

14th Conference of the Arctic Regional Hydrographic Commission

GEBCO-SB2030-CSB

Agenda item C5

IHO Highlights

- 1. New GEBCO Strategy
- 2. GEBCO Governance Review
- 3. Celebration 120-year anniversary
- 4. Ocean Mapping focus at Barcelona April 2024 + Nice June 2025
- 5. SB2030
- 6. Sub-Committee highlights
- 7. GGC41 in Fiji, jointly with SB2030 Pacific RDACC



New GEBCO strategy, endorsed by IHO + IOC

Vision:

To bring knowledge about our planet's seabed to everyone

Mission:

To produce free, open and complete seabed data and information for the world's oceans.

This is achieved by enabling and inspiring seabed mapping efforts through international collaboration, technological innovation, capacity development, and education.



GEBCO Governance Review, endorsed by IHO + IOC

SCOPE

- Mapping of GEBCO organizational and functional structure, detailing the nature of any relationships, reporting lines, obligations or liabilities;
- Review of the legal structure and framework with a statement on the current and recommended future status (if change is deemed necessary);
- Review of financial arrangements with a statement on the current and recommended future status (if change is deemed necessary);
- A gap analysis of the current governance instruments (e.g. MoUs, ToRs etc.);

GGC has started to organize implementation (if + how + priority) of both strategy and governance review

ARHC14, Tromsø Norway 3-5 September 2024



International Hydrographic Organization

Ocean Mapping focus

...is increasing as more people from different disciplines, countries and decision levels are becoming more aware of the relationship between seabed knowledge and:

- 1. Improved climate modelling
- 2. Marine biodiversity discovery and monitoring
- 3. Offshore wind planning process
- UN Ocean Decade conference Barcelona April 2024
- UN Ocean Conference Nice June 2025
- New IOC Executive Secretary



International Hydrographic Organization

REVIEW OF USER REQUIREMENTS AND CONTRIBUTIONS TO GEBCO PRODUCTS 2024

- 63 responses from 38 countries
- Highly supportive of GEBCO, 90% valuing GEBCO gridded bathy sets, 70% GEBCO web-service, >60% undersea feature names + Cap. Dev. aspects of GEBCO
- Request for higher resolution products
- Interest in expanding scope of GEBCO products
- Request for greater choice of file formats, including better visualization tools
- Request for an international seabed data users group



International Hydrographic Organization

Highlights GEBCO Sub-Committees

- Improved cooperation / harmonization between SC's, work from new strategy
- SCUFN: max 25 naming proposals per country per year, max 250 total,
 South China Sea no-og area for undersea feature naming
- TSCOM: work on improving availability, discoverability and accessibility of bathymetric data
- SCRUM: Supporting regional CSB/SB2030 coordinators
- SCOPE: new tasks and comms strategy under development
- SCET: Identify relevant institutions that provide ocean mapping and oceanography courses, work in progress.



SEABED 2030

Energizing Ocean Floor Mapping













Jamie McMichael-Phillips Seabed 2030 Director



The Nippon Foundation-GEBCO Seabed 2030 Project



June 2016



June 2017



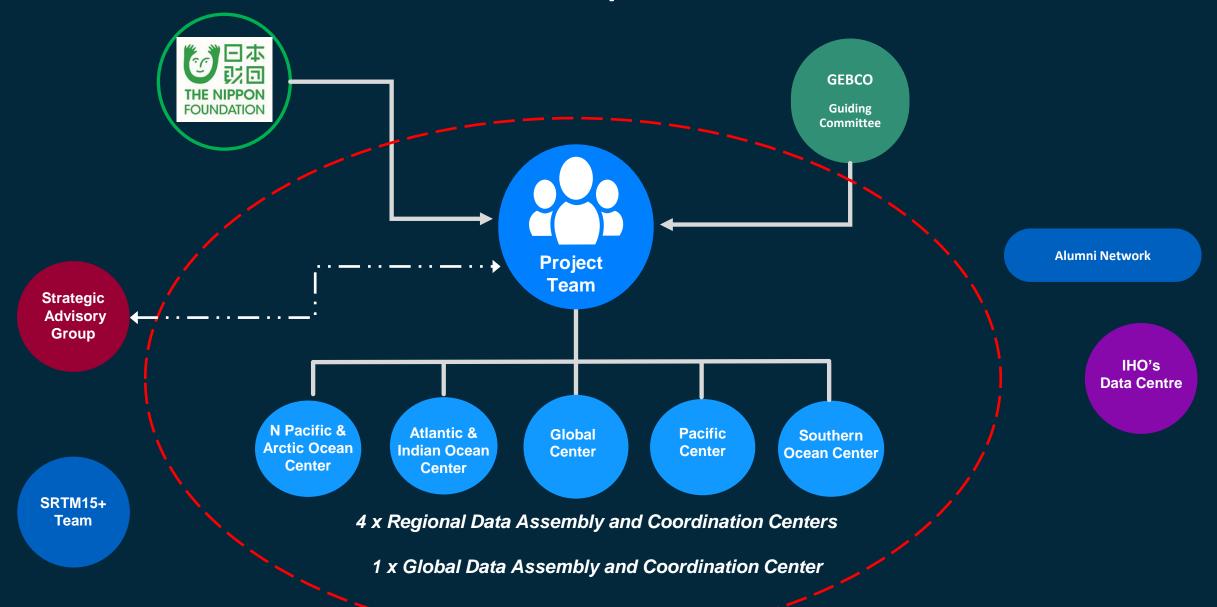
Flagship **Programme**

June 2021

Collaboration to:

- inspire 100% seabed mapping by 2030
- compile the GEBCO Map

Seabed 2030 Simplified Network

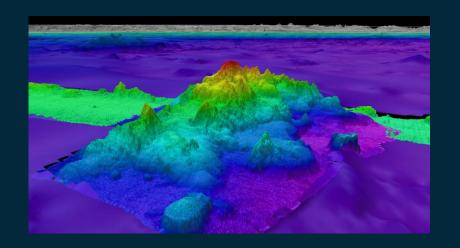


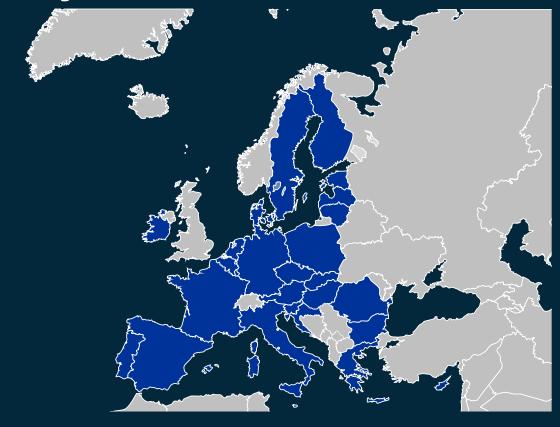
Progress last year

Apr 23 to Jun 24

4.34 million km² new bathymetry added

Equates to size of EU





Credit: Wikipedia Kolja21

Courtesy: Martin Jakobsson, SU

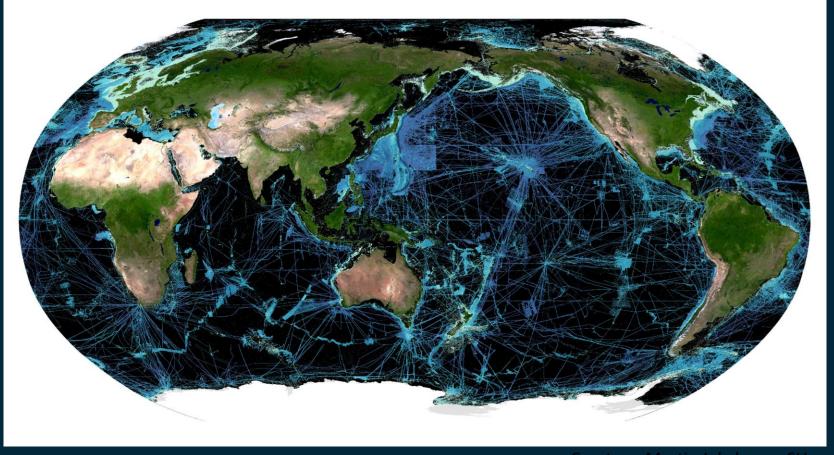
.... a significant quantity of data

Progress so far ... (cont'd)

GEBCO Map:

