The IHO Data Centre for Digital Bathymetry
An Overview

Jennifer Jencks
Director, IHO Data Centre for Digital Bathymetry
IHO CSBWG Chair
NOAA's National Centers for Environmental Information
jennifer.jencks@noaa.gov

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2nd expert meeting of the WG on Marine Geospatial Information
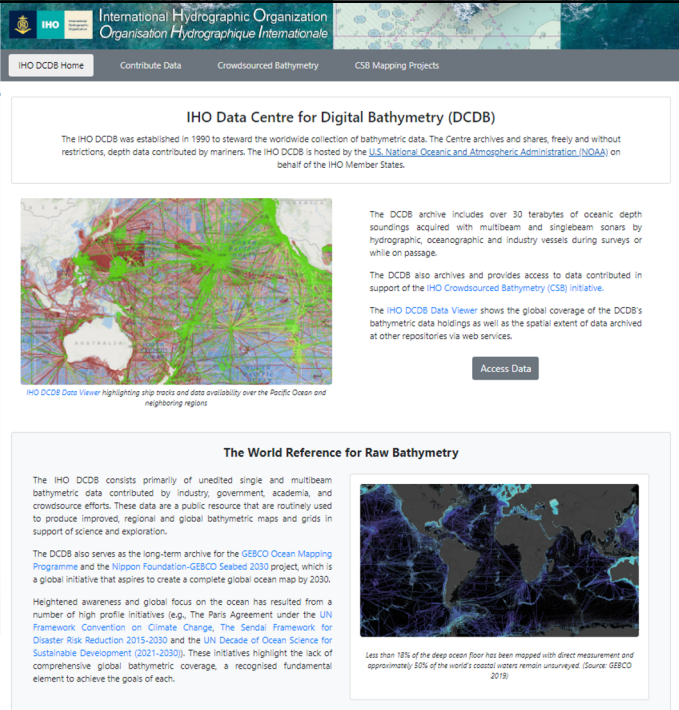
24-28th February 2020

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IHO DCDB

The *IHO Data Centre for Digital Bathymetry* is the recognized IHO repository for all ocean bathymetric data collected by hydrographic, oceanographic and other vessels.

NOAA's NCEI (formally NGDC) has hosted the DCDB since 1990.

Data are sent to the DCDB for long term archive and data management.

The DCDB is the central repository for all raw bathymetric data and all data compiled by Seabed 2030.

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IHO Data Centre for Digital Bathymetry (DCDB)

The IHO DCDB was established in 1990 to steward the worldwide collection of bathymetric data. The Centre archives and shares, freely and without restrictions, depth data contributed by mariners. The IHO DCDB is hosted by the U.S. National Oceanic and Atmospheric Administration (NOAA) on behalf of the IHO Member States.

The DCDB archive includes over 30 terabytes of oceanic depth soundings acquired with multibeam and singlebeam sonars by hydrographic, oceanographic and industry vessels during surveys or while on passage.

The DCDB also archives and provides access to data contributed in support of the IHO Crowdsourced Bathymetry (CSB) initiative.

The IHO DCDB Data Viewer shows the global coverage of the DCDB's bathymetric data holdings as well as the spatial extent of data archived at other repositories via web services.
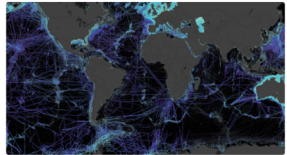
Access Data

IHO DCDB Data Viewer highlighting ship tracks and data availability over the Pacific Ocean and neighboring regions

The World Reference for Raw Bathymetry

The IHO DCDB consists primarily of unedited single and multibeam bathymetric data contributed by industry, government, academia, and crowdsource efforts. These data are a public resource that are routinely used to produce improved, regional and global bathymetric maps and grids in support of science and exploration.

The DCDB also serves as the long-term archive for the GEBCO Ocean Mapping Programme and the Nippon Foundation-GEBCO Seabed 2030 project, which is a global initiative that aspires to create a complete global ocean map by 2030.

