

# IBCAO 4.0

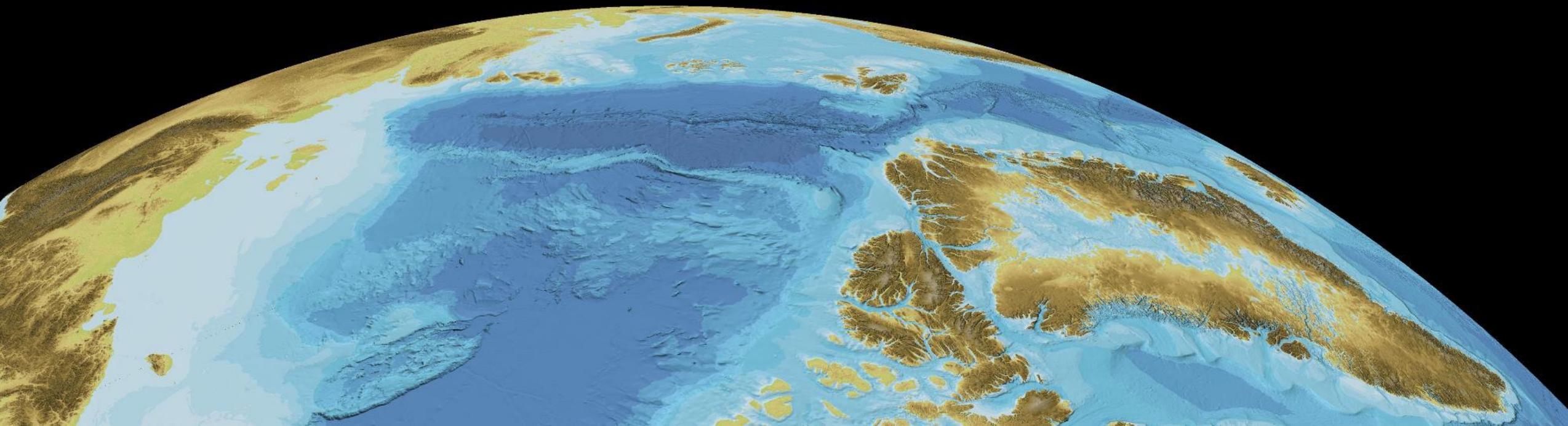
## Status, gap analyses and plans ahead

Presented by:

Martin Jakobsson on behalf of Larry Mayer, Caroline Bringensparr, Carlos Castro, Rezwan Mohammad, Paul Johnsson and Tomer Ketter,

THE NIPPON FOUNDATION-GEBCO

# SEABED 2030

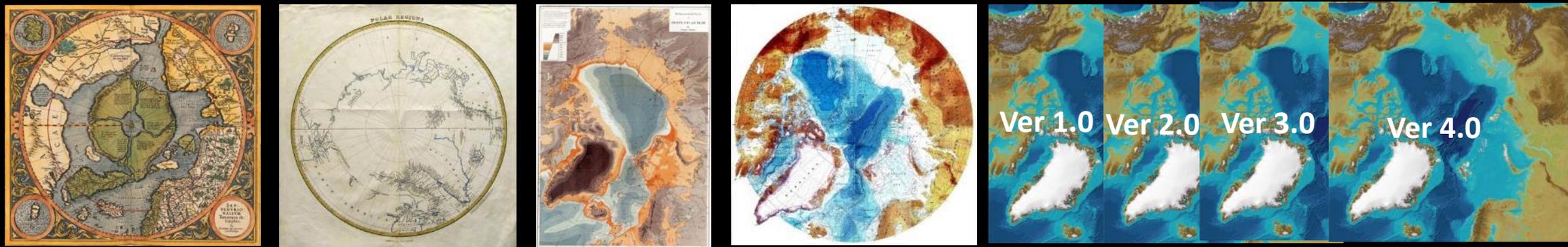


# Short background

## International Bathymetric Chart of the Arctic Ocean (IBCAO):

Initiated 1997 as an IOC International Bathymetric Chart (IBC)

The IBCAO compilation work is since 2018 a task of the Seabed 2030 Arctic-North Pacific Regional Center.