• 6% in 2017

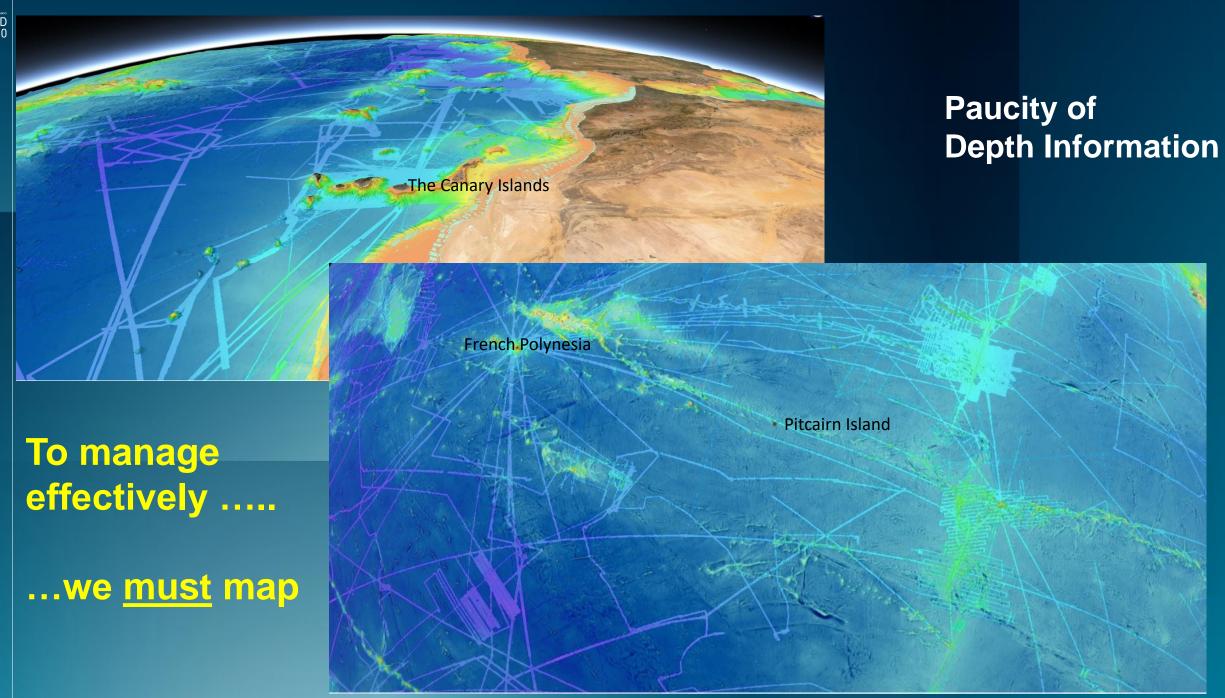
• Now **26.1%**



Courtesy: Martin Jakobsson, SU

Just under 3/4 of ocean floor still to go







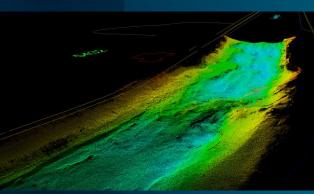
What is meant by data?

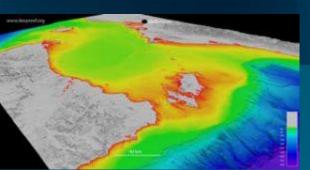
Any form of data that contains a bathymetric measurement is gratefully accepted by Seabed 2030 and by GEBCO!

Examples of data are:

- Sounding sheets
- Raw data from sounders
- NMEA data (e.g. from CSB data loggers)
- Processed data (e.g. GSF or XYZ)
- S-57 ENC
- Processed grids or bathymetric surfaces
- Regional bathymetric products









Benefits Analysis

SEABED NLA INTERNATIONAL

NLA INTERNATIONAL-SEABED 2030
PHASE 3: BENEFITS ANALYSIS WORKSTREAM

Compendium of Seabed Mapping Use Cases

January 2024





NLA International-Seabed 2030

Phase 2b: Benefits Analysis Workstream

Seabed 2030 Value Proposition Document

February 2024





USE CASE: CLIMATE CHANGE GLOBAL OCEAN MODELS • USE CASE REF ID: UC006

USE CASE: CLIMATE CHANGE OCEAN MODELS

Climate change refers to long-term shifts in temperature and weather patterns. Climate models enhance our understanding of climate

ge and provide climate future state ictions. They provide a better rstanding of climate change and inform ate change impact assessment, climate ge mitigation and adaptation planning.

abed mapping has a key role to play towards ming dimate ocean models. As a data input he modelling of key elements usuch as sea-ice raction in polar settings, sub-ocean processes, rahore and coastal interactions, seabed ping enhances our understanding and onse to climate change." Jamie McMi-

hallenge

te change is a global challenge.

ate Models aim to understand and predict e conditions at large spatial scales. They sider atmospheric and oceanic factors along sea ice and land-surface components.

spheric/Oceanic models can be combined, sub-models used to bring in additional data modelling interests.

els are used and tailored to reflect local setting support work at smaller (more detailed) spatial es. In this way climate change mitigation and tation measures can be reviewed and

bed Mapping data is/can be used to enhance ate models and our understanding of climate ige. E.g., sea floor roughness is important for an mixing, among others.

e Ocean areas and in particular the Polar ns present challenging operating conditions eabed mapping data acquisition, yet we now technologies and approaches that can be



troduction

United Nations defines climate change as referring to long-term shifts in temperatures and weather patterns. The shifts may be natural, such as through variations in solar cycle, or as a result of human activities, such as though variations in solar cycle, or as a result of human activities, such as the burning of fossil fuels like cool, oil and gas. Climate change encompasses global warming, i.e., the long-term warming of our planet, and additionally refers to the broader range of changes that are happening to our planet. For instance, the UNI identify that climate change consequences go beyond temperature rese, including, among others, intense droughly, water scarcity, severe fires, rising sea levels, flooding, melting polar ice, consequences create to provide the provided provided the provided provided the provided p

Climate change And Our Oceans. Climate change is impacting our Oceans. As the planet's greatest carbon sink, the ocean absorbs heat and energy released from rising greenhouse gas emissions trapped in the Earth's system. Today, the ocean has absorbed about 109 percent of the heat generated by rising emissions. As the excessive heat and energy warms the ocean, the change in temperature leads to ice-melting, sea-level rise, marine heatwaves, and ocean acidification.

UN presents the following key facts: Sea-level Rise: Sea level has continued to rise over the past decades due to increasing ice loss in the world's polar regions. Global mean sea-level reached a new record high in 2021 ising an average of 4.5 millimetre per year over the period 2013 to 2021 (UN reference WMO), compared to 2.1 millimetre per year during 1993-2002. Together with intensifying tropical cyclones, sea-level rise has exacerbated extreme events such as deadly storm surges and coastal hazards such as flooding, erosion and landslides, which are now projected to occur at least once a year in many locations. Such events occurred once per century historically. Ocean Acidification: Due to climate change, the ocean is warmer, more acidic and less productive today. The ocean has absorbed between 20 to 30 per cent of human-induced carbon dioxide emissions since the 1980s, exacerbating acidification. (UN reference IPCC) Marine heatwaves: Periods of unusually high ocean temperatures that threaten marine biodiversity and ecosystems and make extreme weather more likely - have doubled in frequency since 1982 and are increasing in intensity. Their frequency will increase with rising greenhouse gas emissions. (UN reference IPCC).