Heightened awareness and global focus on the ocean has resulted from a number of high profile initiatives (e.g., The Paris Agreement under the UN Framework Convention on Climate Change, The Sendai Framework for Disaster Risk Reduction 2015-2030 and the UN Decade of Ocean Science for Sustainable Development (2021-2030)). These initiatives highlight the lack of comprehensive global bathymetric coverage, a recognised fundamental element to achieve the goals of each.
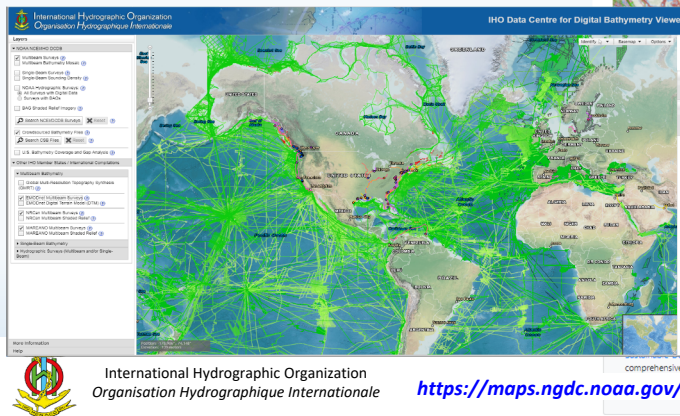
Less than 18% of the deep ocean floor has been mapped with direct measurement and approximately 50% of the world's coastal waters remain unsurveyed. (Source: GEBCO 2019)

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Accessing data

The DCDB utilizes standard web services for promoting data access - both the *discovery and delivery of data and metadata.*

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https://maps.ngdc.noaa.gov/viewers/iho_dcdb/

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IHO DCDB Home | Contribute Data | Crowdsourced Bathymetry | CSB Mapping Projects

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How to Contribute Data to the IHO DCDB

Contact bathydata@iho.int for more information on contributing data or sharing web services to the IHO DCDB.
Refer to Submitting Marine Geophysical Data to the IHO DCDB for how to package and submit data.

Governments, organizations, academia, industry and individuals are encouraged to contribute data to the IHO DCDB.
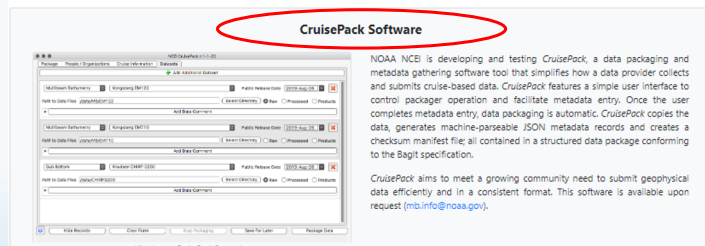
Bathymetric data and metadata can be submitted via File Transfer Protocol (FTP), email, or mail (hard drive) in the formats listed below.

- **Raw sonar data:** MGD77T or the original manufacturer's format
- **Processed data:** gsf, BAG, NetCDF, tiff, xyz, sd, asc, etc.
- **Metadata:** XML or text

Other formats and products will be considered on a case-by-case basis.

Learn more about contributing *crowdsourced bathymetry*.

IHO Member States are invited to provide sounding data extracted from their Electronic Navigational Charts (ENC). Only soundings from ENC cells in navigational purpose bands 2 and 3 are requested. For more information, please refer to IHO Circular Letter 11/2016.

Data contributors → **Data uses**

Government — Hydrographic Offices

Industry — GEBCO Products

Academia — Regional Mapping

International Projects — Web Applications

Crowd sourced Bathymetry — International Agencies

Others — Others

IHO Data Centre for Digital Bathymetry (DCDB)

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CruisePack

- Stand-alone packager for cruise-based data.
- Additional data types and instruments can be added with little or no modifications to code.
- Simple UI with pulldown menus and controlled vocabularies
- Creates consistent BagIt format data packages complete with md5 checksum manifest files.
- Generates cruise-level and series level metadata files

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CruisePack Software

NOAA NCEI is developing and testing *CruisePack*, a data packaging and metadata gathering software tool that simplifies how a data provider collects and submits cruise-based data. *CruisePack* features a simple user interface to control packager operation and facilitate metadata entry. Once the user completes metadata entry, data packaging is automatic. *CruisePack* copies the data, generates machine-parseable JSON metadata records and creates a checksum manifest file; all contained in a structured data package conforming to the BagIt specification.

