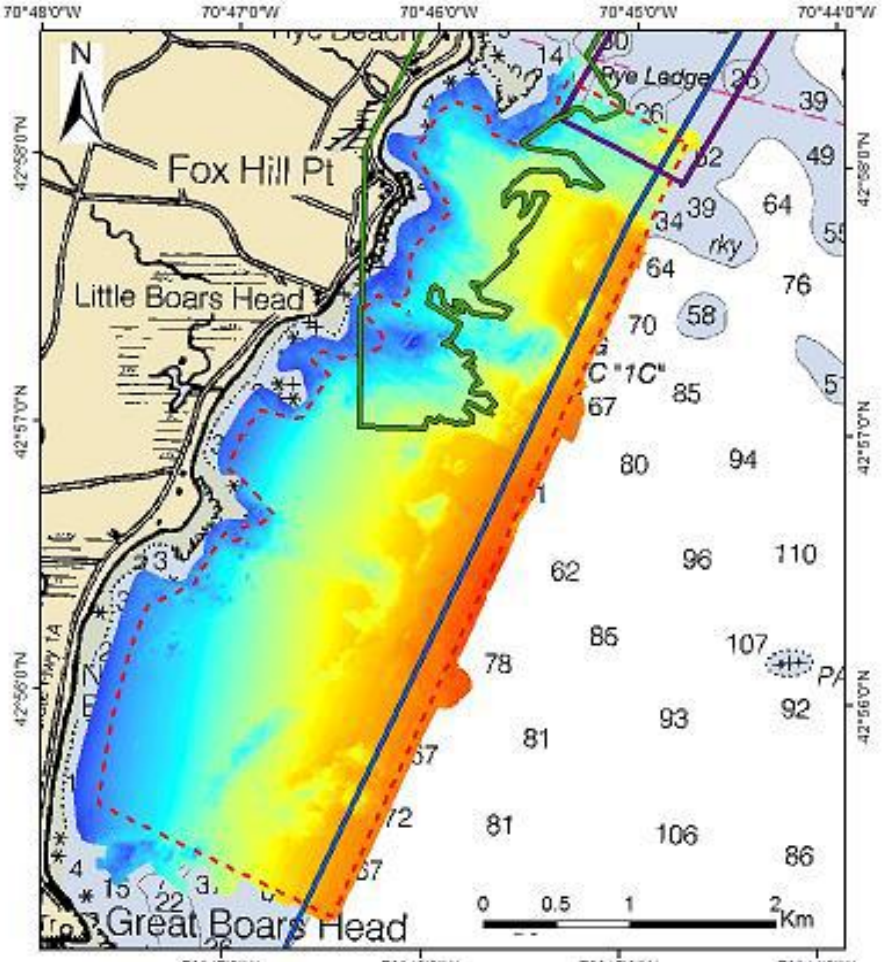



Products: Backscatter and Bathymetric Surface



Nautical Chart:	13278
Title:	Portsmouth to Cape Ann; Hampton Harbor
Type:	Coastal Chart
Scale:	1:80,000
Edition:	28
Print Date:	8/1/2013

Backscatter Mosaic
Resolution: 0.75 m
3 Sigma Ob Range = -40.00 to -6.69
Processed with FMGT



Nautical Chart:	13278
Title/Type:	Portsmouth to Cape Ann; Hampton Harbor Coastal Chart
Scale:	1:80,000
Edition:	28
Print Date:	8/1/2013

Legend
Lidar (H11296)
SH2015
SH2014
Hassler (H12696)

SH 2015 Surface Depth (m)
High : -0.042
Low : -24.34

Nippon Foundation / GEBCO Training program

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 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.

Student Networking Visits

January: NCEI, Boulder, CO

July: 1st Chart Adequacy Workshop NOAA HQ, Silver Spring, MD

Article

First NOAA Chart Adequacy Workshop - 27/08/2015

Dr. Shachak Pe'eri, LT Anthony Klemm and Dr. Rochelle Wigley, USA

The key objective of the NOAA Chart Adequacy Workshop was to demonstrate techniques to evaluate the suitability of nautical chart products using chart quality information and publicly-available information. The three-day workshop was held in Silver Spring, Maryland, USA, from 14 to 16 July 2015. The attendees were cartographers, hydrographers and potential chart producers from hydrographic offices and government agencies around the world. The nations of the participants in the workshop included: Indonesia, Israel, Japan, Kenya, Malaysia, Philippines, South Korea, Sri Lanka, United Kingdom, United States and Venezuela.

The workshop began with a general overview of chart adequacy procedures, emphasising that the focus of the workshop was quality management (as opposed to uncertainty management where risk is calculated based on potential consequences by different users and vessels in different marine settings). NOAA's Lt Anthony Klemm stated the three main goals of the workshop: 1) Train an international group of hydrographers and cartographers; 2) Discuss and review a procedure for assessing chart adequacy based on the depth, main

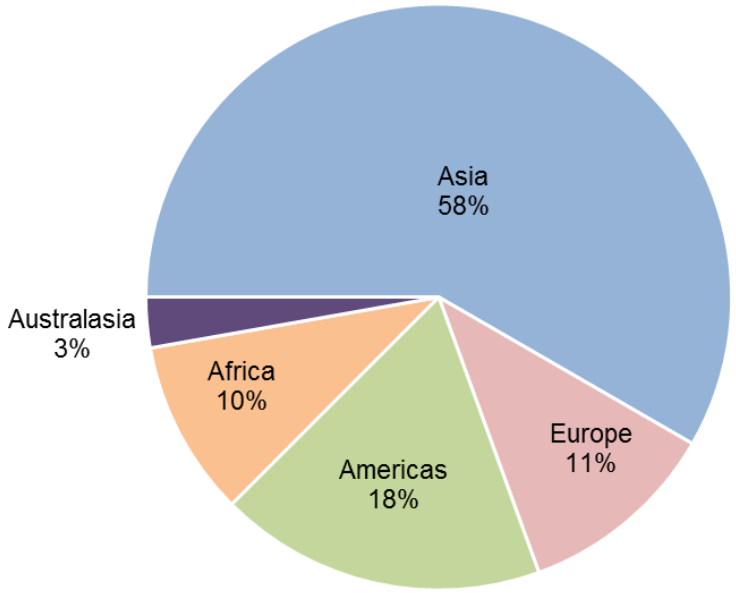
http://www.hydro-international.com/content/article/first-noaa-chart-adequacy-workshop