Rising temperatures increase the risk of irreversible loss of marine and oastal ecosystems. Today widespread changes have been observed, including damage to coral reefs and mangroves that support ocean life, and migration of species to higher latitudes and altitudes where the water could be cooler. UNESCO warm that more than half of the world's marine species may stand on the brink of extinction by 2100. At a 1.1°C increase in temperature tools, an estimated 60 percent of the world's marine

Detailed work based on research, interviews and surveys



Benefits Analysis – Use Cases

1: Seabed Mapping Innovation

2: EEZ Seabed Mapping in the Absence of a National HO

3: Subsea Cable Planning & Design

4: Tsunami Propagation & Storm Surge Modeling

5: Renewable Energy - Offshore Wind Energy

6: Climate Change Ocean Models



7: SIDS* - Sea Level Rise and Coastal Inundation

8: Marine Biodiversity

9: SIDS* - Marine & Coastal
Development, & Use of Seabed
Mapping as Foundation Data for
Marine Spatial Planning

10: Government Policy

11: Ocean Discovery & Ocean Exploration

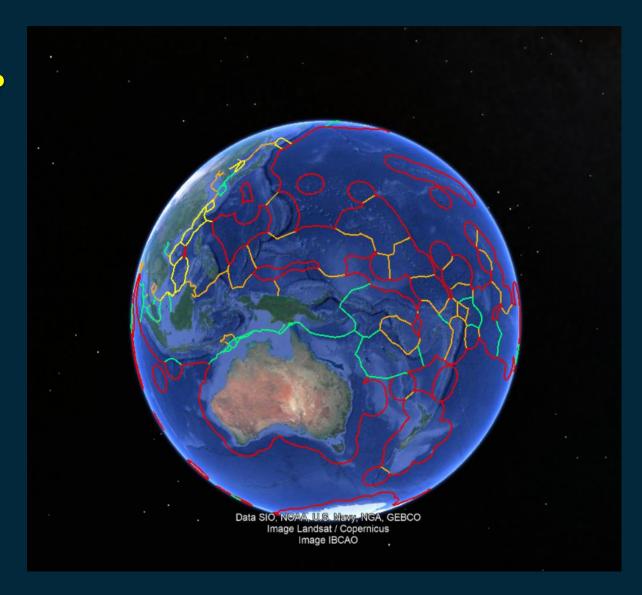
12: Driving Hydrographic Industry Expansion & Human Capital Benefits

(*Small Island Developing States)



CHALLENGES WE FACE:

- Reluctance to release existing data
- Who will pay for new data collection?
 - especially beyond national jurisdiction
- Even if someone pays reluctance to grant permission - MSR

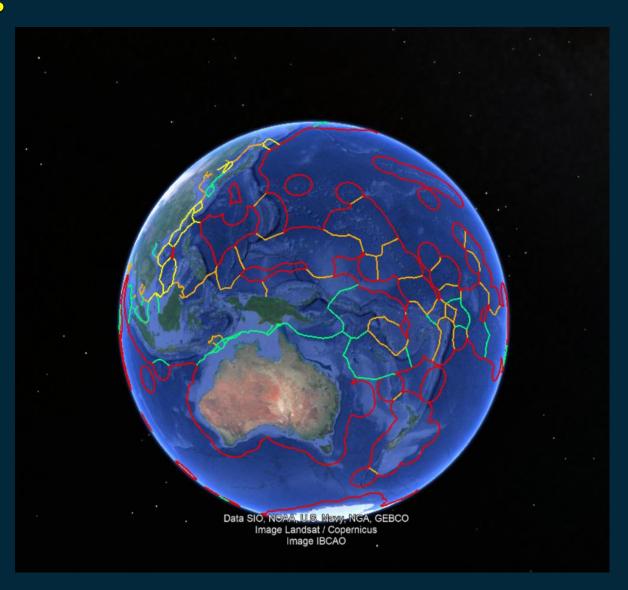


Credit: UNH/CCOM-JHC



OPPORTUNITIES:

- Collaborate in forming regional alliances
 - to encourage new mapping.
- Develop mechanism to allows bathymetry acquisition
 - in support of
 - SB2030
 - **SDG14**
 - Ocean Decade
 - without MSR regime constraints





WIOBathy Project – Supporting Ocean Mapping



- Bathymetry Collation & compilation in Western Indian Ocean (WIO)
 - Multi-scale & multi-resolution
 - First bathymetric map of WIO region
- Project Team of 8 Nippon Foundation-GEBCO Fellows:
 - Kenya, Tanzania, Mauritius & Madagascar
- Supported by Fellows from South Africa
- Championed by The Nippon Foundation
- Reaching out to other regional collaborators

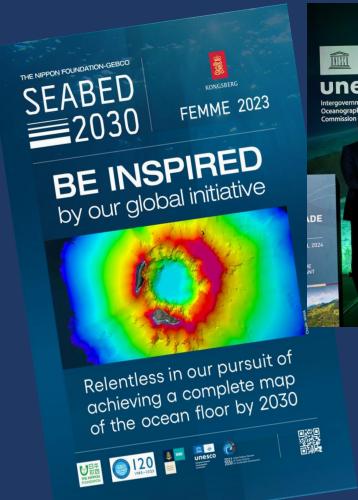
Credit: Amon Kimeli







Outreach is vital, engage widely, & as early as possible.





THE NIPPON FOUNDATION-GEBCO

SEABED = 2030

PODCAST

Thank you















Lamont-Doherty Earth Observatory COLUMBIA UNIVERSITY | EARTH INSTITUTE





SEABED 2030

JULY 2023

IBCAO 5.0























International Bathymetric Chart of the Arctic Ocean (IBCAO):

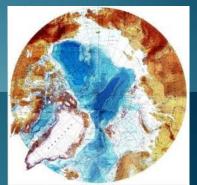
Initiated 1997 as an IOC International Bathymetric Chart (IBC)

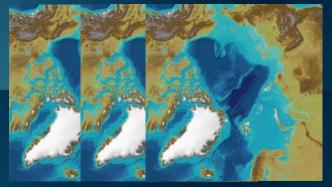
Became part of GEBCO as a Regional Compilation

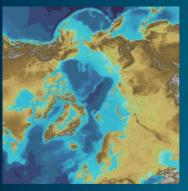












1500 1800 1900 2008 2012 2024



Last formal release: Version 4.0, released Summer 2020 Resolution: 200 x 200 m, Polar Stereographic Projection Release article: Nature Scientific Data, 2020

Editorial Board Version 3.0

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Julian A. Dowdeswell (UK) Scot Polar Research Institute, University of Cambridge

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Yulia Zarayskaya (Russian Federation) Geological Institute of Russian Academy of Science

SCIENTIFIC DATA(11011)

OPEN The International Bathymetric DATA DESCRIPTOR Chart of the Arctic Ocean Version

Martin Jakobsson et al.*

Bathymetry (seafloor depth), is a critical parameter providing the geospatial context for a multitude of marine scientific studies. Since 1997, the International Bathymetric Chart of the Arctic Ocean (IBCAO) has been the authoritative source of bathymetry for the Arctic Ocean. IBCAO has merged its efforts with the Nippon Foundation-GEBCO-Seabed 2030 Project, with the goal of mapping all of the oceans by 2030. Here we present the latest version (IBCAO Ver. 4.0), with more than twice the resolution (200 imes 200 m versus 500 imes500 m) and with individual depth soundings constraining three times more area of the Arctic Ocean (~19.8% versus 6.7%), than the previous IBCAO Ver. 3.0 released in 2012. Modern multibeam bathymetry comprises ~14.3% in Ver. 4.0 compared to ~5.4% in Ver. 3.0. Thus, the new IBCAO Ver. 4.0 has substantially more seafloor morphological information that offers new insights into a range of submarine features and processes; for example, the improved portrayal of Greenland fjords better serves predictive modelling of the fate of the Greenland



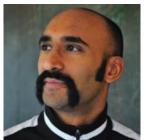


Arctic-North Pacific Ocean Regional Center



Stockholm University

Martin Jakobsson





Rezwann Mohammad

Marcus Karlsson



Björn Eriksson





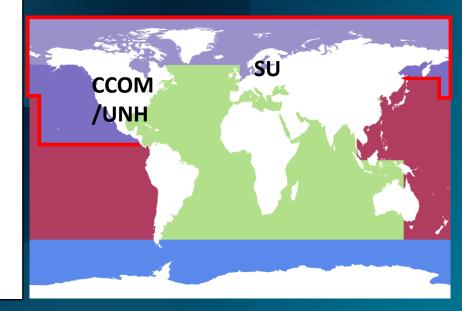
Larry Mayer





Juliet Kinney

Paul Johnson





IBCAO 5.0

- Completed in June 2024
- Main polar stereographic grid 100 x 100 m grid-cell size
- Paper submitted to Nature Scientific Data in July 2024 (under review)
 - Coordinated input from 70 co-authors
- IBCAO 5.0 available from GEBCO web site: https://www.gebco.net/data_and_products/gridded_bathymetry_data/arctic_ocean/

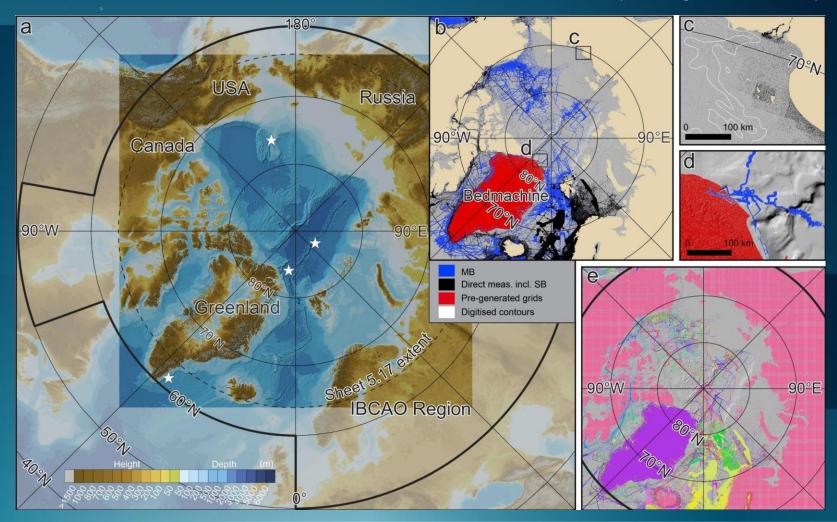


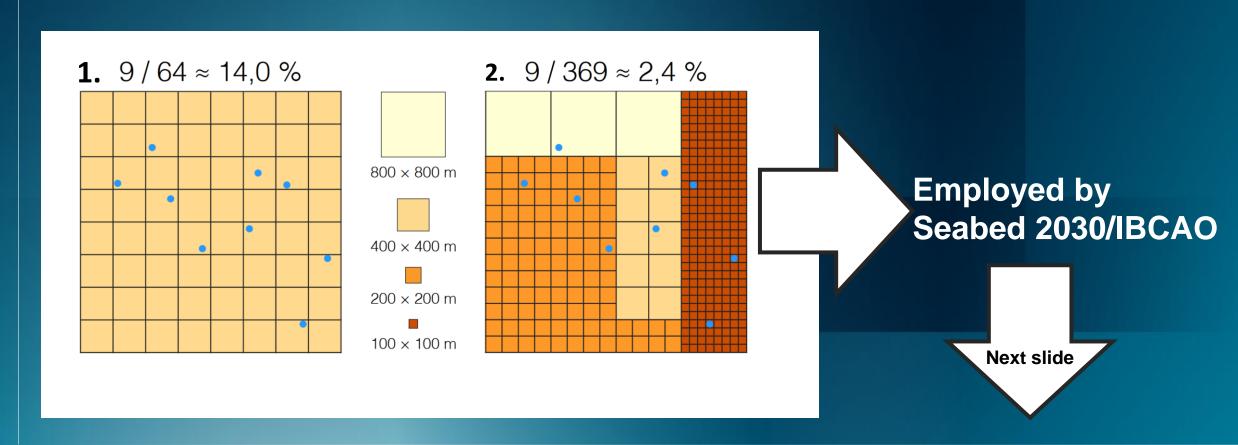
Figure 1 from submitted paper showing the IBCAO region, and Seabed 2030 Arctic region



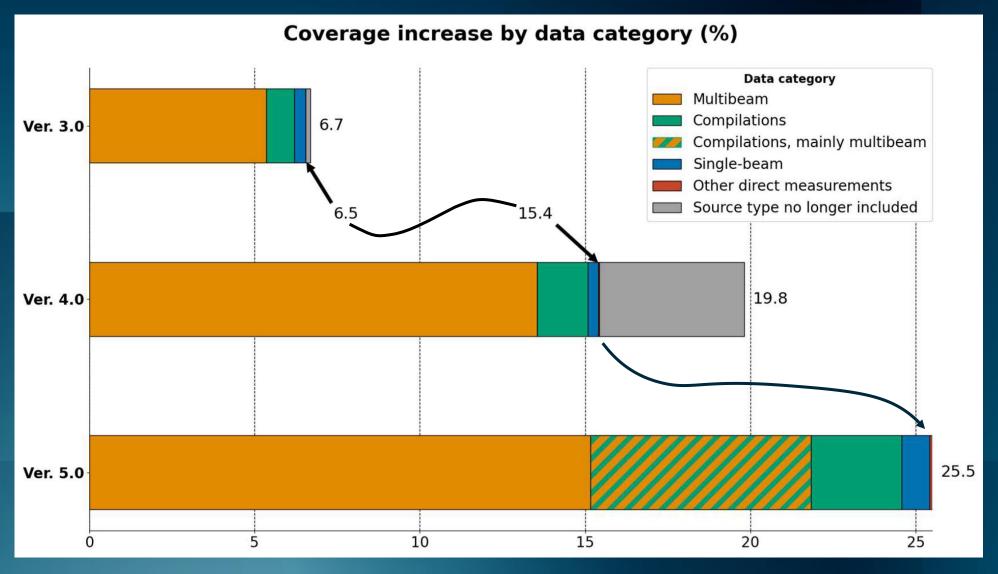
Our calculations of mapping coverage account for the Seabed variable resolution scheme by depth

Several ways to calculate coverage

- 1. Just counting "mapped pixels" (will give different results for different grid resolutions)
- 2. Seabed resolutions and area-correct projection or geodetic



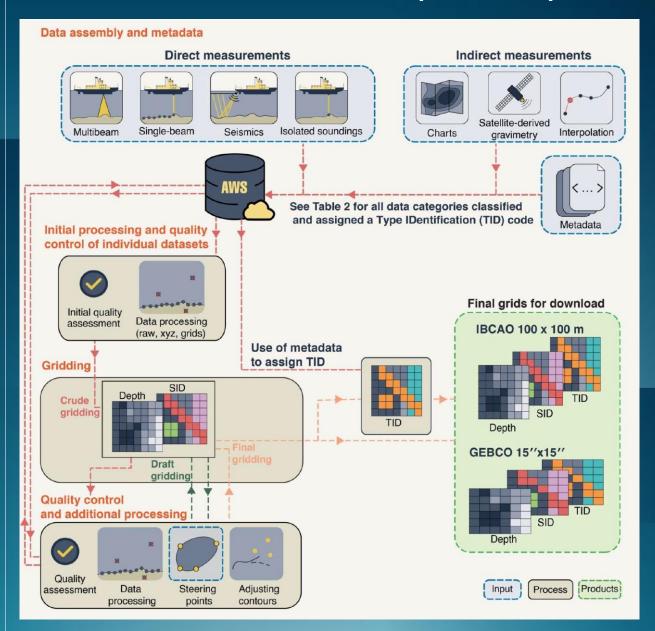




Comparison between the three main source data categories in IBCAO 3.0, 4.0 and 5.0. Note that the grey sections of the bars for IBCAO 3.0 and 4.0 represent source data types we no longer count when calculating mapping coverage. A large segment of the "compilations" data category is likely composed of multibeam measurements, although only a rough estimation is currently available.



New cloud computing compilation methods. Can grid the entire world, has been tested with >30 billion depth source points



Flow chart of the major steps involved in compiling the IBCAO 5.0 grid

AWS: Amazon Web Services

TID: Type Identification

SID: Source Identification



Evert Flier

CSB/Seabed 2030 Coordinator

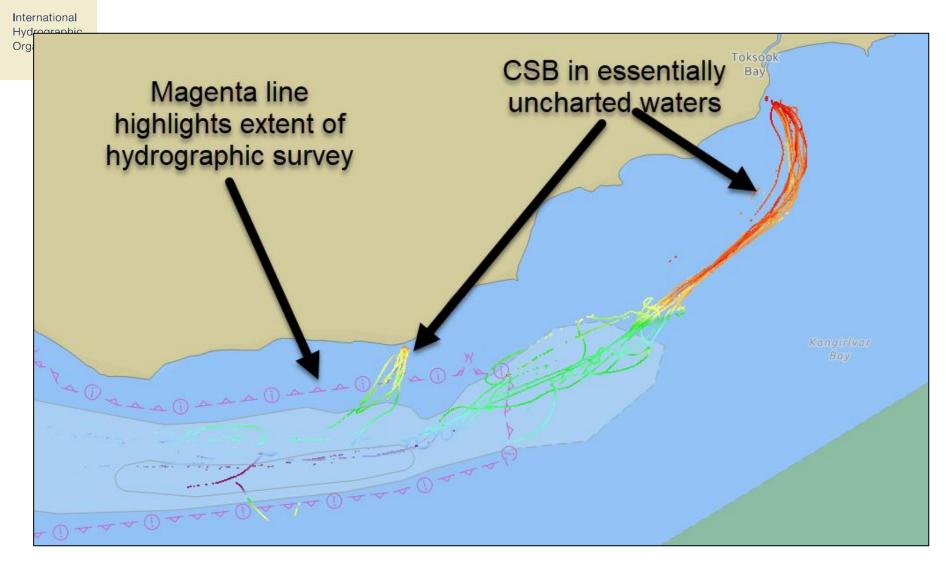
CSBWG Member

evert.flier@kartverket.no





The Value of CSB Data - Fill gaps where data is scarce

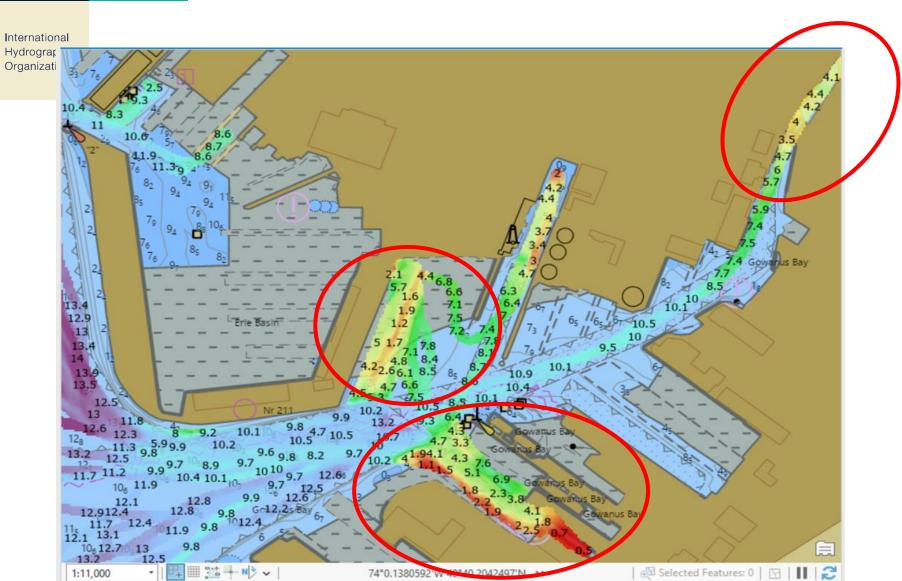


CSB tracks collected through and past the extent of a NOAA hydrographic survey in Toksook Bay, Alaska.

Credit: NOAA

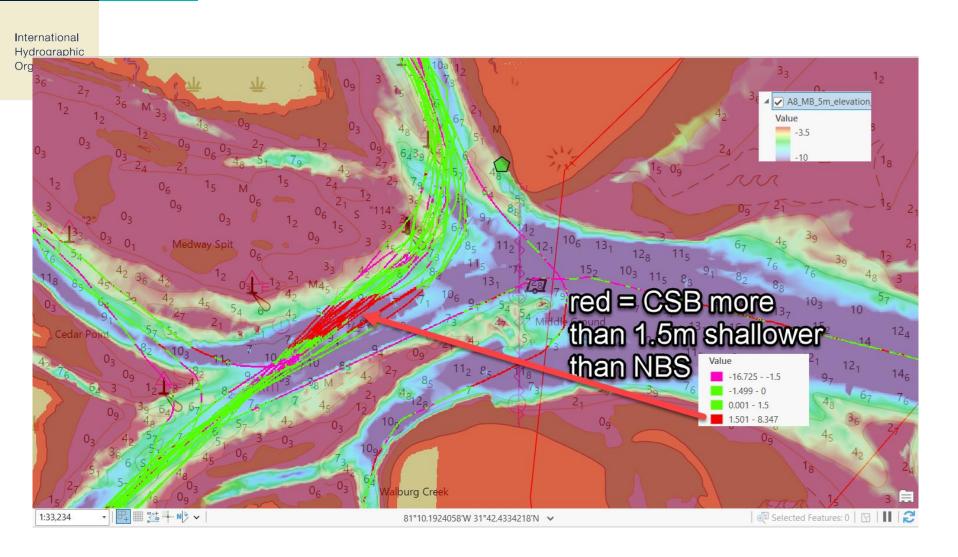


The Value of CSB Data - Fill gaps where mariners navigate





The Value of CSB Data - Discrepancy Modelling

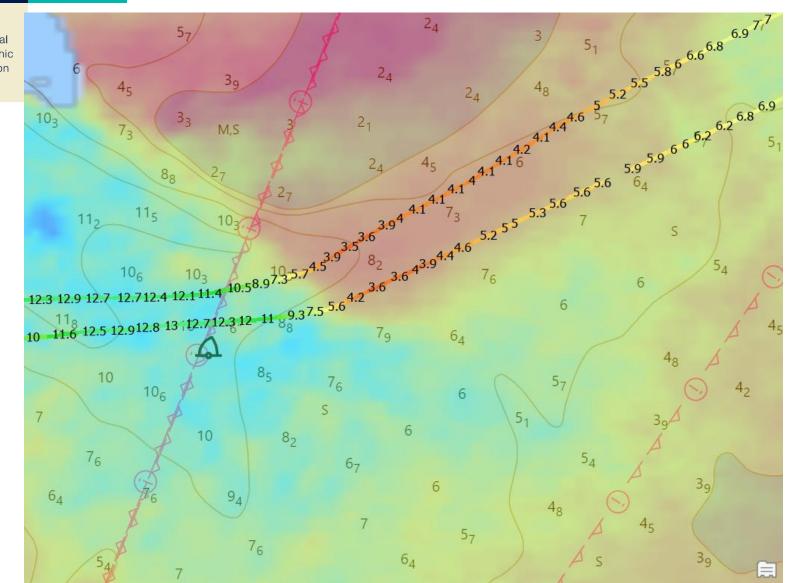


Detecting coastal change over time and discrepancies in underlying bathymetric model.



The Value of CSB Data - SDB correlation and ground truthing

International Hydrographic Organization



CSB detected and SDB confirmed shift of Nautilus Shoal in mouth of Chesapeake Bay

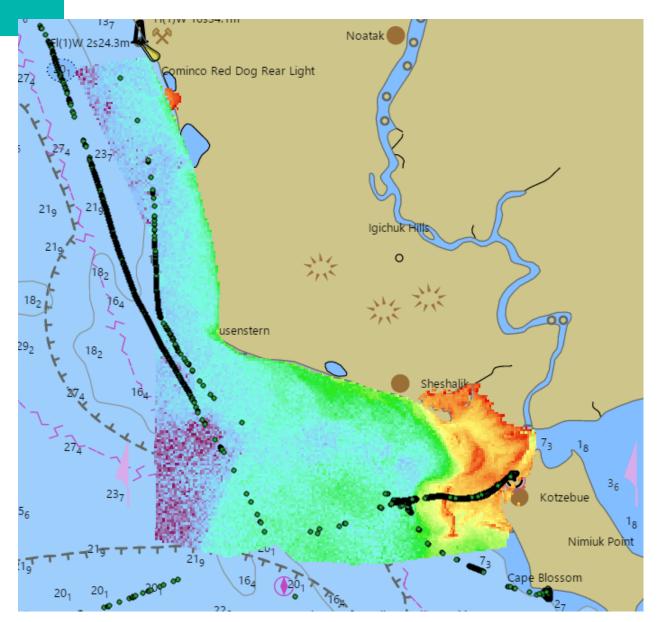
Credit: NOAA



IHO

The Value of CSB Data - SDB correlation and ground truthing

International Hydrographic Organization



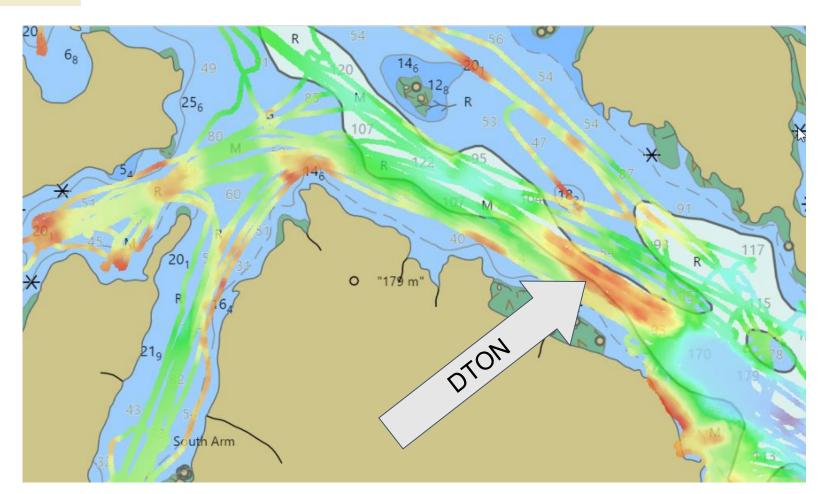
CSB used in analysis of Satellite-Derived Bathymetry Products in Remote Alaskan Arctic

Credit: NOAA



The Value of CSB Data - Detect <u>Dangers to Navigation</u> before deploying field hydrographers

International Hydrographic Organization

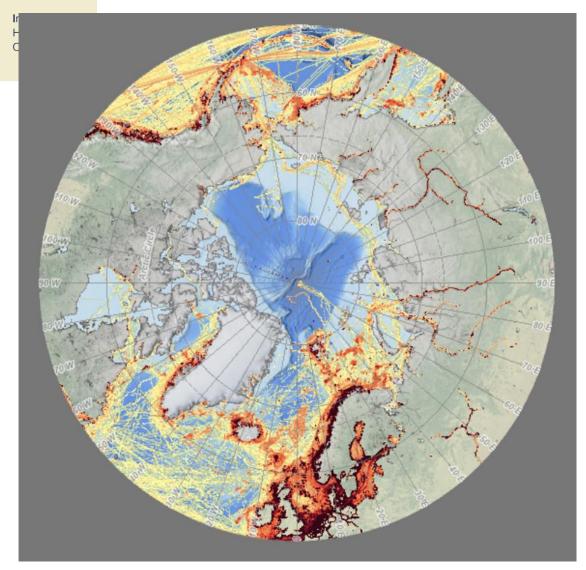


Fairweather 2023 Dixon Entrance Project - CSB identified over half of fieldsubmitted DTONs ahead of time

Credit: NOAA



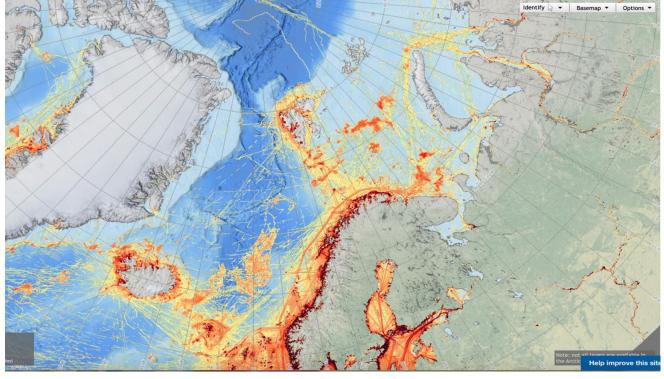
The Value of CSB Data - Could be SO much greater



Global Maritime Traffic Density Service (GMTDS)

The available CSB data is extremely small compared to available AIS data.

The ARHC should actively support the adoption, contribution, publicization, and use of CSB data within this region.





International Hydrographic Organization

CSB TOOLS WORKSHOP

24-25 March 2025 (preceding CSBWG16)

The CSBWG will host a workshop where participants could learn about and see examples on how to use available CSB tools from all aspects of the CSB data cycle. Developers would provide assistance with first attempts to use these tools while also gathering user feedback.

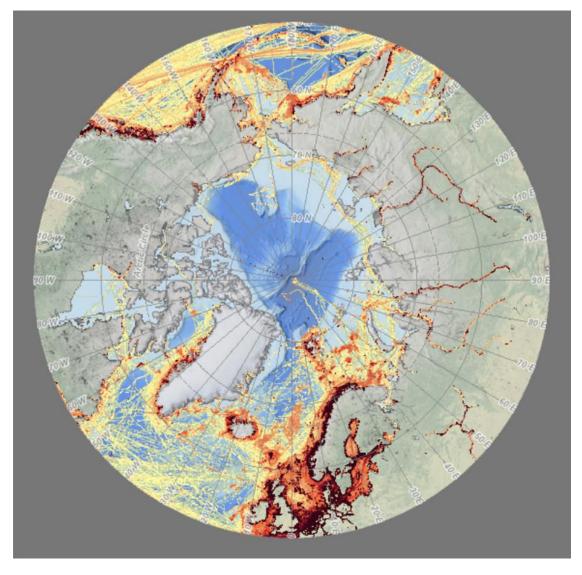
All Hydrographic Offices are encouraged to participate & attend.



The ARHC is requested to:

International Hydrographic Organization

- Note this presentation
- Actively support the adoption, contribution, publicization, and use of CSB data within this region
- Follow the latest developments of the CSBWG
- Connect with your RHC CSB/Seabed2030
 Coordinator
- Take ownership of these data and their potential uses!



Global Maritime Traffic Density Service (GMTDS)

Home Products Services Resources News Contact About

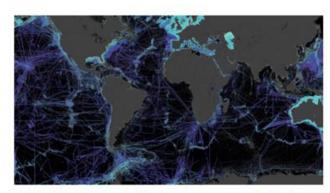
Search NCEI

Home / IHO Data Centre for Digital Bathymetry (DCDB)

IHO Data Centre for Digital Bathymetry (DCDB)

The International Hydrographic Organization (IHO) of Data Centre for Digital Bathymetry (DCDB) was established in 1990 to steward the global collection of bathymetric data. The Centre archives and shares, freely and without restrictions, depth data contributed by mariners and other stakeholders consistent with IHO direction and guidance. The IHO DCDB is hosted by the <u>U.S. National Oceanic and Atmospheric Administration (NOAA)</u> on behalf of the IHO Member States.

The DCDB archive includes over 70 terabytes (uncompressed) of oceanic depth soundings acquired with multibeam and single beam sonars by hydrographic, oceanographic and industry vessels during surveys or while on passage.

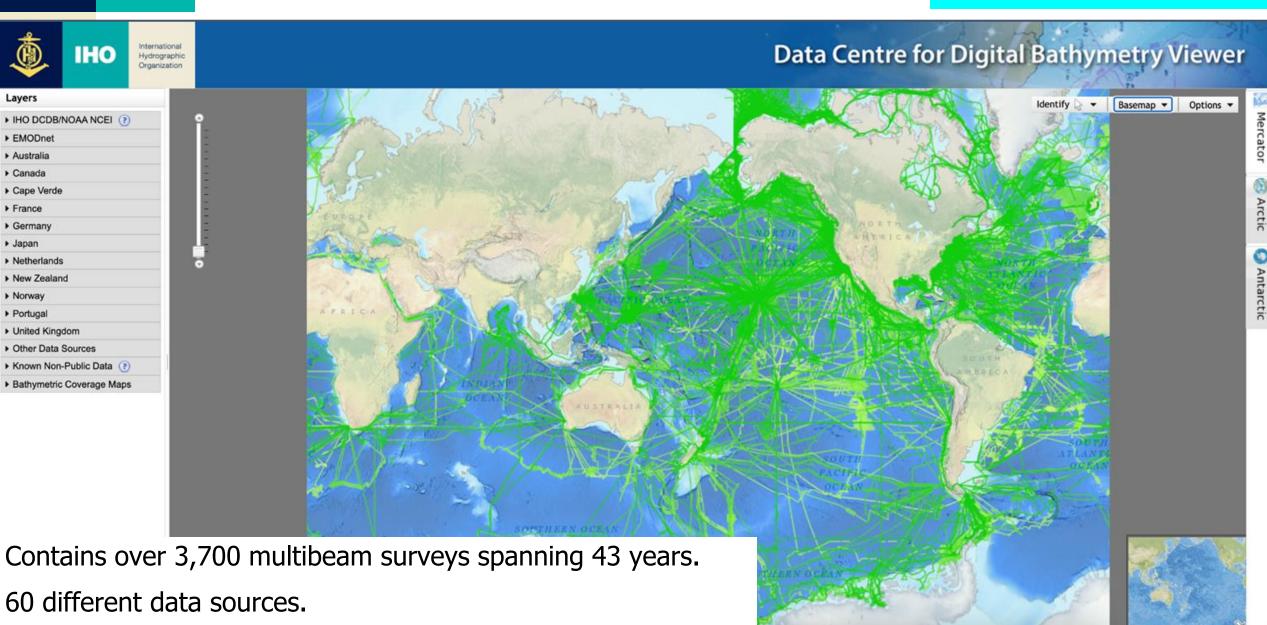


25% of the deep ocean floor has been mapped with direct measurement and approximately 50% of the world's coastal waters remain unsurveyed. (Source: GEBCO)



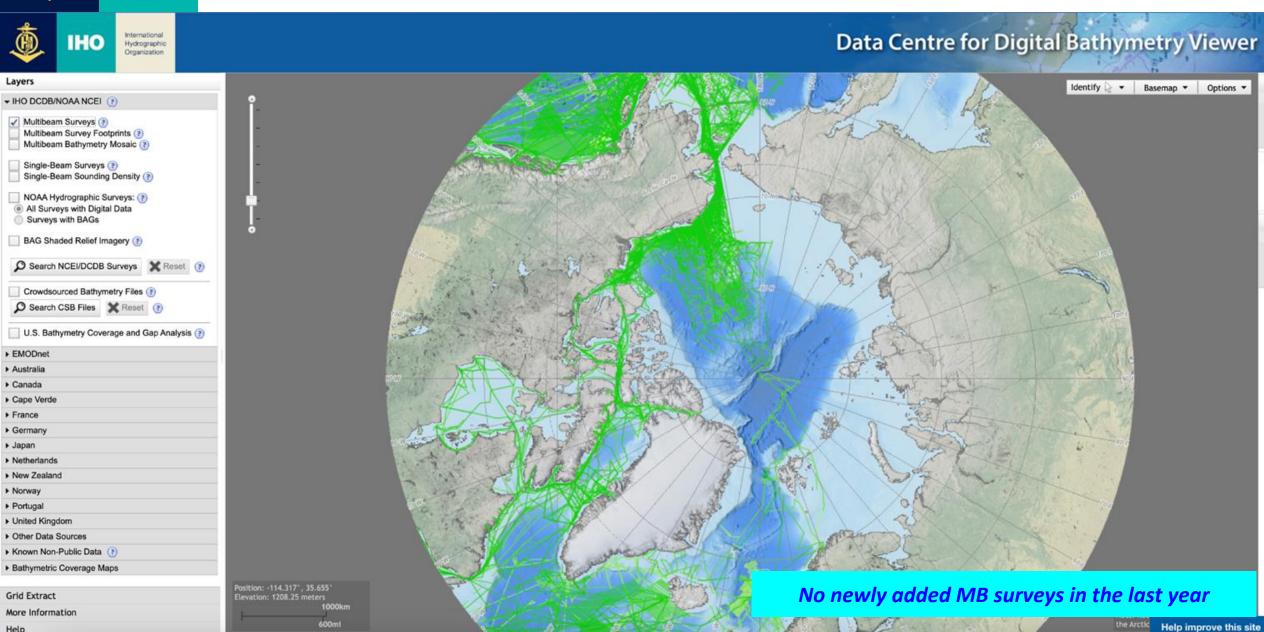
The World Reference for Raw Bathymetry

ncei.noaa.gov/maps/iho_dcdb/



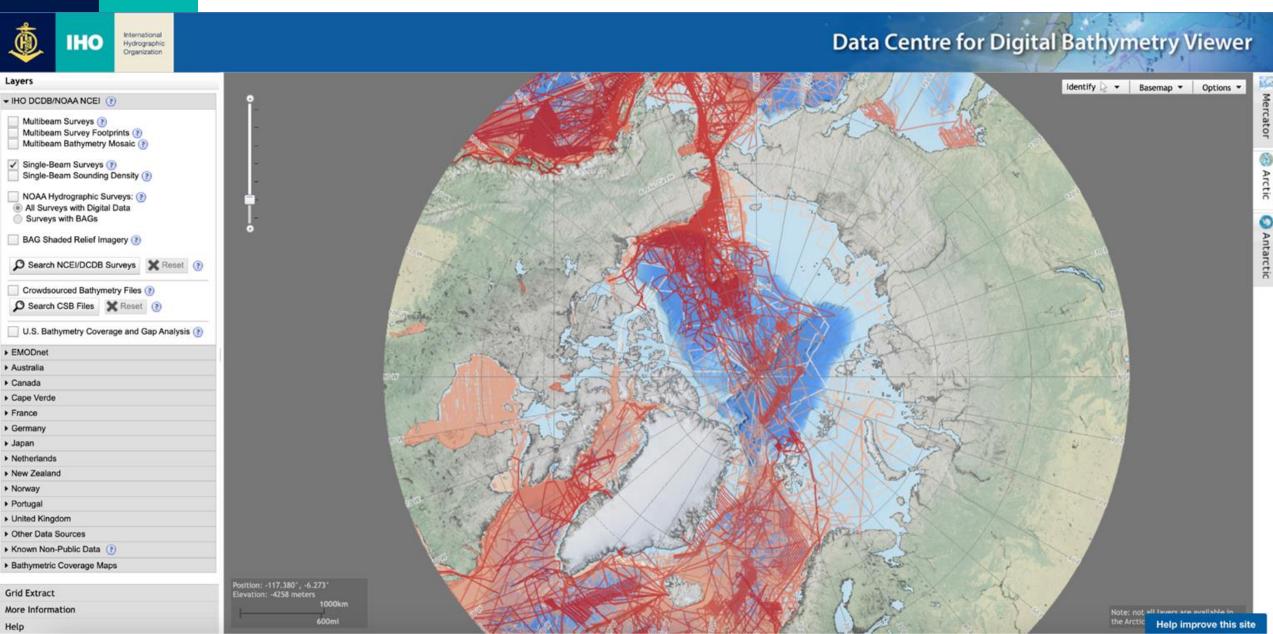


DCDB Data Holdings - Multibeam



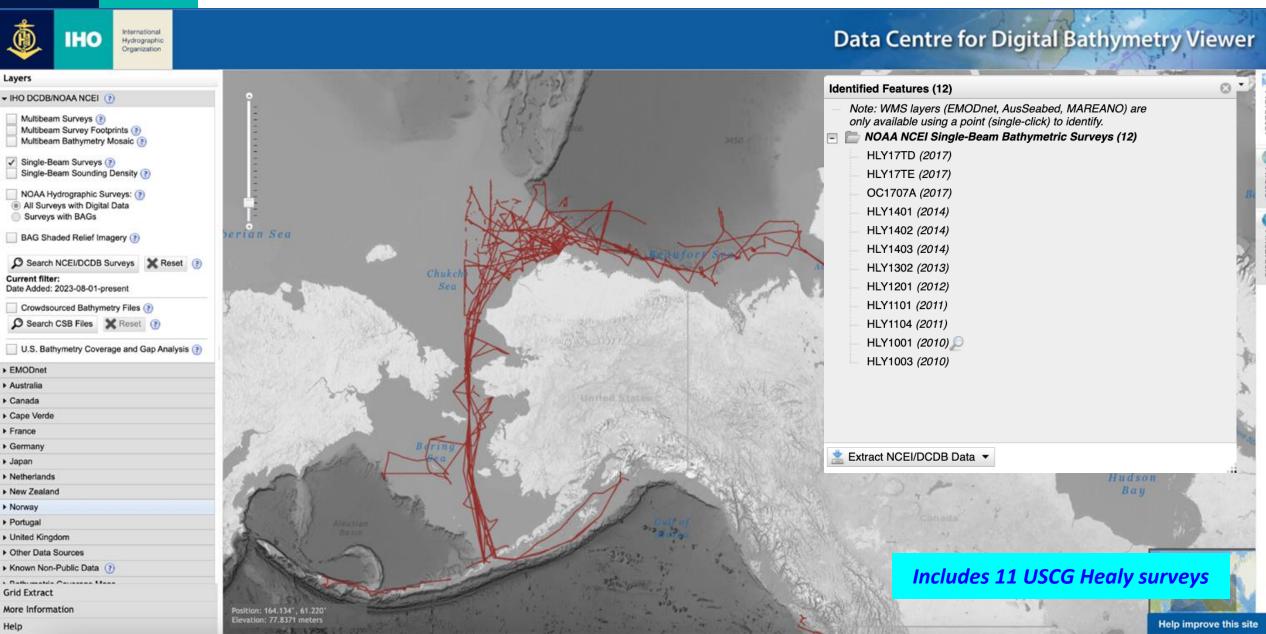


DCDB Data Holdings - Singlebeam



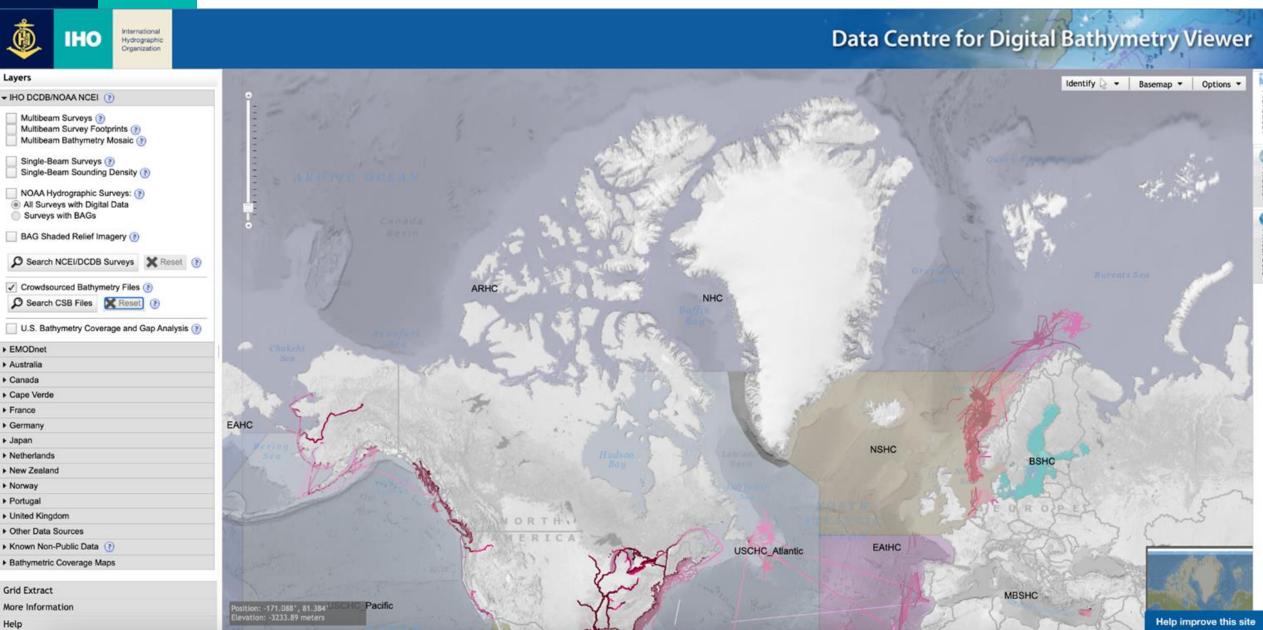


DCDB Data Holdings - NEW Singlebeam



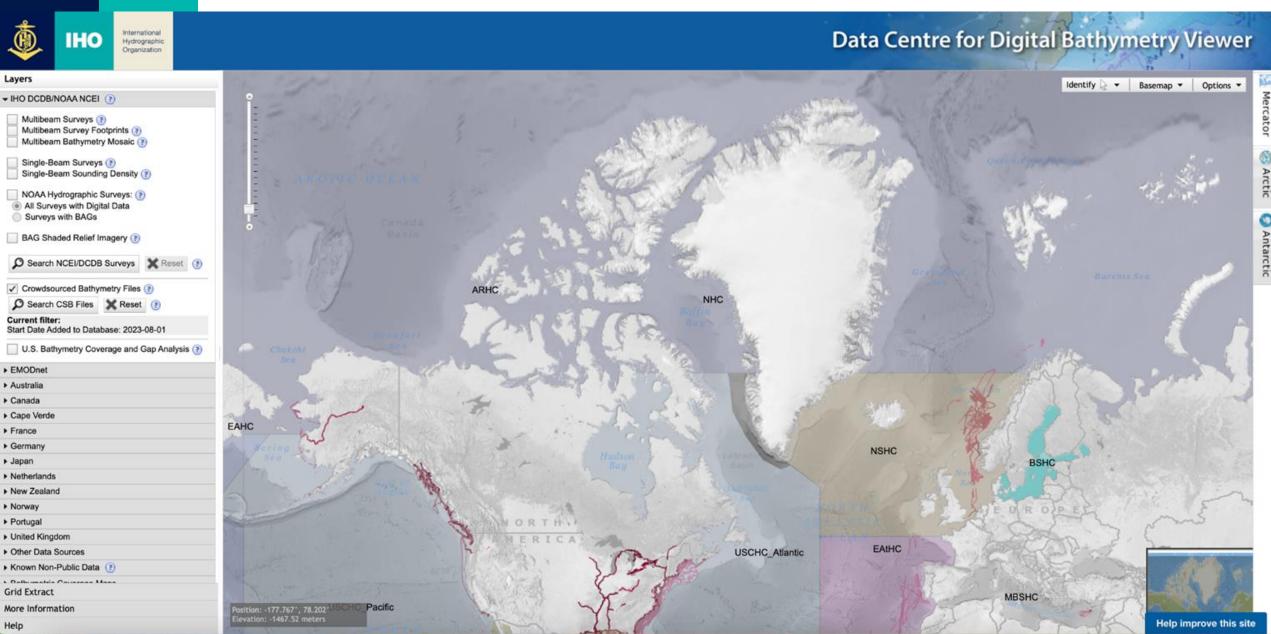


DCDB Data Holdings - Crowdsourced Bathymetry





DCDB Data Holdings - NEW Crowdsourced Bathymetry





DCDB Web Services

Spatial extent of data archived at other repositories via web services provides enhanced data discovery.

Basemap ▼ Options ▼

Help improve this site

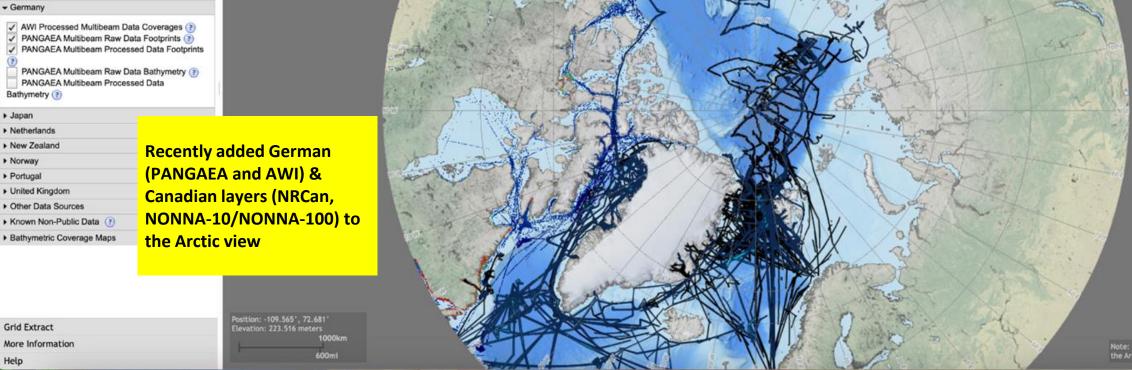


▶ IHO DCDB/NOAA NCEI (?) ▶ EMODnet ▶ Australia → Canada ✓ NRCan Multibeam Surveys ② NRCan Multibeam Shaded Relief (?) ✓ Canadian Hydrographic Service NONNA-10 (?) ✓ Canadian Hydrographic Service NONNA-100 (3) Canadian Hydrographic Service 500m Bathymetry Compilation (?) ▶ Cape Verde ▶ France - Germany ✓ AWI Processed Multibeam Data Coverages (?) PANGAEA Multibeam Raw Data Footprints (?) ✓ PANGAEA Multibeam Processed Data Footprints PANGAEA Multibeam Raw Data Bathymetry (?) PANGAEA Multibeam Processed Data Bathymetry (?) ▶ Japan

▶ New Zealand

▶ Norway

▶ Bathymetric Coverage Maps





ARHC Members are reminded to:

International Hydrographic Organization

- Contact the DCDB if issues arise when attempting to discover or access data
- Consider sharing data to the DCDB
- Consider building and/or including your web services in the DCDB viewer