CruisePack aims to meet a growing community need to submit geophysical data efficiently and in a consistent format. This software is available upon request (mb.info@noaa.gov).

View Larger CruisePack Screenshot

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Aims to meet a growing need from the community to submit geophysical data to the archive efficiently, easily, and in a consistent format

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Recent Data Contributions

UNOLS Fleet, NOAA Fleet: Routine data contributions

Geological Survey of Ireland - 23 surveys

Fugro: 16 new surveys (19 available online)

Five Deeps Expedition - Puerto Rican Trench expedition; data delivered by IHO SG

Brazilian Navy - 10 surveys (data corresponding to Brazilian undersea features accepted at SCUFN 32)

China Undersea Name Authority - multibeam data corresponding to SCUFN 32 features

Swiss Polar Institute - 2016 Antarctic survey

Hydrographic Institute of Italian Navy - Arctic missions High North 2017 - 2018
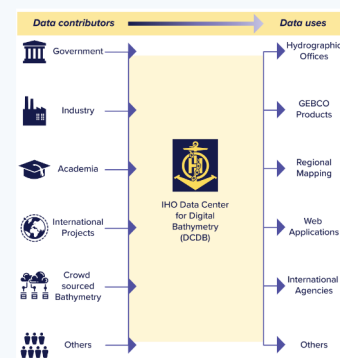
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Contributing data - *IHO Crowdsourced Bathymetry Initiative*

An IHO-led collaborative project to better enable mariners to collect "crowdsourced bathymetry"

CSB is the collection of depth measurements from vessels, using standard navigation instruments, while engaged in routine maritime operations.

To support this initiative, the IHO DCDB built a new data pipeline that allows the public to upload, discover, and download CSB data via a web-based map viewer interface

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PUBLISHED

A Working Group was formed and tasked to develop an IHO publication (*B-12 IHO Guidance on Crowdsourced Bathymetry*) that states the IHO's policy towards, and best practices for, the collection and contribution of CSB.

https://iho.int/uploads/user/pubs/bathy/B_12_Ed2.0.3_2020.pdf

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B-12 Edition 2.0.2

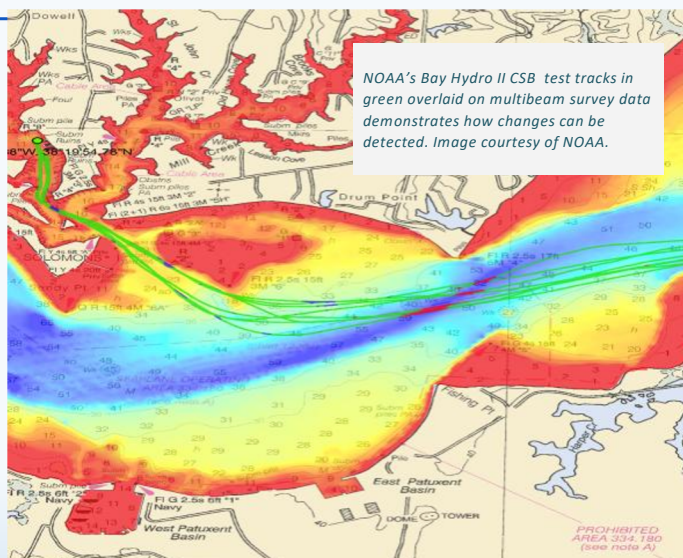**Guidance on Crowdsourced Bathymetry**

IHO

International Hydrographic Organization

Published by the
International Hydrographic Organization
4b quai Antoine 1ᵉʳ
Principauté de Monaco
Tel: (377) 93.10.81.00
Fax: (377) 93.10.81.40
info@iho.int
www.iho.int

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The Value of CSB Data

- Data with scientific, commercial & research value at **no cost** to the public sector

- Fill gaps where data is scarce (eg: Arctic, SIDS)

- Useful along shallow, complex coastlines that are difficult for traditional survey vessels to access and may be more frequently visited by recreational boaters

- Identify uncharted features

- Assist in verifying charted information

NOAA's Bay Hydro II CSB test tracks in green overlaid on multibeam survey data demonstrates how changes can be detected. Image courtesy of NOAA.