Nippon Foundation / GEBCO Training program

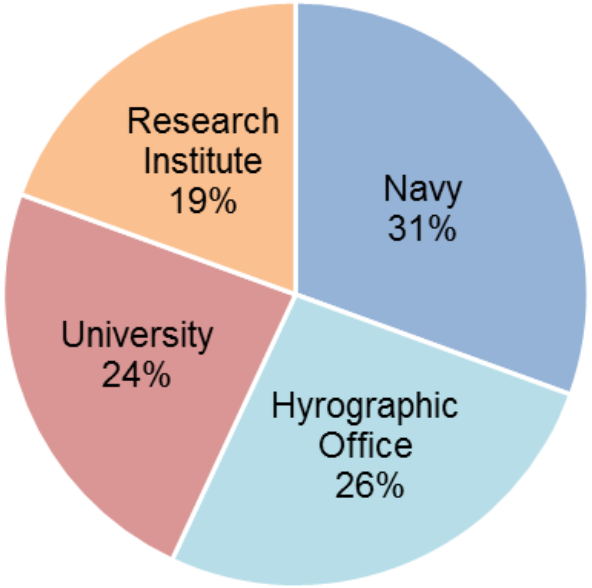
Qualifications attainable:

- GEBCO Postgraduate Certificate in Ocean Bathymetry
- UNH Graduate Certificate in Ocean Mapping
- FIG/IHO/ICA Category A hydrography (theory)

