

THE NIPPON FOUNDATION-GEBCO

SEABED

2030

Report of the Southern  
Ocean Regional Centre  
(SORC)

&

The International Chart  
of the Southern Ocean

Boris Dorschel  
Centre Lead



IHO

International  
Hydrographic  
Organization



2021  
2030 United Nations Decade  
of Ocean Science  
for Sustainable Development

# Update on IBCSO and Seabed 2030 for the Southern Ocean

www.nature.com/scientificdata

## scientific data

OPEN  
DATA DESCRIPTOR

### The International Bathymetric Chart of the Southern Ocean Version 2

Boris Dorschel et al.\*

The Southern Ocean surrounding Antarctica is a region that is key to a range of climatic and oceanographic processes with worldwide effects, and is characterised by high biological productivity and biodiversity. Since 2013, the International Bathymetric Chart of the Southern Ocean (IBCSO) has represented the most comprehensive compilation of bathymetry for the Southern Ocean south of 60°S. Recently, the IBCSO Project has combined its efforts with the Nippon Foundation – GEBCO Seabed 2030 Project supporting the goal of mapping the world's oceans by 2030. New datasets initiated a second version of IBCSO (IBCSO v2). This version extends to 50°S (covering approximately 2.4 times the area of seafloor of the previous version) including the gateways of the Antarctic Circumpolar Current and the Antarctic circumpolar frontal systems. Due to increased (multibeam) data coverage, IBCSO v2 significantly improves the overall representation of the Southern Ocean seafloor and resolves many submarine landforms in more detail. This makes IBCSO v2 the most authoritative seafloor map of the area south of 50°S.

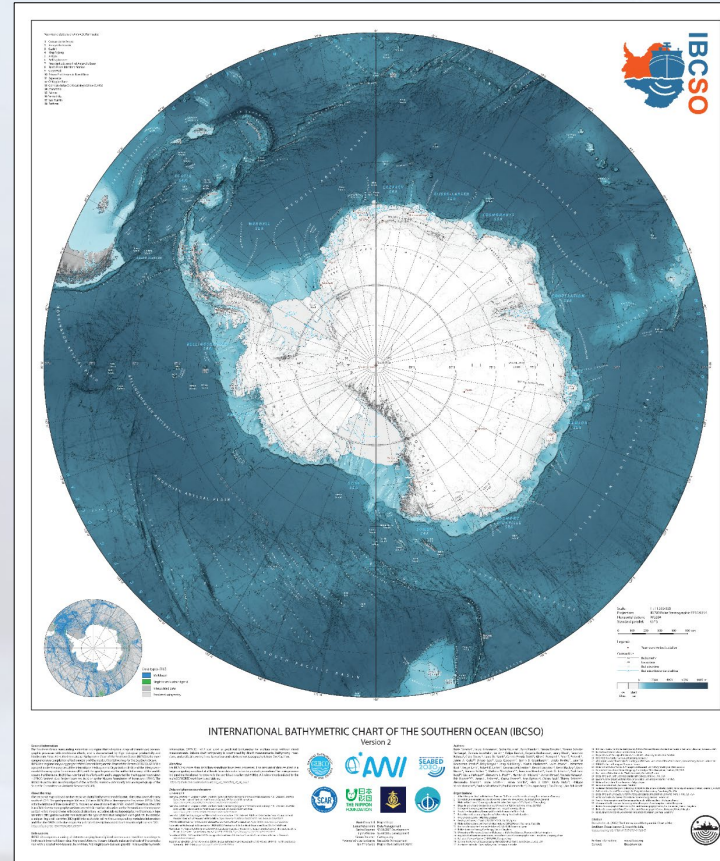
**Background & Summary**  
The Southern Ocean is a major component of the coupled ocean-atmosphere climate system<sup>1</sup> and includes the largest ocean current on earth, the Antarctic Circumpolar Current (ACC). It is furthermore the most important ocean region for the uptake of anthropogenic CO<sub>2</sub> and heat from the atmosphere<sup>2,3</sup>, and cold and dense bottom waters form on the shelves surrounding Antarctica<sup>4,5</sup>. Interactions of the Southern Ocean with Antarctic glaciers and ice shelves are the main drivers of present, past, and future Antarctic ice sheet mass balance<sup>6</sup> and thus global sea-level change. Biologically, the Southern Ocean is a high-productivity area<sup>7</sup> with high biodiversity<sup>8</sup>. The Southern Ocean is also one of the most remote and harshest areas of the world with extensive sea-ice cover and year-round severe weather conditions. Despite its remoteness and hostility, human activities are increasingly extending into this distant part of the world, examples including research, fisheries, and tourism. Precise bathymetric information as e.g. provided by the International Bathymetric Chart of the Southern Ocean (IBCSO) and the Digital Bathymetric Model of the Drake Passage (DBM-BATHORKE)<sup>9</sup> are paramount to better understand the Southern Ocean and its processes as well as for human activities and conservation and management measures<sup>10</sup>. IBCSO aims to provide the most comprehensive compilation of bathymetric data for this region.