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...but only if vessels collect and donate depth information while on passage

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CSB Data Providers = *Trusted Nodes*

Rose Point Navigation System

- Mariners can enable their electronic charting system log file to record *position, depth and time*.
- When a mariner updates their software or chart catalog, data is sent to RP who then transmits the data to NCEI
- ***154 million soundings; 168 contributing vessels; 6585 data deliveries***
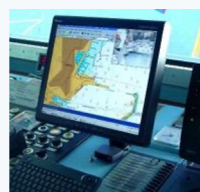
www.pcmaritime.com

www.rosepointnav.com

James Cook University

- Distributed inexpensive data loggers to ~100 volunteer vessels using their own echo sounder and GPS sensors along the Great Barrier Reef
- Establishing data pipeline with NCEI
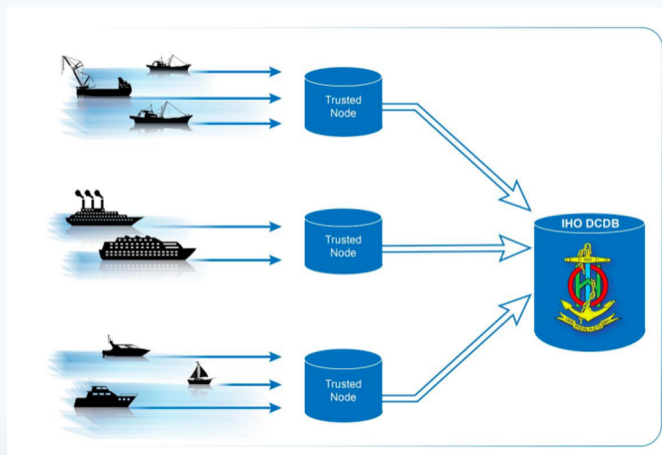
SmartLog USB data logger

MV ARGO volunteer vessel in Cairns

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Challenges

At the request of several IHO member states, the DCDB implemented a geographic filter for incoming data to take in to account coastal countries' positions on the collection of CSB in their areas of jurisdiction.

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IHO CL 11/2019 **Annex B**

"ACCEPTANCE OF CROWDSOURCED BATHYMETRY ACTIVITIES IN NATIONAL WATERS OF JURISDICTION"

- 13 IHO MS have replied "positive"
  - CL 47/2019 provides a summary analysis of positive responses ==>

- The IHO DCDB will filter out CSB data collected from the waters of **all coastal countries not included on the positive list**. This includes:
  - MS we believe are pro-CSB but have not replied
 - Coastal countries that are not IHO MS

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Summary analysis of positive responses

1. Based on the comments received to the questionnaire in Annex B to IHO CL 11/2019, the following table will be published as the Positive List to guide potential data gathering activities undertaken by the wider maritime community in waters of national jurisdiction:

Member State	Area	Specific actions required
Argentina	EEZ only	Provide copy of dataset to Hydrographic Office
Brazil	EEZ only	Provide copy of dataset to Hydrographic Office
Cyprus	All waters	Provide copy of dataset to Hydrographic Office
Denmark	All waters	Inform Hydrographic Office of any variance with published chart
Georgia	All waters	Provide copy of dataset to Hydrographic Office
Germany	All waters	Inform Hydrographic Office of new dataset
Monaco	All waters	Provide copy of dataset to Hydrographic Office
Netherlands	All waters	Inform Hydrographic Office of new dataset
New Zealand	All waters	Inform Hydrographic Office of new dataset
Norway	All waters – no multibeam activity without prior permission	Inform Hydrographic Office of new dataset
Philippines	Shipping routes and transit passages only	None
South Africa	EEZ only	Provide copy of dataset to Hydrographic Office
Sweden	EEZ only	Inform Hydrographic Office of new dataset
USA	All waters	None