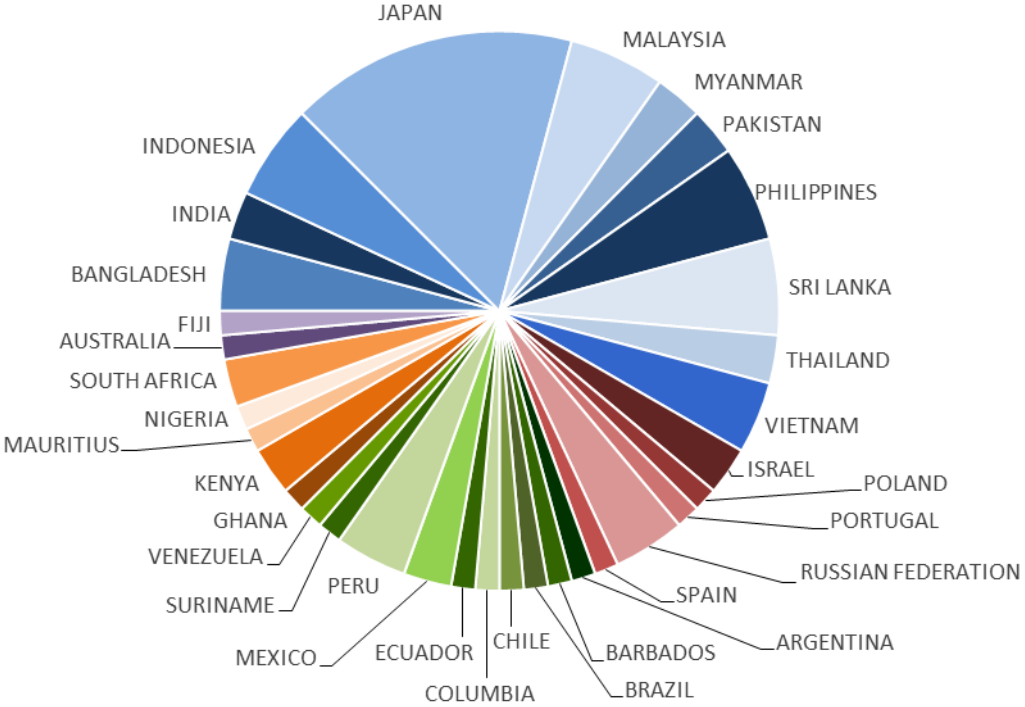
Year 1 – 12 Incoming regions



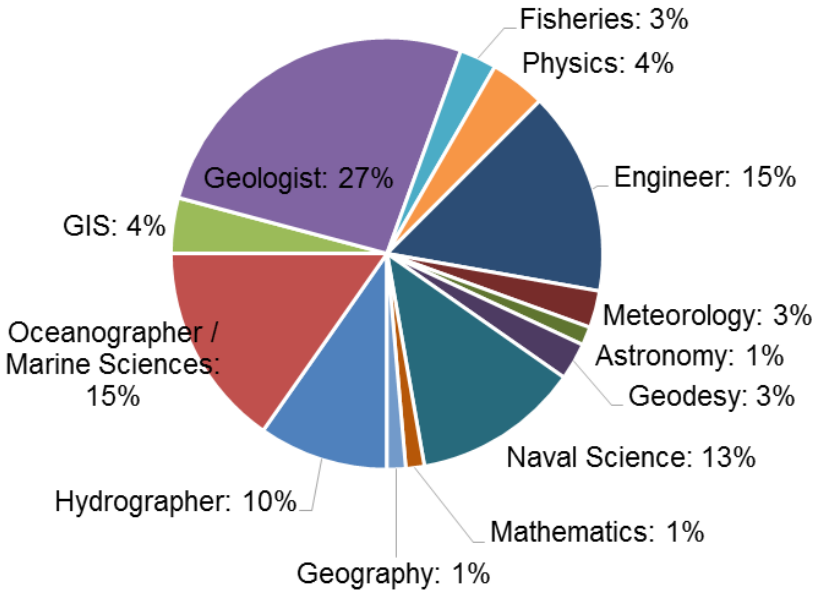
Year 1 – 12 Incoming home organizations



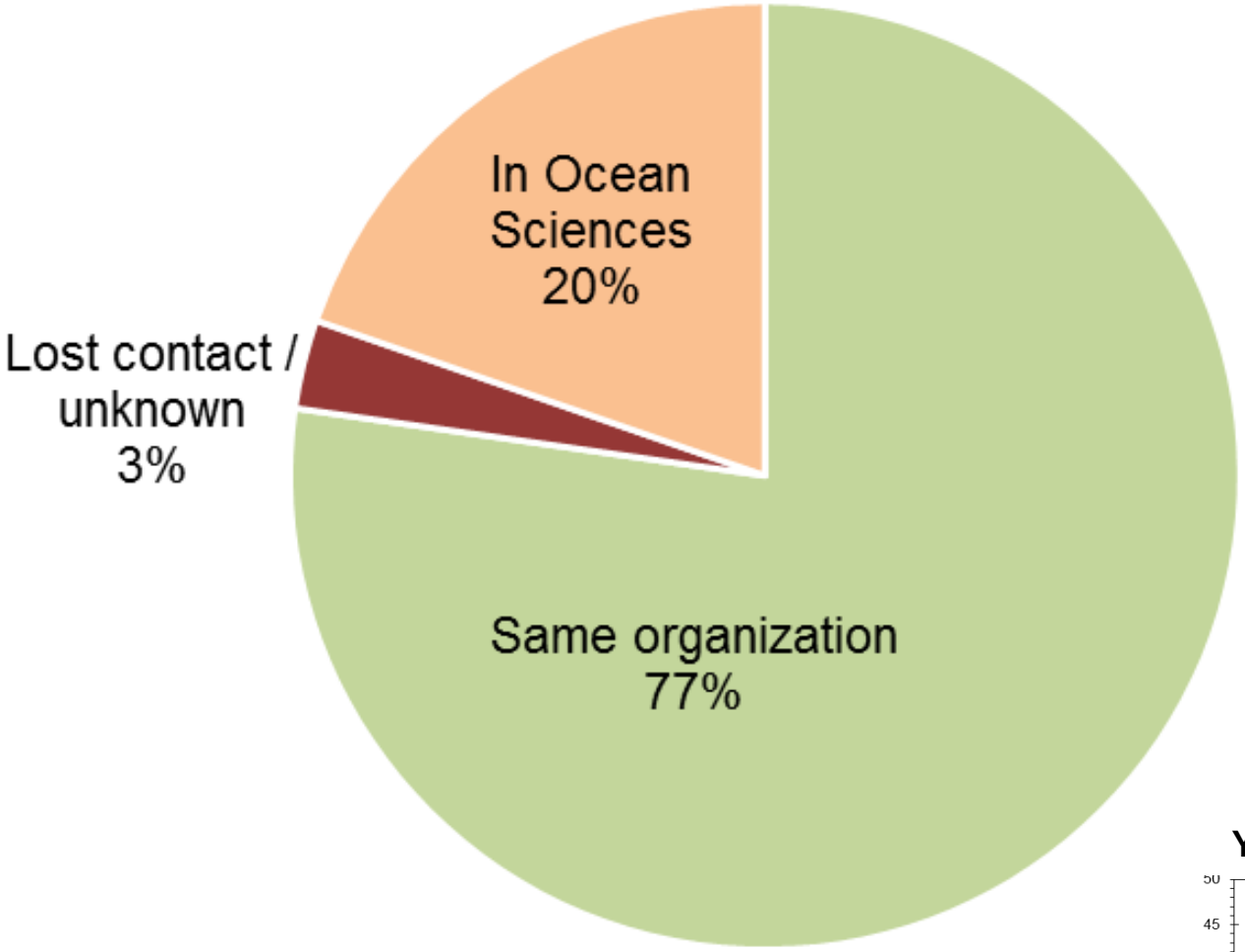
Year 1 – 12 Incoming countries



Diverse backgrounds in Ocean Sciences

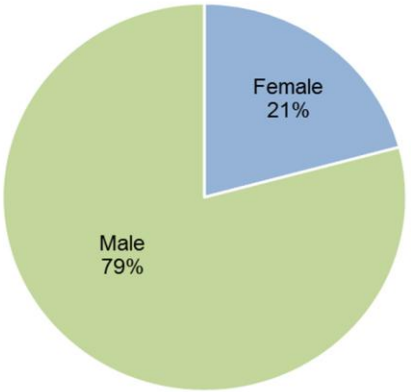


Measure of success: Continuity in Career paths

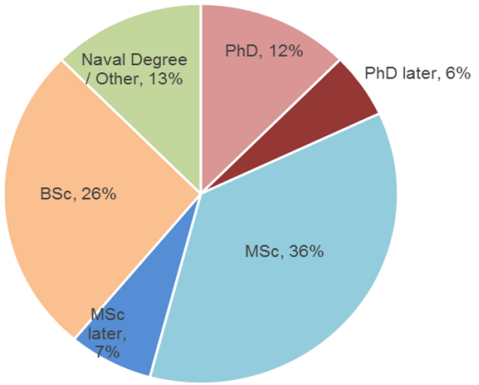


More program statistics

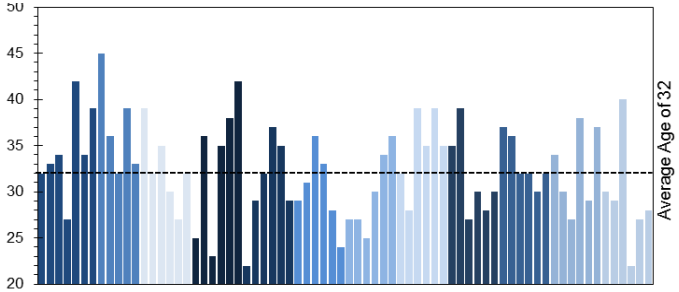
Mix in genders



Education levels



Year 1 – 12 Incoming students age



Strengths of training program
A scholars perspective

- Combines both theory (science and technology) and practical experience (field work).
- Networking amongst GEBCO scholars, Alumni and CCOM graduates significantly from NOAA and other USA govt. agencies
- Network development through interacting with academic, scientific and business leaders at CCOM, UNH and through lab visits, internships and other GEBCO meetings

Applications Now Open

for 13th Year of the Nippon Foundation / GEBCO Postgraduate Certificate in Ocean Bathymetry

Circular Letter 08 of 2016 - 11 February 2016

http://iho.int/mtg_docs/circular_letters/english/2016/CL_ENG_16.htm

https://www.youtube.com/watch?v=blfuyzzS_Gg

Nippon Foundation / GEBCO Indian Ocean Bathymetric Compilation

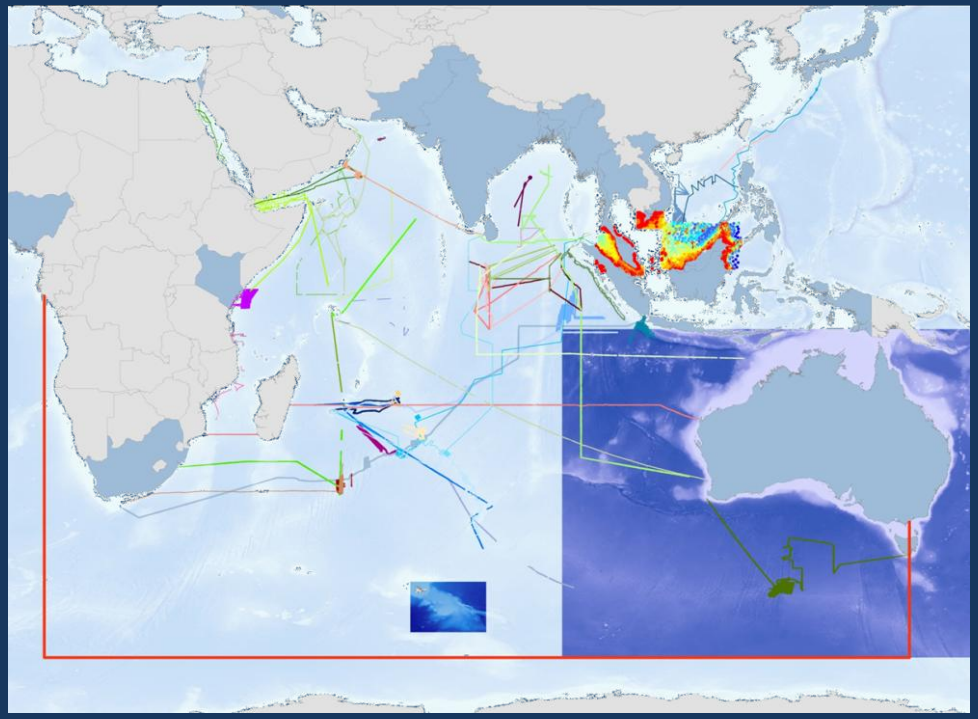
- Assemble all bathymetric data from the different research cruises and hydrographic surveys undertaken in the Indian Ocean
- Publish a regional bathymetric grids that will also be integrated into the next world ocean map and grid by GEBCO
- **UTILISE SCHOLARS NETWORKS**

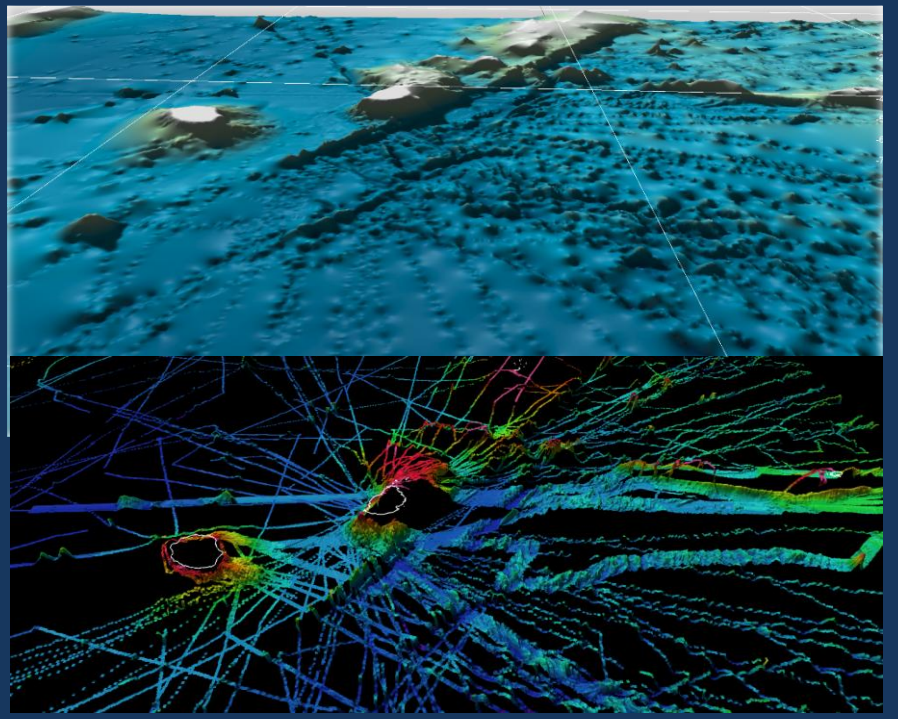




Inception meeting in Bangladesh from 20 - 22 January 2013

Second workshop in Kuala Lumpur from 5 - 9 May 2014

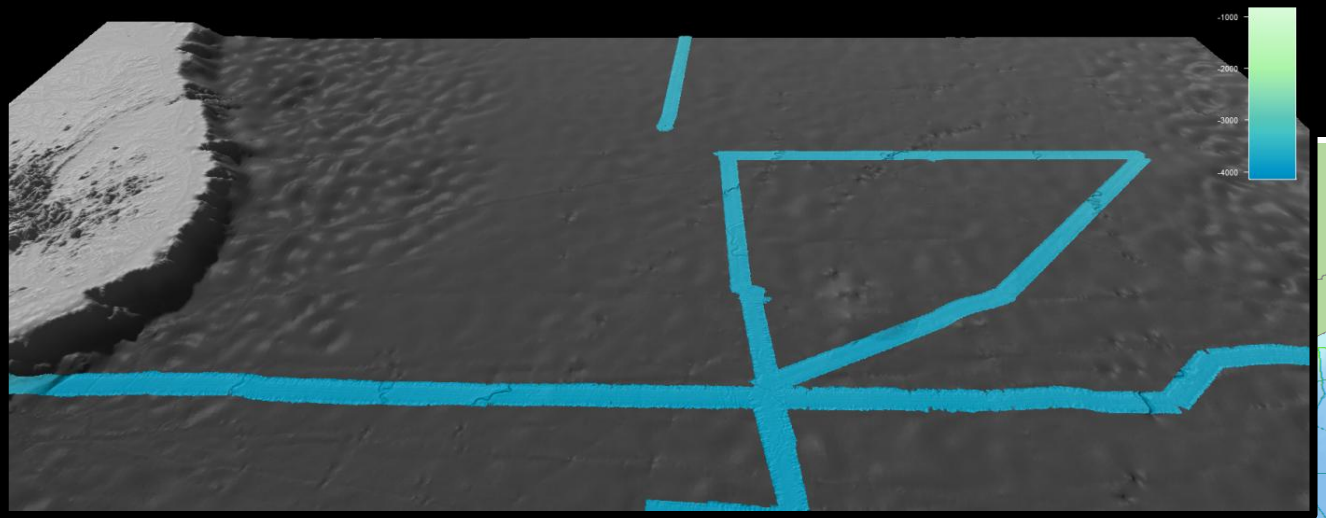




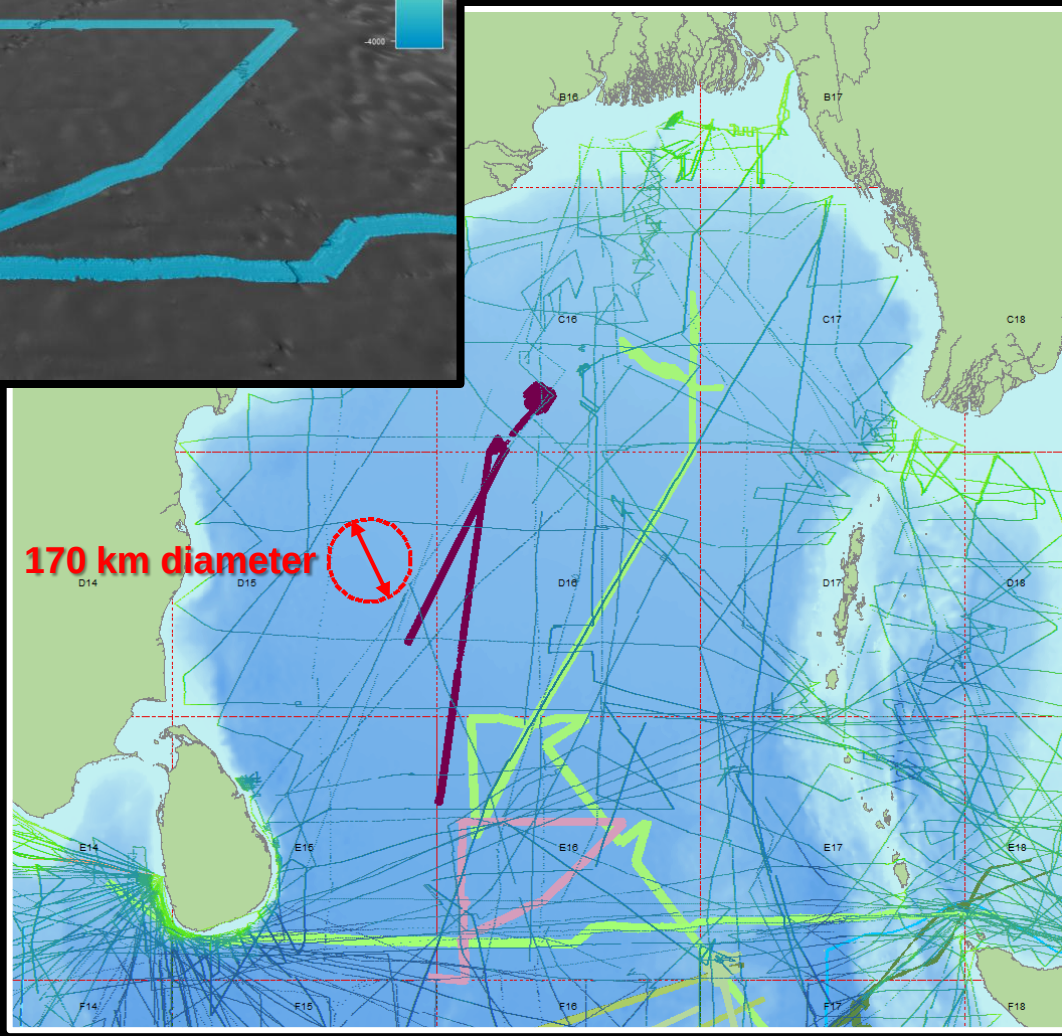
Poor data coverage in public domain

United Nations Educational, Scientific and Cultural Organization

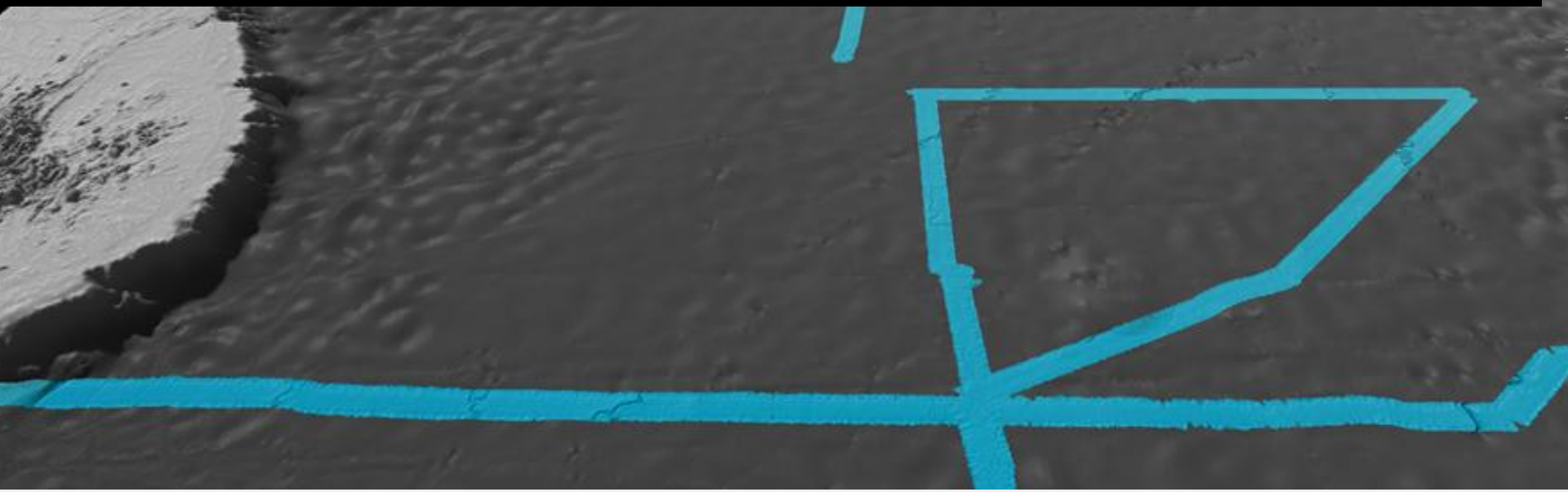
Intergovernmental Oceanographic Commission

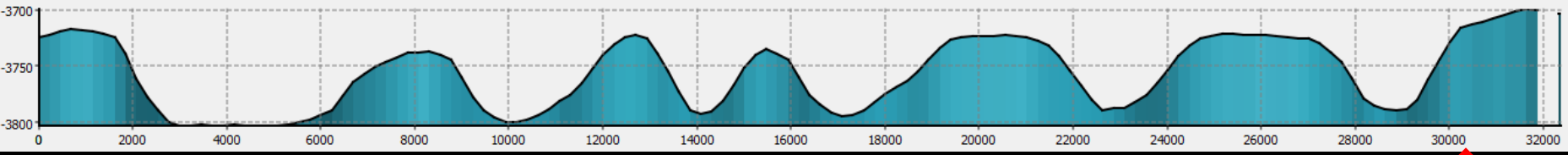


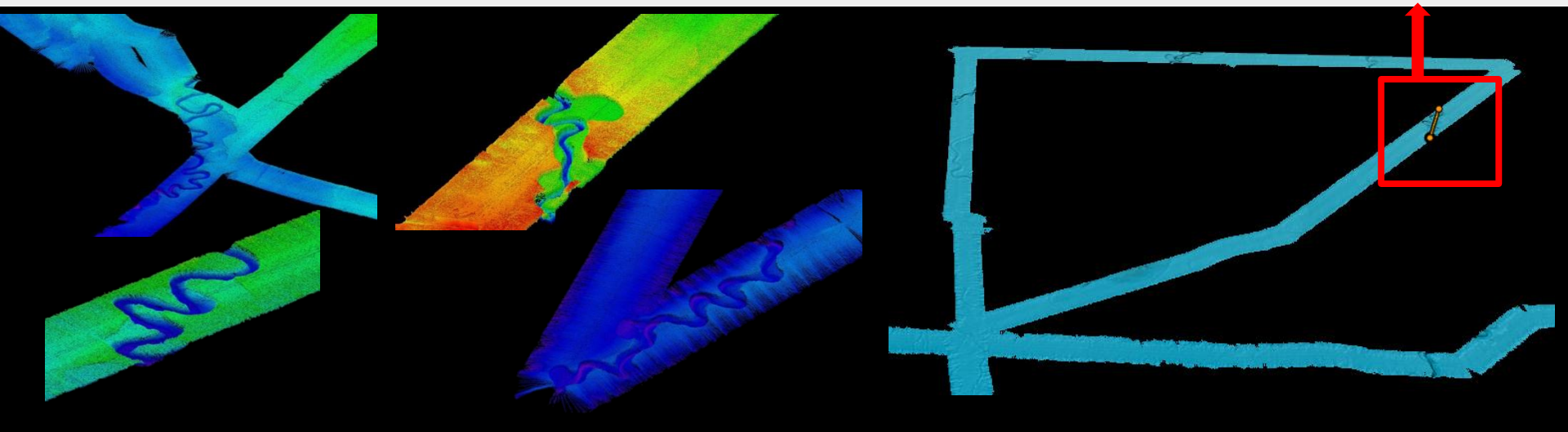
1,000 m GEBCO DTM from Bay of Bengal (Overlain by 500 m IOBC MBES grid)

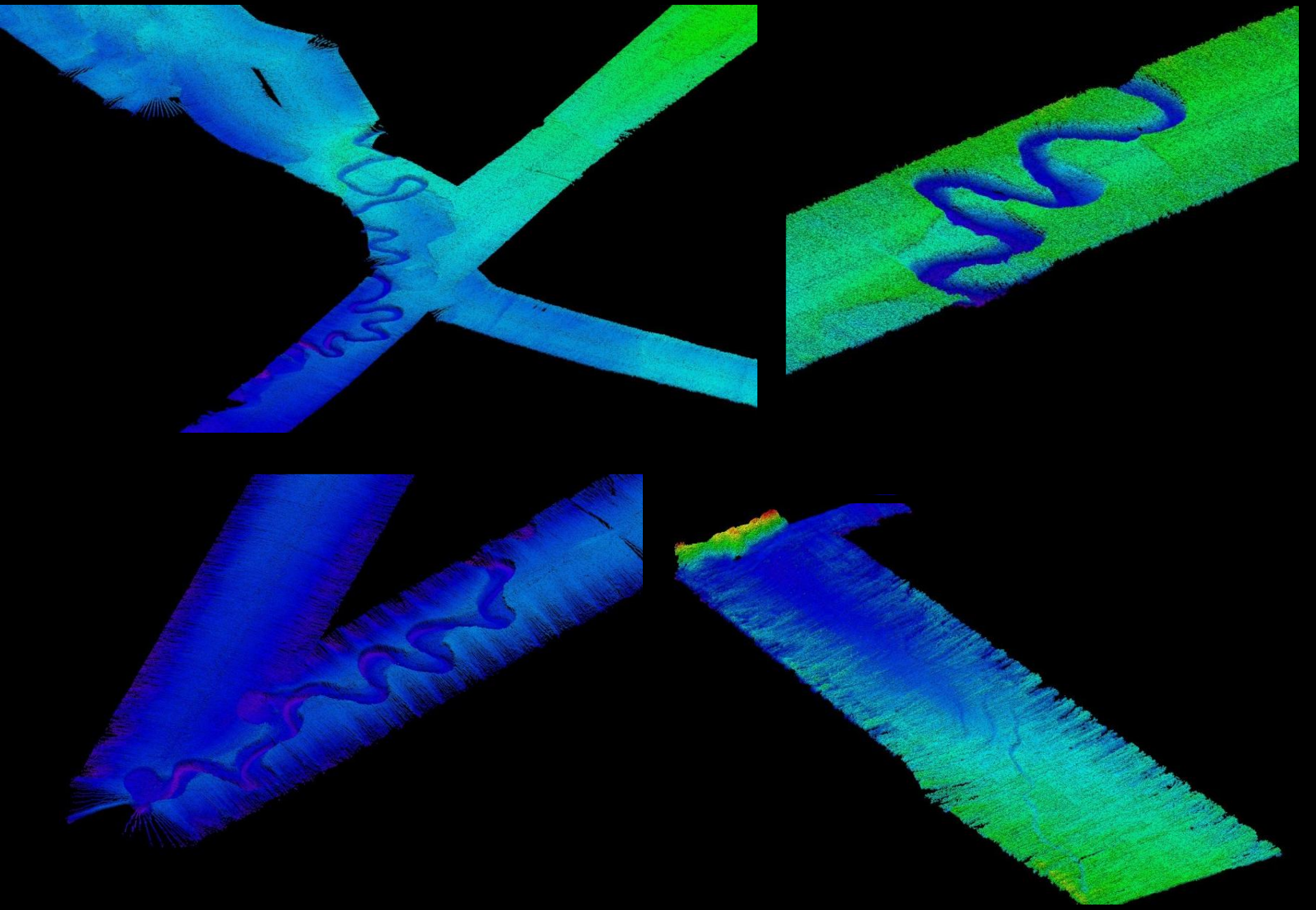


The Importance of a single swath



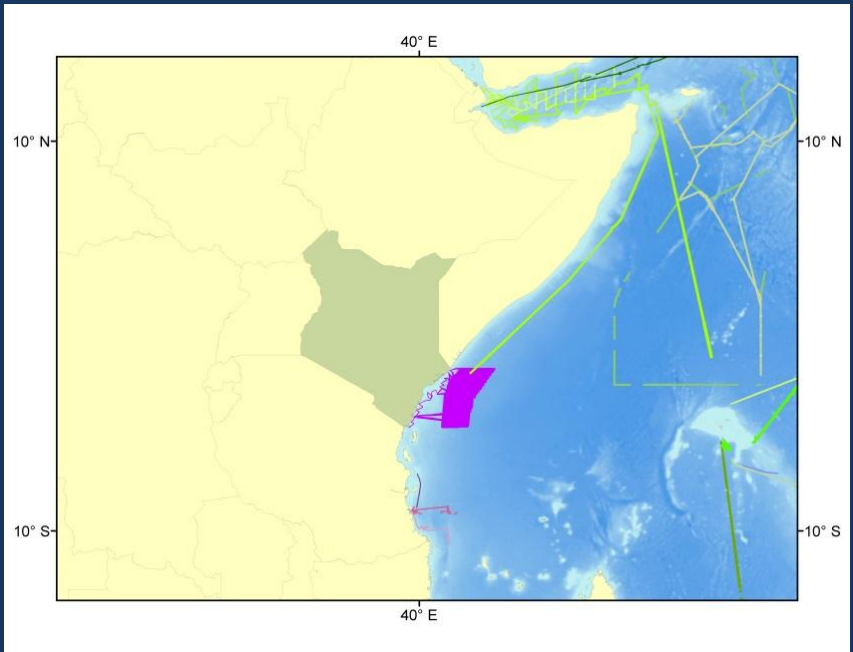


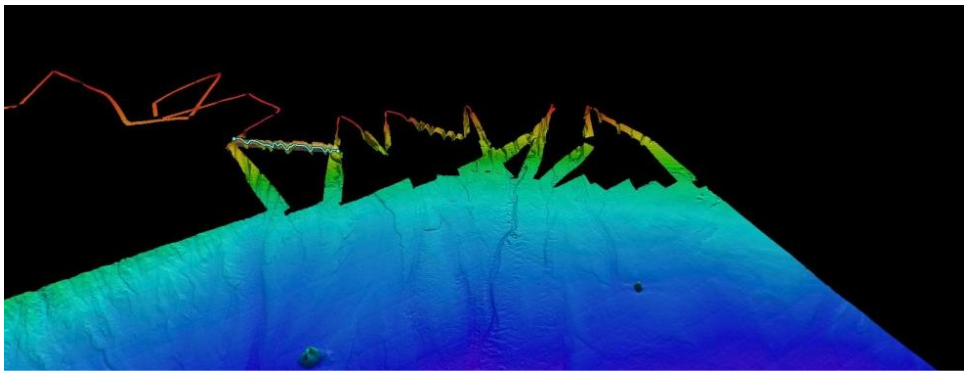


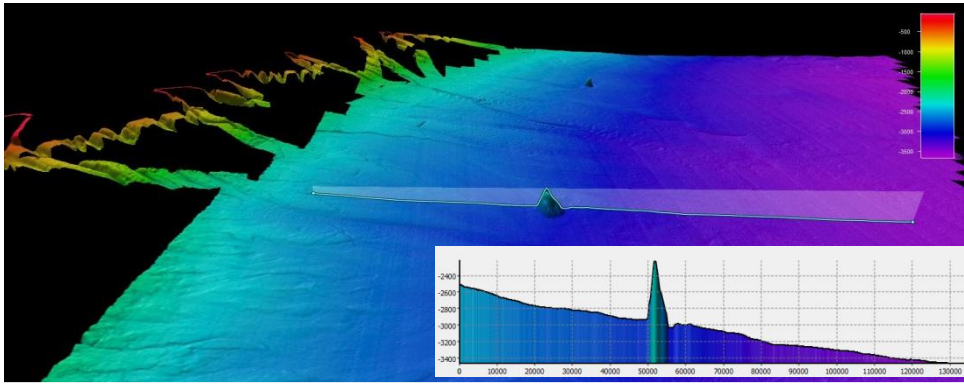


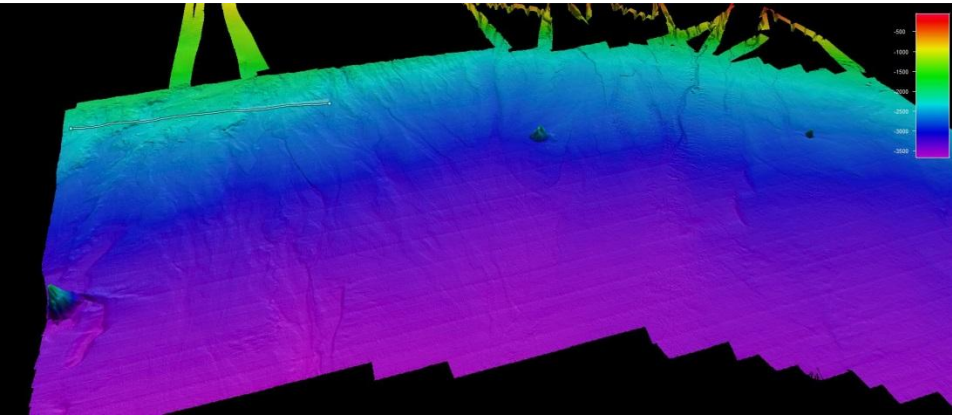
Teaching Tool

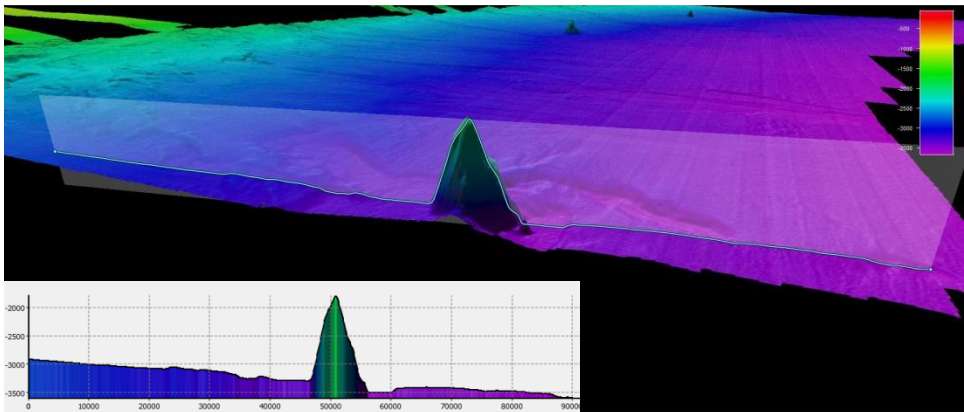
KMFRI provided with dataset that they could not read or display – with no metadata associated – and so no idea on information they had on shelf morphology

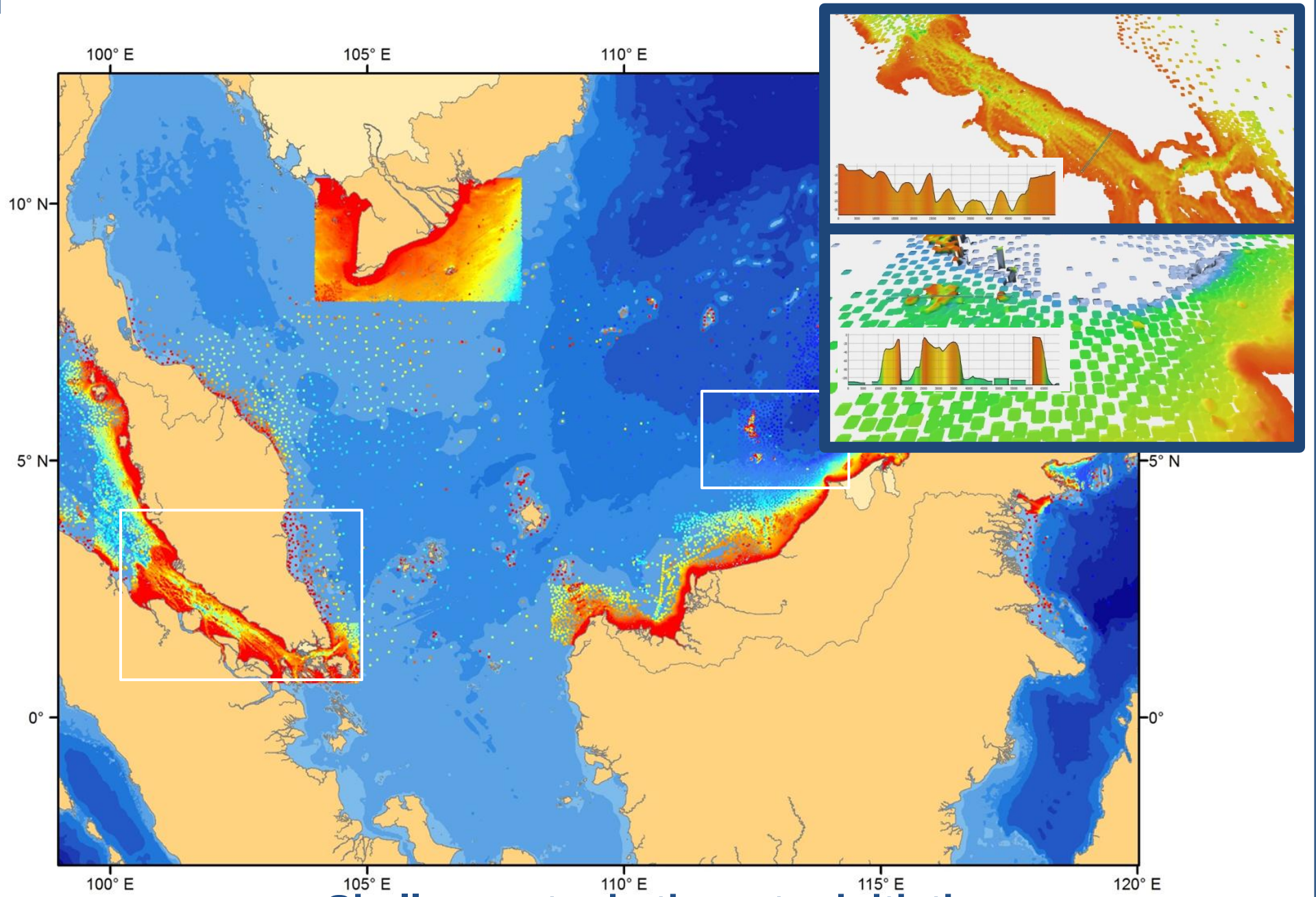












Shallow-water bathymetry initiative:
Regional mapping contribution: Improving GEBCO's global grid

GEBCO aims to:

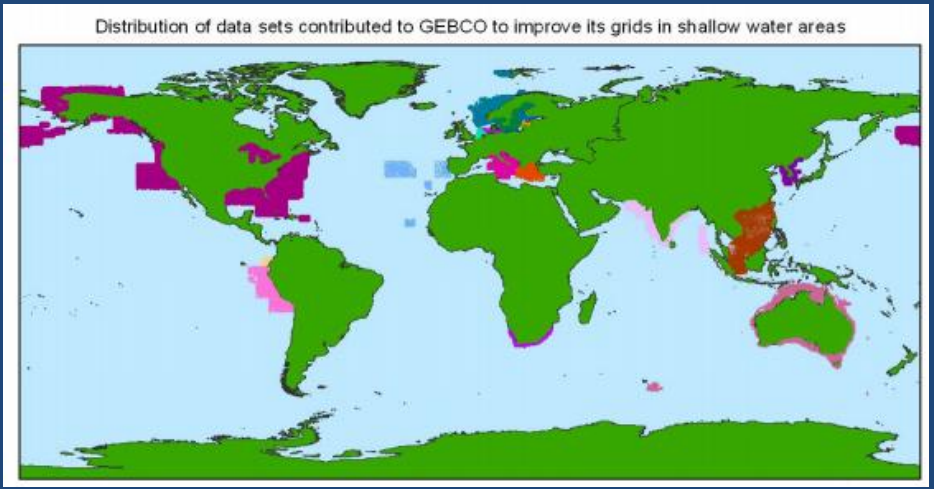
Continually update and improve its global bathymetric model and collaborate with regional mapping groups to help achieve this

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

http://www.iho.int/srv1/index.php?option=com_content&view=article&id=305&Itemid=697&lang=en




General Bathymetric Chart of the Oceans
GEBCO
United Nations
Educational, Scientific and
Cultural Organization
Intergovernmental
Oceanographic
Commission

THANK YOU