IBCSO was initiated in 2006 with the first version published by Arndt et al.<sup>11</sup> in 2013<sup>12</sup>. It is the southern equivalent of the International Bathymetric Chart of the Arctic Ocean (IBCAO), which was originally produced in 2000 and recently released its fourth version<sup>13,14</sup>. Both initiatives are regional mapping projects of the General Bathymetric Chart of the Oceans (GEBCO). GEBCO is a project under the auspices of the International Hydrographic Organization (IHO) and the Intergovernmental Oceanographic Commission (IOC) with the goal to produce the authoritative map of the world's oceans. Furthermore, IBCSO has combined its efforts with and is supported by the Nippon Foundation – GEBCO Seabed 2030 Project launched in 2017 by the Nippon Foundation of Japan and GEBCO<sup>15</sup>. The IBCSO Project is also an integral part of the Antarctic research community and an expert group of the Scientific Committee on Antarctic Research (SCAR).

Initially, IBCSO was limited to the Antarctic Treaty area covering the area south of 60°S with a resolution of 500 m × 500 m in a Polar Stereographic projection<sup>16</sup>. Following the release of Version 1, the user community expressed the wish for an IBCSO reaching to 50°S to cover the entire ACC and the Antarctic circumpolar frontal systems. This request, the growing demand for bathymetric information of the Southern Ocean, and the

\*A full list of authors and their affiliations appears at the end of the paper.

SCIENTIFIC DATA | (2022) 9:275 | https://doi.org/10.1038/s41597-022-01366-7 | 1



Projection	Description	IMAGE	Size (Size) (Bytes)	Binary (Size) (Bytes)
IBCSO projection	IBCSO v2 digital chart		151.5 Mbytes	48.8 Mbytes
IBCSO projection	IBCSO v2 sea-surface		708.4 Mbytes	708.4 Mbytes
WG64	IBCSO v2 sea-surface WG64		54.5 Mbytes	242.6 Mbytes
IBCSO projection	IBCSO v2 sea-surface HGA		161.9 Mbytes	161.9 Mbytes
IBCSO projection	IBCSO v2 bed		180.9 Mbytes	708.4 Mbytes
WG64	IBCSO v2 bed WG64		60.8 Mbytes	242.6 Mbytes
IBCSO projection	IBCSO v2 bed HGA		169 Mbytes	169 Mbytes
IBCSO projection	IBCSO v2 RID		23.3 Mbytes	708.4 Mbytes
WG64	IBCSO v2 RID WG64		9.2 Mbytes	242.6 Mbytes
IBCSO v2 RID metadata	IBCSO v2 metadata		68.4 Mbytes	68.4 Mbytes
IBCSO projection	IBCSO v2 TID		14.7 Mbytes	708.4 Mbytes
WG64	IBCSO v2 TID WG64		5.9 Mbytes	242.6 Mbytes
IBCSO projection	IBCSO v2 coverage		136.5 Mbytes	136.5 Mbytes
WG64	IBCSO v2 coverage WG64		536.5 Mbytes	536.5 Mbytes
	Definition of projection		2 Mbytes	2 Mbytes

Published 07 June 2022



**BBC NEWS**

Home UK World Business Politics Tech

ADVERTISEMENT

Ad

## Antarctica: Southern Ocean floor mapped in greatest ever detail

By Jonathan Amos  
BBC Science Correspondent

8 June 2022

Southern Ocean floor in unprecedented detail

Factorian Deep  
-7,432m

**NATIONAL GEOGRAPHIC**

UMWELT

## Unbekannte Welten im Detail: Neue Karte vom Boden des Südozeans

Der Meeresboden macht den größten Teil der Erdoberfläche aus – und doch wissen wir kaum etwas über seine Beschaffenheit. Eine neue Karte vom Grund des Südlichen Ozeans bringt nun das, was vorher verborgen war, ans Licht.

**SCI NEWS**

### Scientists Create New High-Resolution Map of Southern Ocean

June 9, 2022 by Steve Nadis

After years of plotting, planning, processing and interpreting data, an international team of researchers has now released the most accurate of the International Bathymetric Chart of the Southern Ocean (IBCO 303) yet.

The International Bathymetric Chart of the Southern Ocean (IBCO) is a high-resolution map of the seafloor in the Southern Ocean, one of the world's largest and least explored oceans. The IBCO 303 is a major component of the global seafloor bathymetry data set and includes the largest seafloor extent on Earth, the Antarctic Circumpolar Current.

It is the first time the most important ocean region for the global carbon cycle and climate change has been mapped in such detail. The seafloor topography is a major component of the global climate system and includes the largest seafloor extent on Earth, the Antarctic Circumpolar Current.

It is in fact the most important ocean region for the global carbon cycle and climate change. The seafloor topography is a major component of the global climate system and includes the largest seafloor extent on Earth, the Antarctic Circumpolar Current.

It is also one of the most remote and least explored areas of the world with extensive areas of coral and open-ocean seafloor habitats.

Despite its remoteness and harshly, human activities are increasingly encroaching on this remote part of the world, examples including research, fisheries, and tourism.

Francis Bathrelmy's information are paramount to better understand the Southern Ocean and its processes as well as the human activities and environmental management processes.

"No matter where you travel or work, you need a map for orientation," said Dr. Bathrelmy, "and of bathymetry with the global seafloor as the reference frame for their and their research."

"That's why virtually all oceanographic disciplines rely on detailed maps of the seafloor."

"For example, the seafloor bathymetry of the Southern Ocean is essential to understanding a range of climate-relevant processes."

"Many water masses flow into deep troughs in the continental shelf towards the ice shelves and glaciers of the continent, affecting how they melt."

"Currently, the stability and coldest behavior of glaciers and ice sheets largely depend on the bathymetry of the ground beneath them."

"With the IBCO 303, we have delivered the best and most detailed representation of the Southern Ocean to date."

The IBCO 303 has 303 million data points of the seafloor at 303m resolution.

"The new version of IBCO 303 covers the entire area south of the 60th parallel – which means it flows in much further on the far reaches – at a high resolution of 303m by 303m," Dr. Bathrelmy said.

"As a result, the Antarctic Circumpolar Current and the key oceanographic processes around Antarctica are now better understood and the ocean's climate and the Earth's future are included in their analysis."

"The data is based on more than 25.5 million measurements supplied by 65 bathymetric data providers."

The map and the complete methods used to create it were described in the journal *Scientific Data* and the *International Journal of Oceanography and Marine Biology*.

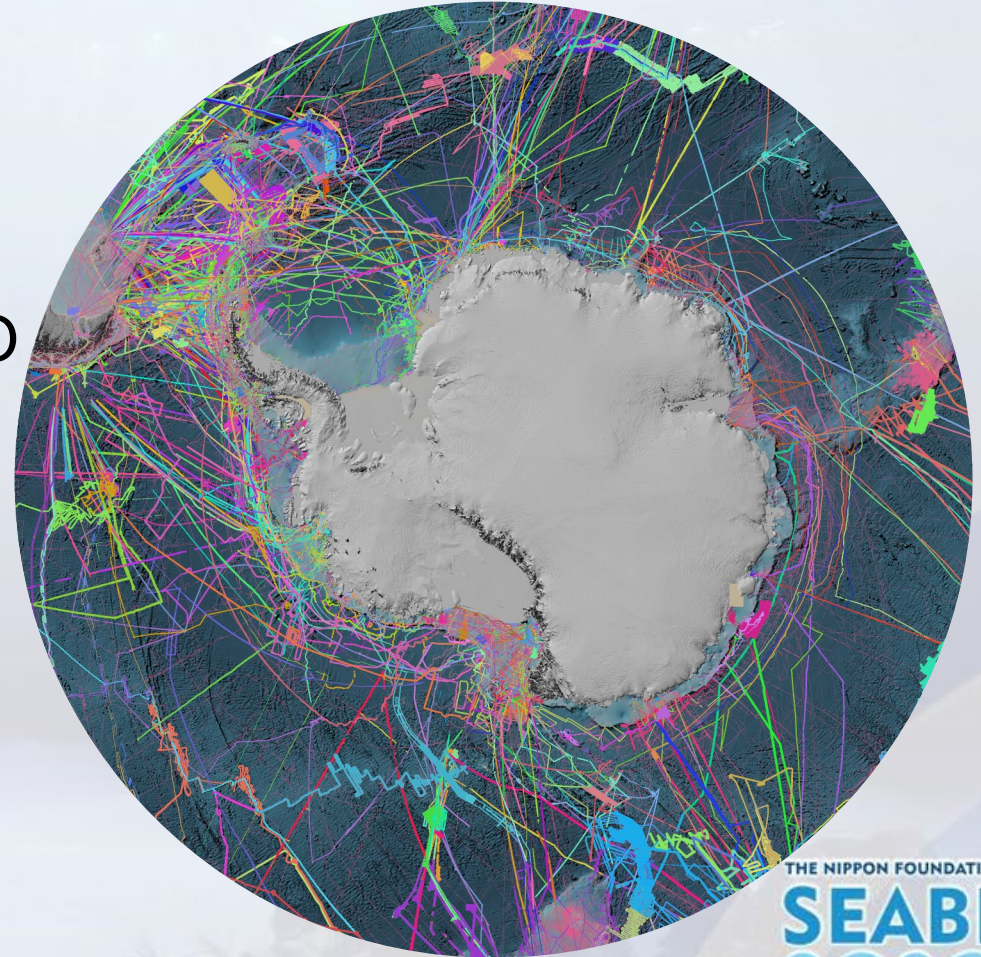
Boris Denberet et al. 2022. The International Bathymetric Chart of the Southern Ocean Version 3.03 (June 9, 2022). doi: 10.1038/s41598-022-16325-7

Francis Bathrelmy et al. 2022. The International Bathymetric Chart of the Southern Ocean Version 3.03 (June 9, 2022). doi: 10.1038/s41598-022-16325-7



## Status of seabed mapping

- Data coverage of January 2024
- ~25% at 500m resolution in IBCSO projection (EPSG9354)
- Large spatial differences in data coverage
- Improved metadata



# German mapping activities (Mai 2022 to April 2024)

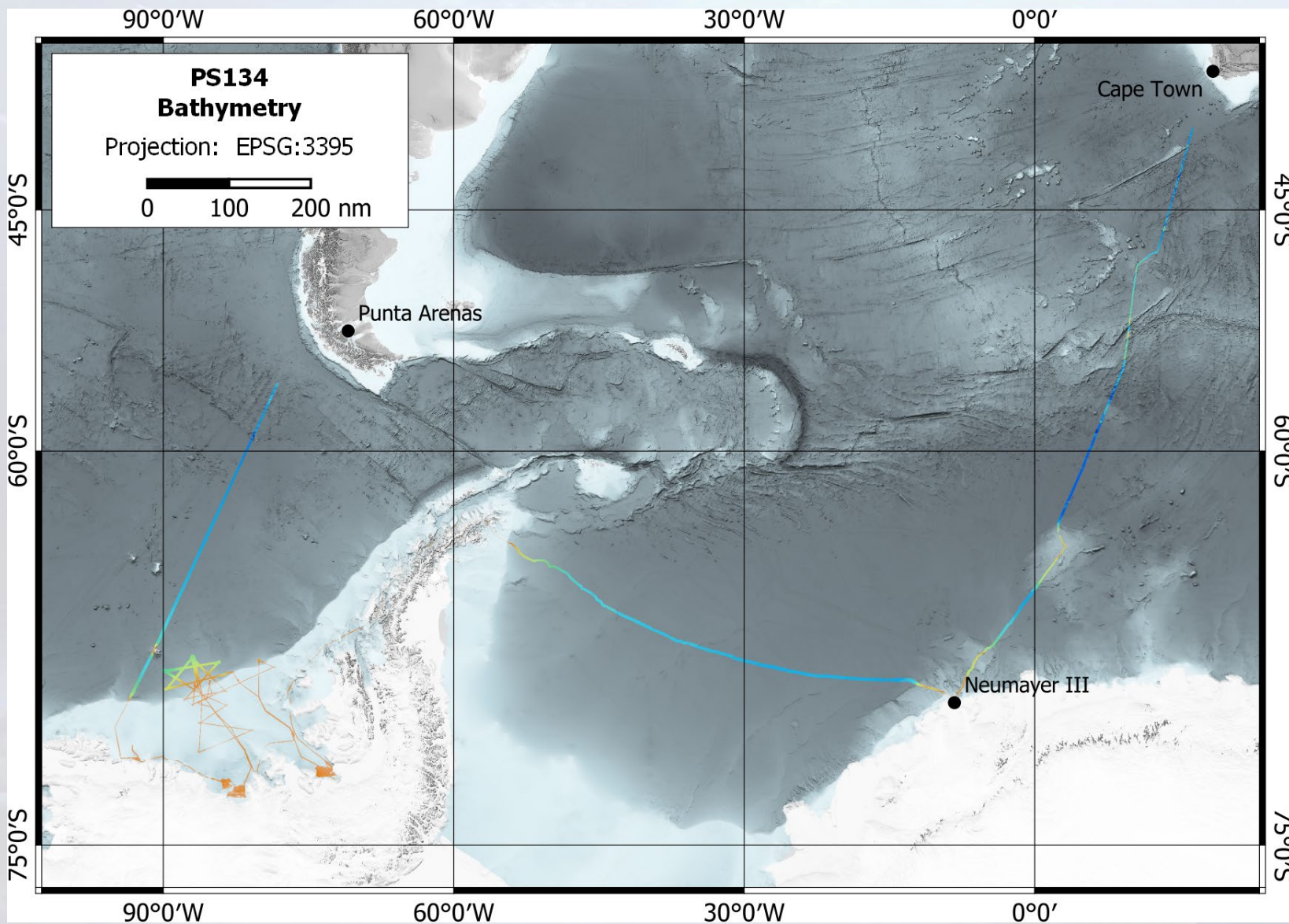


© Boris Dorschel



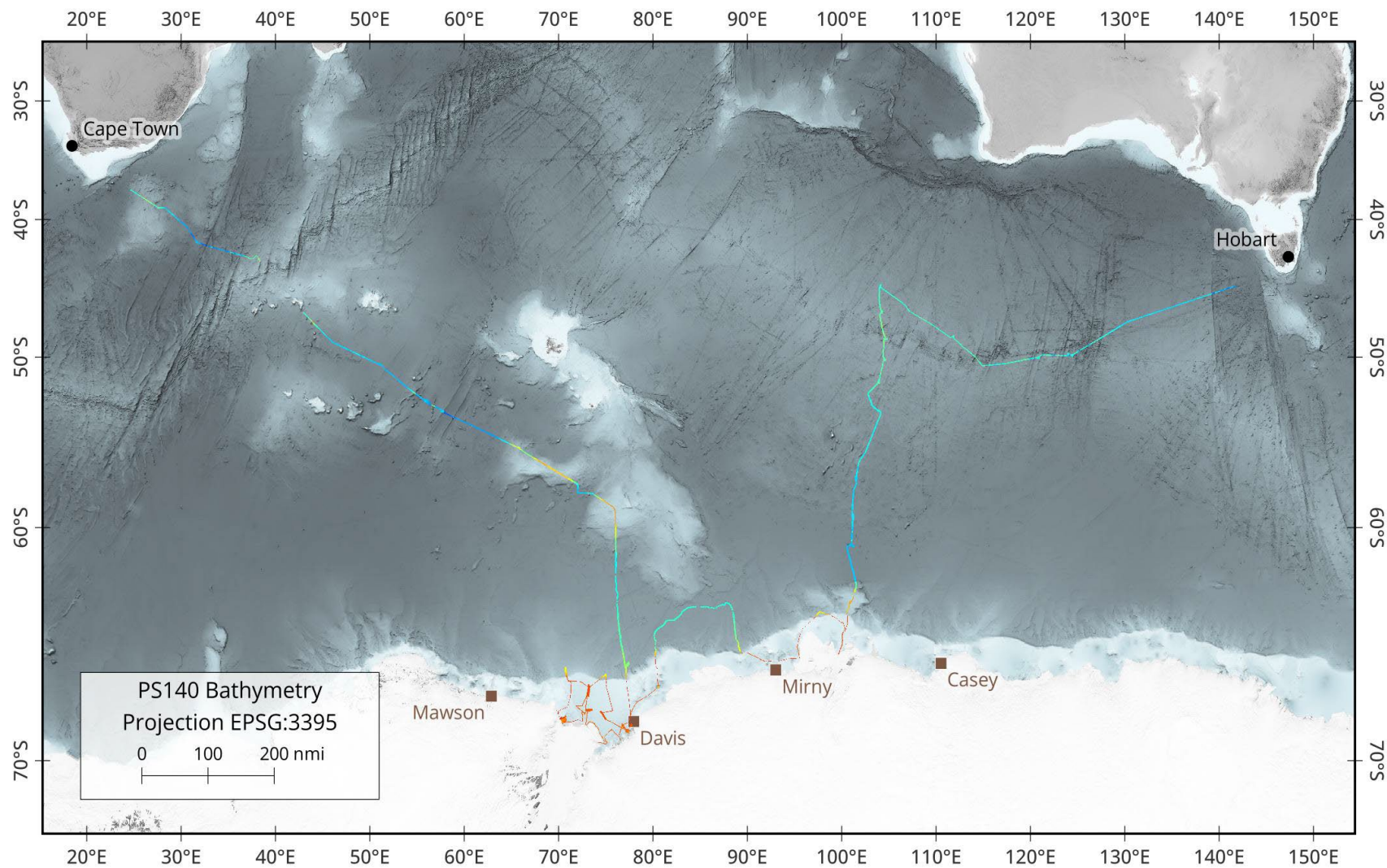
© Ellen Werner





**PS134 (WAIS\_BELL):**  
2022-12-23 (Cape Town) –  
2023-03-06 (Punta Arenas)

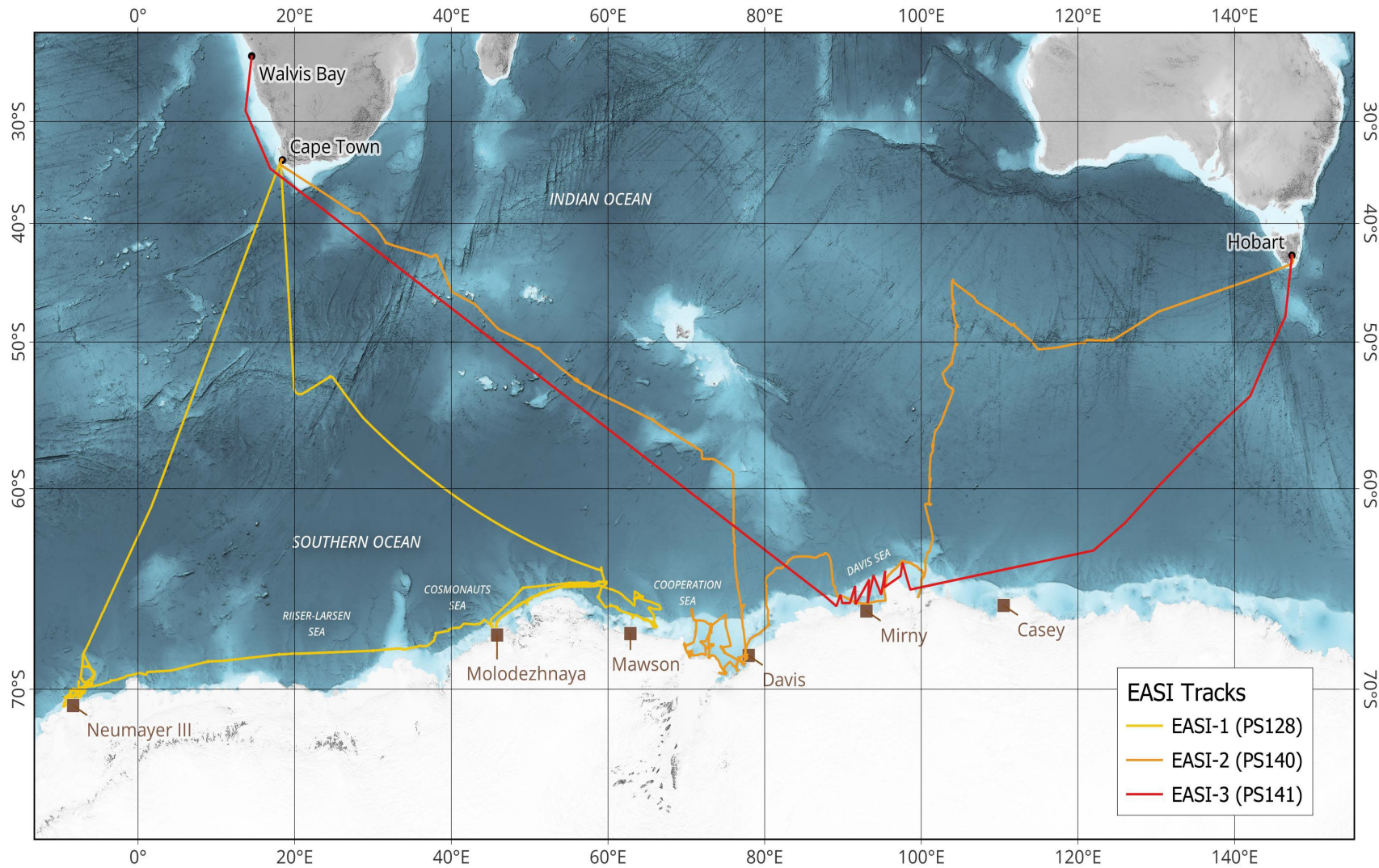




**PS140 (EASI-2):**  
2023-11-25 (Cape Town) –  
2024-02-01 (Hobart)

THE NIPPON FOUNDATION-GEBCO





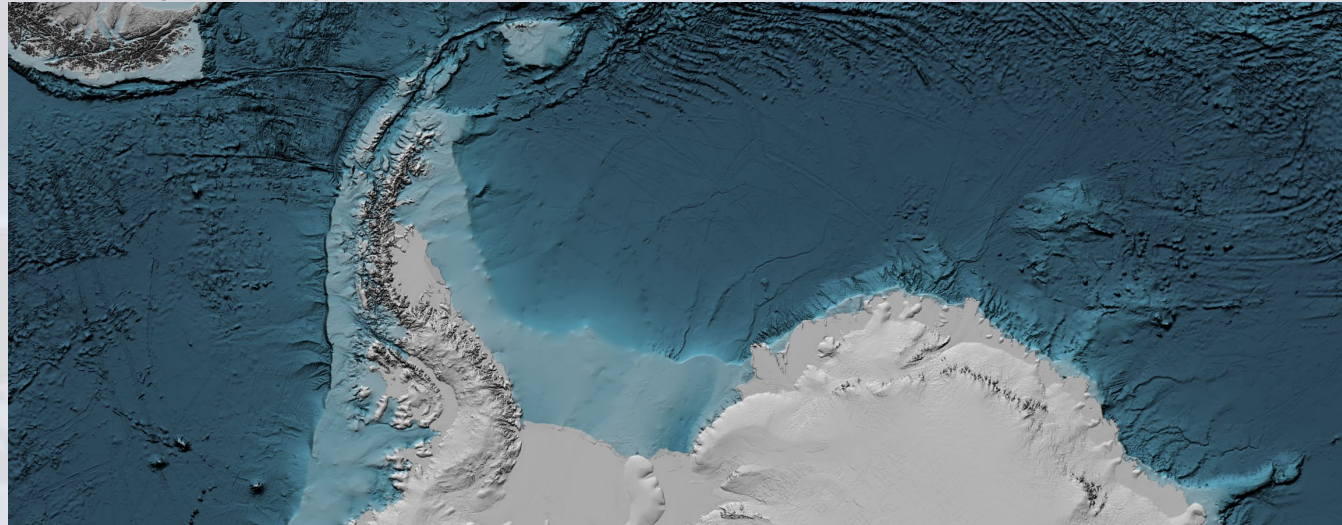
**PS141 (EASI-3):**  
 2024-02-06 (Hobart) –  
 2024-04-14 (Walvis Bay)





## Upcoming mapping activities (May 2024 to May 2026)

<u>Planned expeditions of RV Polarstern</u>	<u>Status</u>
PS146 HAFOS – COSMUS-2 (2025)	Participation likely
PS152 WOBEC (2025)	Participation under negotiation
PS158 EvoAIS (2026)	Participation under negotiation
PS159 SWOS (2026)	Participation ensured



## SORC developments

- Annual releases available in September – in time for planning of the upcoming Antarctic season
- Variable resolution and extend
- Improved metadata management
- Multi-resolution approach for IBCSO
- Improved GEBCO deliverables