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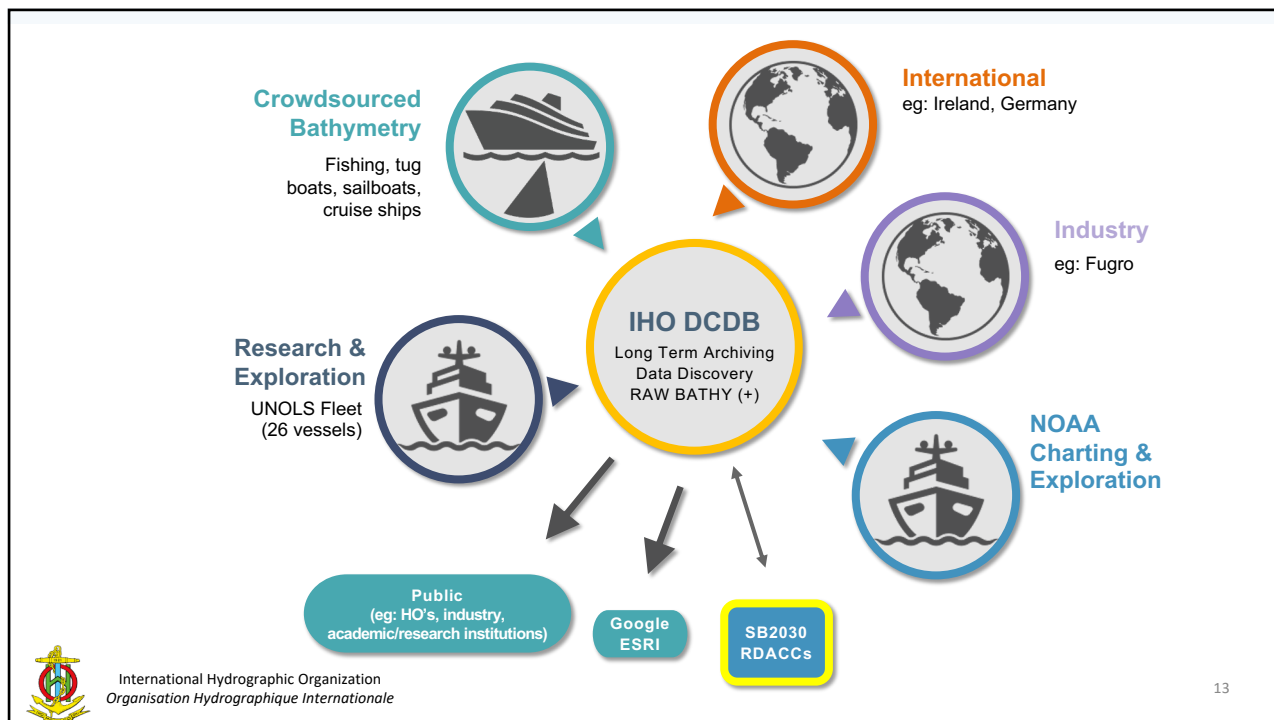
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