THE NIPPON FOUNDATION-GEBCO

SEABED 2030

Exploring Applications for Bathymetric Grid Generation

Dr Vicki Ferrini
Lamont-Doherty Earth Observatory
Columbia University

THE NIPPON FOUNDATION · GEBCO General Bathymetric Chart of the Oceans · IHO International Hydrographic Organization · unesco Intergovernmental Oceanographic Commission · 2021 2030 United Nations Decade of Ocean Science for Sustainable Development

What is Seabed 2030?

The Nippon Foundation - GEBCO Seabed 2030 Project is a collaborative project to inspire the complete mapping of the world's ocean by 2030, and to compile all bathymetric data into the freely-available GEBCO Ocean Map.

> *Seabed 2030 aspires to empower the world to make policy decisions, use the ocean sustainably, and undertake scientific research that is informed by a detailed understanding of the global ocean floor.*

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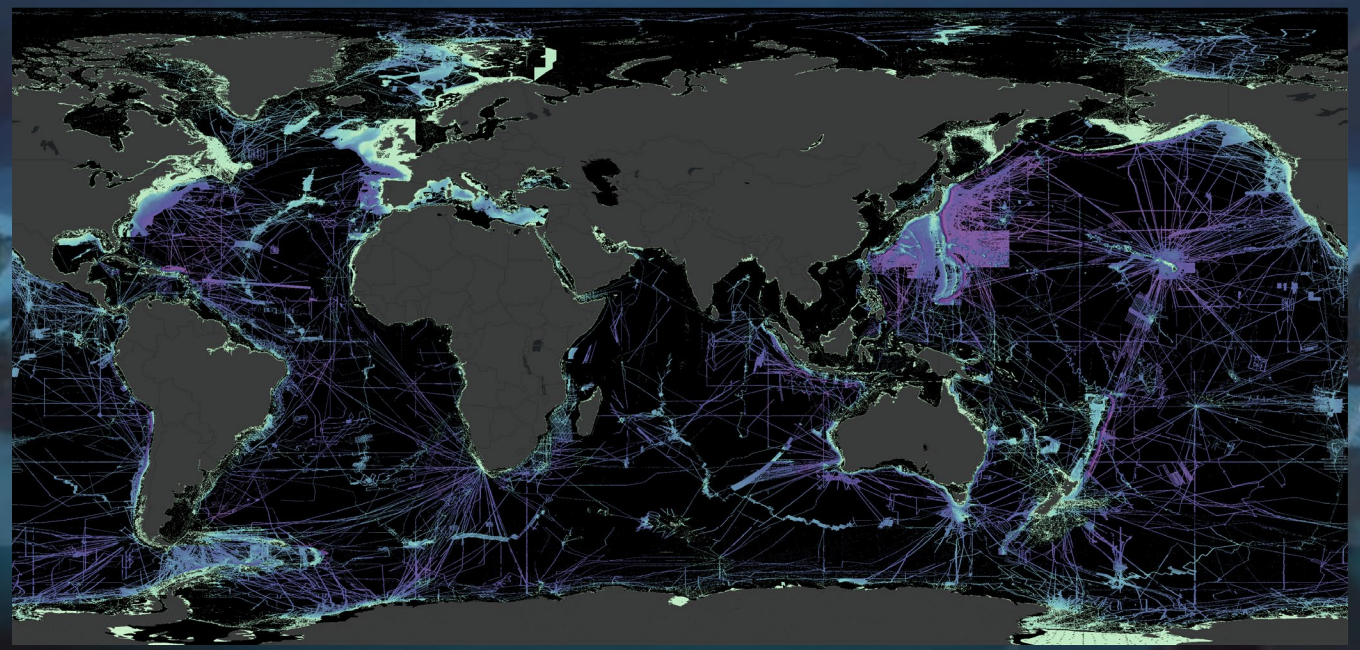
Why is Seabed 2030 Important?

- Bathymetry data is an essential ocean observation
- Seabed mapping data has broad use and value
- Ocean processes extend beyond territorial waters
- Only ~20% of the ocean has been mapped with direct observation
- Mapping the entire ocean is a massive task that can only be achieved through cooperation and coordination



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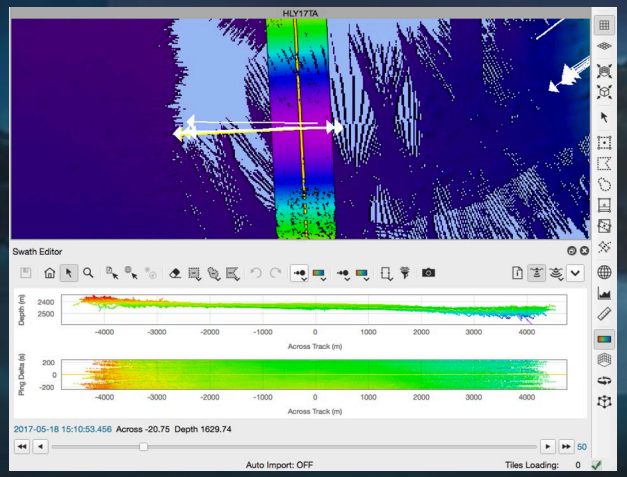
Why grid data?

Accessibility

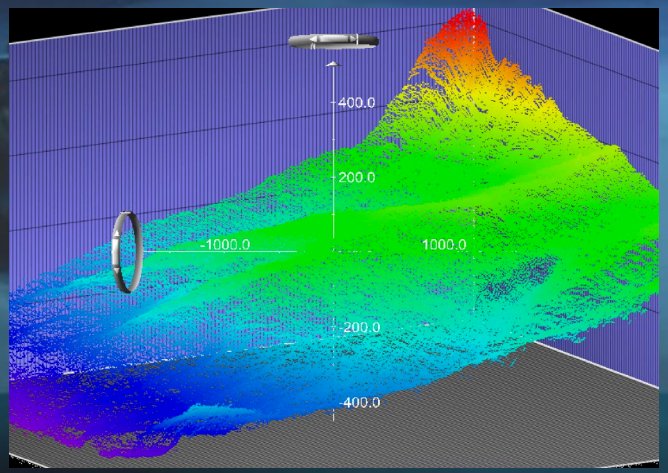
Specialist Users → **Non-specialist Users**

Storage & Data Assembly Efficiency

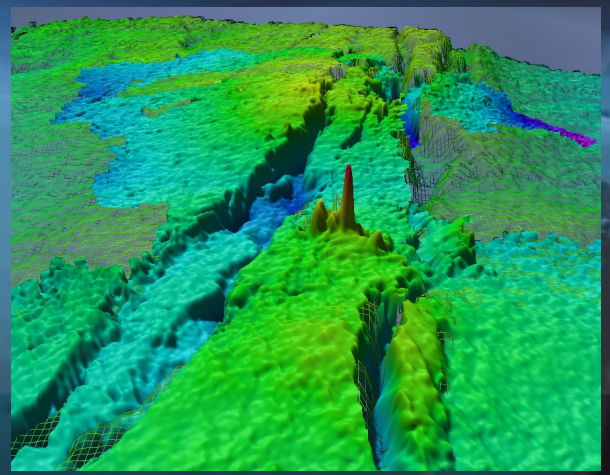
Swath Files



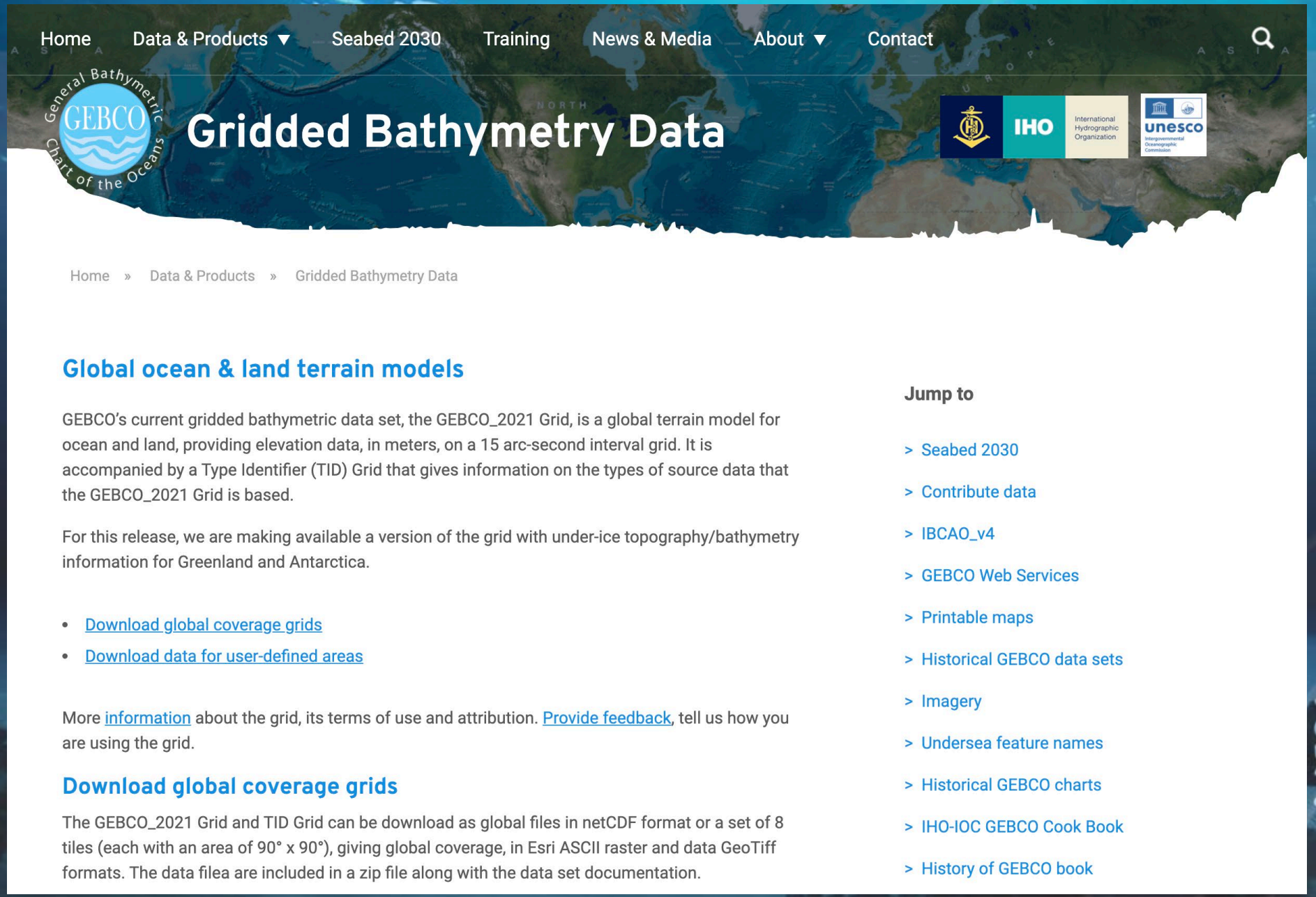
Point Clouds



Grids



Images



https://www.gebco.net/data_and_products/gridded_bathymetry_data/

International Hydrographic Organization
Organisation Hydrographique Internationale

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

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.

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

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

The World Reference for Raw Bathymetry

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https://www.ngdc.noaa.gov/iho/

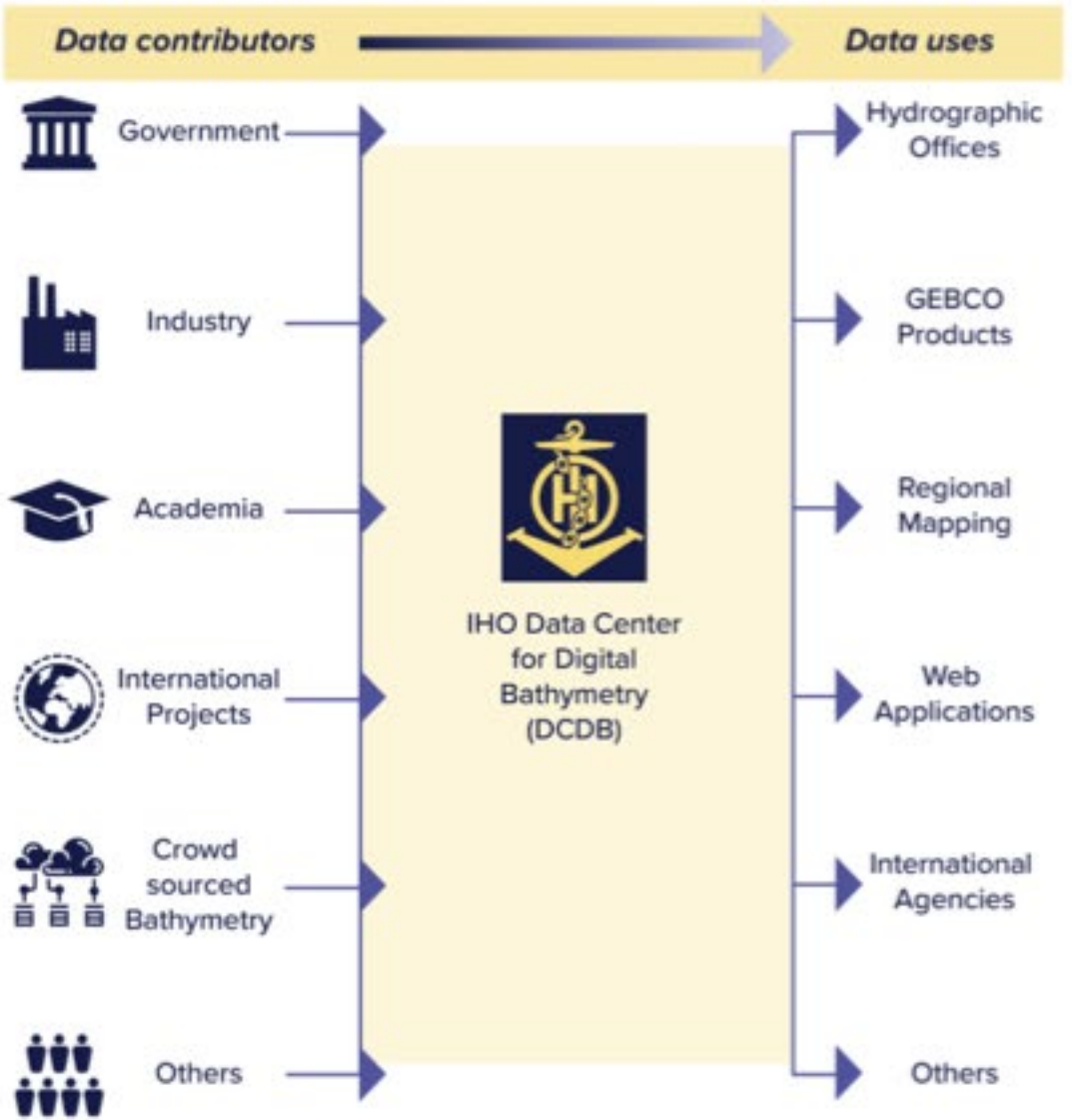
International Hydrographic Organization
Organisation Hydrographique Internationale

IHO Data Center for Digital Bathymetry (DCDB)

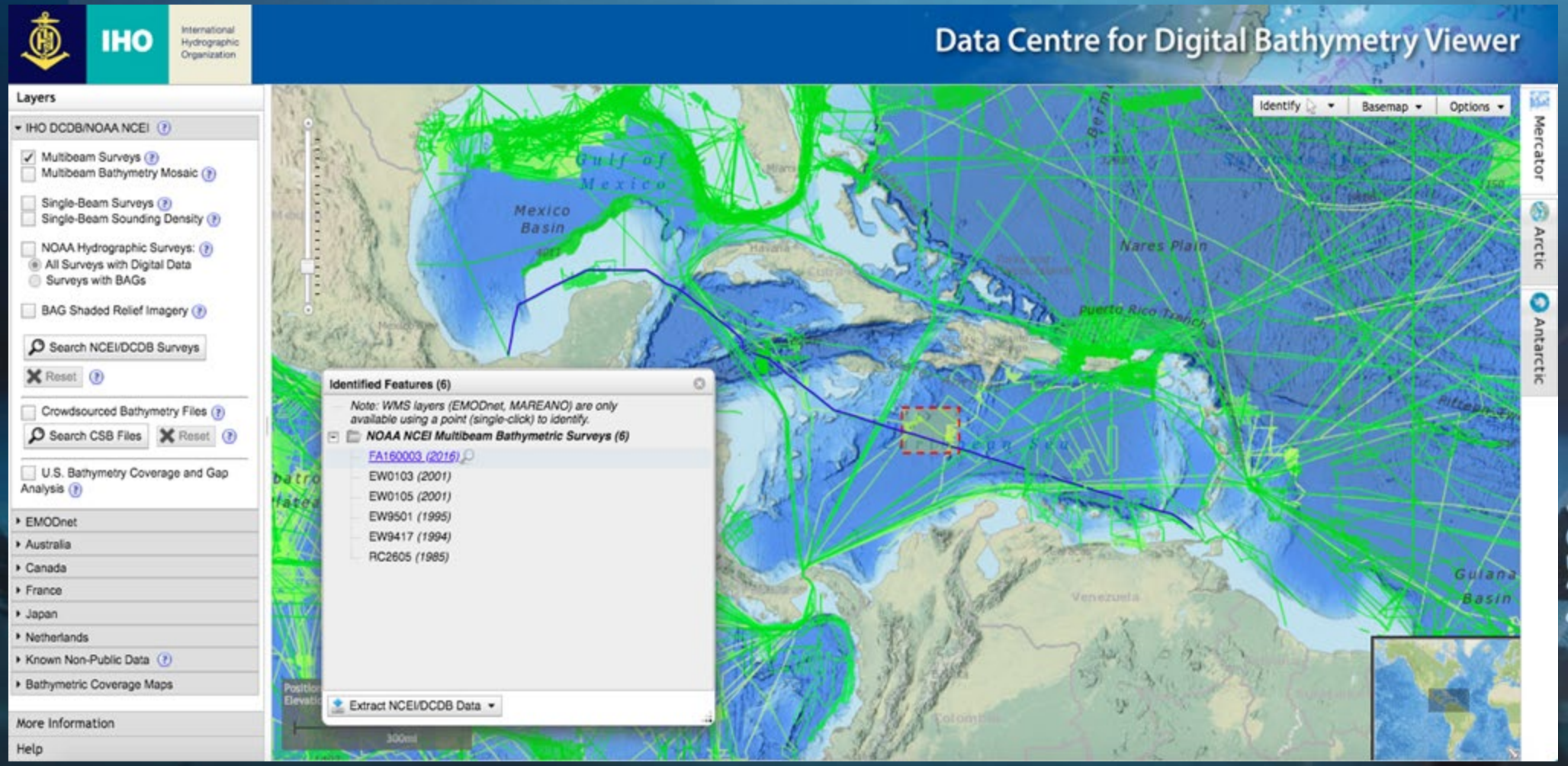
> *The IHO DCDB is the recognized IHO repository for all ocean bathymetric data.*

The DCDB works closely with the Seabed 2030 Project to provide long-term preservation, discovery and access of source bathymetry data.

www.ngdc.noaa.gov/iho/



Extracting Data from IHO DCDB:
Download Swath Files



https://www.ncei.noaa.gov/maps/iho_dcdb/

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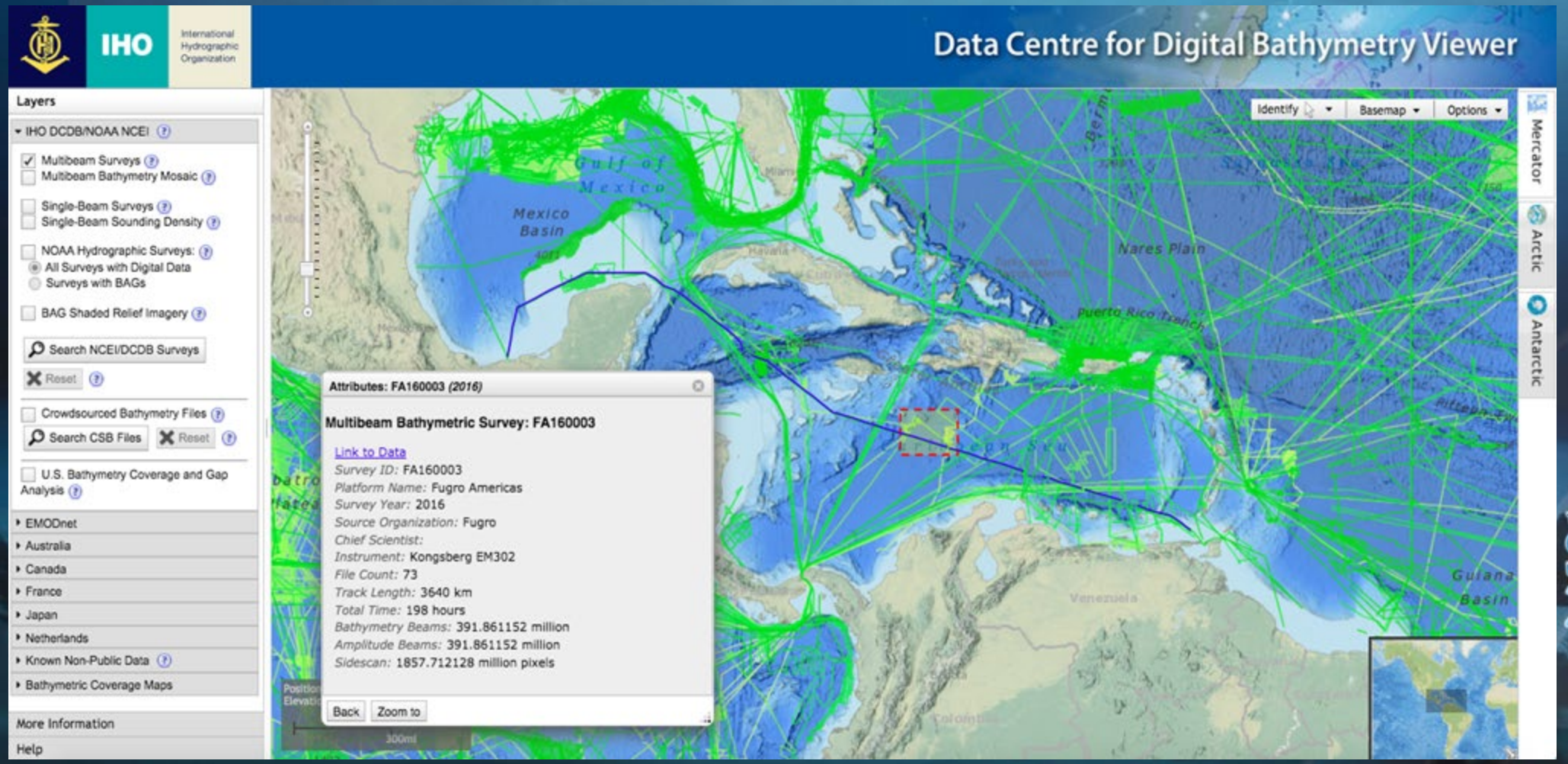

https://www.ncei.noaa.gov/maps/iho_dcdb/

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Multibeam Report for FA160003

Ship Name:	Fugro Americas
Chief Scientist:	
Source Organization:	Fugro
Start Date:	2016-09-30
End Date:	2016-10-15

View ISO Metadata

Download / Request All Files

[Expand All] [Collapse All]

File Information

Full Resolution Bathymetry as collected (raw): 73

Files	File Size	Description
0007_20161006_161234_Fugro_Americas.all.mb58.gz	1021.31MB	Kongsberg multibeam vendor format
0008_20161006_191233_Fugro_Americas.all.mb58.gz	289.33MB	Kongsberg multibeam vendor format
0009_20161006_221236_Fugro_Americas.all.mb58.gz	209.06MB	Kongsberg multibeam vendor format
0010_20161007_011234_Fugro_Americas.all.mb58.gz	268.33MB	Kongsberg multibeam vendor format
0011_20161007_041233_Fugro_Americas.all.mb58.gz	127.68MB	Kongsberg multibeam vendor format
0012_20161007_071237_Fugro_Americas.all.mb58.gz	97.50MB	Kongsberg multibeam vendor format
0013_20161007_101233_Fugro_Americas.all.mb58.gz	106.00MB	Kongsberg multibeam vendor format
0014_20161007_131237_Fugro_Americas.all.mb58.gz	122.78MB	Kongsberg multibeam vendor format
0015_20161007_161241_Fugro_Americas.all.mb58.gz	122.37MB	Kongsberg multibeam vendor format

Multibeam Bat

Cruise Det

Project: Tra

Instrument: Ko

Data Quali

Number of Files:

Request Summary | Multibeam Surveys 1 | Help

Data Request Summary:

Multibeam Surveys

Files: 74

Compressed Size: 16.2 GB

Request Data:

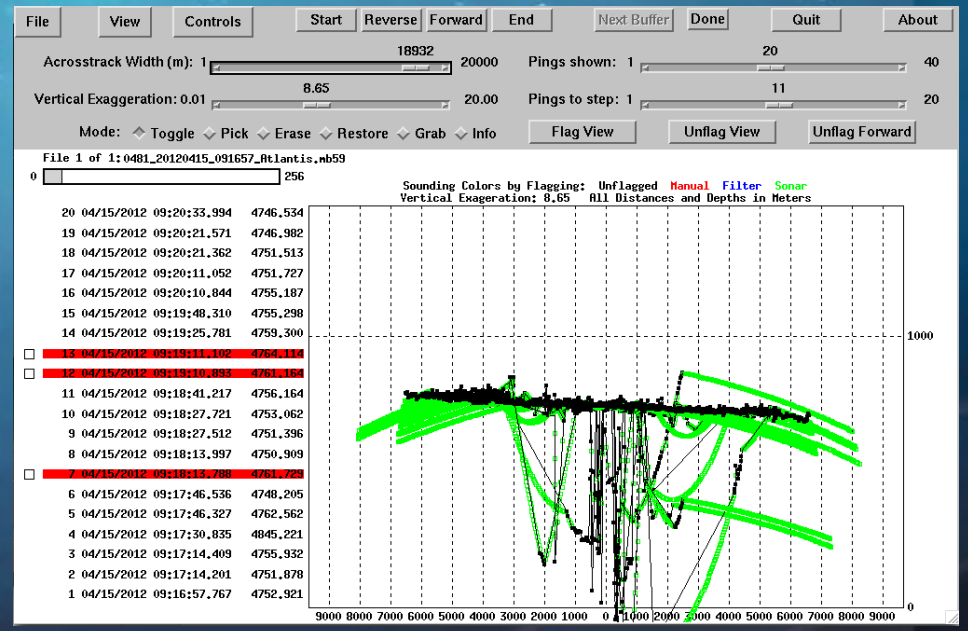
Email | Submit Request

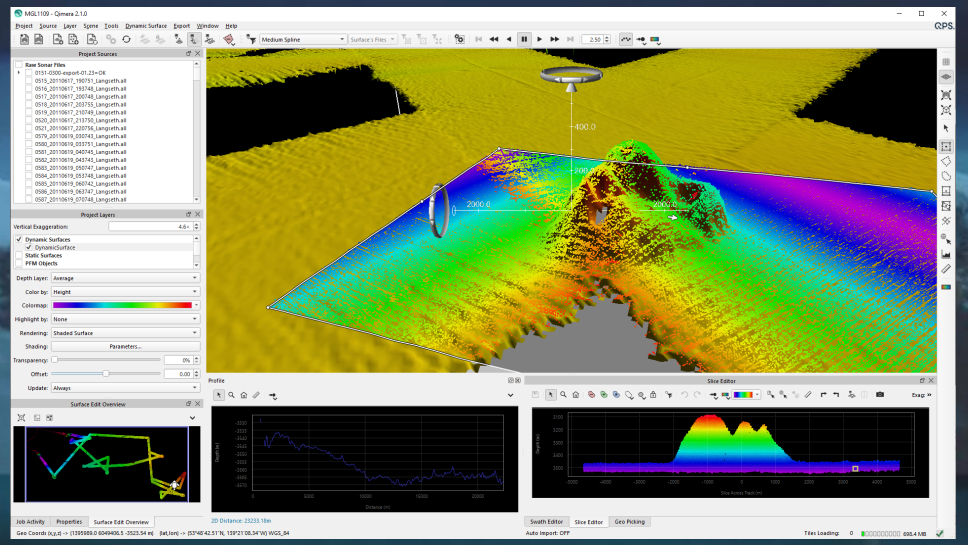
0032_20161009_191223_Fugro_Americas.all.mb58.gz	128.37MB	Kongsberg multibeam vendor format

Transforming Swath Files into Grids

Several tools are available

- Open Source
- Commercial





MB SYSTEM

THE GENERIC MAPPING TOOLS

Qimera.

TELEDYNE CARIS
Everywhereyoulook™
Part of the Teledyne Imaging Group

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IHO – IOC GEBCO Cook Book

A technical reference manual on how to build bathymetric grids

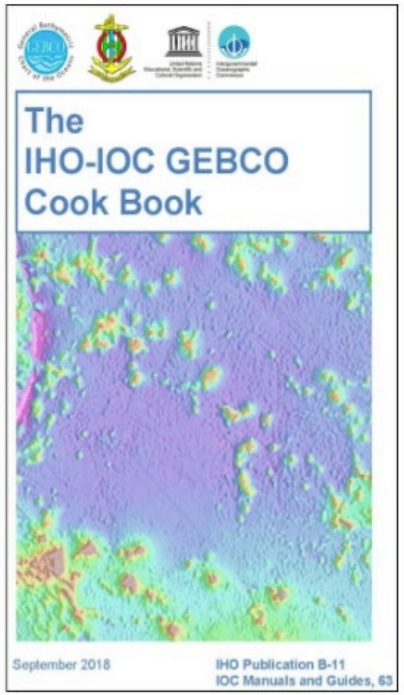
GEBCO aims to provide the most authoritative publicly available bathymetric data sets for the world's oceans.

In order to assist and encourage further participation in bathymetric grid development work, GEBCO has created a technical reference manual, the IHO-IOC GEBCO Cook Book, on how to build bathymetric grids.

Access a copy of the IHO-IOC GEBCO Cook Book from web pages hosted at the US Dept. of Commerce, National Oceanic and Atmospheric Administration (NOAA) Laboratory for Satellite Altimetry.

A wide range of topics are included, for example

- gathering data
- data cleaning
- gridding examples
- software overviews



The IHO-IOC GEBCO Cook Book includes input from a number of individuals and organisations, all of whom are experts in their respective fields.

Originally released in October 2012, find out what's new in the latest (October 2019) release.

https://www.gebco.net/data_and_products/gebco_cook_book/

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Questions?

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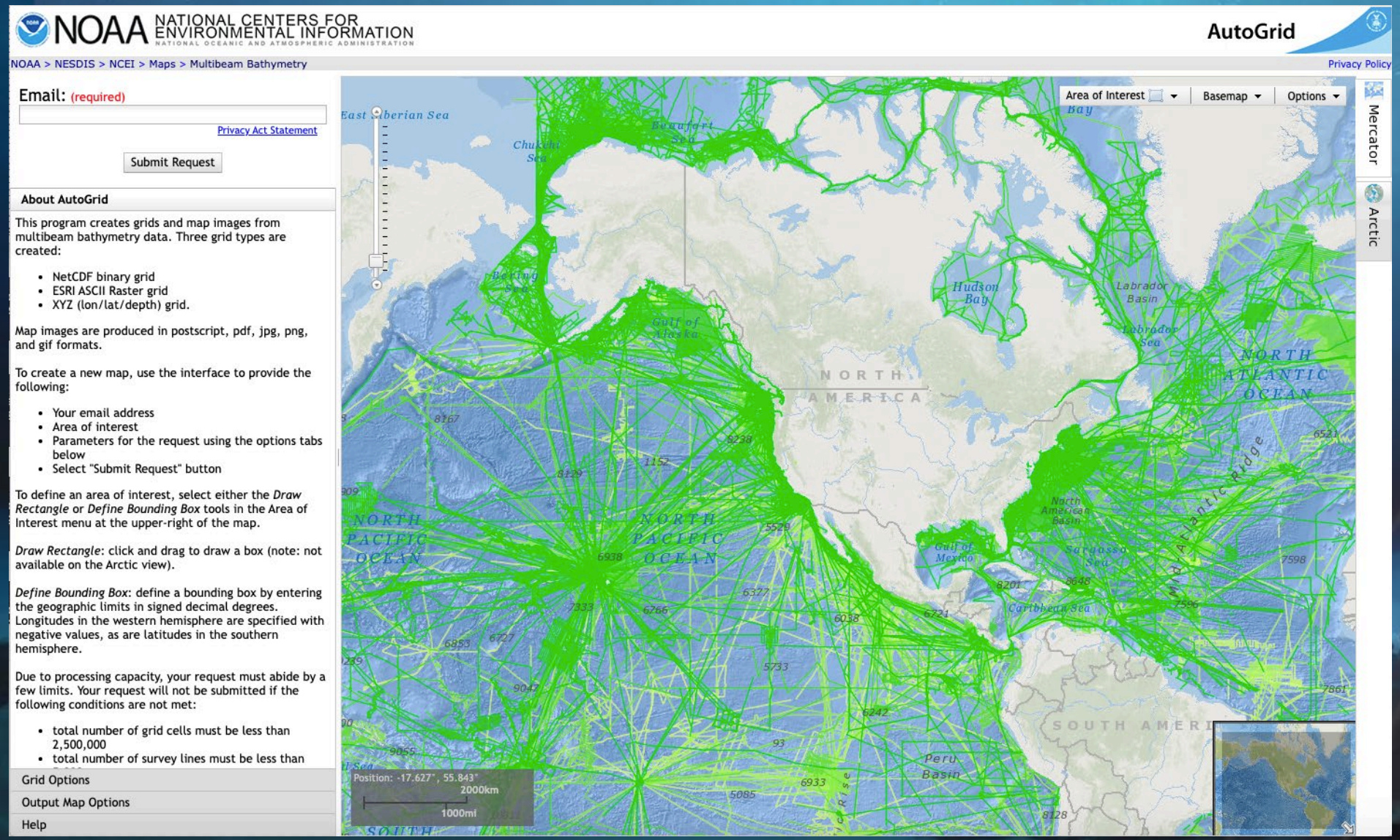
Extracting Data from IHO DCDB: NOAA Auto-Grid



https://www.ngdc.noaa.gov/maps/autogrid/

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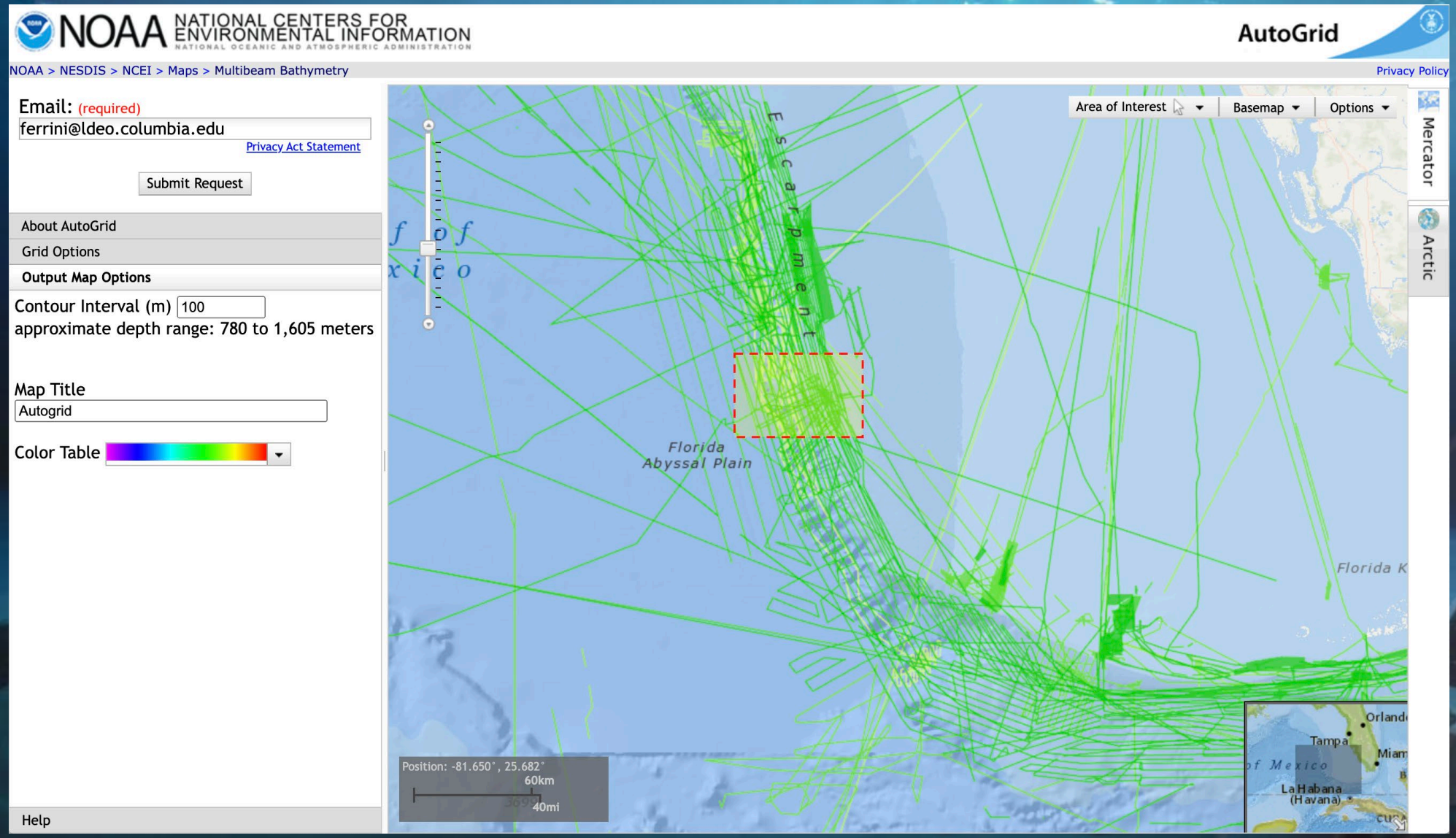

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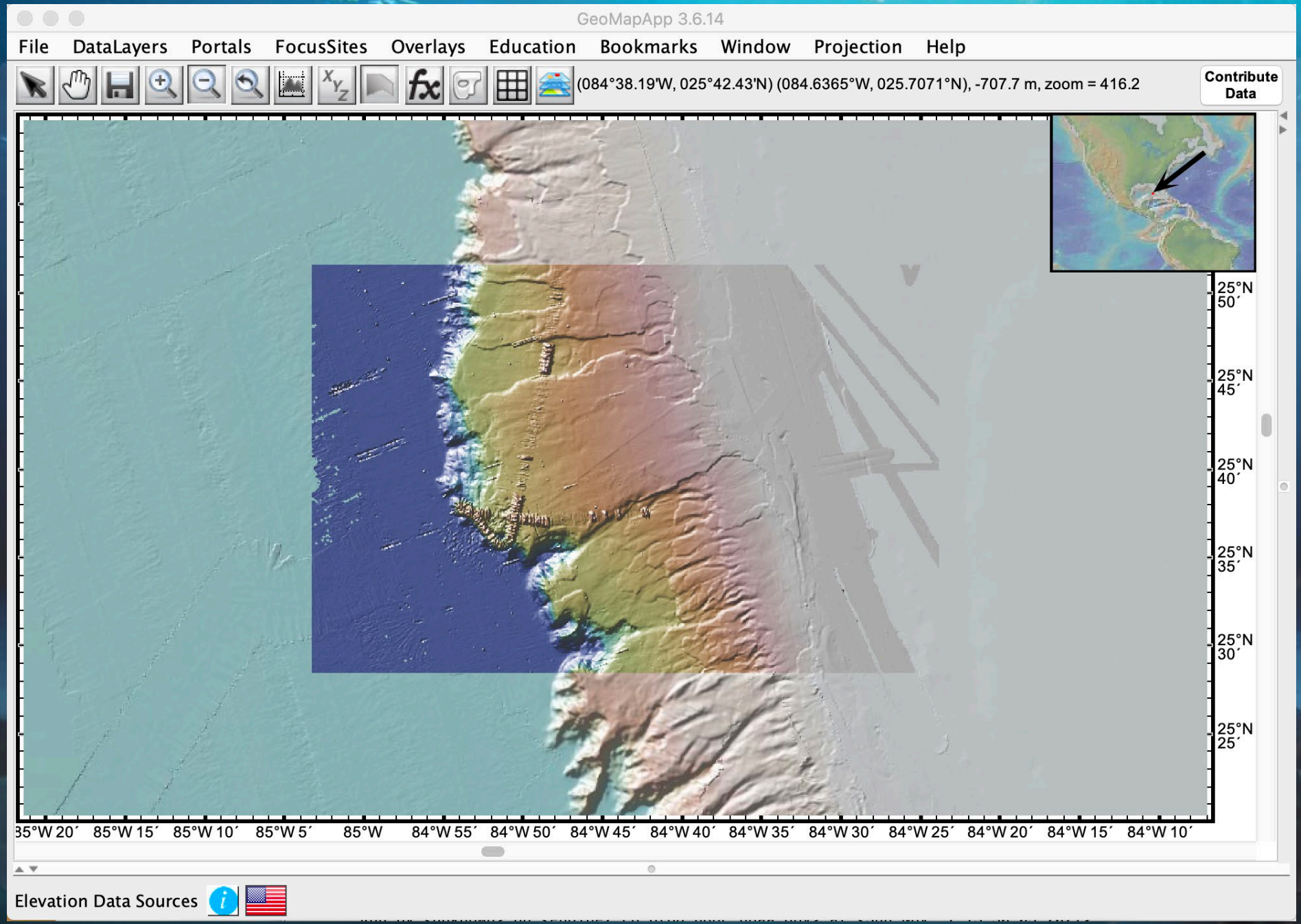

