



IHO Data Centre for Digital Bathymetry

Report to IHO - IRCC16

By Jennifer Jencks
Director, IHO DCDB



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ncei.noaa.gov/iho-data-centre-digital-bathymetry

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IHO Data Centre for Digital Bathymetry (DCDB)

The [International Hydrographic Organization \(IHO\)](#) 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.S. National Oceanic and Atmospheric Administration \(NOAA\)](#), 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)

[About](#)

[Multi/Singlebeam Bathymetry](#)

[Crowdsourced Bathymetry](#)



Bathymetric Data

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.

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. The DCDB accepts submissions from government, academic, industrial, and research organizations, as well as individual researchers.

[Data Submission and Packaging Instructions](#)

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: native sensor 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.

CruisePack Software

CruisePack is a data packaging and metadata gathering software tool that simplifies the collection and submission process for cruise-based data.

[CruisePack Download Instructions](#)

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IHO Crowdsourced Bathymetry Initiative

The IHO defines crowdsourced bathymetry (CSB) as depth measurements collected and contributed by vessels, using standard navigation instruments, while engaged in routine positioning operations.

In 2014, the IHO recognized that there was a need to encourage and enable mariners and professionally collected on vessels with common to supplement the more rigorous and world.

Contribute CSB Data

Access CSB Data

IHO Guidance on

The IHO's Crowdsourced Bathymetry hydrographic experts, was tasked by data loggers, preferred data formats

The guidance document also provides uncertainty and accuracy issues with

[B-12 Edition 3.0 IHO Guidance Docu](#)

Contribute CSB Data

Access CSB Data

Interactive Map/Data Viewers

Download CSV or GeoJSON files, including full metadata as contributed, via the [IHO DCDB Viewer](#) or [NOAA's Bathymetric Data Viewer](#). The package is delivered as a gzipped tar file with the contents nested in directories several levels deep.

API

Download soundings using the [CSB Data Extract API](#). This API can be called directly or by using the [DCDB map viewer](#) for a more human-friendly experience. The soundings can also be requested as a gridded product with a specified resolution.

Cloud Access

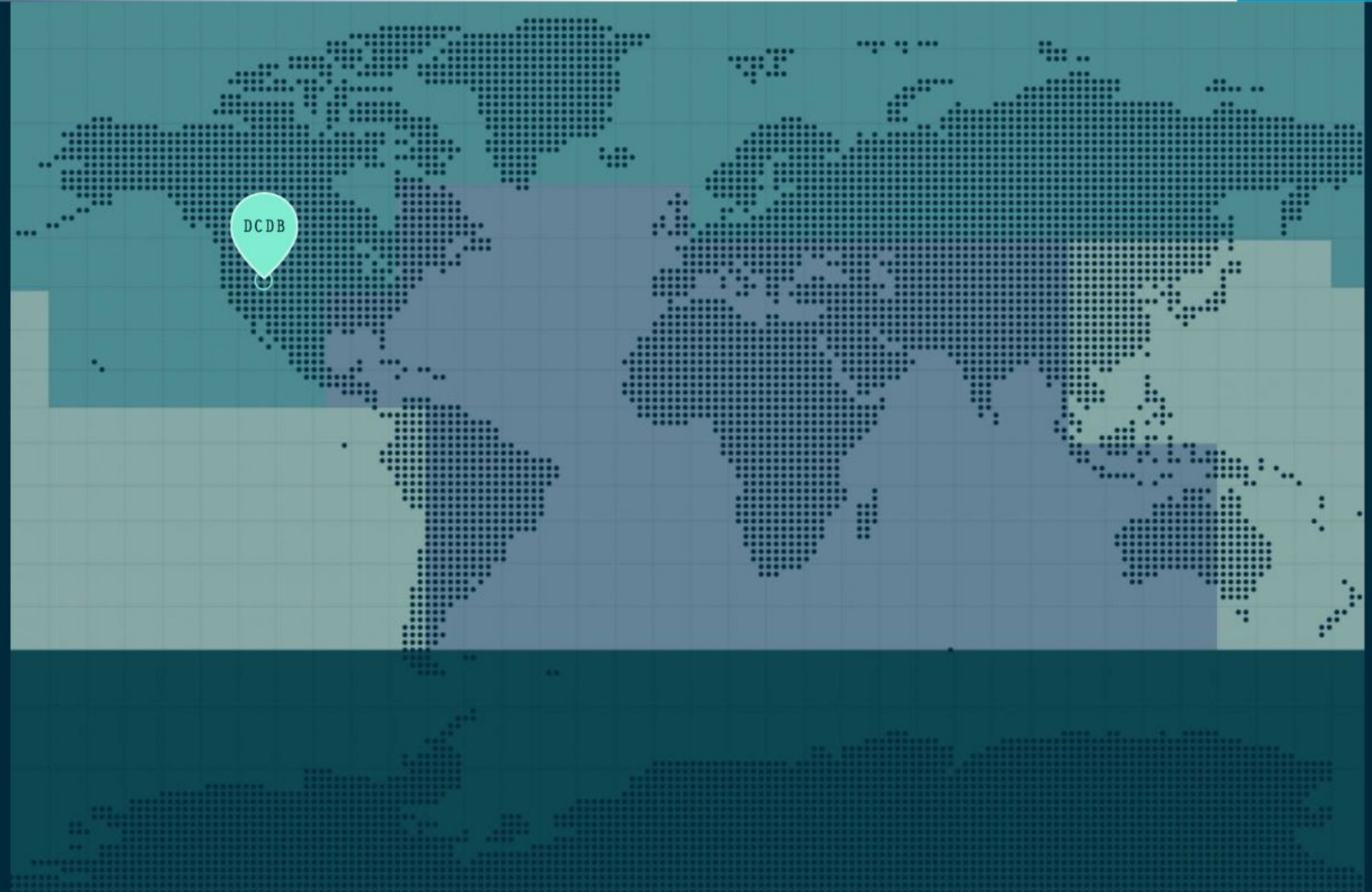
Download CSV-format files directly from the AWS S3 bucket hosted by the [NOAA Open Data Dissemination Program](#). Users can review the [registry of open data](#), [browse data in the bucket](#) and download individual files, or use AWS-provided and third-party tools and SDKs for programmatic access.





Note: CSV files downloaded from the S3 bucket only contain UniqueID, File_UUID, lon, lat, depth, time, platform name, provider attributes and that full metadata is not provided.

Additional information can be found in the [Crowdsourced Bathymetry Frequently Asked Questions](#).



The IHO Data Center for Digital Bathymetry is the central repository for raw bathymetric data and all data compiled by Seabed 2030 and is hosted by the US National Oceanic and Atmospheric Administration (NOAA) in Boulder, Colorado. The DCDB archives and freely shares depth data acquired by vessels during surveys or while on passage.



-  ATLANTIC AND INDIAN OCEAN
-  NORTH PACIFIC AND ARCTIC OCEAN
-  SOUTHERN OCEAN
-  SOUTH AND WEST PACIFIC OCEAN



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DCDB Data Holdings



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The World Reference for Raw Bathymetry



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Layers

IHO DCDB/NOAA NCEI ?

- Multibeam Surveys ?
- Multibeam Survey Footprints ?
- Multibeam Bathymetry Mosaic ?
- Single-Beam Surveys ?
- Single-Beam Sounding Density ?
- NOAA Hydrographic Surveys: ?
 - All Surveys with Digital Data
 - Surveys with BAGs

BAG Shaded Relief Imagery ?

?

Crowdsourced Bathymetry Files ?

?