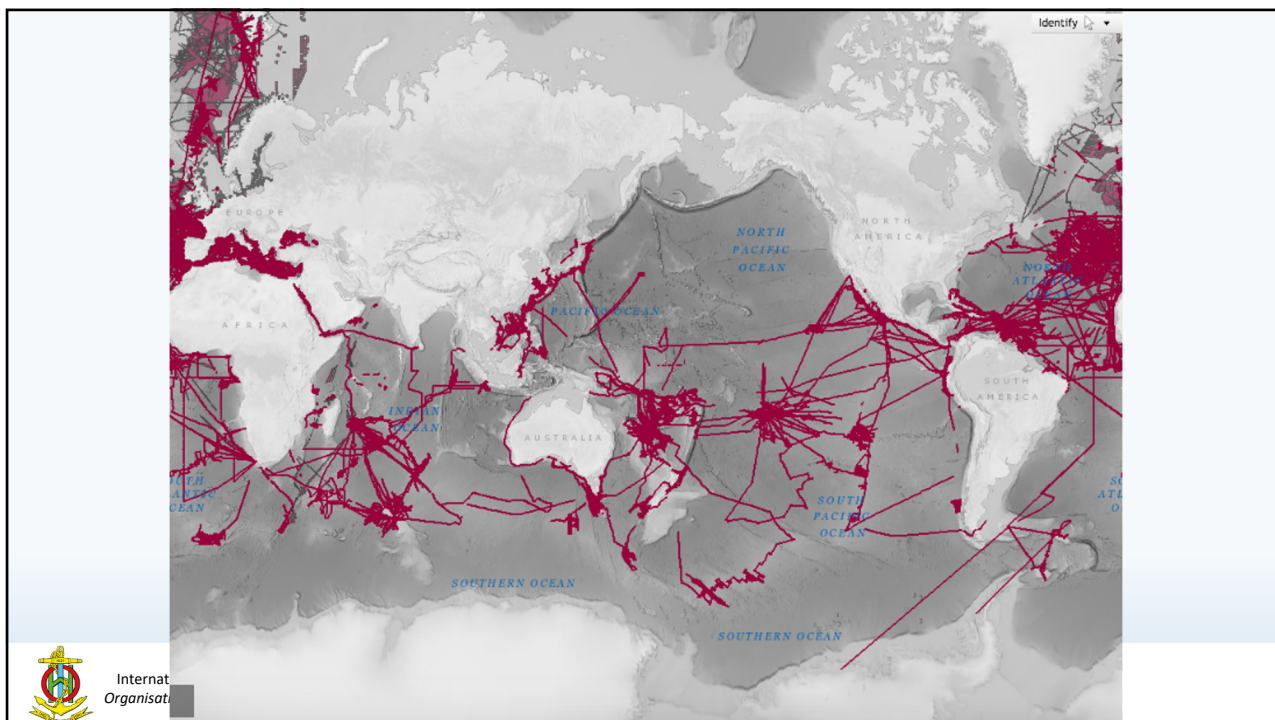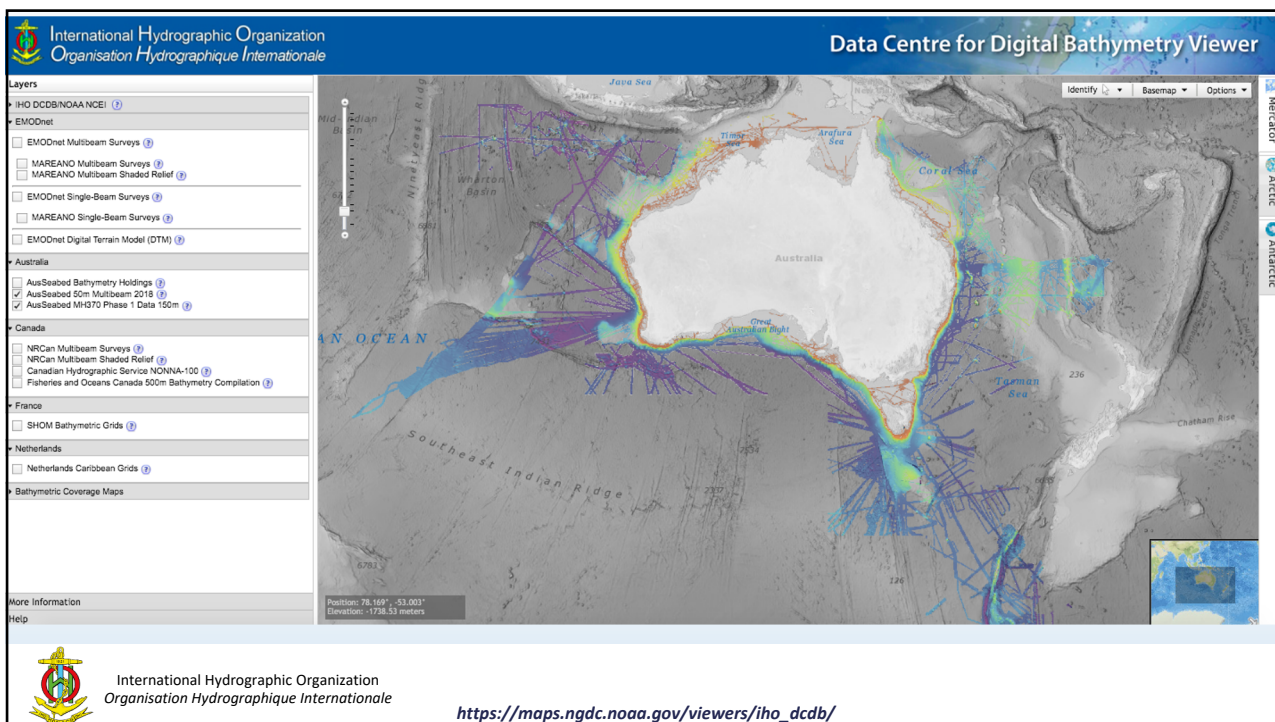*Organisation Hydrographique Internationale*