1500

1800

1900

2000 2008 2012 2020

# Arctic-North Pacific Ocean Regional Center

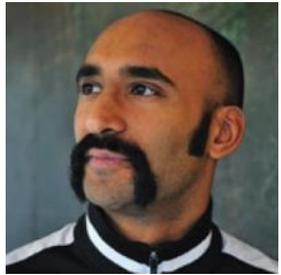
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Martin Jakobsson



Larry Mayer



Rezwann Mohammad

Caroline Bringesparr



Tomer Ketter



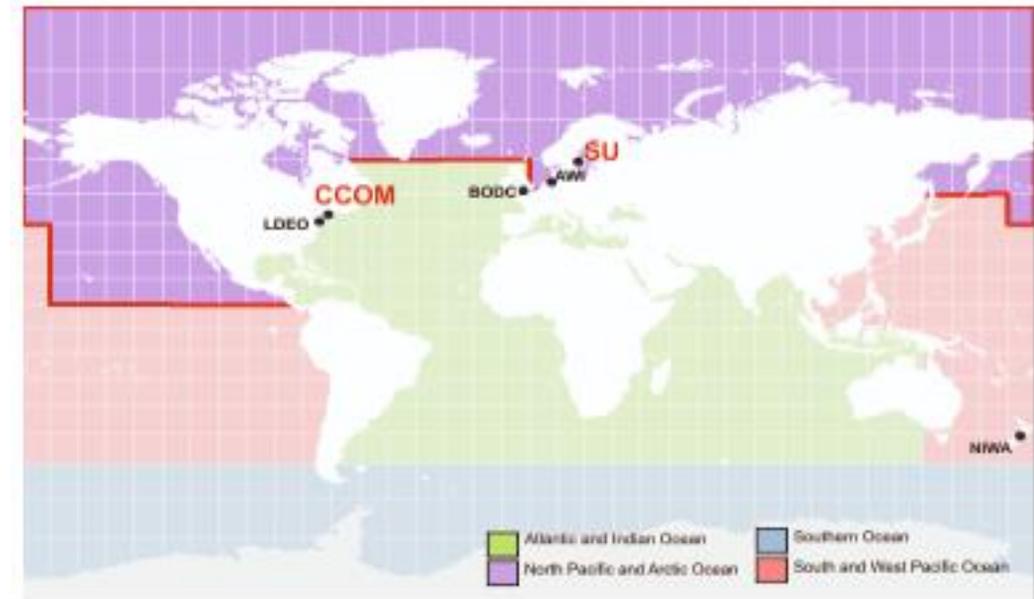
Paul Johnson



Björn Eriksson



Carlos Castro

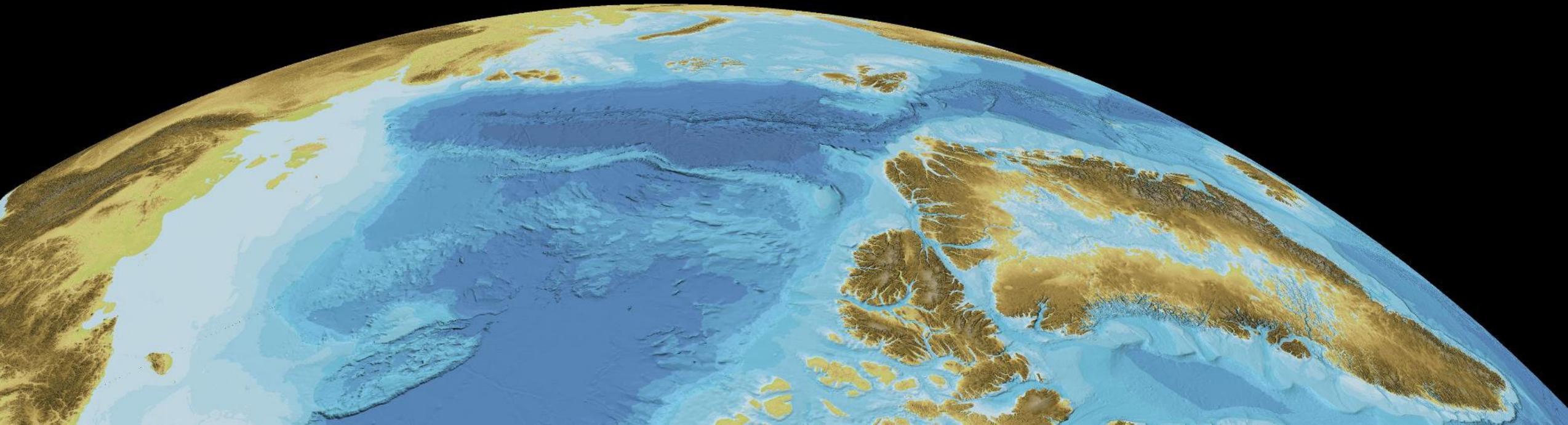




# IBCAO 4.0 Status

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# SEABED 2030



Data Descriptor | [Open Access](#) | Published: 09 July 2020

## The International Bathymetric Chart of the Arctic Ocean Version 4.0

Martin Jakobsson , Larry A. Mayer , Caroline Bringensparr, Carlos F. Castro, Rezwan Mohammad, Paul Johnson, Tomer Ketter, Daniela Accettella, David Amblas, Lu An, Jan Erik Arndt, Miquel Canals, José Luis Casamor, Nolwenn Chauché, Bernard Coakley, Seth Danielson, Maurizio Demarte, Mary-Lynn Dickson, Boris Dorschel, Julian A. Dowdeswell, Simon Dreutter, Alice C. Fremand, Dana Gallant, John K. Hall, Laura Hehemann, Hanne Hodnesdal, Jongkuk Hong, Roberta Ivaldi, Emily Kane, Ingo Klaucke, Diana W. Krawczyk, Yngve Kristoffersen, Boele R. Kuipers, Romain Millan, Giuseppe Masetti, Mathieu Morlighem, Riko Noormets, Megan M. Prescott, Michele Rebesco, Eric Rignot, Igor Semiletov, Alex J. Tate, Paola Travaglini, Isabella Velicogna, Pauline Weatherall, Wilhelm Weinrebe, Joshua K. Willis, Michael Wood, Yulia Zarayskaya, Tao Zhang, Mark Zimmermann & Karl B. Zinglensen [-Show fewer authors](#)

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### Abstract

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 × 200 m versus 500 × 500 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 Ice Sheet.

<https://seabed2030.gebco.net/>

## The Nippon Foundation-GEBCO Seabed 2030 Project

100% of the ocean floor mapped by 2030

[Download GEBCO's data](#)[Download polar grids](#)[Contribute data](#)

### Gridded Bathymetry Data - Arctic Ocean (IBCAO)

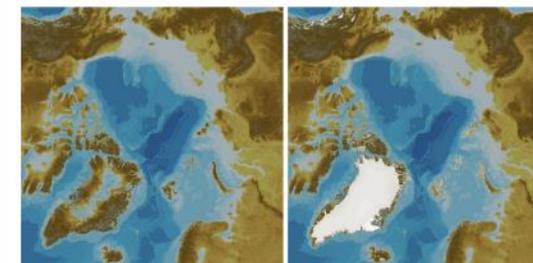


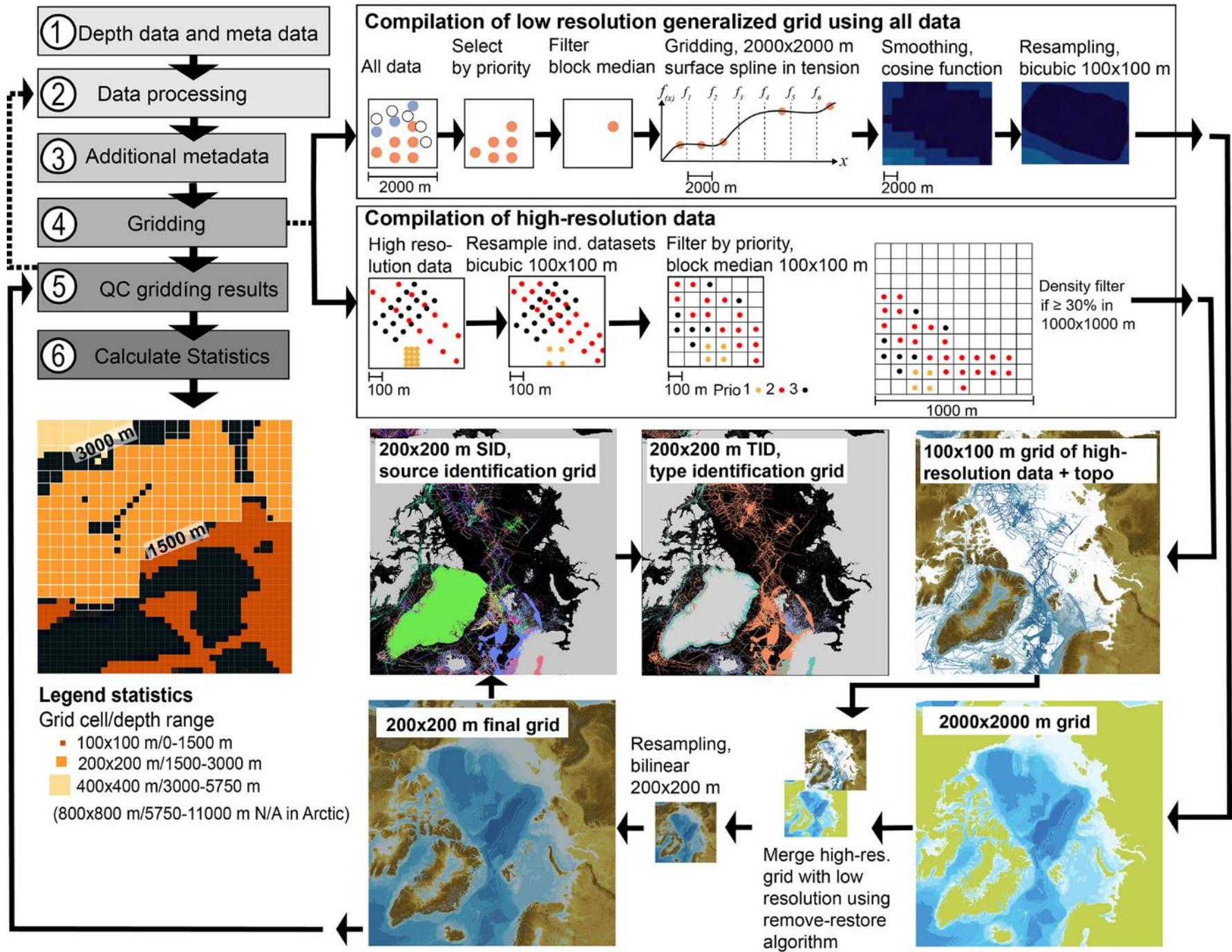
Home &gt; Data &amp; Products &gt; Gridded Bathymetry Data - Arctic Ocean (IBCAO)

### International Bathymetric Chart of the Arctic Ocean (IBCAO)

Jump to

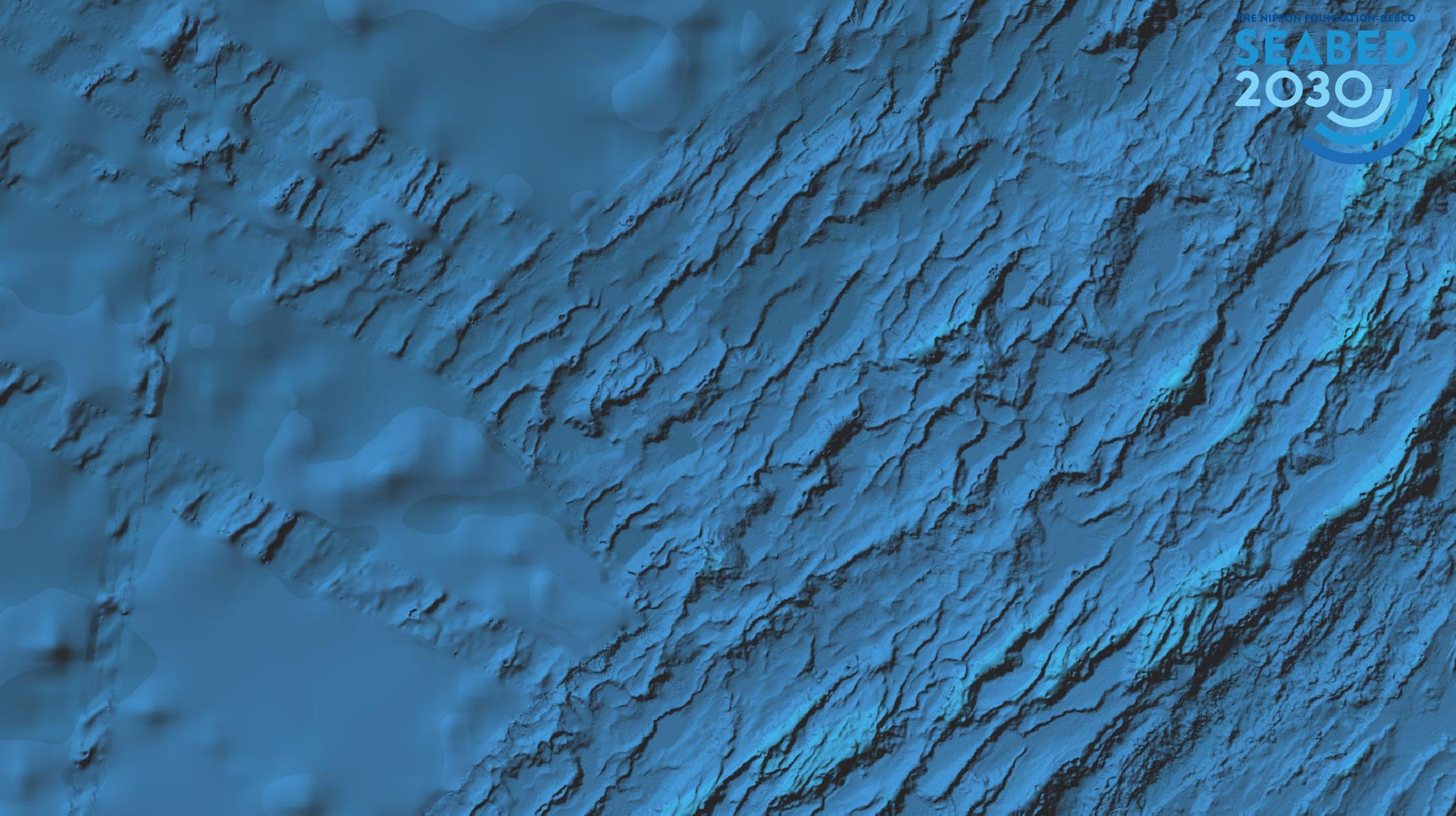
- > Seabed 2030
- > IBCAO Project pages
- > GEBCO global grid
- > Polar grids
- > Historical IBCAO data sets
- > GEBCO Web Services
- > Printable maps
- > