



# GEBCO

## (GENERAL BATHYMETRIC CHART OF THE OCEANS)

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***NIOHC meeting, 16-18 March 2015***

# What is GEBCO?



## The General Bathymetric Chart of the Oceans (GEBCO):

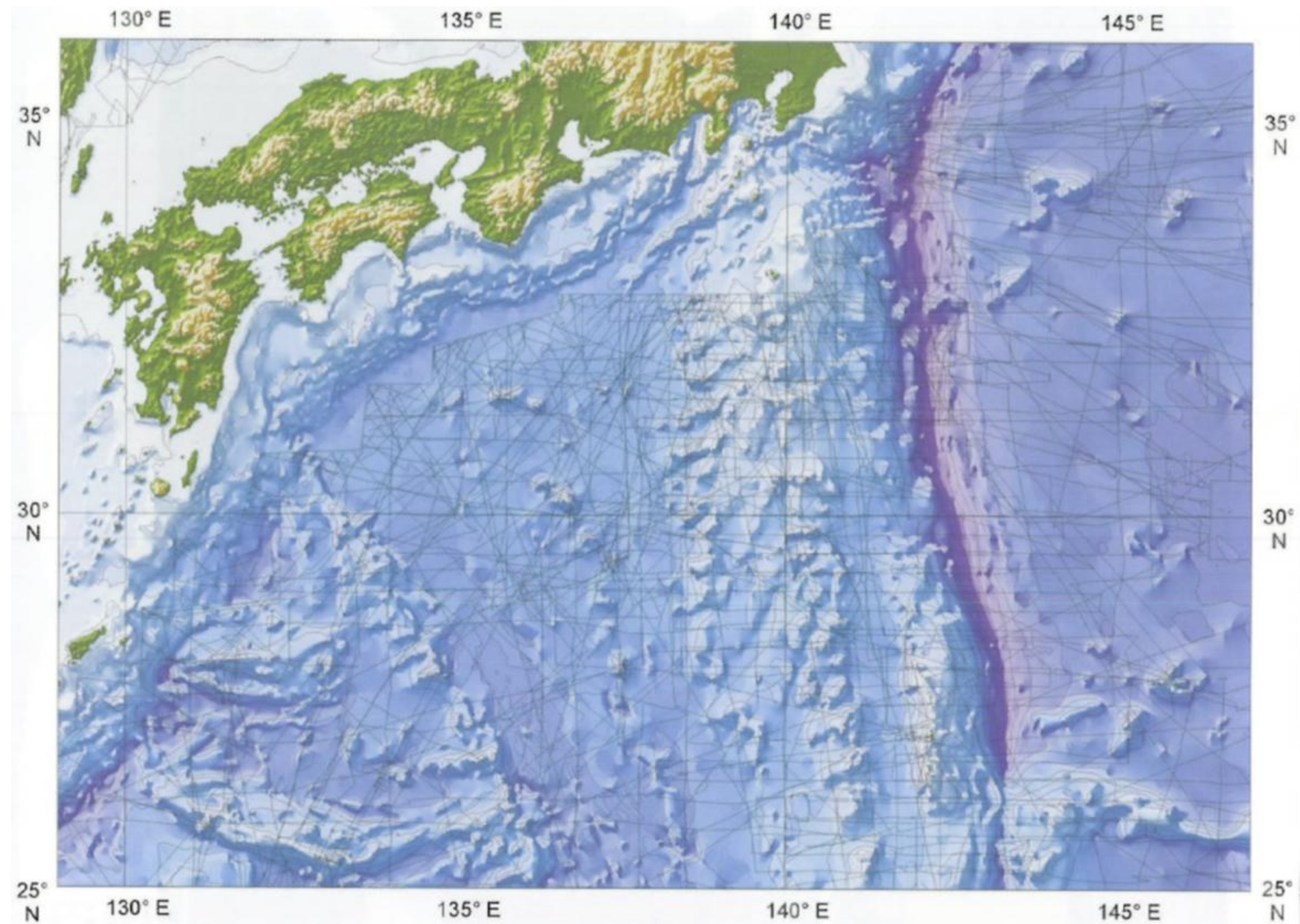
- Aims to provide the most authoritative, publicly-available comprehensive bathymetric datasets for the world's oceans from the coast to ocean basins
- Maintains and makes available a gazetteer of undersea feature names
- GEBCO operates under the joint auspices of the International Hydrographic Organization (IHO) and Intergovernmental Oceanographic Commission (IOC) of UNESCO

# GEBCO History

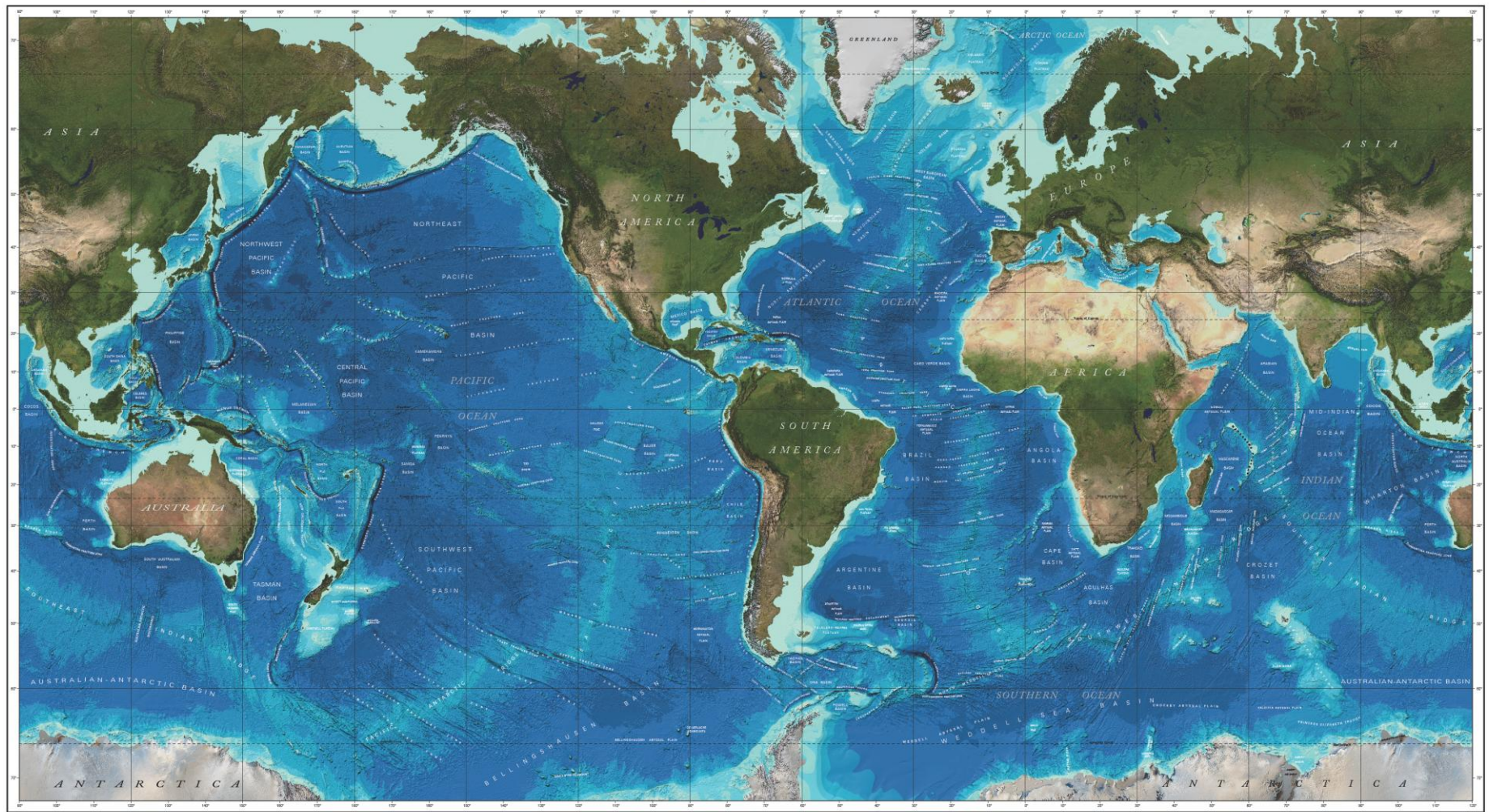


April 1903 His Serene Highness Prince Albert I of the Principality of Monaco (1848-1922) offered to finance the production of the General Bathymetric Chart of the Oceans



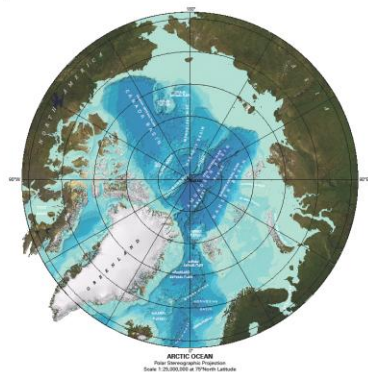






**GENERAL BATHYMETRIC CHART OF THE OCEANS (GEBCO)  
WORLD OCEAN BATHYMETRY**

2014-00



#### INTRODUCTION

The GEBCO community consists of an international group of experts in oceanographic sciences who are dedicated to the development of a global bathymetric chart of the world's oceans. The chart is a product of the International Geophysical Commission (IGC) and the International Hydrographic Organization (IHO). The chart is a product of the International Geophysical Commission (IGC) and the International Hydrographic Organization (IHO). The chart is a product of the International Geophysical Commission (IGC) and the International Hydrographic Organization (IHO).

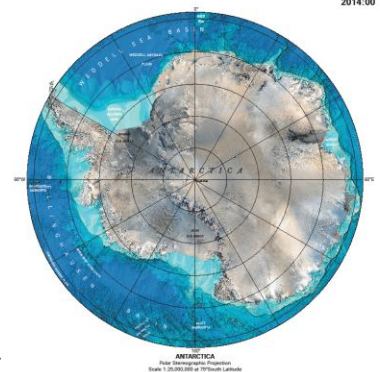
**JOINT IGC AND IHO COORDINATING COMMITTEE FOR GEBCO-2014**  
Dr. Robert A. M. Thompson (Chairman)  
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Mercator Projection - Scale 1:30 000 000 at the Equator  
Depths in corrected meters



#### MAP PRODUCTION

This is the second of the GEBCO Digital Data (GDD) maps. It was created by the GEBCO community using the GEBCO Digital Data (GDD) and the GEBCO Digital Data (GDD). The map is a product of the International Geophysical Commission (IGC) and the International Hydrographic Organization (IHO). The map is a product of the International Geophysical Commission (IGC) and the International Hydrographic Organization (IHO). The map is a product of the International Geophysical Commission (IGC) and the International Hydrographic Organization (IHO).

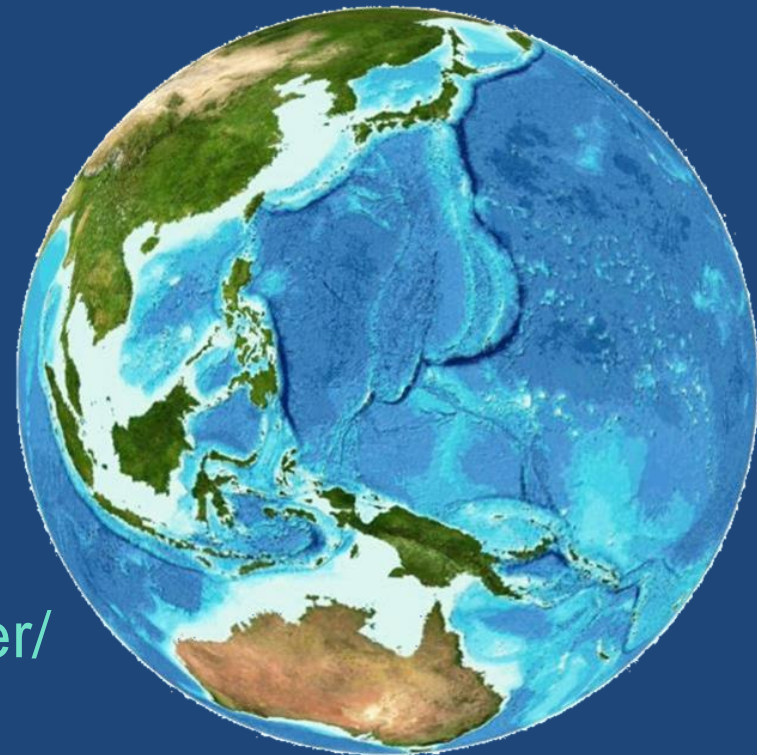




# What is new



- The GEBCO\_2014 Grid is a continuous terrain model for ocean and land with a spatial resolution of 30 arc seconds
- GebCO\_2014 associated with GEBCO Source Identifier (SID) Grid
- GEBCO Sub-Committee on Undersea Feature Names digital gazetteer of the names, now available via a web map application (hosted by the IHO DCDB hosted NGDC)  
<http://www.ngdc.noaa.gov/gazetteer/>



# GEBCO's products



## 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/](http://www.gebco.net/data_and_products/)

# Regional mapping work



Recognising the importance of the contributions of regional experts in improving its global bathymetric models, GEBCO has setup the Sub-Committee on Regional Undersea Mapping (SCRUM) to:

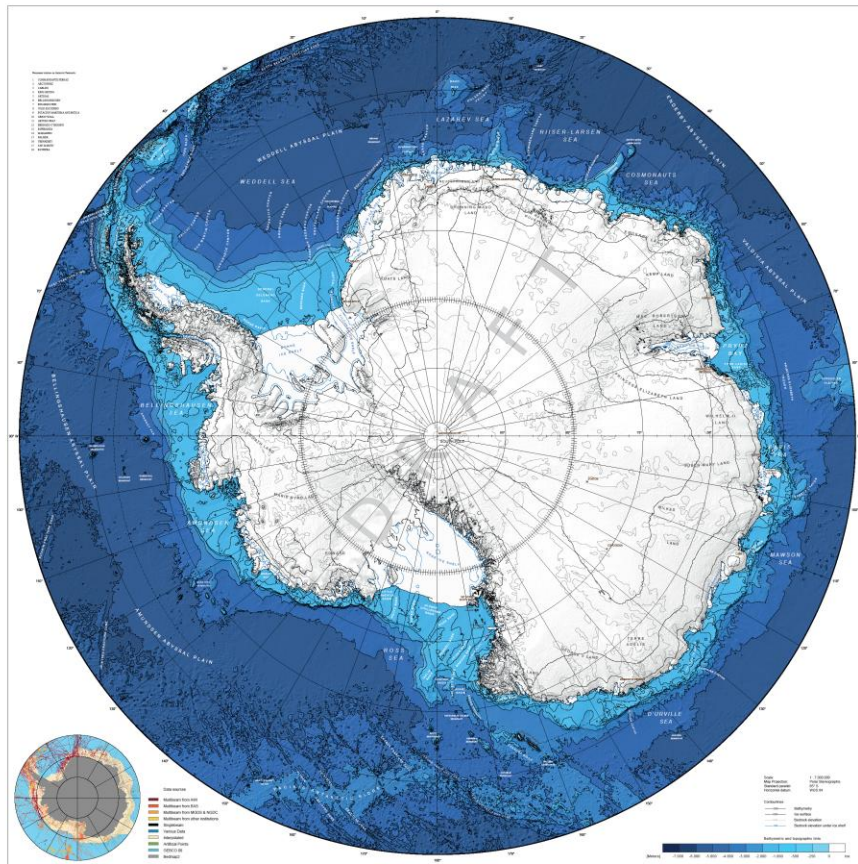
- Collaborate with regional groups, such as RHCs
- Encourage and coordinate regional mapping efforts

**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/](http://www.gebco.net/regional_mapping/mapping_projects/)



# IBCSO & IBCAO



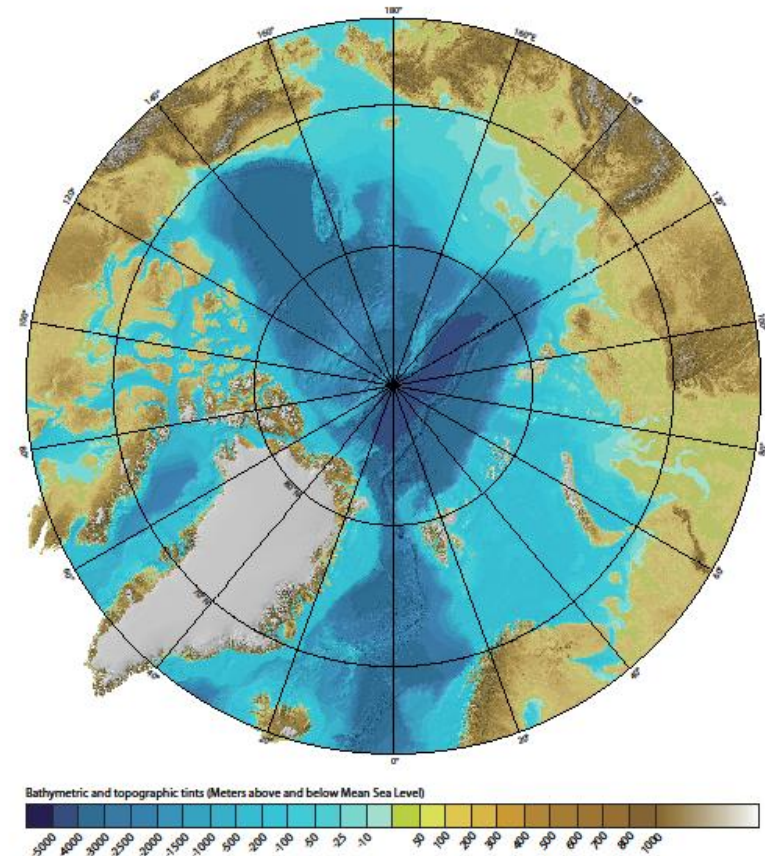
THE INTERNATIONAL BATHYMETRIC CHART OF THE SOUTHERN OCEAN (IBCSO)

**IBCSO** is a project of the International Hydrographic Organization (IHO) and the United Nations Educational, Scientific and Cultural Organization (UNESCO). It is a collaborative effort to create a comprehensive bathymetric chart of the Southern Ocean, covering the area from 60°S to 90°S. The chart is based on data from various sources, including satellite altimetry, ship-based surveys, and historical charts. It is a significant contribution to the understanding of the Southern Ocean's bathymetry and topography.

**IBCAO** is a project of the International Hydrographic Organization (IHO) and the United Nations Educational, Scientific and Cultural Organization (UNESCO). It is a collaborative effort to create a comprehensive bathymetric chart of the Indian Ocean, covering the area from 0° to 90°S. The chart is based on data from various sources, including satellite altimetry, ship-based surveys, and historical charts. It is a significant contribution to the understanding of the Indian Ocean's bathymetry and topography.

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Bathymetric and topographic tints (Meters above and below Mean Sea Level)



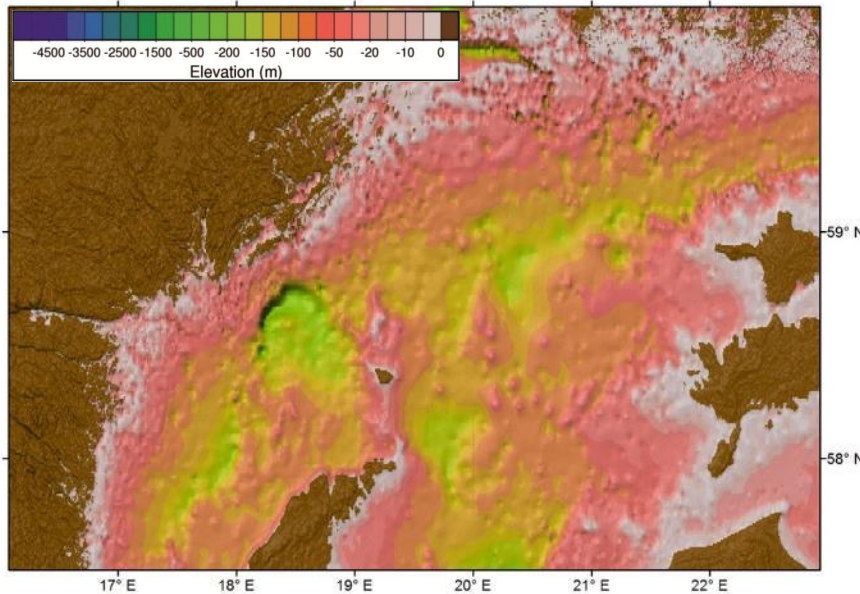
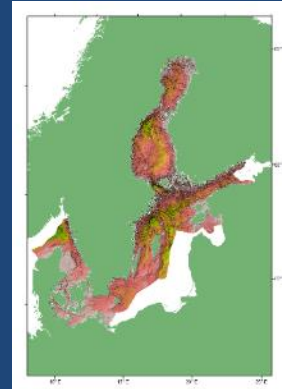


# Regional mapping work: improving GEBCO's global grid

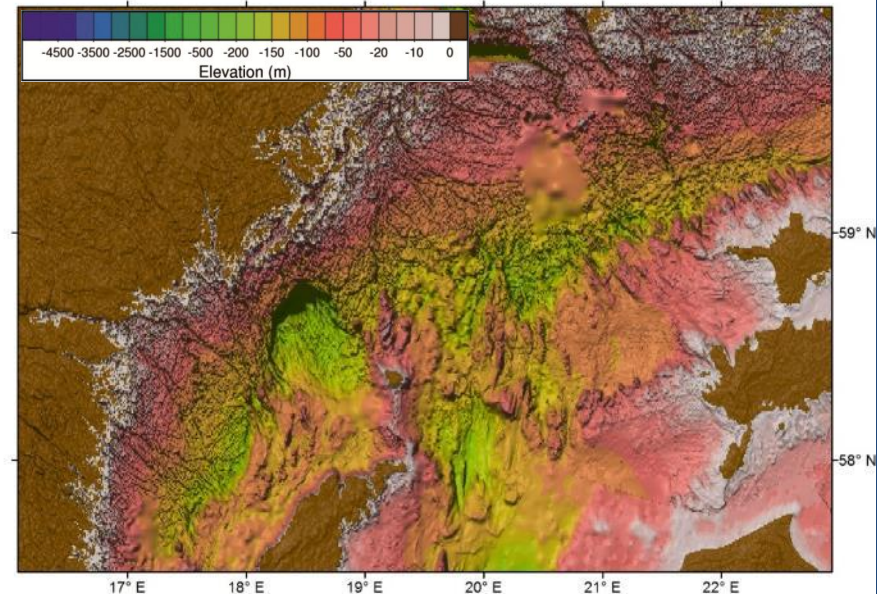


## Examples of regional mapping contributions to GEBCO

Baltic Sea Hydrographic Commission (BSHC) →  
Contribution of a gridded data set for part of the  
Baltic Sea region for updating the GEBCO global grid



Existing GEBCO grid



GEBCO grid updated with BSHC grid



# Indian Ocean Bathymetric Compilation (IOBC) project

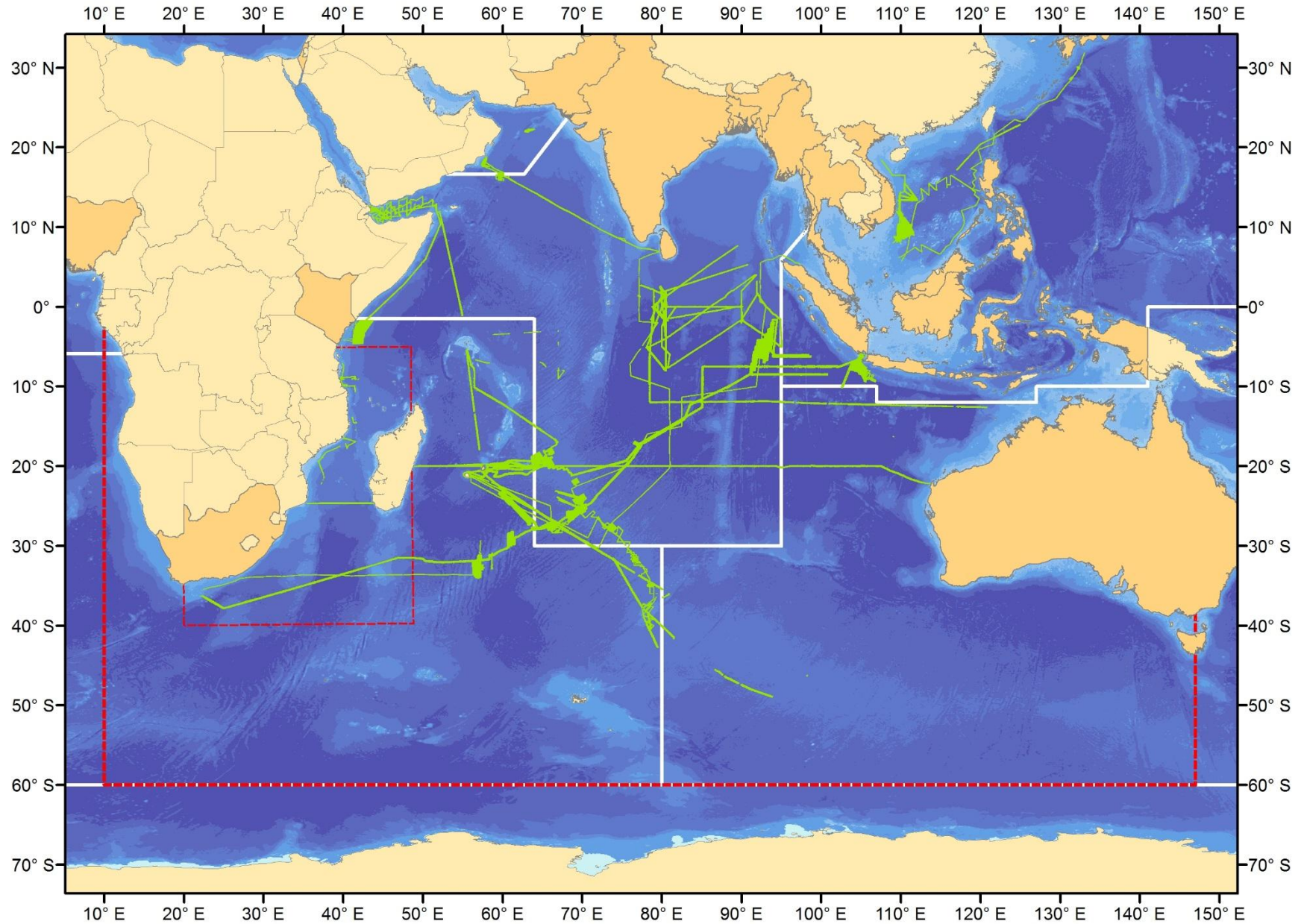


**This is a GEBCO regional project funded  
by the Nippon Foundation**

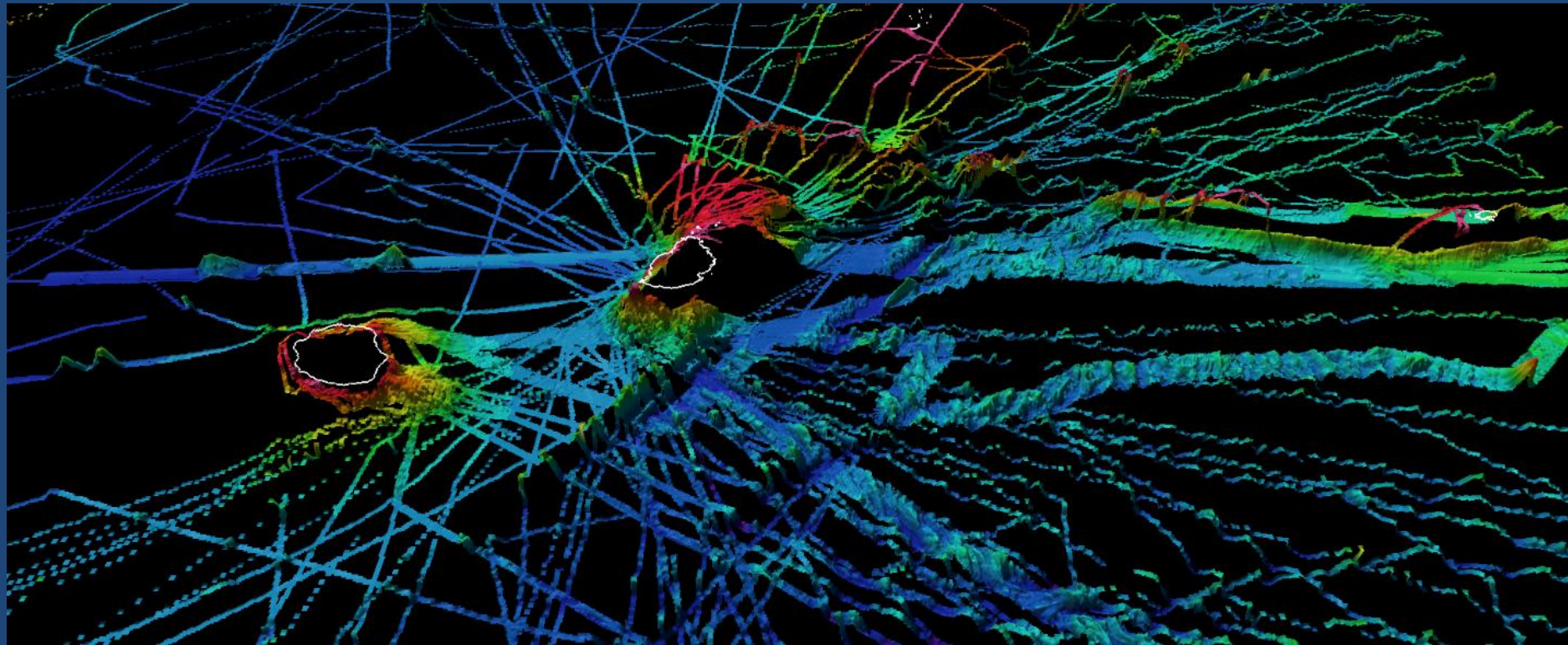
## **OBJECTIVES:**

The aim of this multi-nation project is to assemble, collate, archive, interpret and publish all publically-available bathymetric data as a grid and a paper map from all available sources within the “Indian Ocean”

# 1.5% of Indian Ocean covered by publically-available MBES data

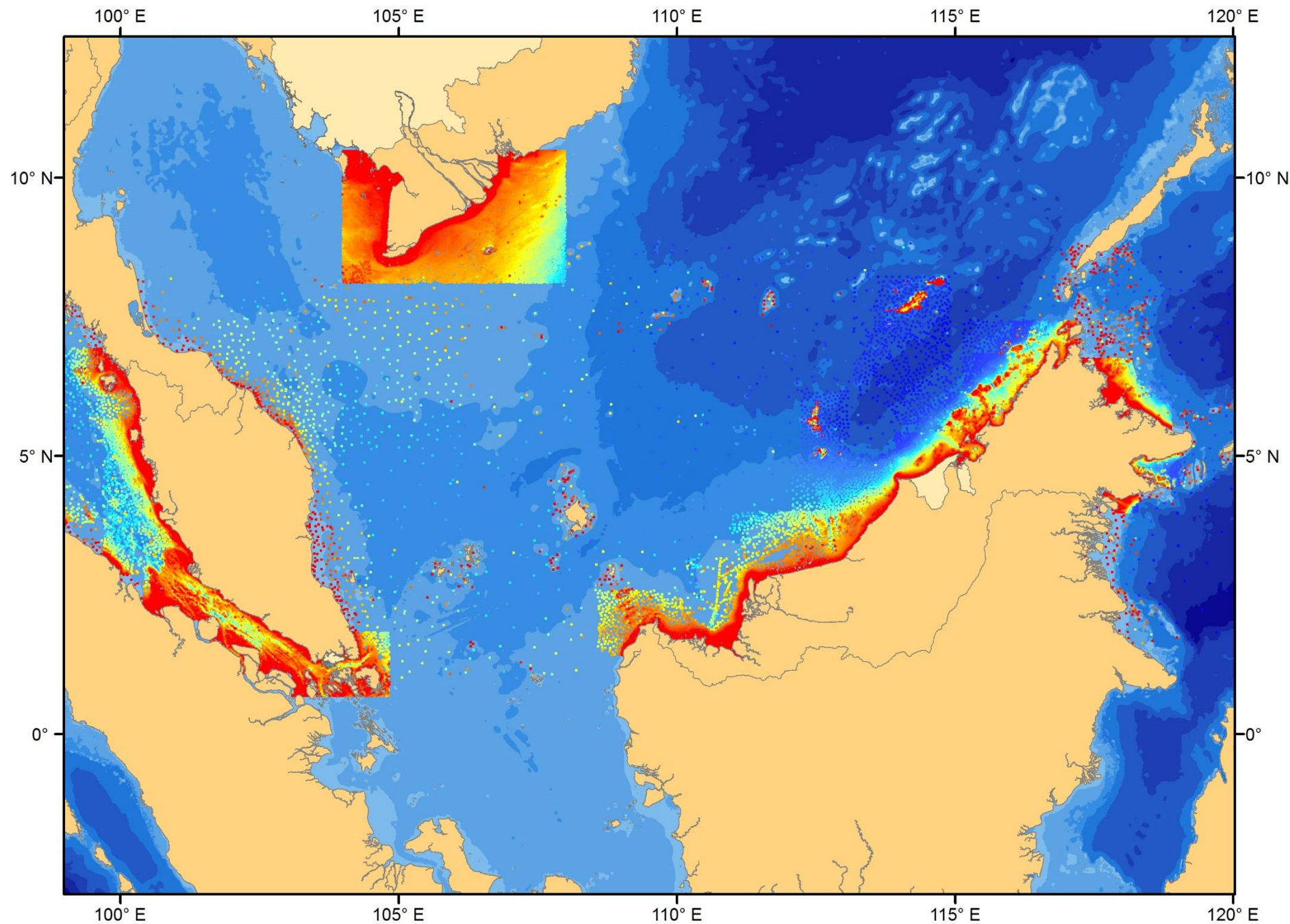






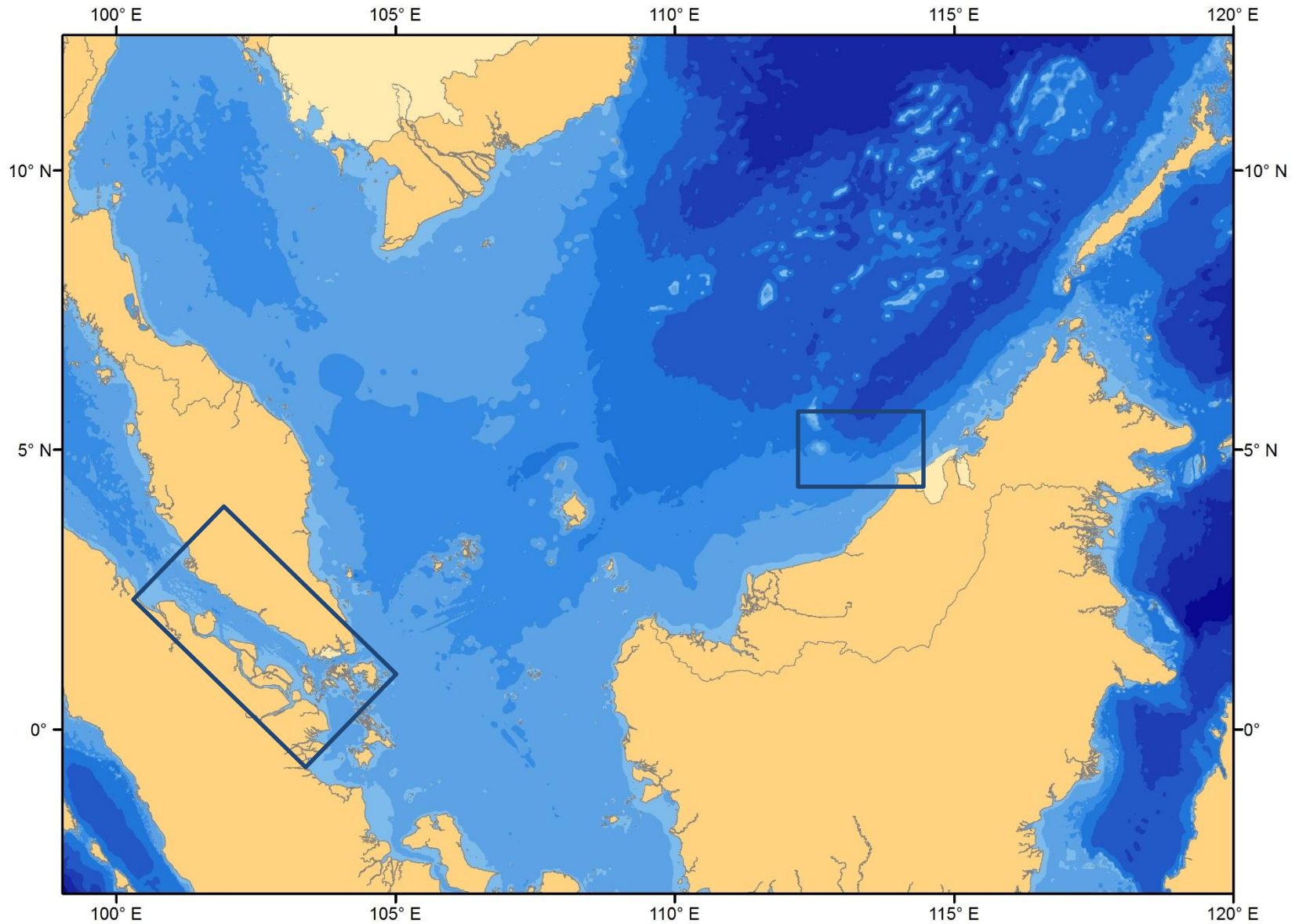
2 km grid resolution for SBES and 500 m for MBES data  
around Mauritius and Reunion





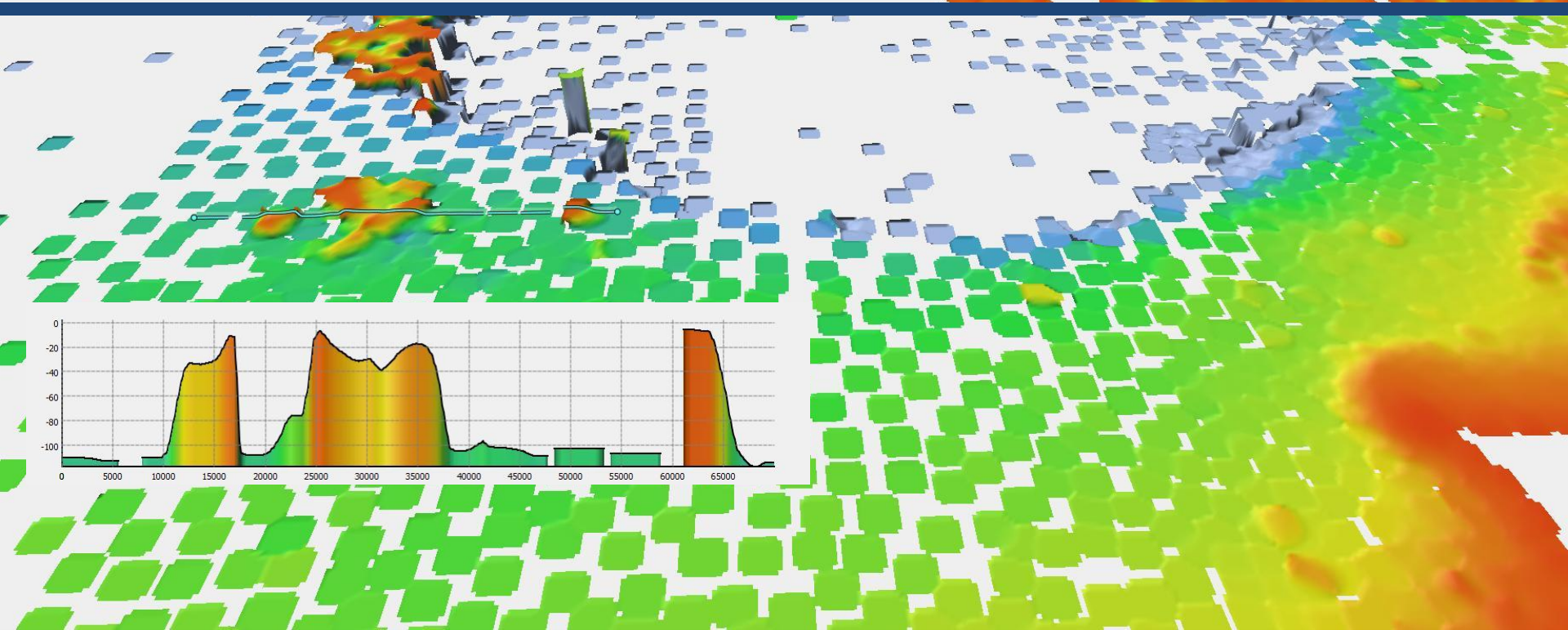
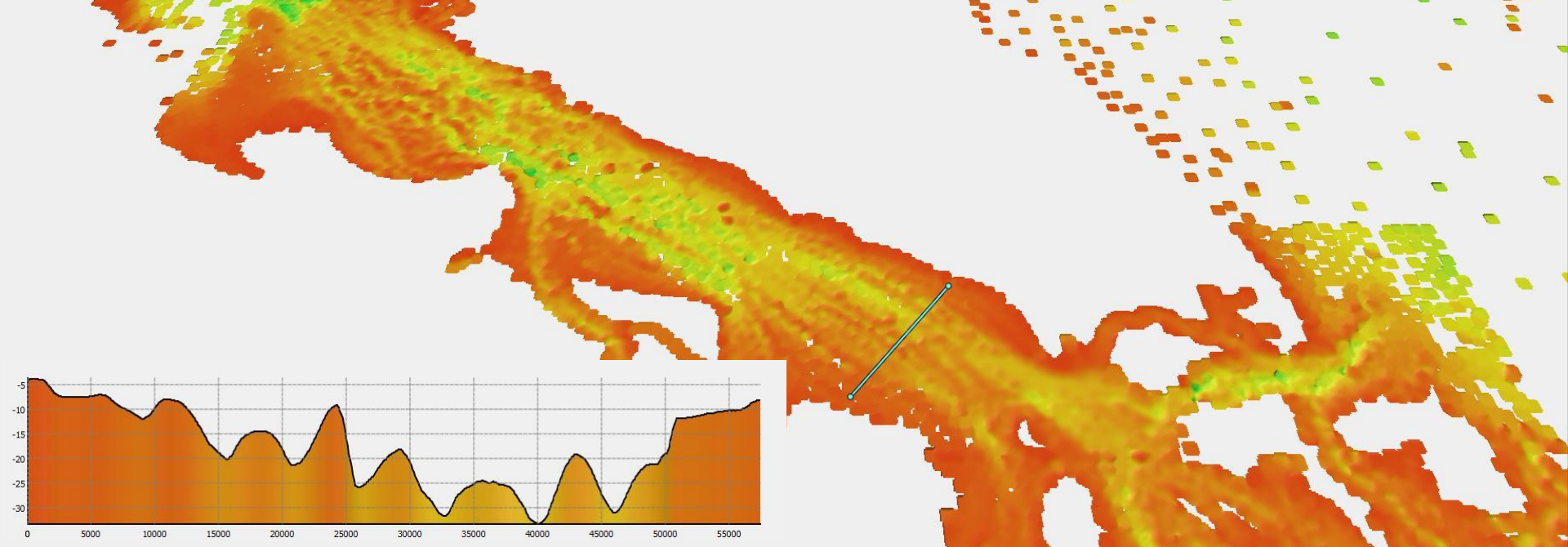
**Regional mapping contribution: Improving GEBCO's global grid**





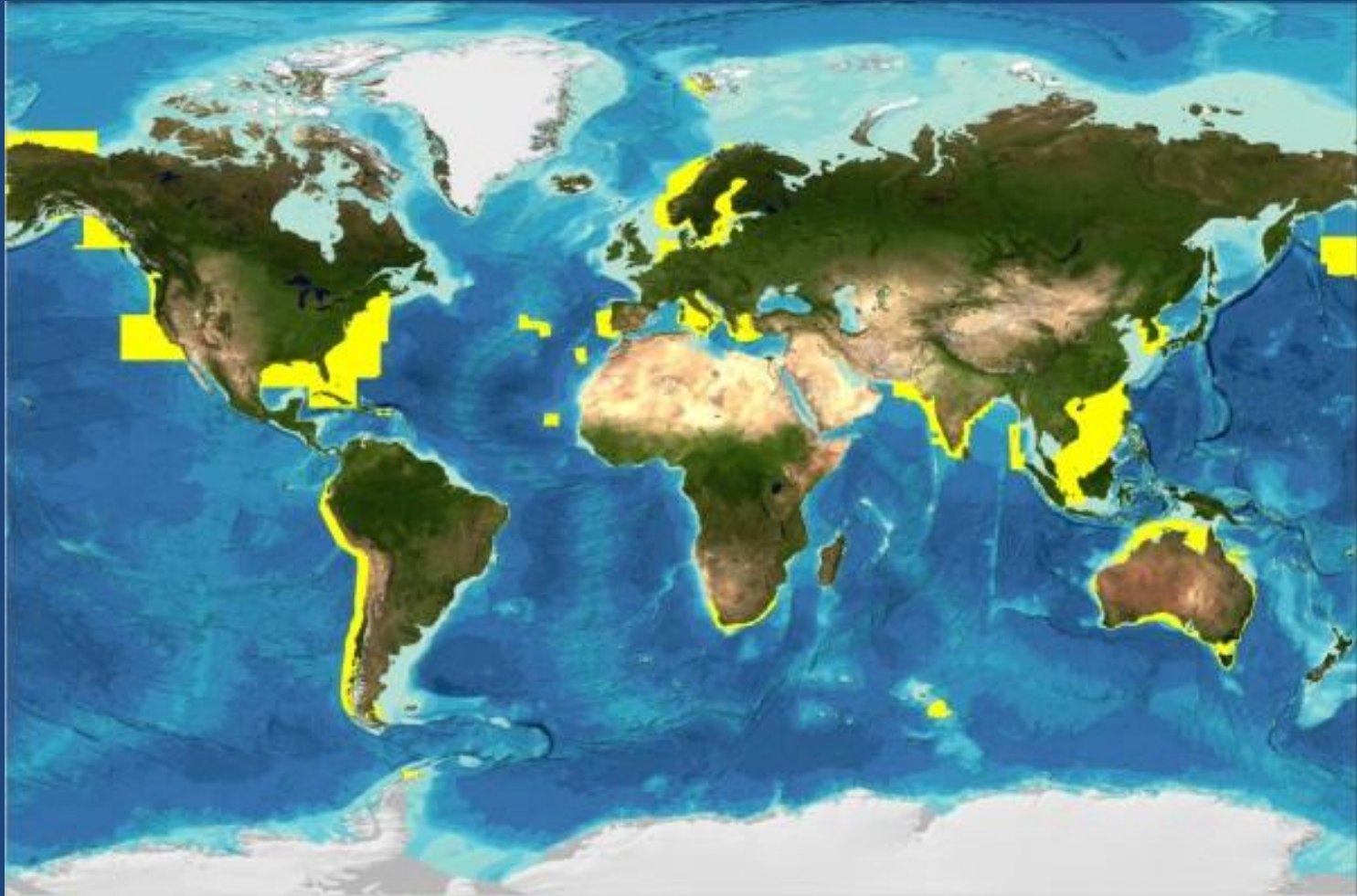
## **The GEBCO 2014 Grid — a global 30 arc-second grid**

Largely generated by combining quality-controlled ship depth soundings with interpolation between sounding points guided by satellite-derived gravity data





# Shallow-water bathymetry initiative



ENC data coverage (usage bands 2 & 3) provided, to date, by IHO Member States and organizations to GEBCO for grid updating work

# How to help improve global bathymetric models



GEBCO extends a further request to RHCs and Member States to help with GEBCO's global grid development work by:

- Submitting, where possible, any bathymetry data to the IHO DCDB and/or GEBCO to be included in its global grids and those of regional partners
- Ensuring that data from scientific cruises within their national waters is made available to the IHO DCDB and/or GEBCO

*NOTE: GEBCO respects the data policies of contributing organizations and will not pass on source bathymetric data sets to other organizations without prior permission. We will only make grids developed from these source data sets available to the public.*



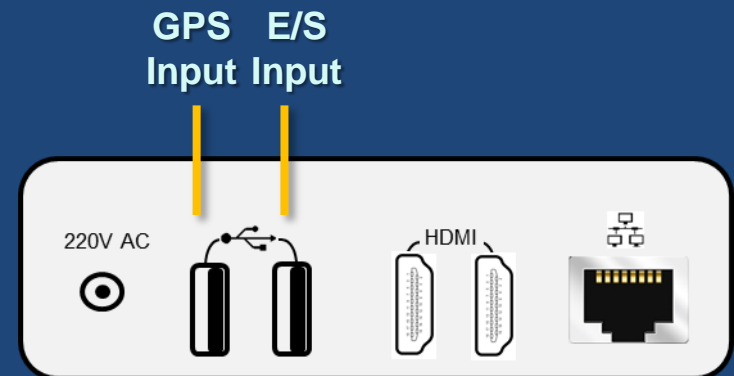
# CROWD-SOURCED BATHYMETRY



- IHO has noted an overall 35% reduction in government-operated survey fleets over last 25 years
- Estimates still only have ~10% of ocean have a bathymetric measurement
- Need to explore alternate sources of bathymetric data
- IOBC exploring CSB pilot project using alumni network

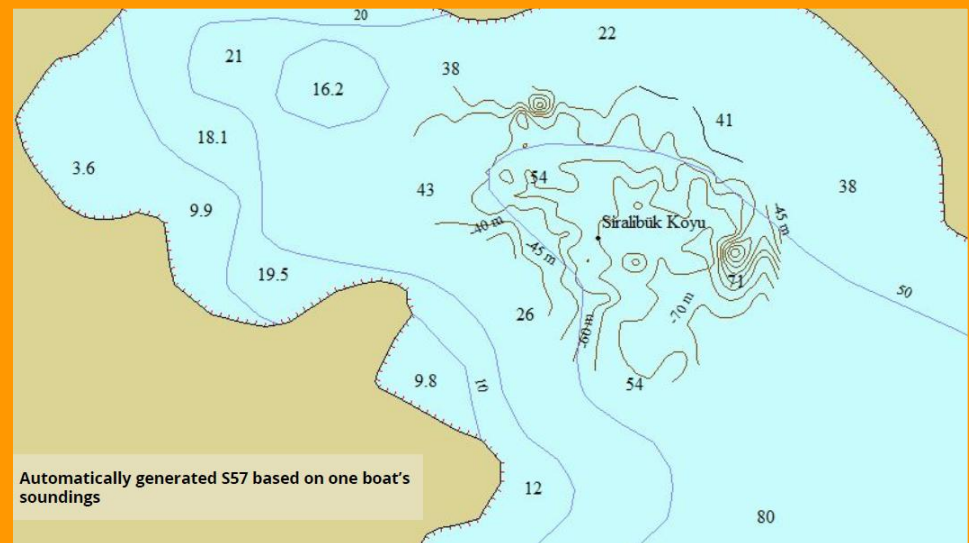
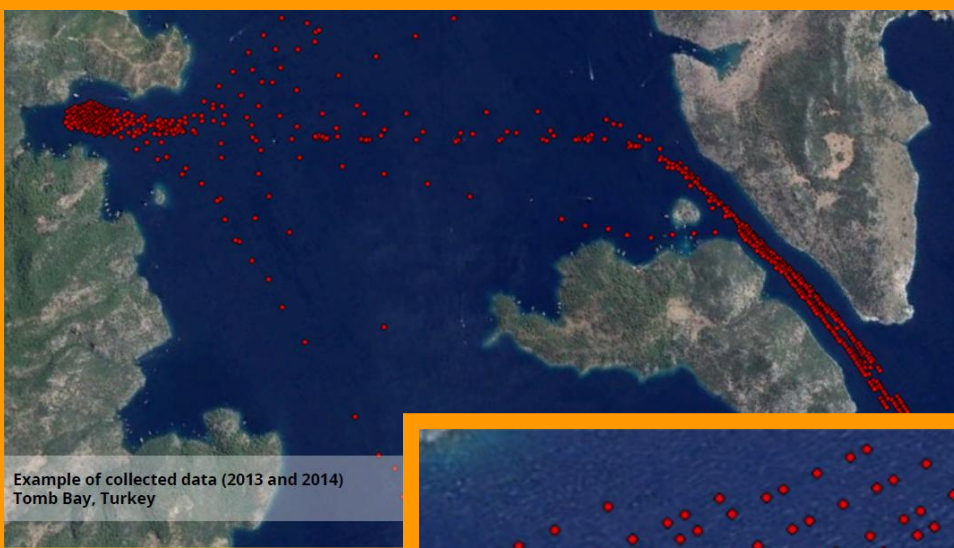
# Sea ID LOGGER

- Stable clean 220 V AC power input - UPS is essential
- GPS and Digital echosounder with standard NMEA string output
- System set up for daily data download of ~200 kb data file
- Suitable location to mount 20 cm logger box
- Logger is believed to work up to 10 years.





# CROWD-SOURCED BATHYMETRY: Sea-ID Super Yacht Project





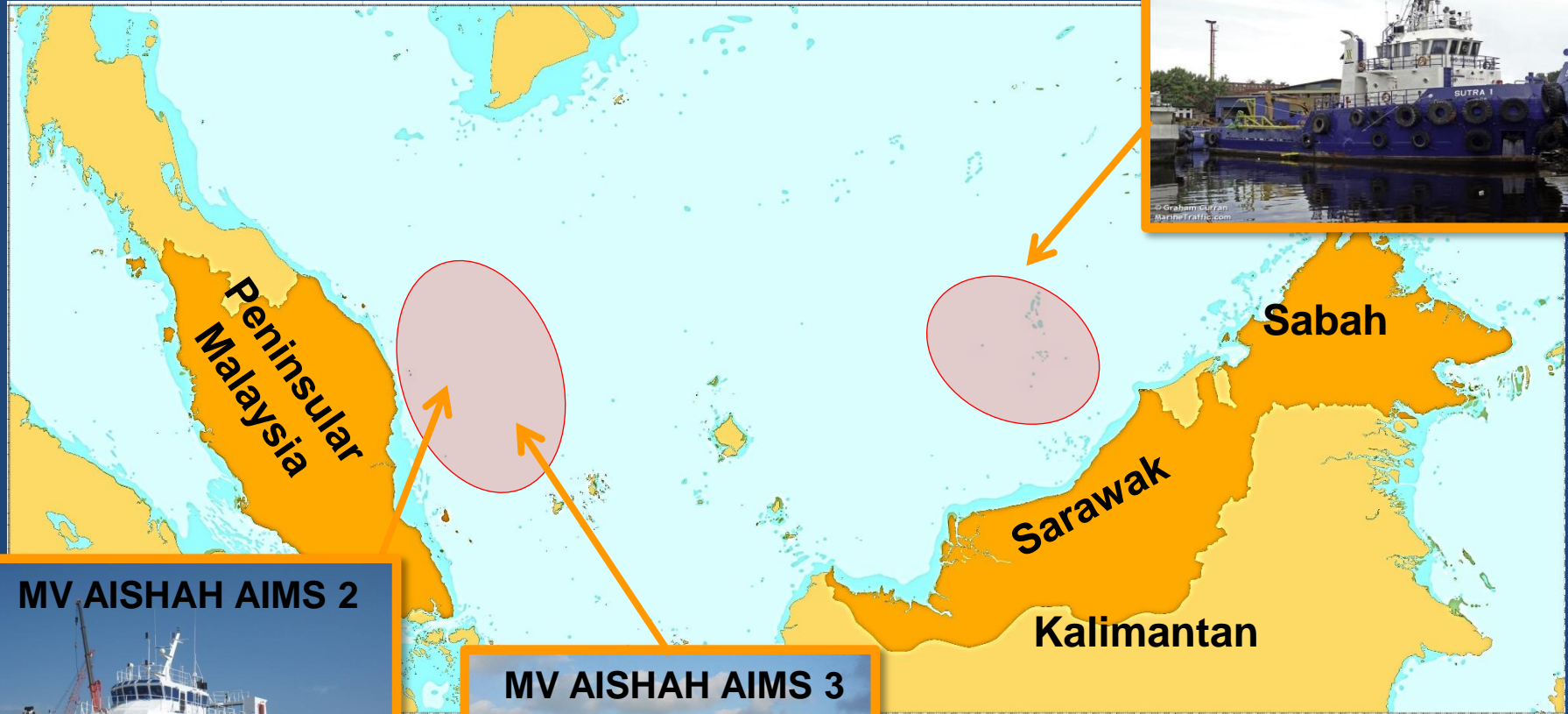
## PRELIMINARY SEA-ID RESULTS:

5 months and 7 vessels →

34 million soundings and 22,000 nm covered



# MALAYSIAN WATERS



**TB SUTRA 1**



**MV AISHAH AIMS 2**



**MV AISHAH AIMS 3**



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# LESSONS LEARNT



- Some information on metadata and setup essential
- Need to simplify hardware for easier installation and data retrieval – not all vessels have technology of super-yachts
- *Explore whether this technology can be adapted for fishing industry?*
- Data must be made publically-available and exploring ways to do this through GEBCO and IHO-DCDB



# WAY FORWARD

- Sea-ID involved in ongoing R&D to develop their technology to facilitate ease of installation and data assimilation.
- Keep an eye on website as Sea-ID looking to develop a way to "sign up for a box".  
*<https://www.sea-id.org>*
- GEBCO is simultaneously looking at the potential for ongoing alumni-led involvement in this relevant CSB project aimed at collection of bathymetric data with new and affordable technology.

# Capacity-building initiative: postgraduate training course



## 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/](http://www.nippon-foundation.or.jp/en/)

and taught at:

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



Intergovernmental  
Oceanographic  
Commission



# PCOB Content



The academic program consists of core and elective courses, class projects and the Summer Hydrographic Field Course.

Core courses:

- Fundamentals of Ocean Mapping I & II
- Applied Tools in Ocean Mapping
- Geological Oceanography
- Bathymetric Spatial Analysis
- Geodesy and Positioning from Ocean Mapping

Elective options (max. of 1 per semester):

- Mathematics for Mapping, Physical Oceanography, Applied Geophysics, Underwater Acoustics, Nearshore Processes and Coastal Remote Sensing and Special Study Course as required (UNCLOS, coding, sea-floor characterization)



# Nippon Foundation / GEBCO Training program



Students also undertake a working visit to

- another research organization, and
- a research cruise over the summer

(Selected by student and home organization in a field of interest)



**NOAA** NATIONAL GEOPHYSICAL  
DATA CENTER



# 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)

## APPLICATIONS NOW OPEN (CL 13):

[http://www.gebco.net/training/training\\_project/](http://www.gebco.net/training/training_project/)





# Thank you





United Nations  
Educational, Scientific and  
Cultural Organization



Intergovernmental  
Oceanographic  
Commission

# Thank you

## Any questions?





## Why do we need bathymetry data? An accurate knowledge of the shape and depth of the seafloor has numerous applications

- **Safety of Navigation:**
  - \* 11/2014: Grounding of *Vestas Wind* during the 2014 Volvo Ocean Race on Cargados Carajos Shoals (~430 km NE Mauritius);
  - \* 01/2005: *USS San Francisco*, a US nuclear submarine, collided with an unmapped seamount ~ 675 km (364 nm) SE of Guam at a depth of 160 m
- **Scientific and academic research:** Tectonic and ocean current models
- **Geohazard modelling and mitigation:** Tsunami-propagation and storm surge models
- **Sustainable Resource Management:** Fisheries-resource management, aquaculture, petroleum / mineral exploration, renewable energy resources
- **Environmental Stewardship:** Habitat monitoring, national heritage, management of marine protected areas