https://maps.ngdc.noaa.gov/viewers/iho_dcdb/

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IHO DCDB = World Reference for Raw Bathymetry

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
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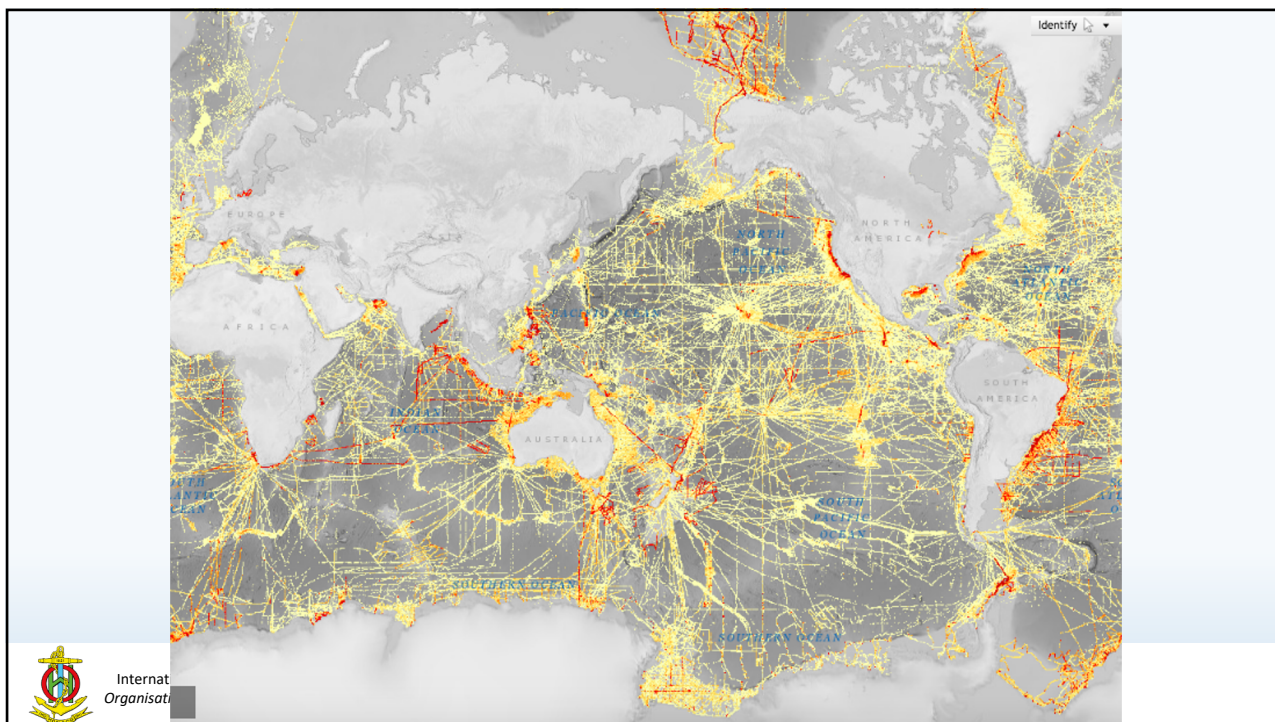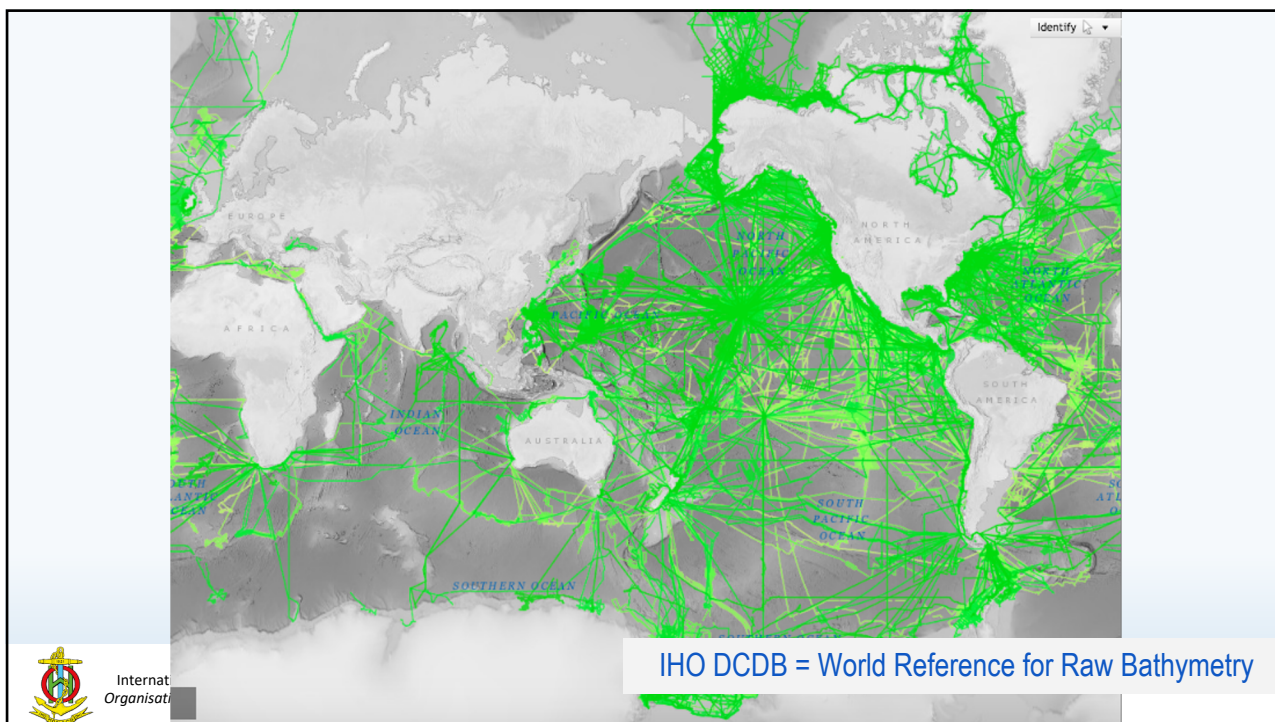
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Next Steps