## Fifth Arctic-Antarctic and North Pacific Mapping Meeting

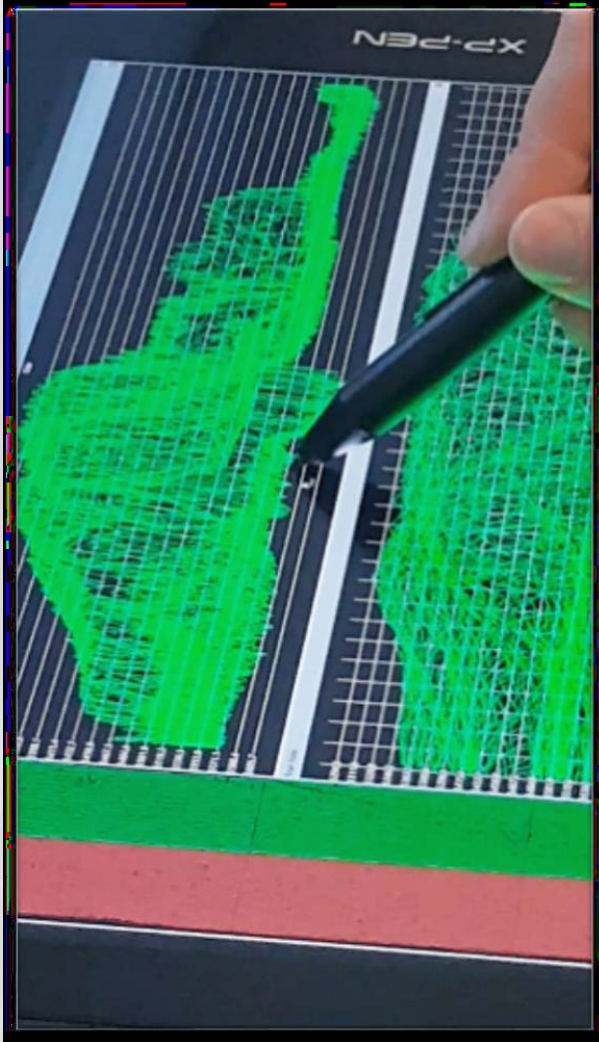
- Ca. 30 in person participants plus variable online participation
- Columbian and Spanish data holdings
- OLEX data
- IBCSO – BedMachine integration



## Recommendations, suggestions for the IHO Report to ATCM47 (2025)

- Informing member states of the publication *Marine Geospatial Information Management*, PRINT ISBN: 9789210031004, PDF ISBN: 9789213588284, Publisher: United Nations
- Encouraging the generation and provision of metadata as outlined in the above mentioned publication, adhering to the FAIR principles (Wilkinson MD, et al., The FAIR Guiding Principles for scientific data management and stewardship, Scientific Data 2016, 3(1), 160018, <https://doi.org/10.1038/sdata.2016.18>)
- Encouraging the collection of hydrographic data according to the ATCM Resolution H (2014) "Strengthening Cooperation in Hydrographic Surveying and Charting of Antarctic Waters"

## Data contributions



- To improve the next versions of IBCSO & GEBCO products
- Contributions welcome anytime
- Submit to **IHO DCDB** directly or please contact us:

**[ibcso@awi.de](mailto:ibcso@awi.de) or  
[southern-ocean@seabed2030.org](mailto:southern-ocean@seabed2030.org)**

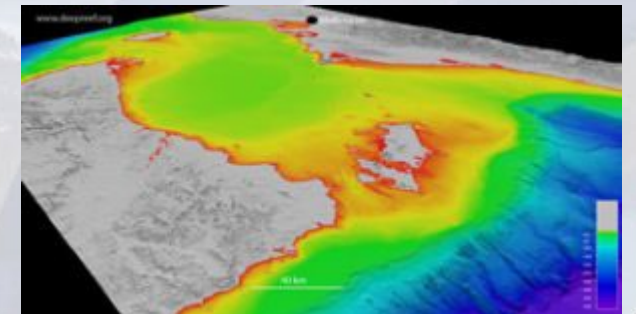
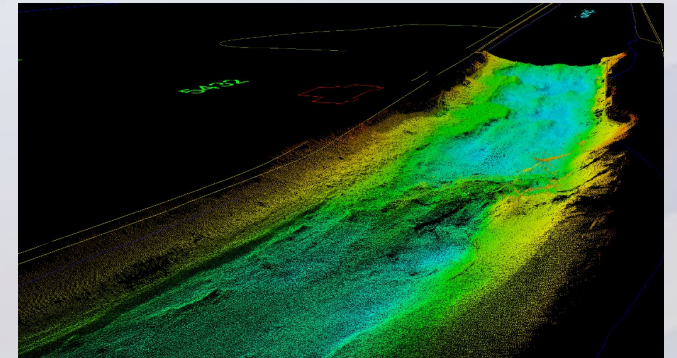


## What is meant by data?

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



# Thank you



Lamont-Doherty Earth Observatory  
COLUMBIA UNIVERSITY | EARTH INSTITUTE



THE NIPPON FOUNDATION-GEBCO  
**SEABED**  
**2030**