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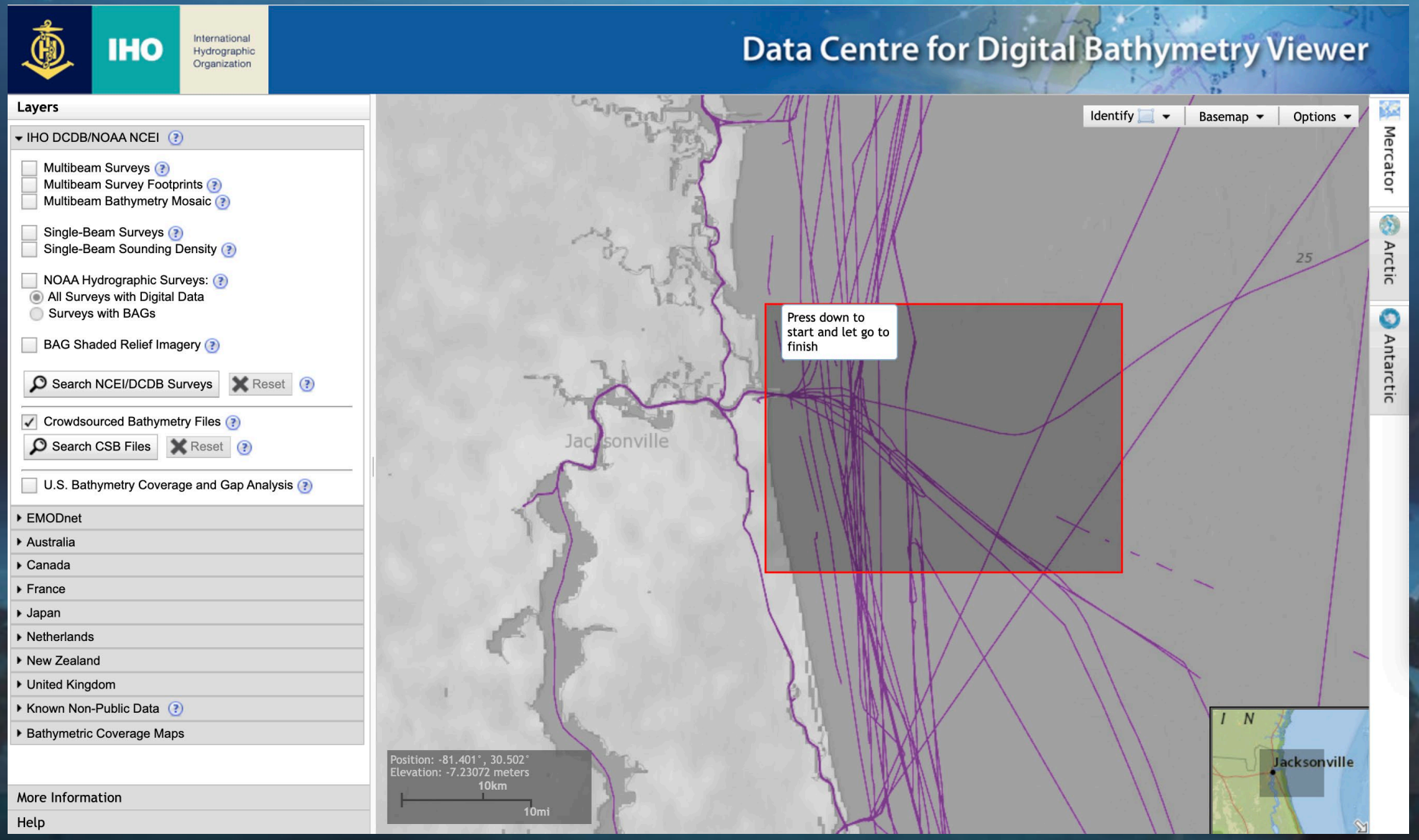
https://www.geomapapp.org

Extracting a CSB grid from DCDB



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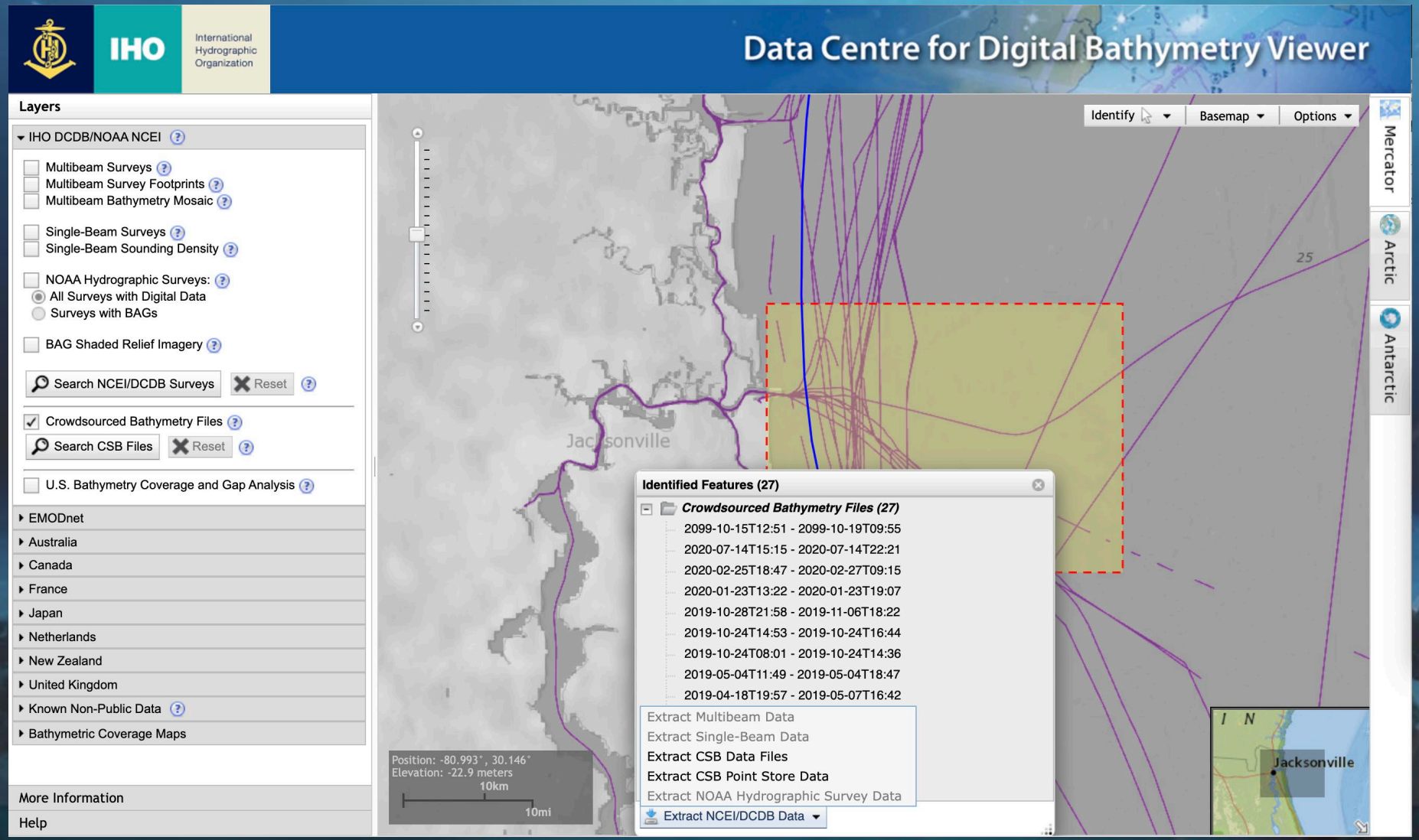
Extracting a CSB grid from DCDB



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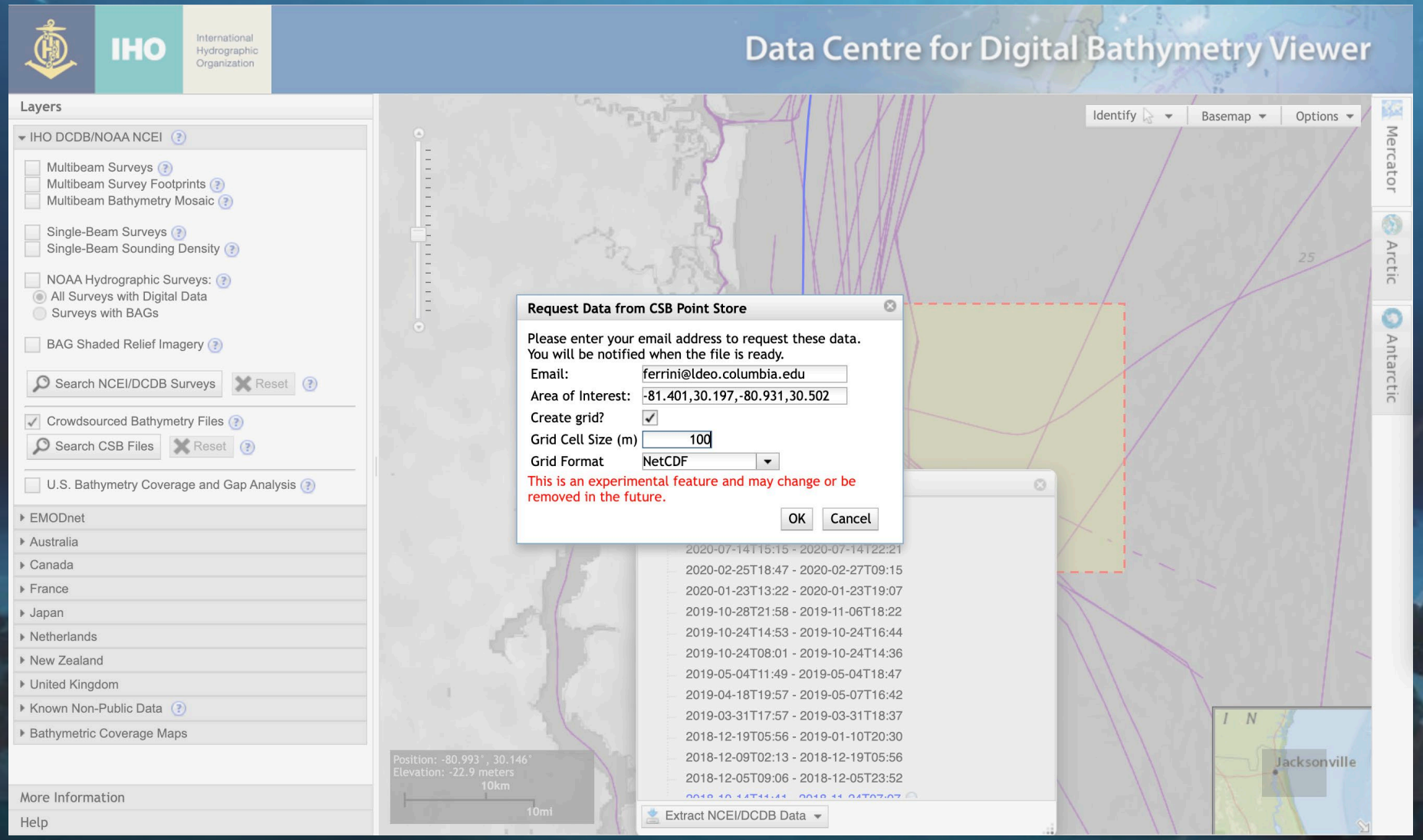
Extracting a CSB grid from DCDB



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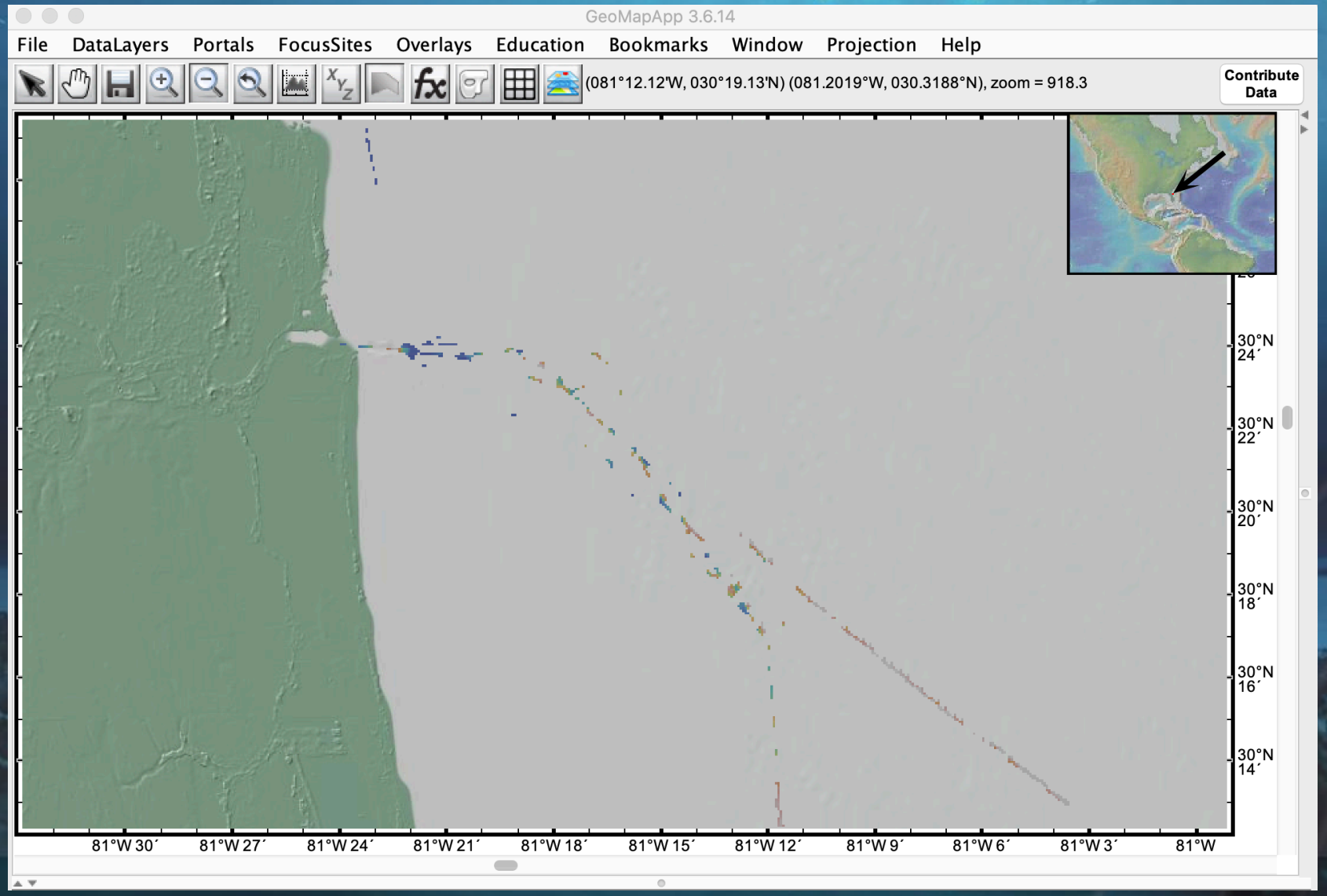

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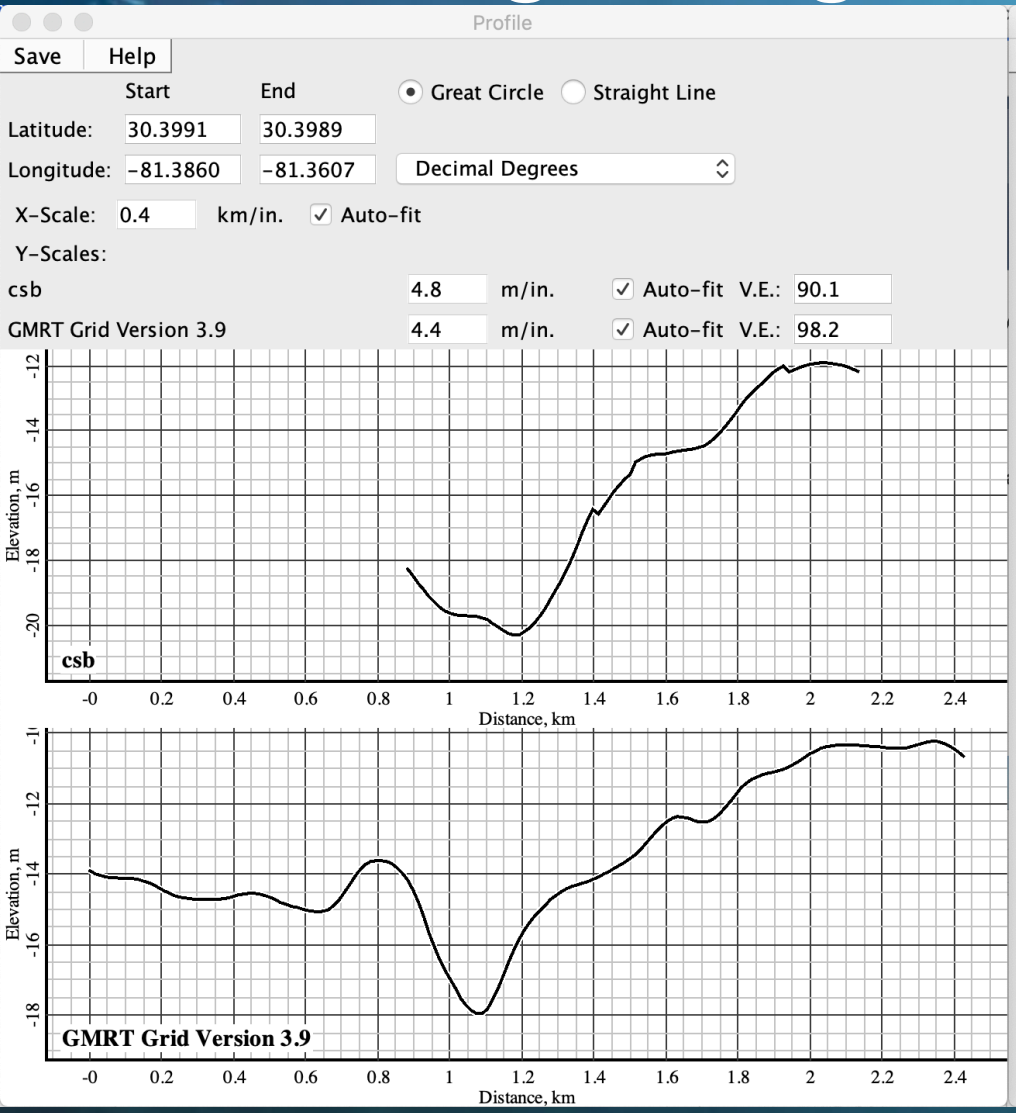

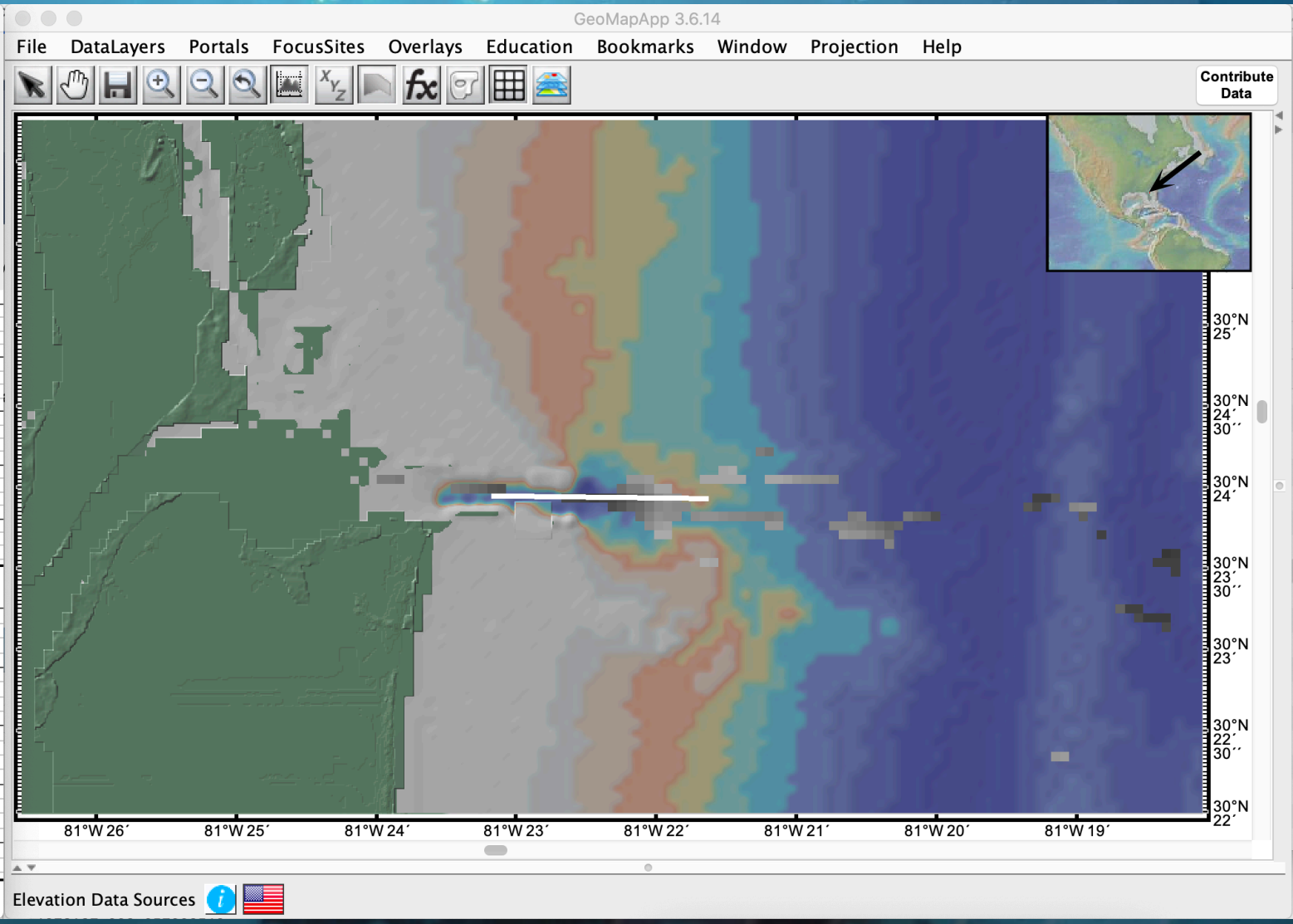

https://www.geomapapp.org

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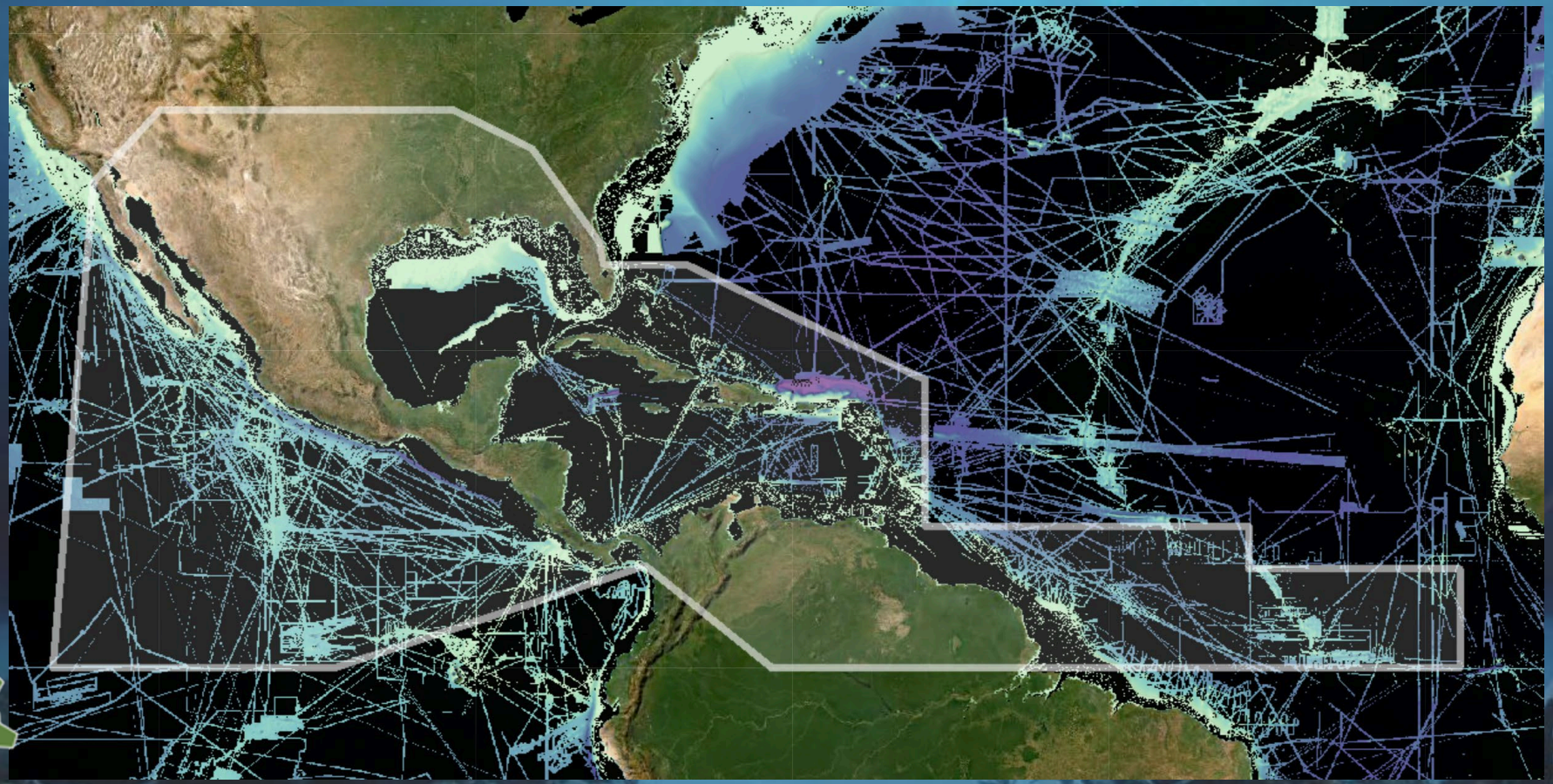
Assembling the Regional Grid



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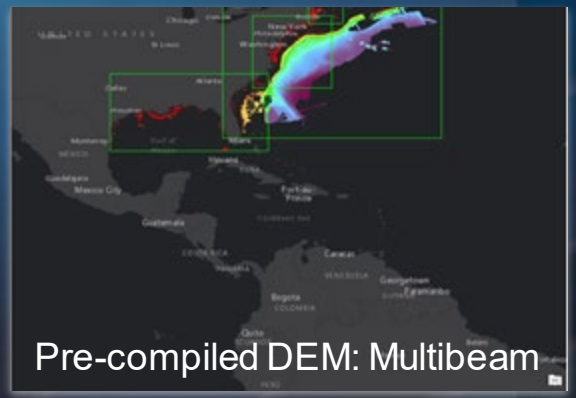
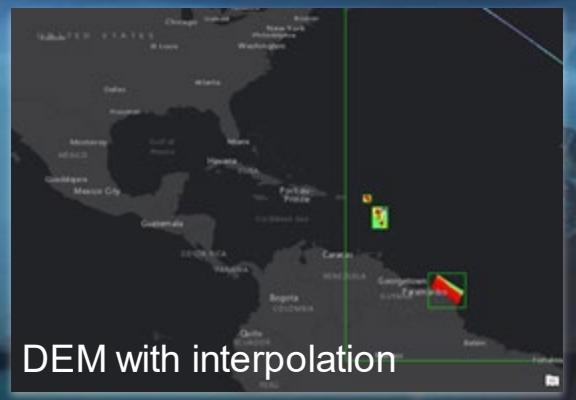
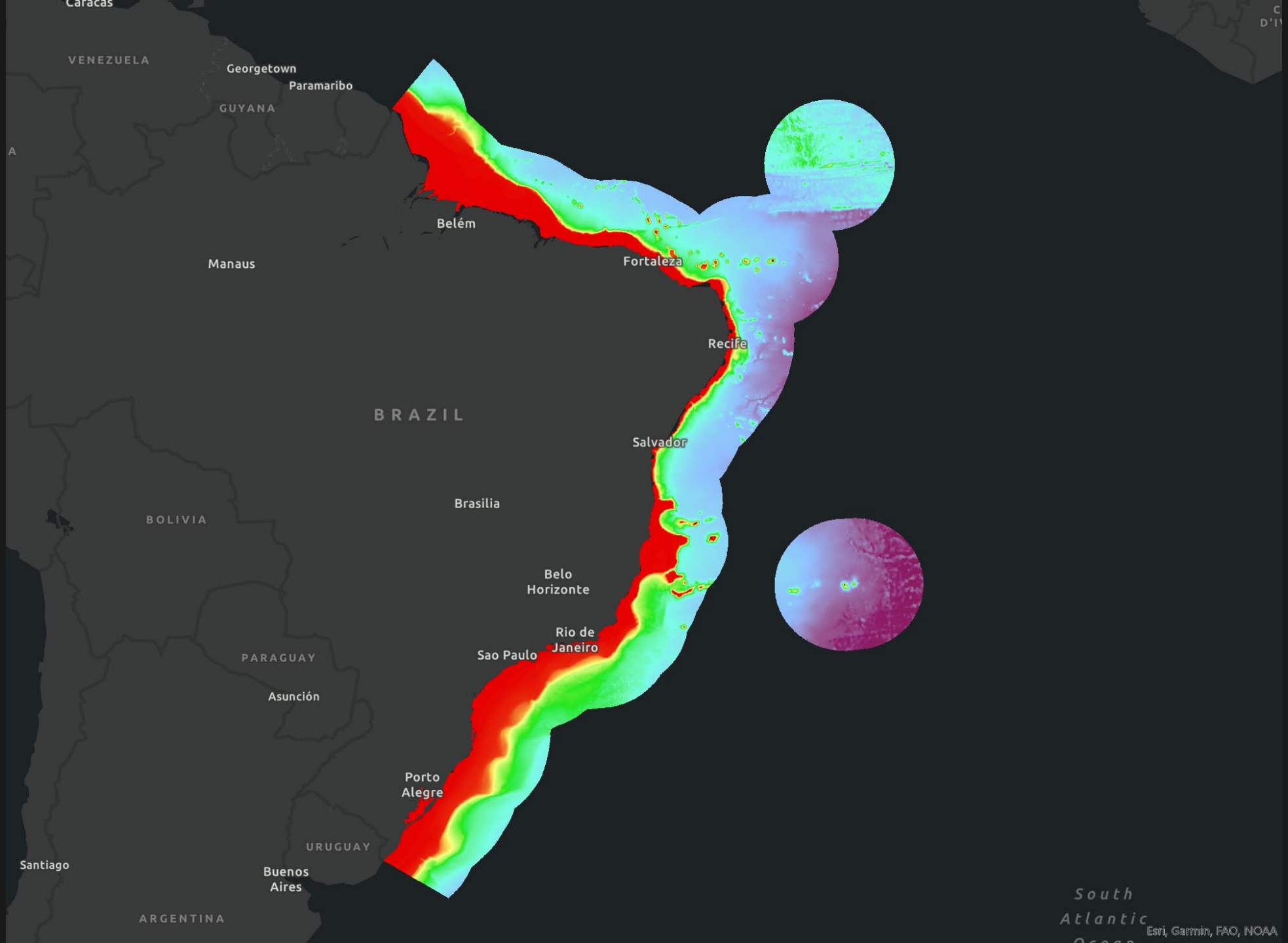
Assembling the Regional Grid

Integrate *gridded* data

- Variable gridding algorithms
- Swath files
  - cleaned, gridded and blended
- Gridded contributions (DEMs)
  - BAGs, geotiffs, grd
- Sparse data
  - ENC, singlebeam, CSB