- Continue to promote the importance of public accessibility of bathymetric data.

- Continue to work with data providers to contribute their data to the DCB

- Continue to ingest _**map services**_ from other organizations and countries to provide a more accurate representation of where data already exists

- Work towards implemenation oft point storage (cloud) technology to better handle and store data as a seamless collection of points.

The Great Barrier Reef Project

The Crowdsourced Bathymetry on the Great Barrier Reef Project uses TeamSurv-supplied SmartLog USB data loggers installed onto volunteer vessels to collect singlebeam depth data throughout the Great Barrier Reef in north-eastern Australia. Funding for the loggers and installation costs were provided by the Great Barrier Reef Foundation. A wide variety of vessels from dive expedition boats, luxury motor yachts, commercial fishing and government vessels, now generate data coverage to remote
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Canadian Hydrographic Service: Inside Passage

The Canadian Hydrographic Service (CHS) has used CSB to update several Inside Passage charts along the coastal routes stretching from Seattle, Washington, to Juneau, Alaska. The data were downloaded and easily converted into CHS formats. A systematic comparison of charted depths less than 10 m yielded improved charted channel depths, data density and improved chart compilation in areas that were surveyed with singlebeam. CSB helped prioritize survey areas for the following survey
+ Show More

The Hydroball Project

Canada envisions the development of a crowdsourced approach to face the huge challenge of collecting hydrographic data in the Northern Canada area. About 47% of the 4.4 million km2 of the Canadian Arctic is underwater and only 10% of these waters are adequately surveyed. Ice is melting more than ever in Northern Canada thus, marine traffic is increasing and safety of navigation at sea will become a greater risk. In 2017, the Canadian Ocean Mapping Research and Education Network (COMREN)
+ Show More

FarSounder

FarSounder designs and manufactures 3D Forward Looking Sonar (3D-FLS) for navigation and obstacle avoidance. FarSounder customers, including expeditionary cruise ships and private superyachts, use the system to safely explore exotic and poorly charted or uncharted areas. The company began working with select customers with itineraries including Antarctica, the Northwest Passage, and the South Pacific, to collect geo-referenced 3D-FLS data, along with data from other sensors
+ Show More

"If we got 1% of all seagoing vessels logging data, and on average they spent half their time at sea, then that's about 5 billion data points a day."

- Tim Thornton, TeamSurv

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Thank you.

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