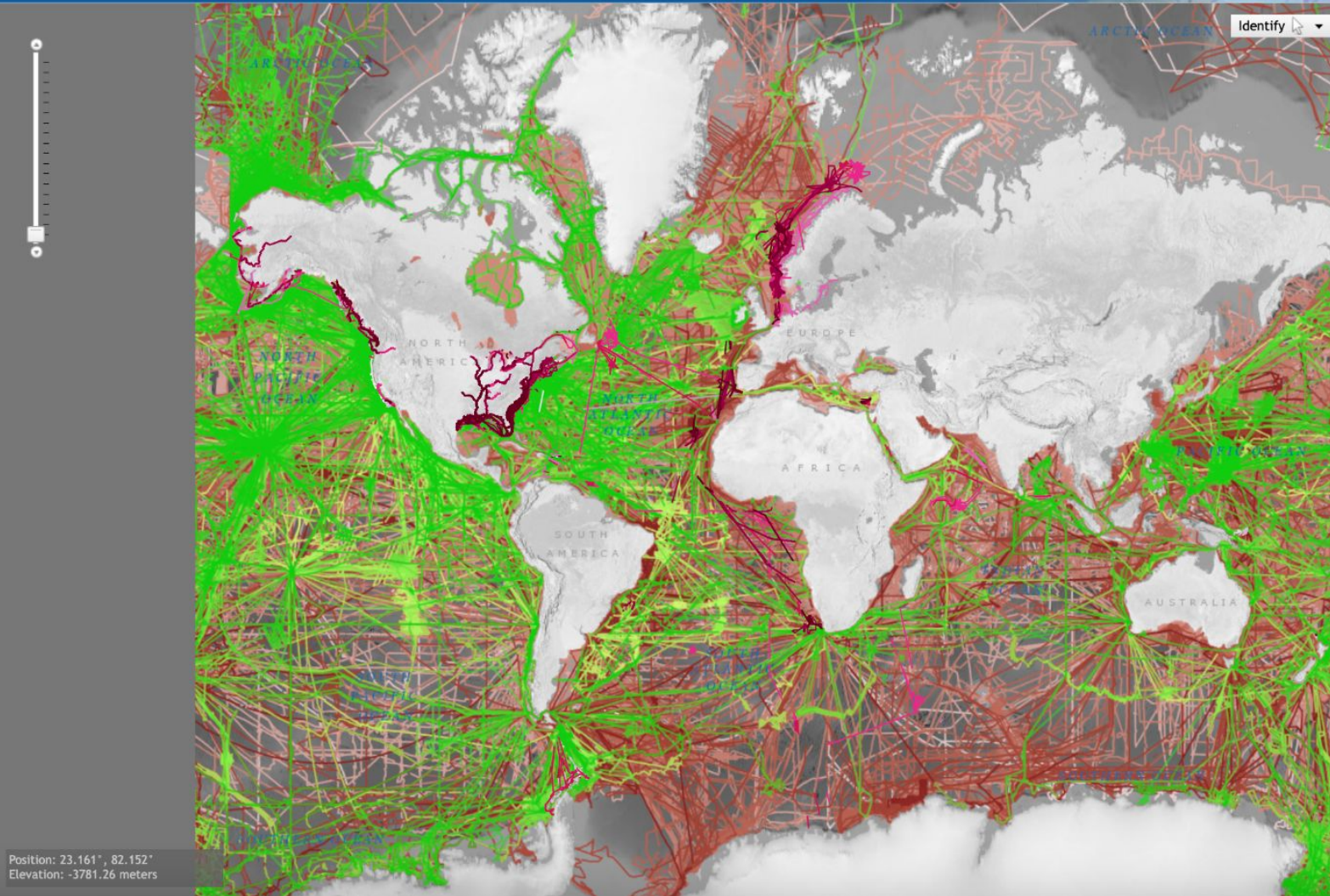
U.S. Bathymetry Coverage and Gap Analysis ?

- ▶ EMODnet
- ▶ Australia
- ▶ Canada
- ▶ Cape Verde
- ▶ France
- ▶ Germany
- ▶ Japan
- ▶ Netherlands
- ▶ New Zealand
- ▶ Norway
- ▶ Portugal
- ▶ United Kingdom
- ▶ Other Data Sources
- ▶ Known Non-Public Data ?
- ▶ Bathymetric Coverage Maps

Grid Extract

More Information

Help



Identify Basemap Options

- Mercator
- Arctic
- Antarctic





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The World Reference for Raw Bathymetry



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International Hydrographic Organization

Data Centre for Digital Bathymetry Viewer

International Hydrographic Organization

Layers

IHO DCDB/NOAA NCEI ?

- Multibeam Surveys ?
- Multibeam Survey Footprints ?
- Multibeam Bathymetry Mosaic ?
- Single-Beam Surveys ?
- Single-Beam Sounding Density ?
- NOAA Hydrographic Surveys: ?
 - All Surveys with Digital Data
 - Surveys with BAGs
- BAG Shaded Relief Imagery ?

Search NCEI/DCDB Surveys X Reset ?

Current filter: Date Added: 2023-06-01 to 2024-05-01

Crowdsourced Bathymetry Files ?

Search CSB Files X Reset ?

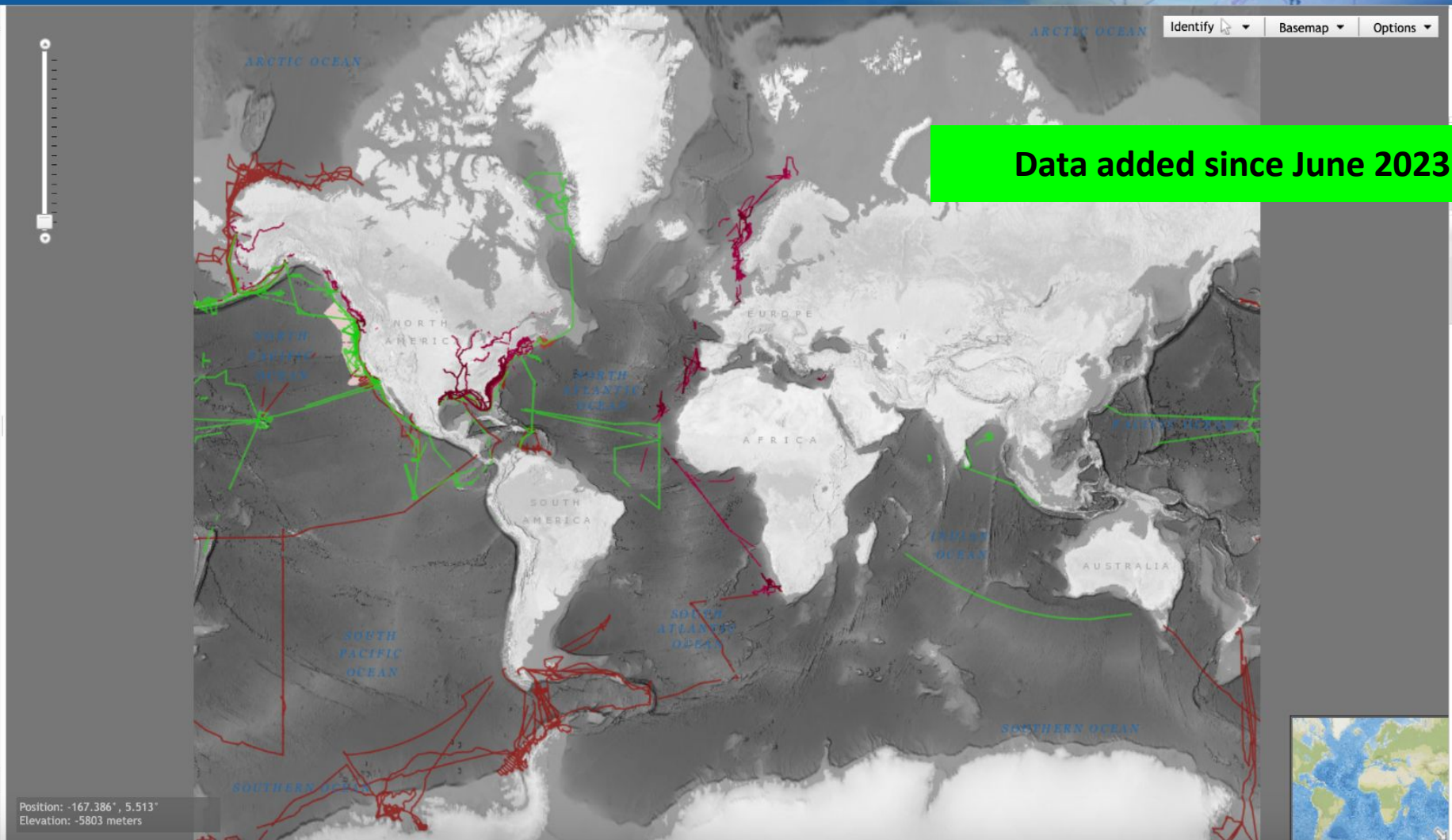
Current filter: Start Date Added to Database: 2023-06-01 End Date Added to Database: 2024-05-01

U.S. Bathymetry Coverage and Gap Analysis ?

- EMODnet
- Australia
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- United Kingdom
- Other Data Sources
- Grid Extract

More Information

Help



Data added since June 2023



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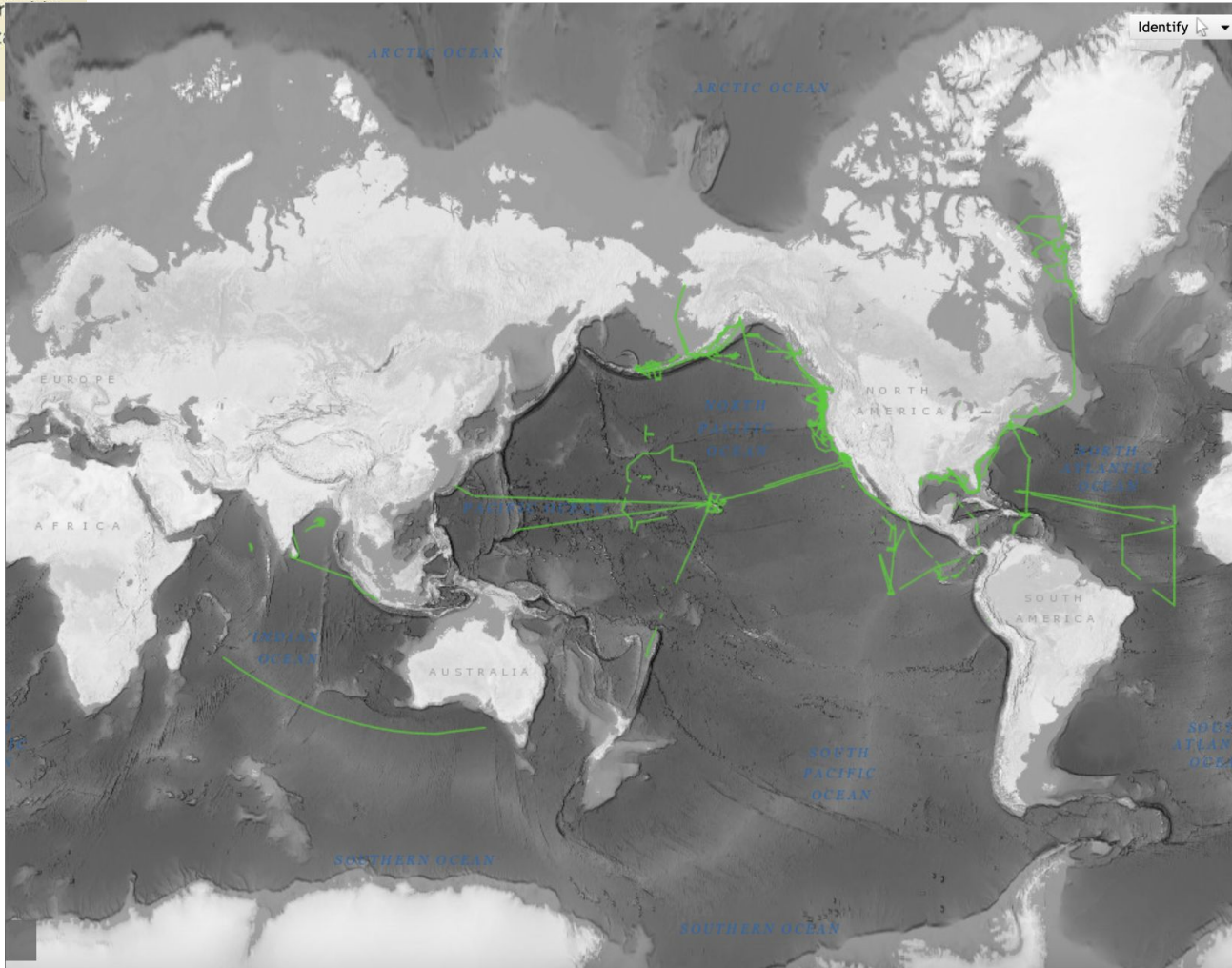
DCDB Data Holdings

Multibeam Bathymetry

93 surveys added since June 2023

Total: over 3800 surveys by over 60 different institutions.

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U.S. Academic Research Fleet (ARF): 55 surveys

NOAA - 32 surveys

Inkfish - 2 surveys

DIHIDRONAV - 1 survey

GEOMAR - 1 survey

Maine Coastal Mapping Initiative - 1 survey

Northwestern Michigan College - 1 survey



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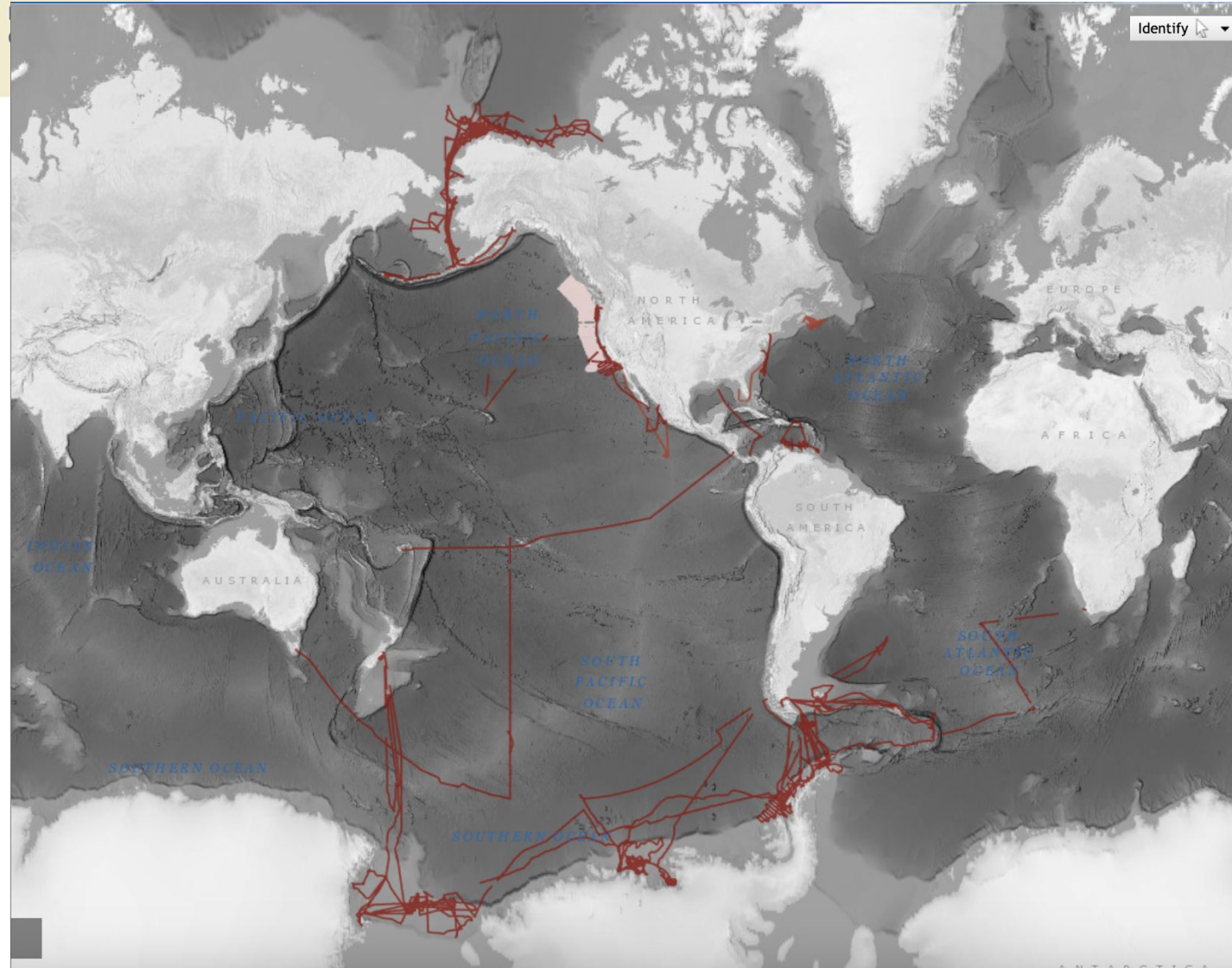
DCDB Data Holdings

Singlebeam Bathymetry

34 surveys added since June 2023

Total: nearly 6000 surveys by over 200 different institutions.

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DCDB Data Holdings

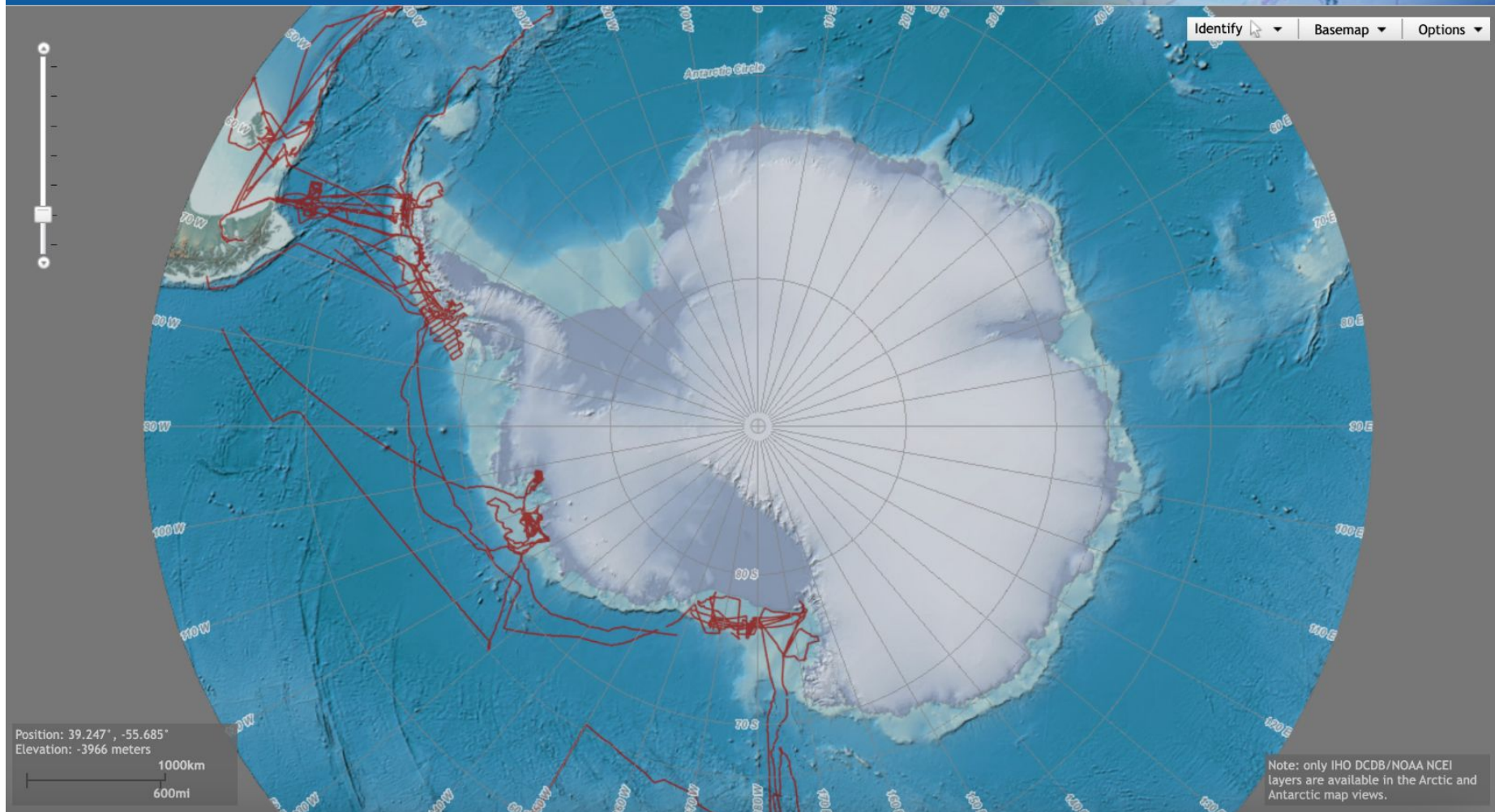
Singlebeam Bathymetry

21 Newly ADDED Surveys, all collected on the *Nathaniel B. Palmer*:

- NBP0007A, 2000
- NBP0105, 2001
- NBP0202, 2002
- NBP0305, 2003
- NBP0404, 2004
- NBP0409, 2004
- NBP0703, 2007
- NBP0710, 2007
- NBP0802, 2008
- NBP0803, 2008
- NBP0901, 2009
- NBP1005, 2010
- NBP1105, 2011
- NBP1107, 2011
- NBP1303, 2013
- NBP1304, 2013
- NBP1403, 2014
- NBP1410, 2014
- NBP1601, 2016
- NBP1603, 2016
- NBP1701, 2016

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Data Centre for Digital Bathymetry Viewer



Position: 39.247°, -55.685°
Elevation: -3966 meters

1000km
600mi

Note: only IHO DCDB/NOAA NCEI layers are available in the Arctic and Antarctic map views.



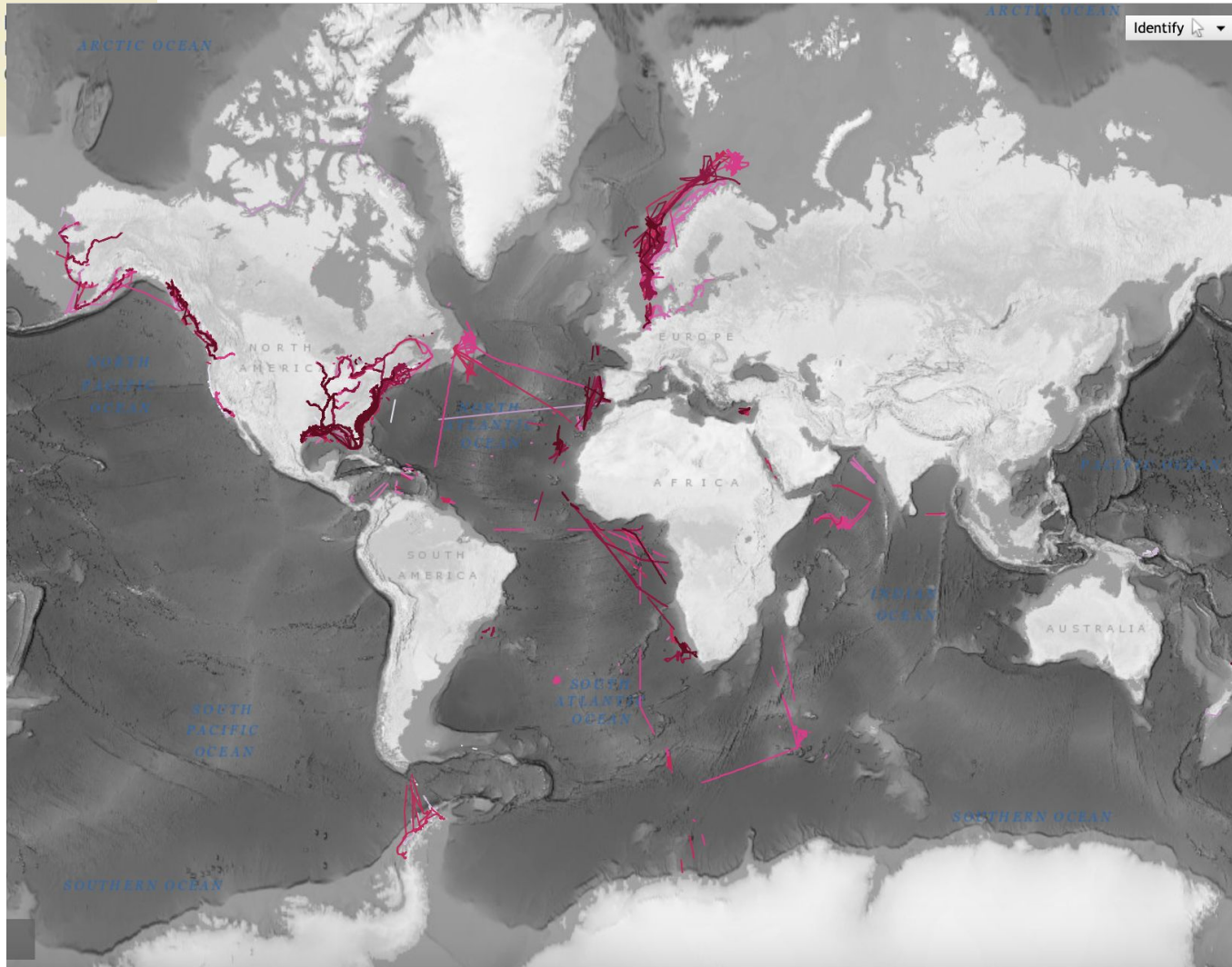
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DCDB Data Holdings

Crowdsourced Bathymetry

31.5 GB of CSB data, contributed from 369 vessels, are publicly accessible.

In April the DCDB exceeded 1 billion data points (1,008,164,463).



The DCDB continues to bring in CSB data from: Rosepoint Navigation System, FarSounder Inc, PGS, MacGregor Germany, M2Ocean, Great Lakes Observing System (GLOS), Orange Force Marine and GEC Aqua Map

New CSB pipelines were finalized with: Interdisciplinary Center for Development in Ocean Mapping (CIDCO), Seabed 2030, International Seakeepers Society, and the Center for Ocean Mapping and Innovative Technologies (COMIT).

Onboarding in process for: Alcatel Submarine Network and Docktech, Map the Gaps and OMS Group



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DCDB Infrastructure Updates



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DCDB Map Viewer

Improvements and updates

International Hydrographic Organization



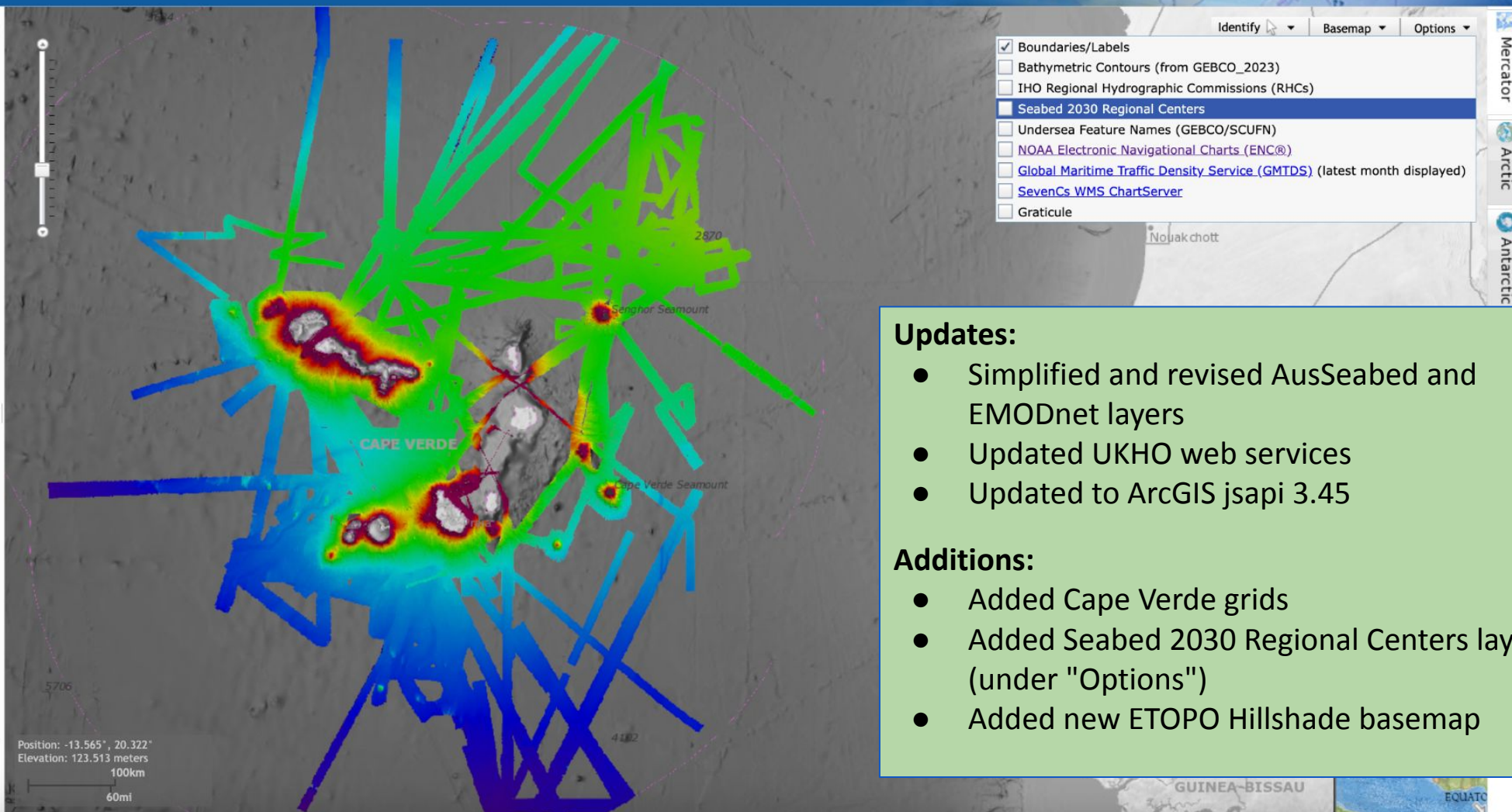
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Data Centre for Digital Bathymetry Viewer

Layers

- ▶ IHO DCDB/NOAA NCEI ?
- ▶ EMODnet
- ▶ Australia
- ▶ Canada
- ▼ Cape Verde
 - Cape Verde Bathymetric Grids ?
- ▶ France
- ▶ Germany
- ▶ Japan
- ▶ Netherlands
- ▶ New Zealand
- ▶ Norway
- ▶ Portugal
- ▶ United Kingdom
- ▶ Other Data Sources
- ▶ Known Non-Public Data ?
- ▶ Bathymetric Coverage Maps



- Boundaries/Labels
- Bathymetric Contours (from GEBCO_2023)
- IHO Regional Hydrographic Commissions (RHCs)
- Seabed 2030 Regional Centers
- Undersea Feature Names (GEBCO/SCUFN)
- NOAA Electronic Navigational Charts (ENC@)
- Global Maritime Traffic Density Service (GMTDS) (latest month displayed)
- SevenCs WMS ChartServer
- Graticule

Updates:

- Simplified and revised AusSeabed and EMODnet layers
- Updated UKHO web services
- Updated to ArcGIS jsapi 3.45

Additions:

- Added Cape Verde grids
- Added Seabed 2030 Regional Centers layer (under "Options")
- Added new ETOPO Hillshade basemap

- Grid Extract
- More Information
- Help

Position: -13.565°, 20.322°
 Elevation: 123.513 meters
 100km
 60mi



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DCDB Map Viewer

Next Year: “next generation” map viewer

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Motivations to modernize map viewers:

- Maintainability
- Ability to update to latest ArcGIS API for JavaScript 4.x
- Use of well-supported libraries
- Modern UI design
- Accessibility - 508 compliance

The screenshot displays the DCDB Map Viewer interface. On the left is a 'Filter Cruises' sidebar with the following controls:

- Survey Type: All Survey Types (dropdown)
- Min Year: 1939, Max Year: 2024
- Platform Names (dropdown)
- Institution Names (dropdown)
- Survey IDs (dropdown)
- Date added to database: Start and End (calendar pickers)
- ZOOM TO RESULTS (button)
- RESET FILTER (button)

The main map area shows a world map with a dense network of red lines representing survey tracks. The map includes labels for various ocean basins and seas, such as Hudson Bay, Labrador Basin, North American Basin, North Atlantic Ocean, South Atlantic Ocean, South Pacific Ocean, East Pacific Rise, Peru Basin, and Argentine Basin. A position indicator at the bottom left shows coordinates: Position: -166.49576° 62.75806°. At the bottom of the map, there is a footer with text: 'General Bathymetric Chart of the Oceans (GEBCO); NOAA National Centers for Environmental Information (NCEI) | NOAA National Centers for Environmental Information (NCEI) ... Powered by Esri'. Below the footer are links for Privacy Policy, Freedom Of Information Act, Information Quality, Disclaimer, Take Our Survey, Department of Commerce, NOAA, NESDIS, and Contact Us.



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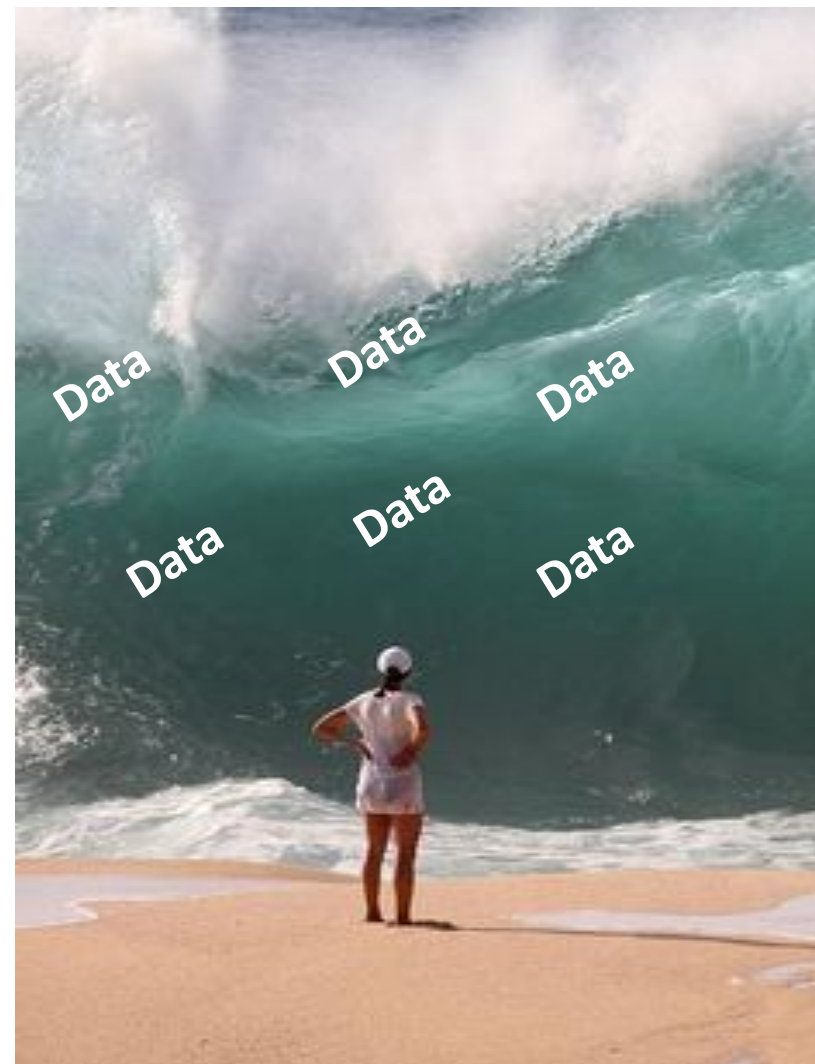
Multibeam Ingest Pipeline

Preparing for the Wave of Data

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The work can be simplified into 6 projects:

1. Develop a new database schema to store metadata - **Completed**
2. Build a new application pipeline - **Completed**
3. Provision and configure pipeline hosts, deploy pipeline applications - **Completed**
4. Migrate over 40 years of metadata to the new schema - **Completed**
5. Reingest all 3800 multibeam surveys through new pipeline - **Work to begin Fall 2024**
6. Update map services and data access (NEXT) dependencies - **Work to begin Fall 2024**





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CSB Coastal State Review Application

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The DCDB has developed a **CSB Coastal State Review Application** to automate the approval process of data for coastal states who have provided positive responses but request pre-approval of data before the public distribution from DCDB.

Many thanks to Denmark and France who tested the application last Fall.

Deployment of the application underway.

Home Manage Username: Chris Slater Log Out

Layer Chooser Show

Search Areas [Search CSB Data](#)

Search

Search Clear

Trace Id	Publish	External Id	Provider	Platform	Instrument	Start Time	End Time	File Name	File Size	Last Updated
000033e4-759c-4591-af98-04c29f6b967b	true Change	MACGR-9221566-AIDAAURA-oyHjp011	MacGregor	Anonymous		2020-03-28T03:08:33Z	2020-03-28T03:10:16Z	20220322085844674039_9221566-AIDAAURA-oyHjp011.tar.gz	965	2022-03-28T21:17:48.738516Z
000042ca-d435-4d84-ae4-ec04163d4dc2	true Change	MACGR-9221566-AIDAAURA-oyHjp011	MacGregor	Anonymous		2020-04-29T03:00:32Z	2020-04-29T03:02:36Z	20220322083434750180_9221566-AIDAAURA-oyHjp011.tar.gz	798	2022-03-28T15:16:03.354039Z

French Exclusive Economic Zone

ID	296
GEONAME	French Exclusive Economic Zone
TERRITORY1	France
ISO_TER1	FRA
SOVEREIGN1	France
TERRITORY2	
ISO_TER2	
SOVEREIGN2	
TERRITORY3	
ISO_TER3	
SOVEREIGN3	
ISO_SOV1	FRA
ISO_SOV2	
ISO_SOV3	
EXCLUDE	manual
DATA_SET	EEZ



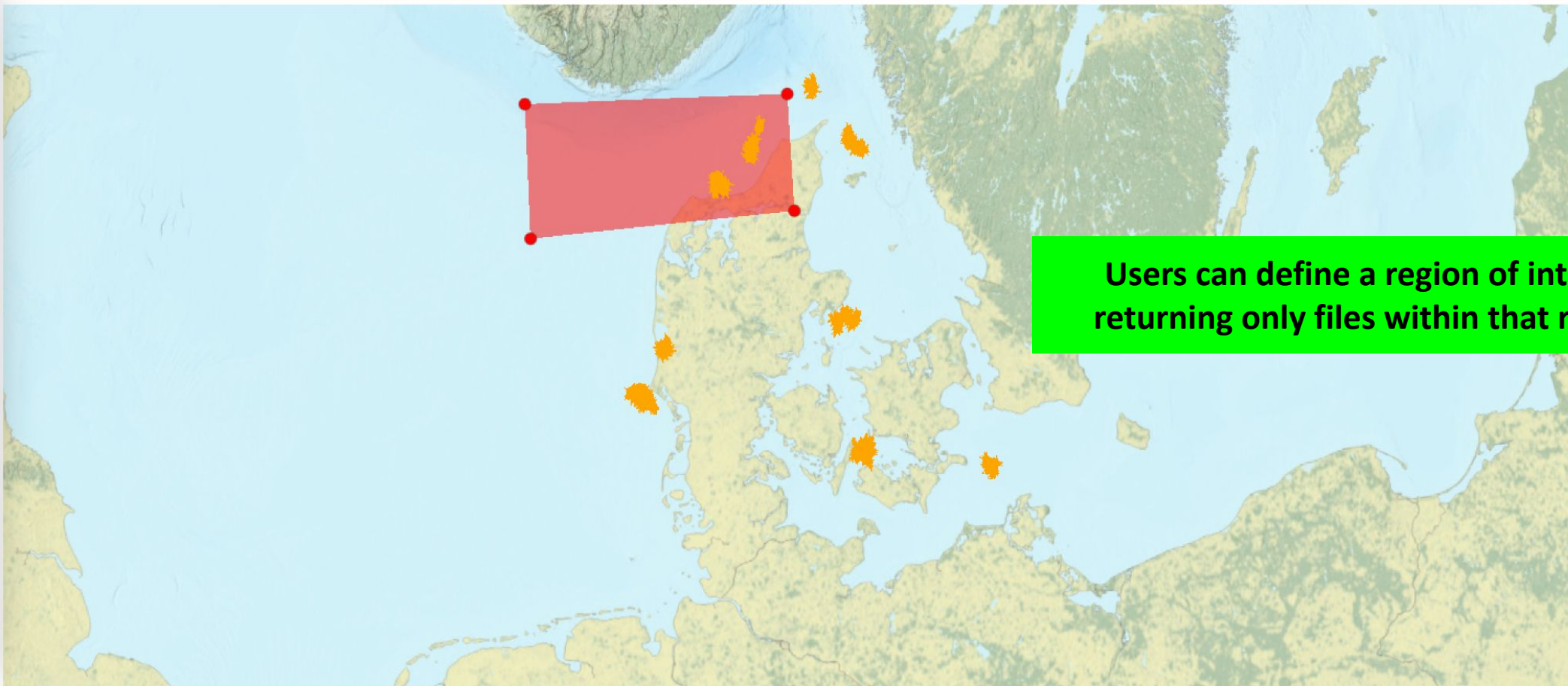
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CSB Coastal State Review Application

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[Home](#) [Approve](#) [Access Tokens](#) [API Documentation](#)

Username: **Edgar Earthquake** [Log Out](#)



Users can define a region of interest, returning only files within that region.

[Refresh](#) [Search](#) [Sort](#) [Clear Search Area](#) [Confirm Search Area](#) [Export Table](#) [Download All Files](#)

[Batch Approve](#)

CSB Data

Approval Data File Size



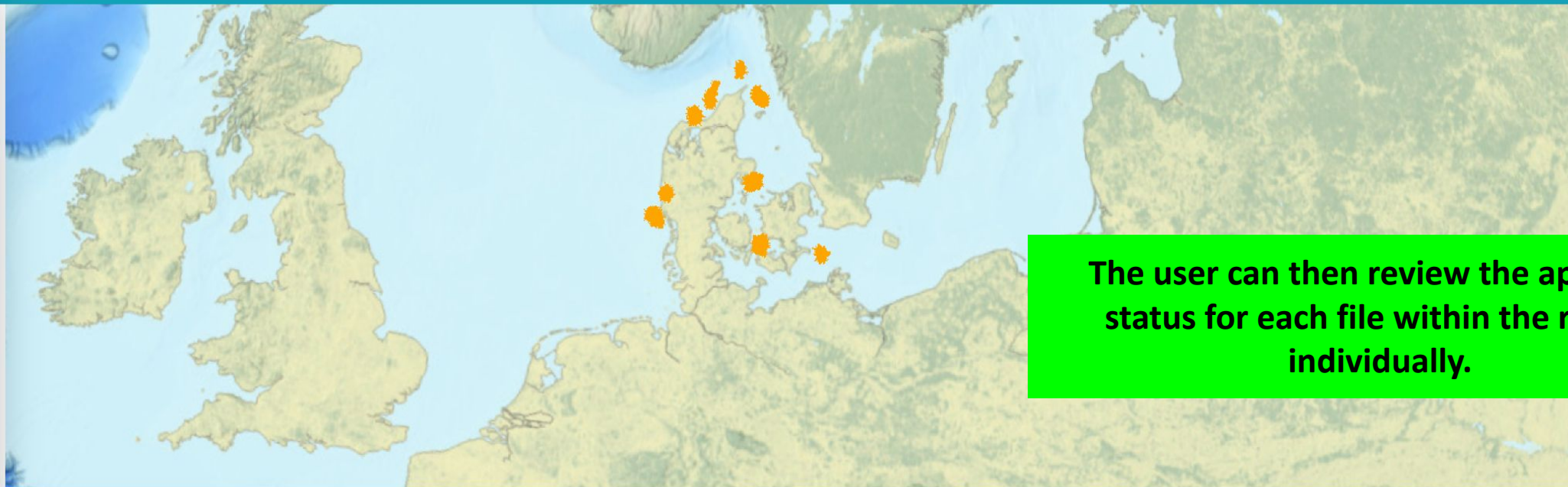
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CSB Coastal State Review Application

International Hydrographic Organization

Home Approve Access Tokens API Documentation

Username: Edgar Earthquake [Log Out](#)



The user can then review the approval status for each file within the region individually.

[Refresh](#) [Search](#) [Sort](#) [Draw Search Area](#) [Export Table](#) [Download All Files](#) [Batch Approve](#)

CSB Data

File Name	Approval Status	Data License	Instrument	Start Time	End Time	File Size (B)	Last Updated	Created	Last Reviewed	Actions
20240116152320381054_dcba3a80-781f-43fd-9969-41368e7320e5.tar.gz	Not approved	CC0 1.0		2024-01-16T15:23:20Z	2024-01-16T15:23:20Z	34294	2024-01-16T15:28:54.990900Z	2024-01-16T15:28:54.861629Z		+ ↓
20240116152306335176_dcba3a80-781f-	Not	CC0 1.0		2024-01-	2024-01-	25612	2024-01-	2024-01-		+



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CSB Coastal State Review Application

Next year

International Hydrographic Organization

The DCDB will reach out to coastal States who requested pre-approval of CSB data (in response to IHO CL 21/2020, IRCC CL 1/2020) and provide them training and access to the CSB CSRA.

The DCDB will seek and gather feedback and recommendations for future enhancements.

The screenshot shows a web application interface for the DCDB. At the top, there is a navigation bar with 'Home' and 'Manage' links, and a user profile for 'Chris Slater' with a 'Log Out' button. The main content area is divided into two sections. On the left, there is a search interface with a 'Search Areas' button and a 'Search CSB Data' button. Below this is a search input field with a dropdown menu and 'Search' and 'Clear' buttons. On the right, there is a map of the world showing the French Exclusive Economic Zone (EEZ) highlighted in green. A 'Layer Chooser' and 'Show' button are visible above the map. A tooltip window is open over the map, displaying the following information:

French Exclusive Economic Zone	
ID	296
GEONAME	French Exclusive Economic Zone
TERRITORY1	France
ISO_TER1	FRA
SOVEREIGN1	France
TERRITORY2	
ISO_TER2	
SOVEREIGN2	
TERRITORY3	
ISO_TER3	
SOVEREIGN3	
ISO_SOV1	FRA
ISO_SOV2	
ISO_SOV3	
EXCLUDE	manual
DATA_SET	EEZ

Below the map is a table with the following columns: Trace Id, Publish, External Id, Provider, Platform, Instrument, Start Time, End Time, File Name, File Size, and Last Updated. The table contains two rows of data:

Trace Id	Publish	External Id	Provider	Platform	Instrument	Start Time	End Time	File Name	File Size	Last Updated
000033e4-759c-4591-af98-04c29f6b967b	true	MACGR-9221566-AIDAAURA-oyHjp011	MacGregor	Anonymous		2020-03-28T03:08:33Z	2020-03-28T03:10:16Z	20220322085844674039_9221566-AIDAAURA-oyHjp011.tar.gz	965	2022-03-28T21:17:48.738516Z
000042ca-d435-4d84-ae4-ec04163d4dc2	true	MACGR-9221566-AIDAAURA-oyHjp011	MacGregor	Anonymous		2020-04-29T03:00:32Z	2020-04-29T03:02:36Z	20220322083434750180_9221566-AIDAAURA-oyHjp011.tar.gz	798	2022-03-28T15:16:03.354039Z



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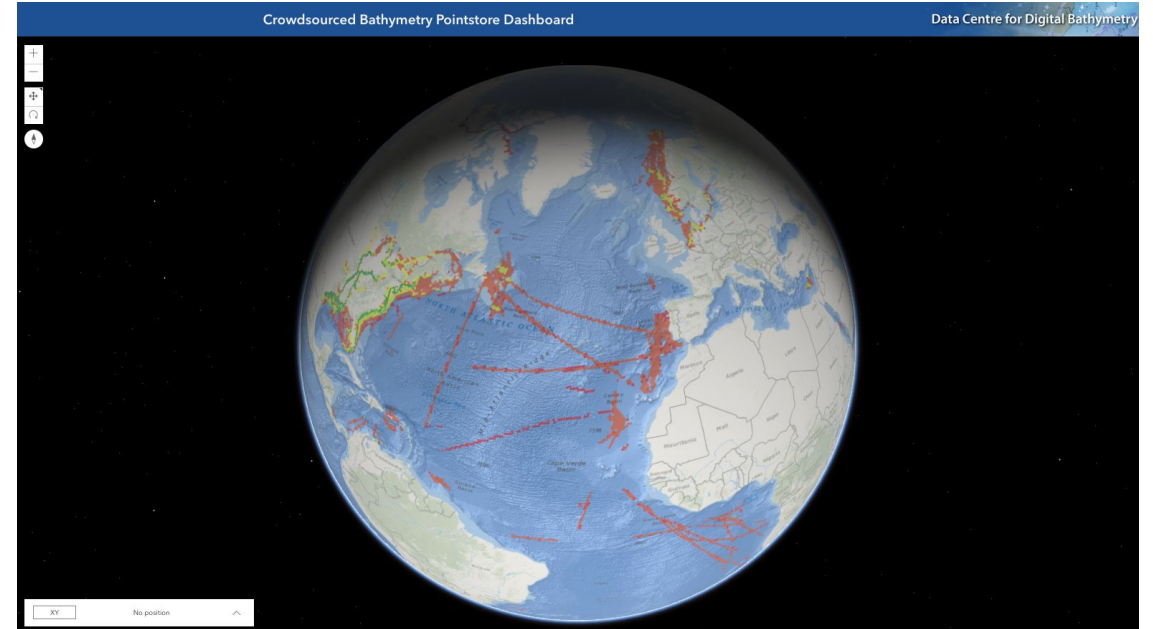
Crowdsourced Bathymetry Pipeline (Crowbar)

Suggested enhancements from the CSBWG:

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Focus: Improving the discovery and access of CSB data through programmatic methods with our point cloud API.

- Increase searchability of cloud copies of CSB files
- Improve translation of files between ArcGIS MapService API and S3 bucket.
- Ensure full metadata is accessible in cloud buckets.
- Review options to improve efficiency of CSV files in cloud buckets.
- Ensure pipeline is compatible with GeoJSON schema updates.
- Add ability to create a custom URL for map viewers, allowing users to specify all files from a particular provider or platform within the URL.





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AutoGrid

Updated gridded data viewer

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- The existing Autogrid web application accepts a user's area of interest, cell size, and grid format and asynchronously produces a custom data grid from the **multibeam archive**.
- The updated application, currently under development, **integrates multibeam and CSB**.
- New filter criteria and output formats will be supported. GEBCO will be added as additional background fill options.
- **On pause:** We are held up by the required re-ingestion of multibeam data through MABLE

NOAA National Centers for Environmental Information
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Gridded Data Viewer

[MORE INFORMATION](#)

NCEI Home > Maps and Geospatial Products > Passive Acoustic Data

AutoGrid

- 1 Data Types to Include
 - Multibeam Bathymetry
 - Crowdsourced Bathymetry

[CONTINUE](#)
- 2 Enter Filter Criteria
- 3 Define Area of Interest
- 4 Output Grid Options
- 5 Enter Email Address Last Step

Grid Extract

Position: -78.29956° 40.91438°

Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS | General Bathymetric Chart of the Oceans (GEBCO) | NOAA National Centre... Powered by Esri

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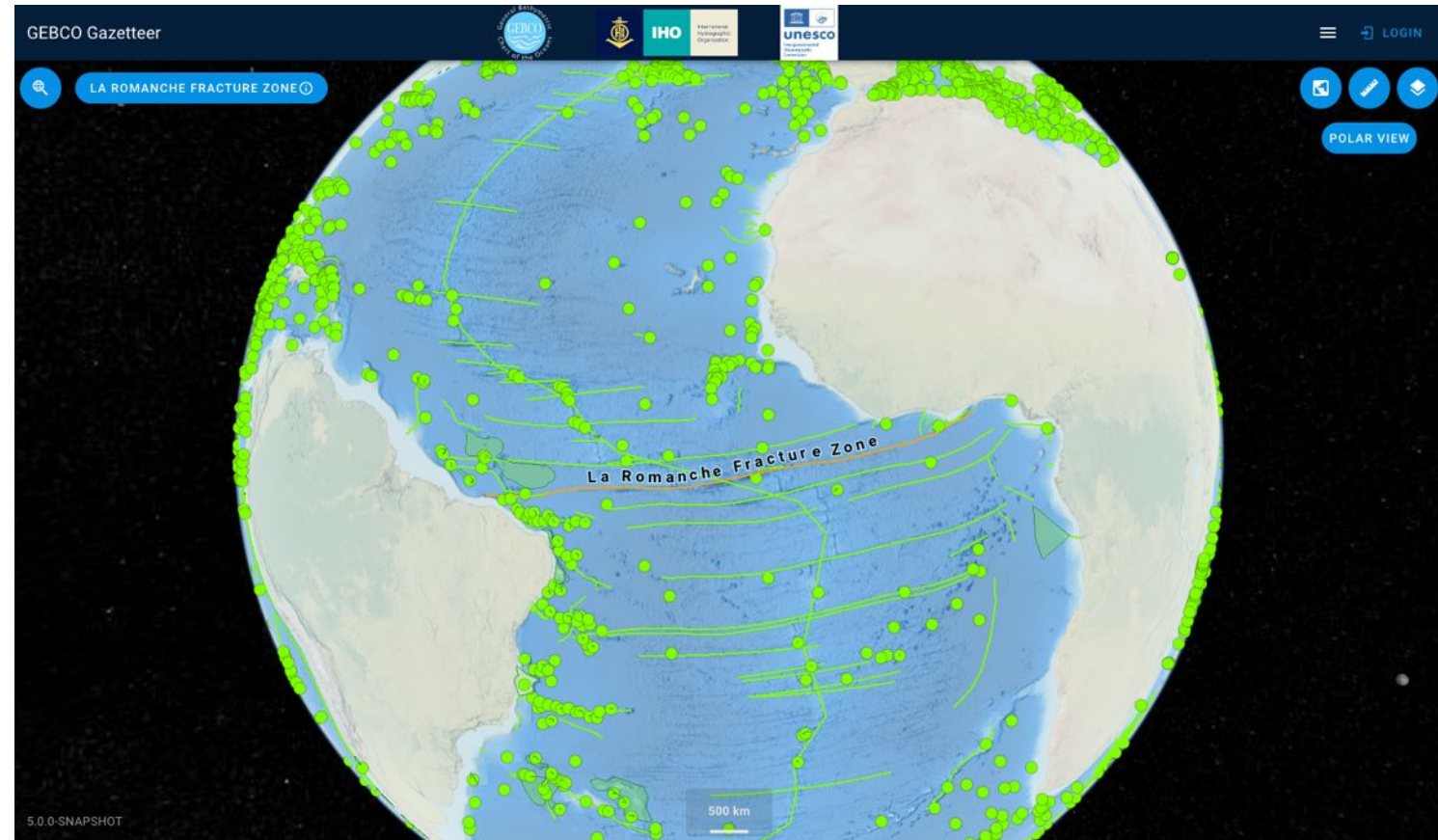


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GEBCO Gazetteer

A web tool that allows the public to search for, view, and download information on more than 3800 undersea features.

- Enhancements to Gazetteer 5 based on feedback from SCUFN members and internal testing
- 8 enhancements and 9 fixes were made since SCUFN 36
- Gazetteer v5.0.4 will be deployed to production after SCUFN 37 to prevent disruption during critical SCUFN activities



ngdc.noaa.gov/gazetteer



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Other Business



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Problems Encountered

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The DCDB has recently lost two (out of three) data managers.

The DCDB's lead software developer will be on paternity leave for much of the Summer.

A newly-hired (April) software developer is currently being onboarded.

This will (temporarily) impact almost every item listed above, along with our ability to work with the community on documenting, contributing, searching for and accessing data in a timely manner.

Our intent is to advertise for two data manager positions this summer.



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Any Other Items of Note

SPI Reporting

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While the DCDB has been provided the opportunity to virtually present regional breakdowns of data holdings at several RHC meetings in 2023-2024, ideally this would become a standard agenda item for all RHCs moving forward.

The DCDB also continues to be willing to provide these data breakdowns for RHC SPI reporting if requested.



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Conclusions and Recommended Actions

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It is highlighted that the DCDB is an IHO Member States' resource that requires additional data to increase the coverage and move towards a comprehensive global bathymetric dataset.

Therefore IHO Member States and stakeholders are ***invited to contribute and encourage the provision of bathymetric data regardless of its origin or reason for gathering.***



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Actions Requested of IRCC

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- a) Note the contents of this report;
- b) Encourage Member State and community bathymetric data contributions to the DCDB, regardless of origin, resolution or quality;
- c) Encourage RHC Chairs to collaborate with the DCDB on developing and highlighting annual regional breakdowns of data holdings as part of SPI reporting.
- d) Take any other action it considers appropriate.