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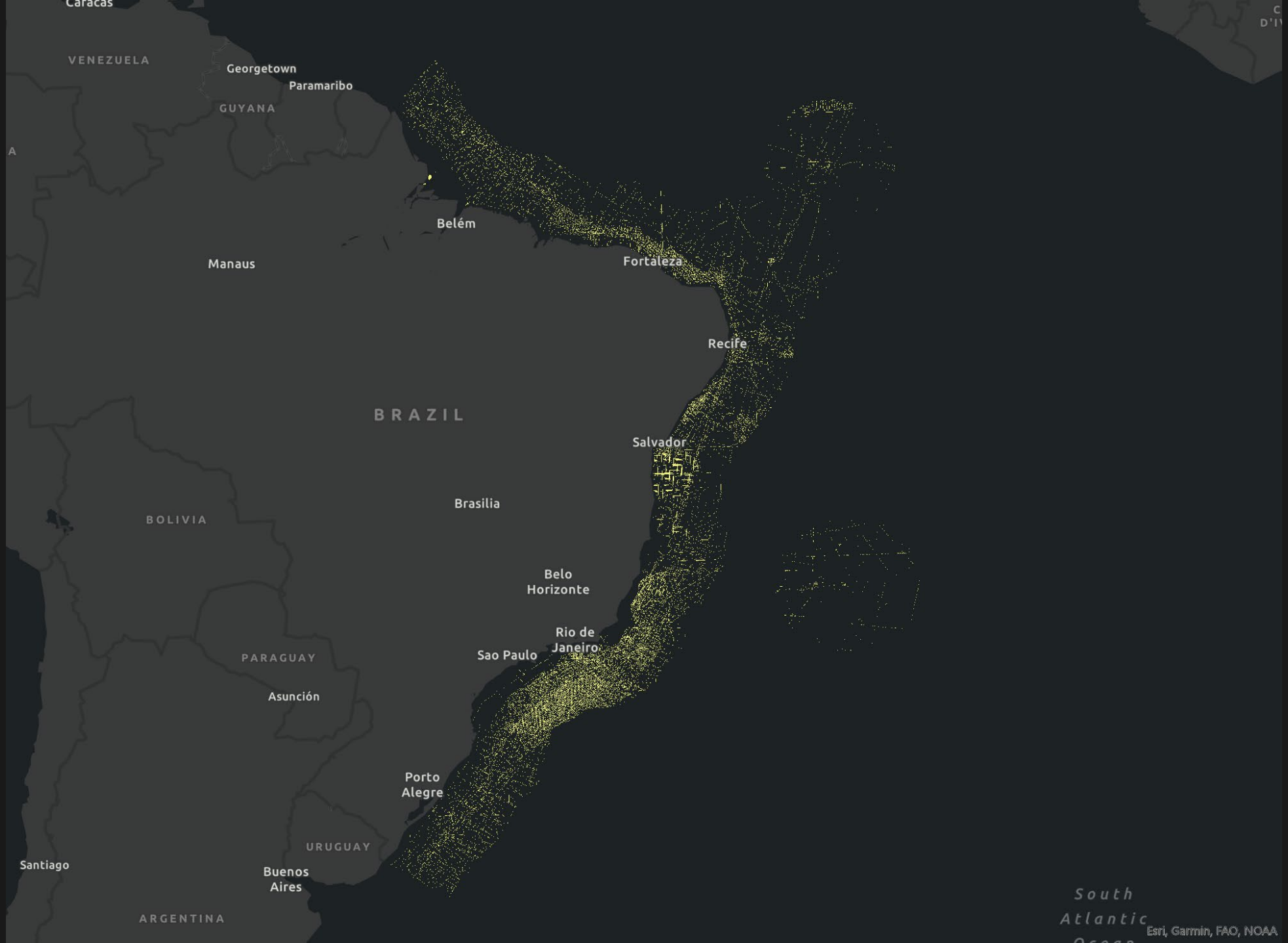
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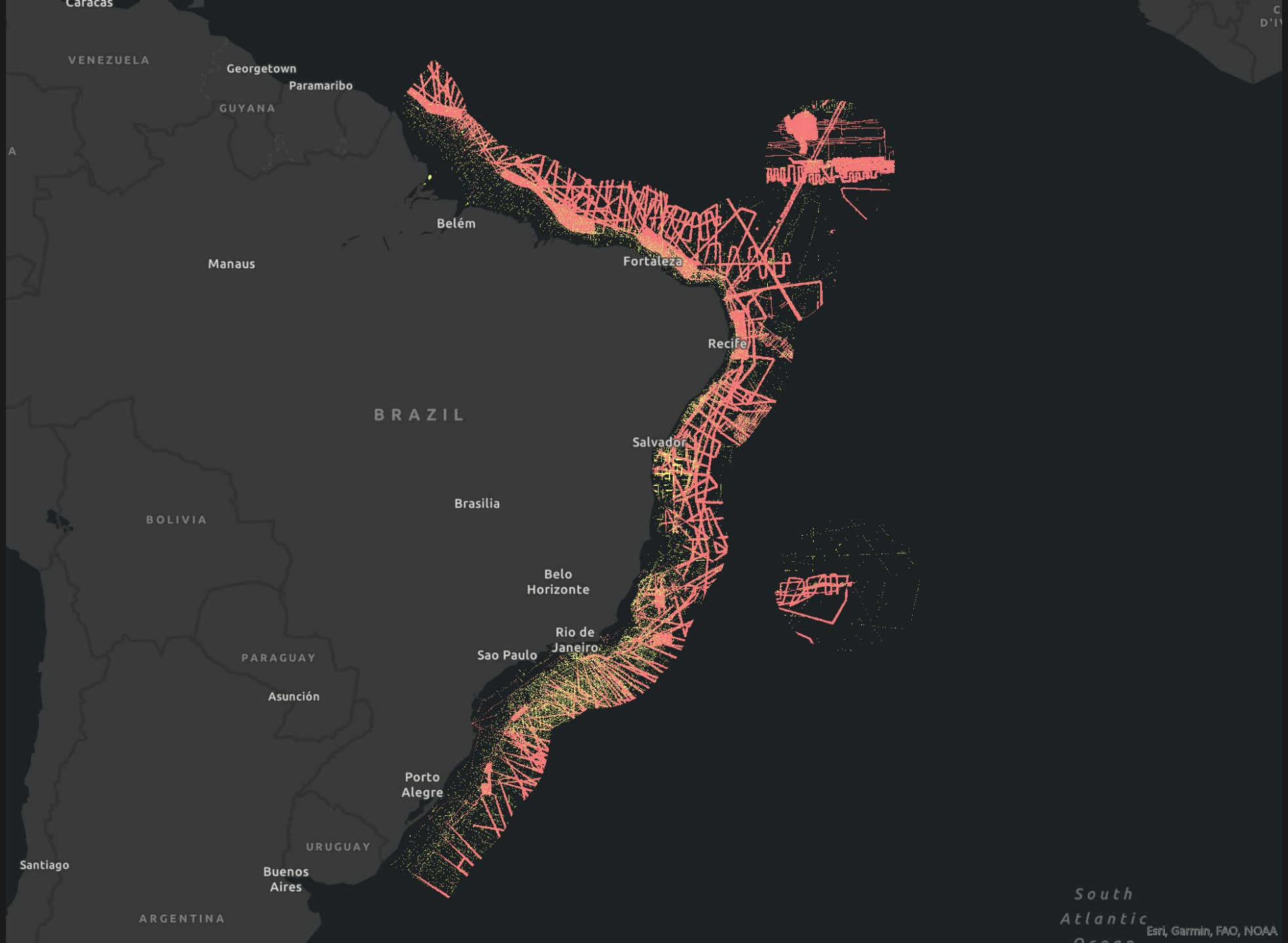
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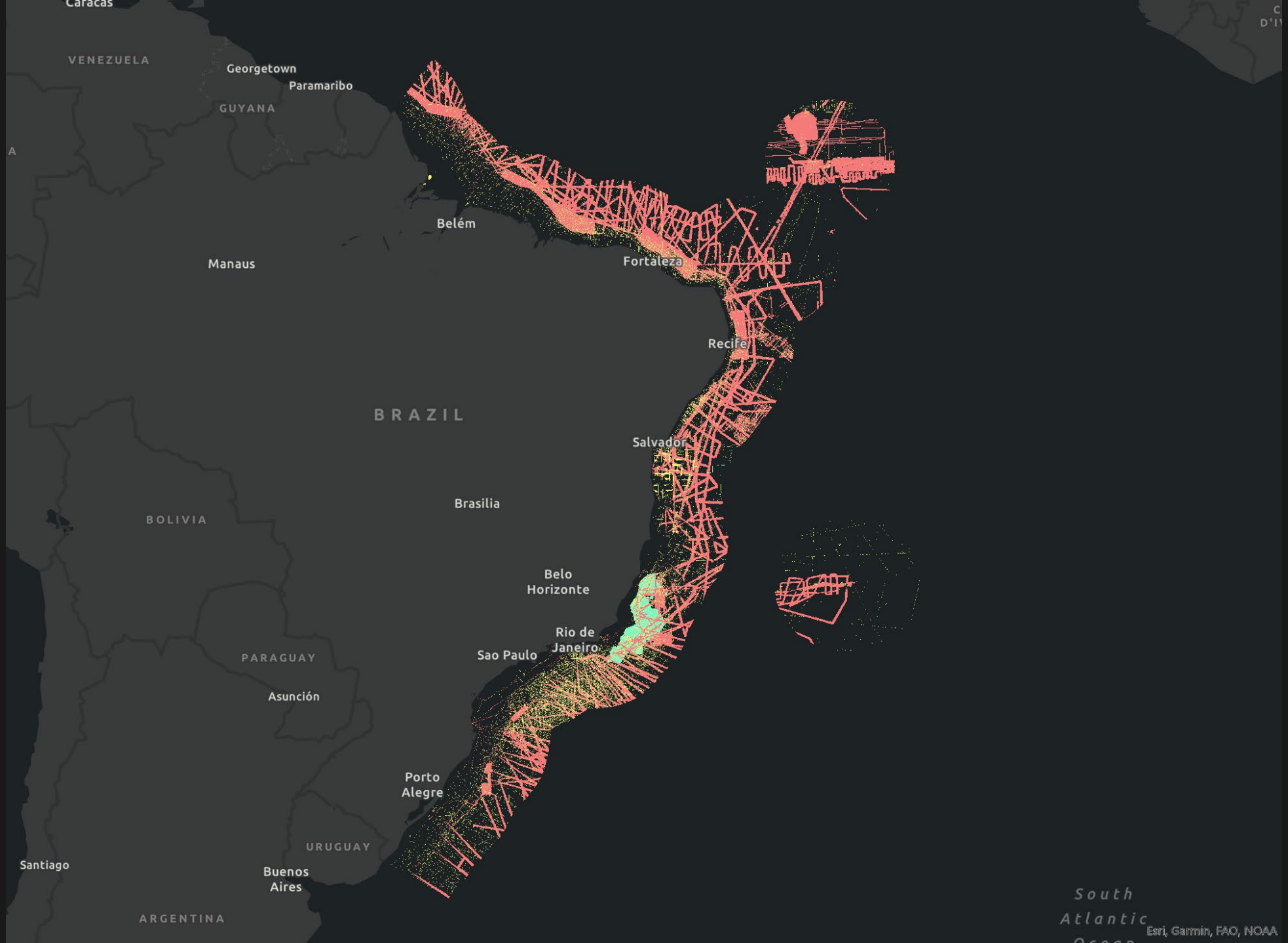
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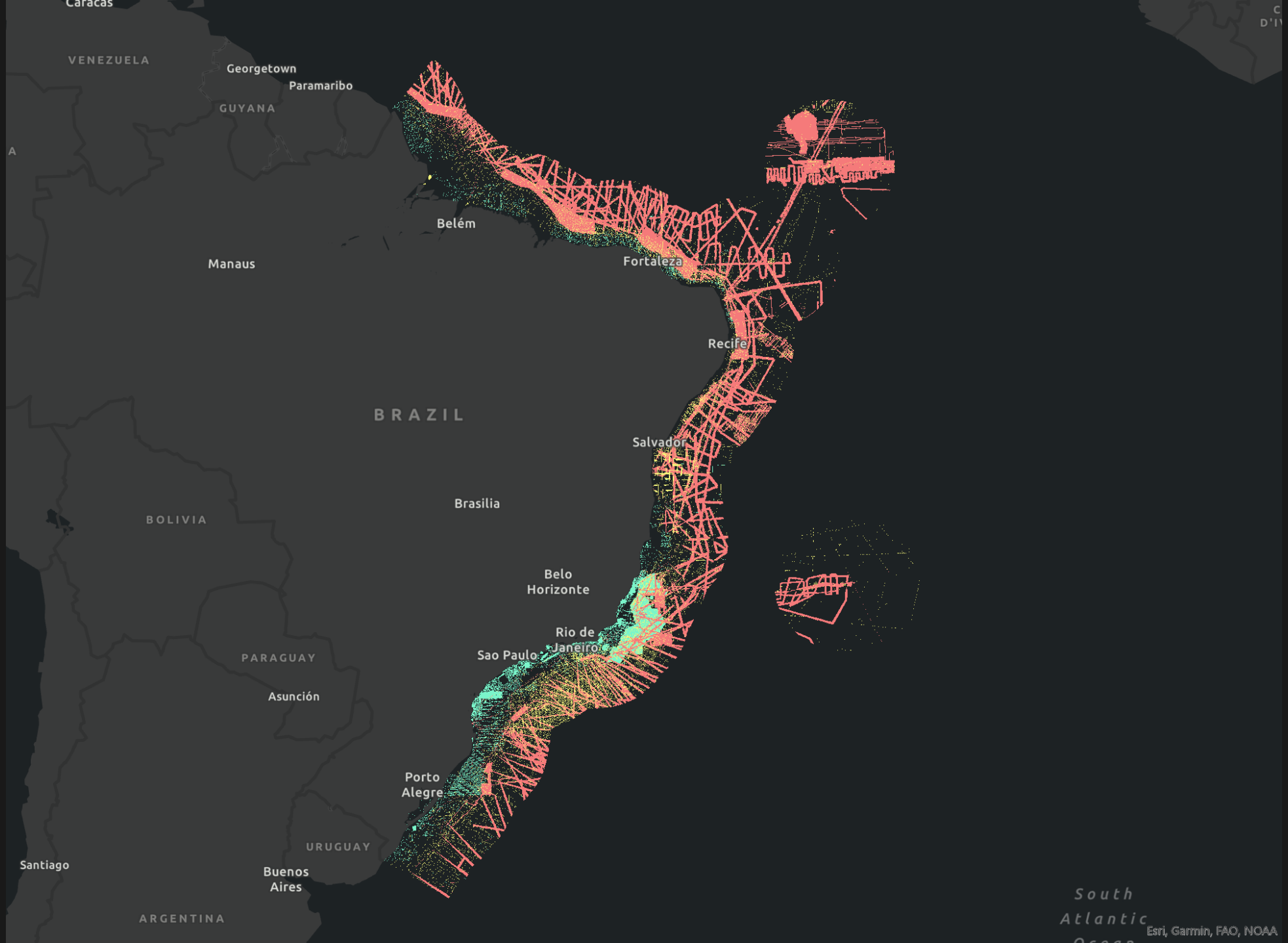
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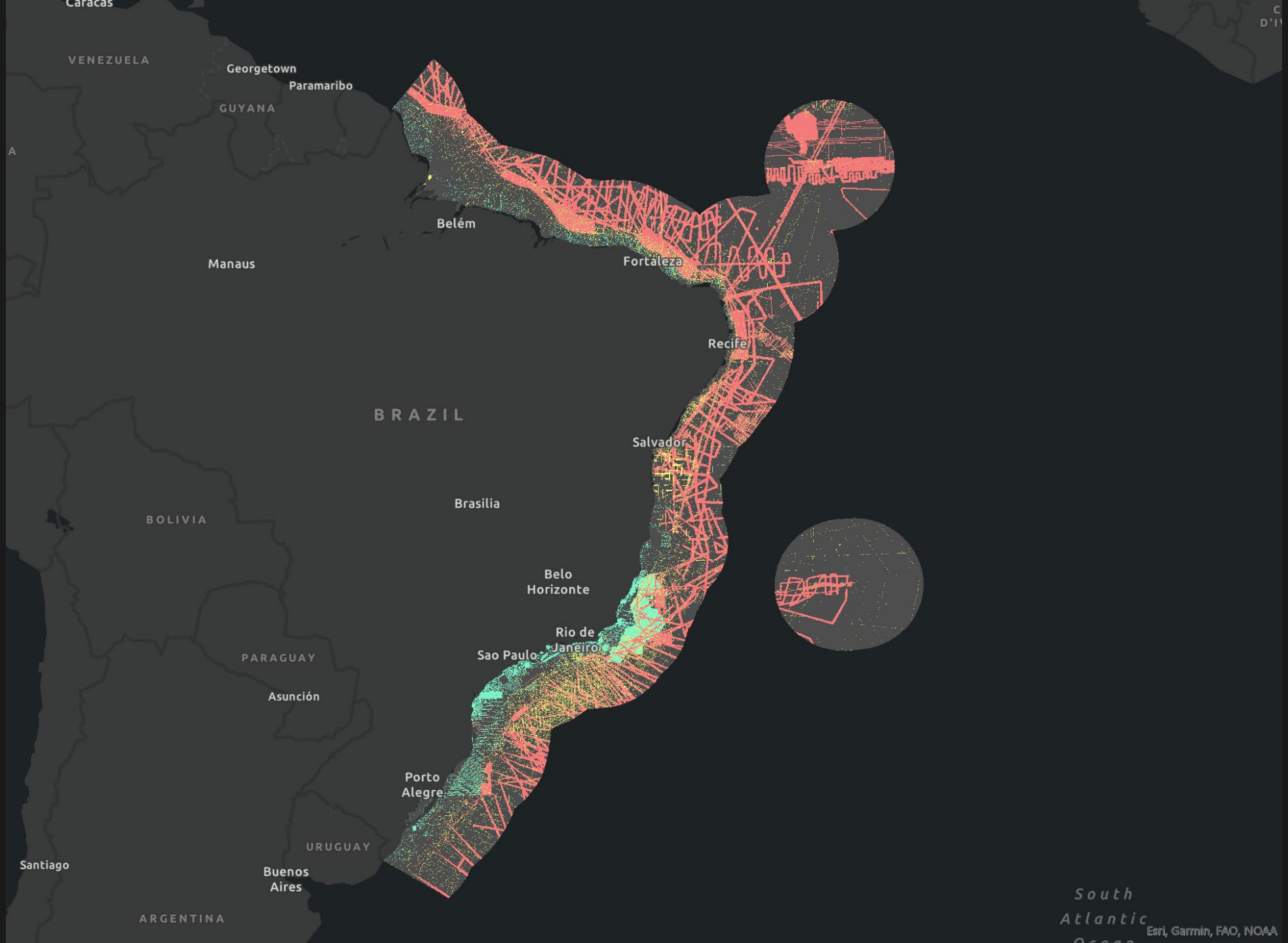
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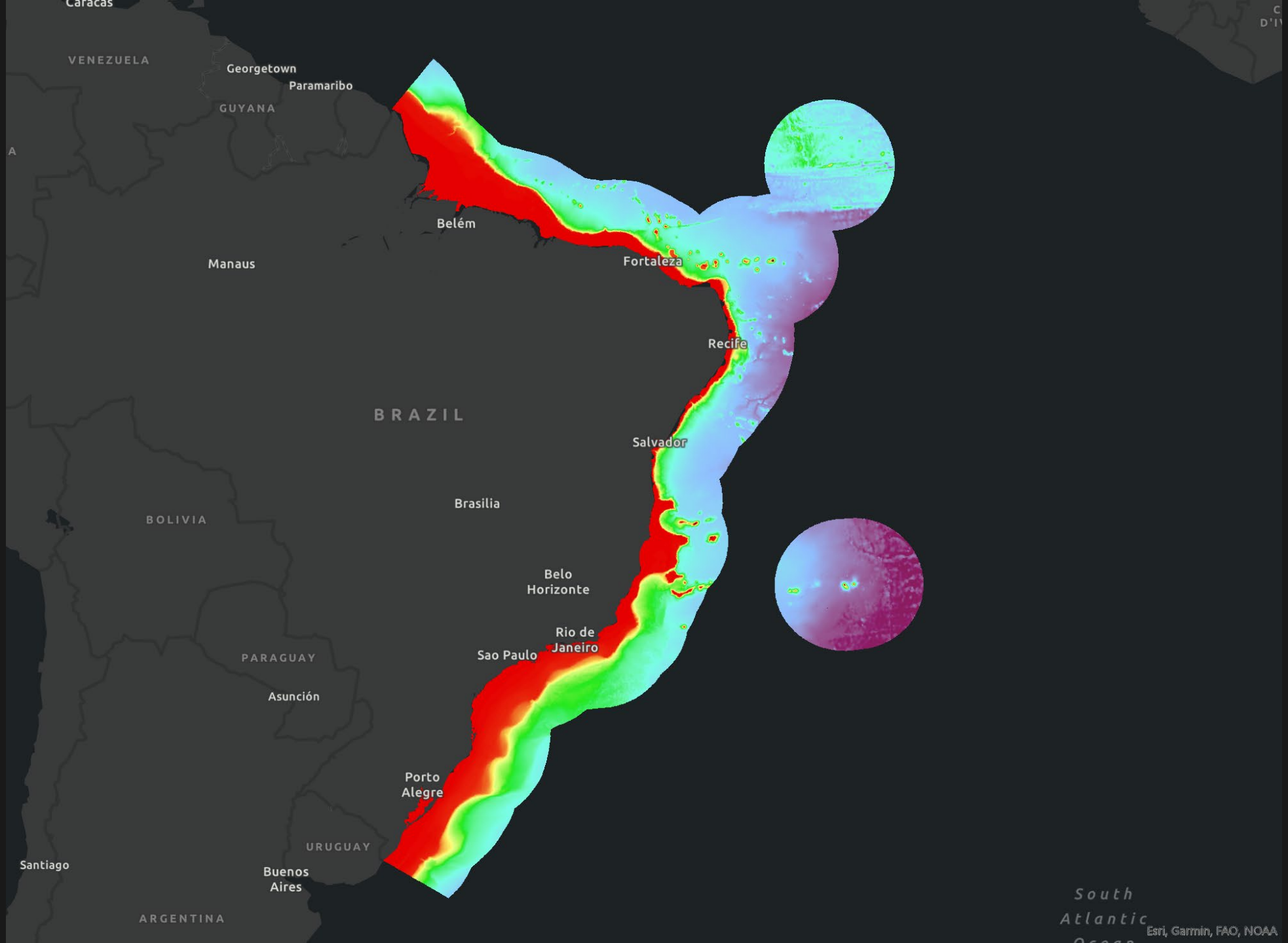
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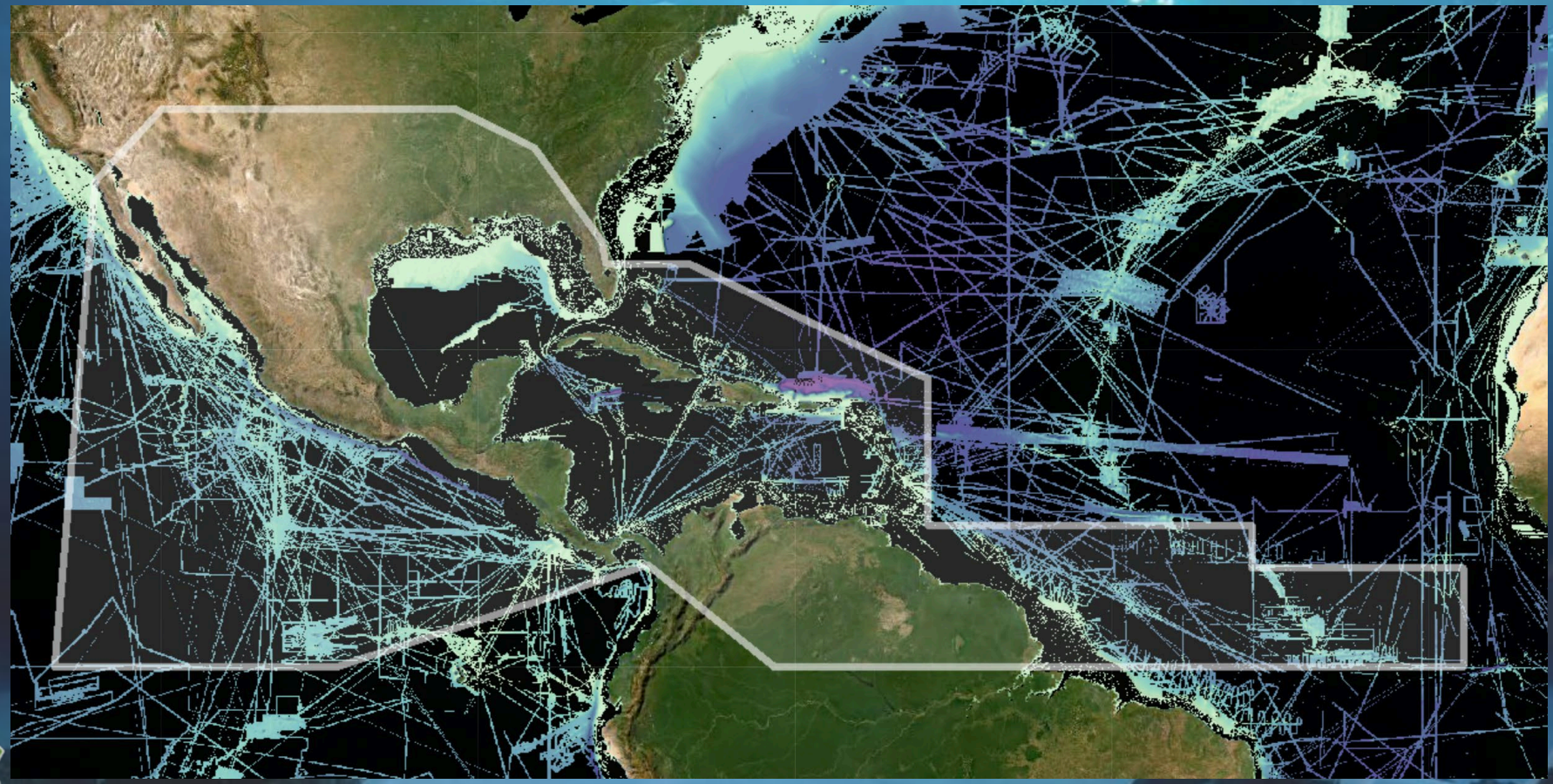
Status of Mapping in the MACHC Region

Status of Mapping in the MACHC Region



GEBCO 2020: 20% mapped
GEBCO 2021: **23%** mapped

Thank you to all data contributors!!!

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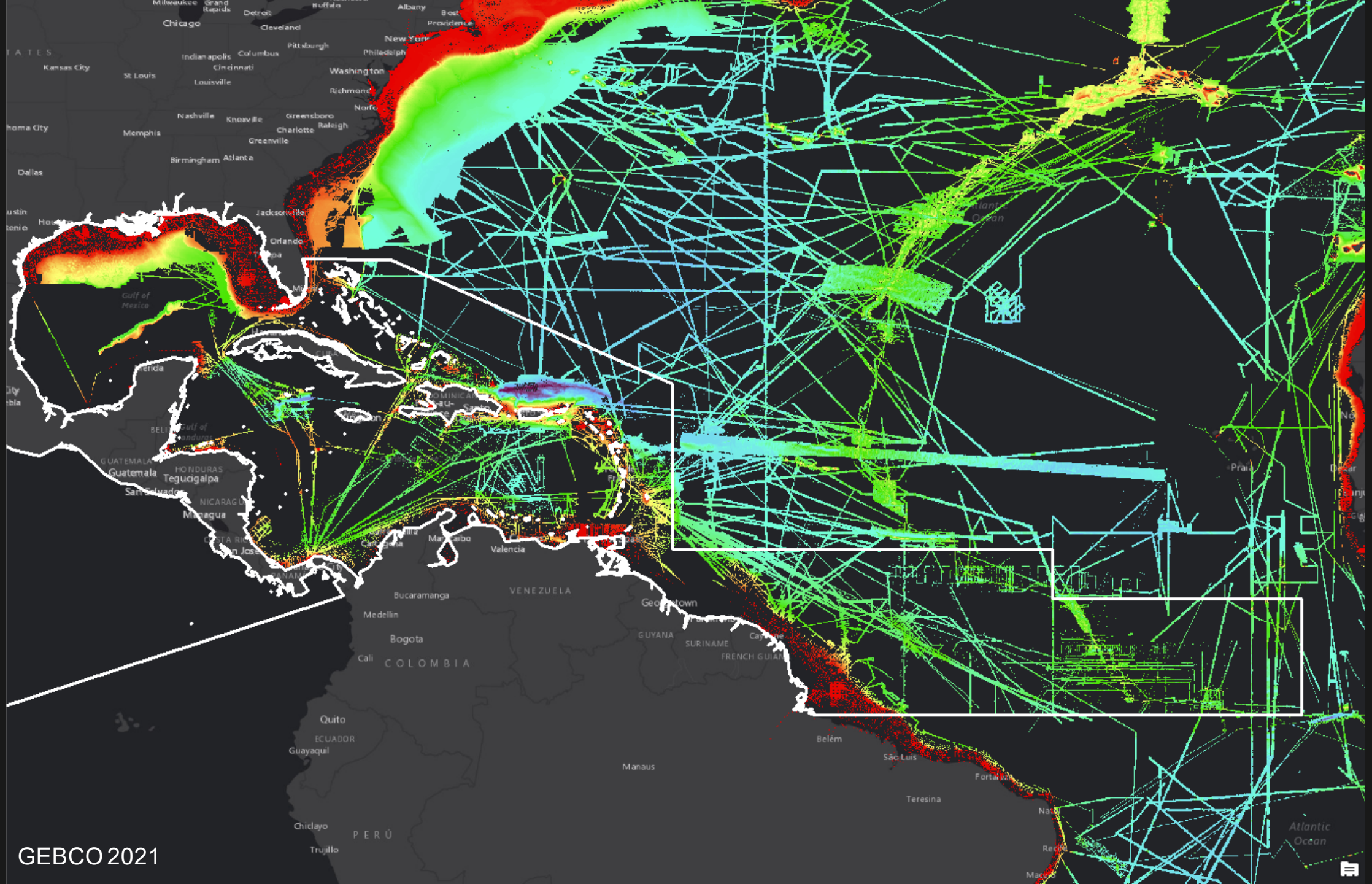
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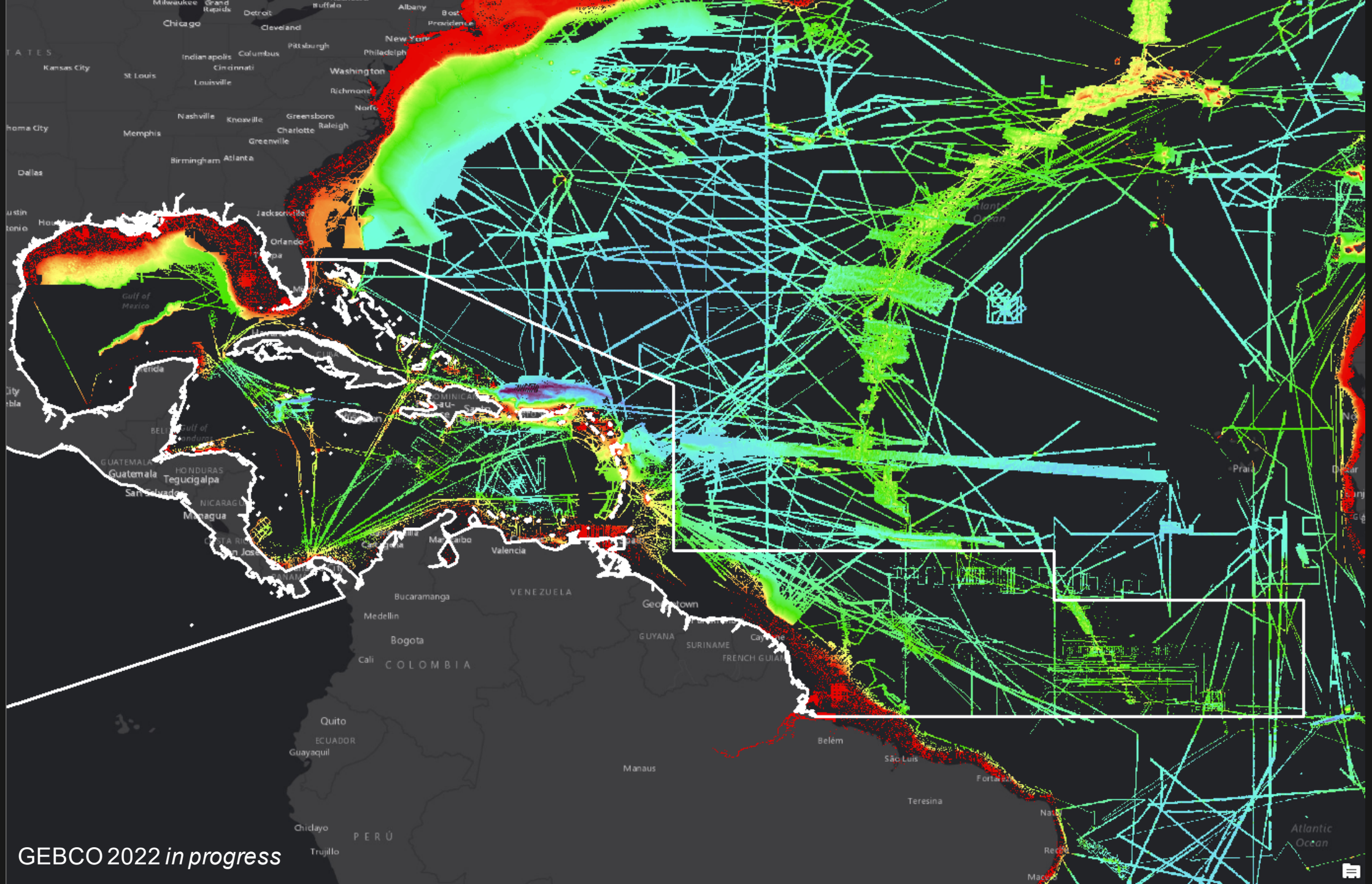
Atlantic Ocean
GEBCO 2021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GEBCO 2022 *in progress*

Thank you to all Data Contributors in the MACHC Region!!

- More than 30 gridded data sets *and growing!*
- Data contributions from many organizations within several countries

Brazil, Dominican Republic, France, Germany, Japan, Netherlands, Norway, Russia, USA, Venezuela…

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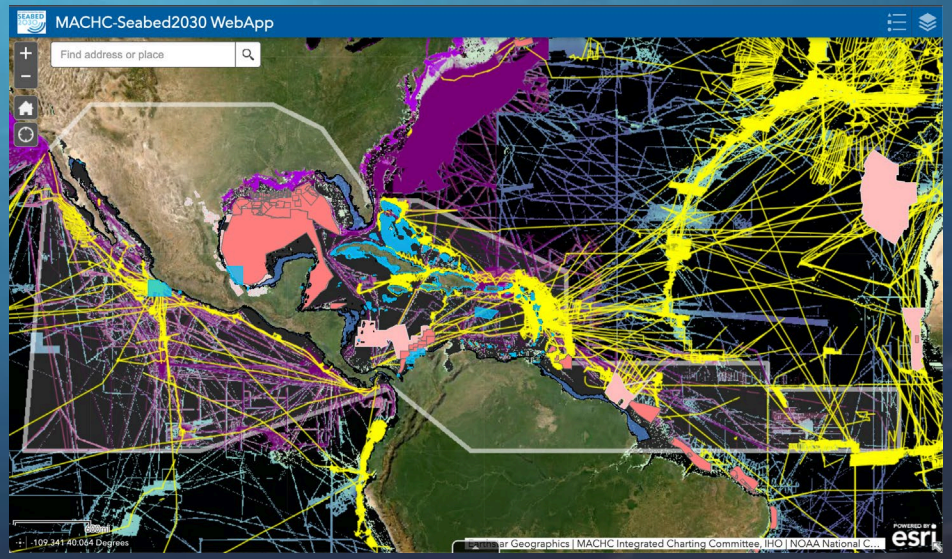
We are here to help!

- Please contact us with:
  - Technical questions
  - Assistance accessing data
  - Data contributions
  - Metadata contributions
  - Suggestions



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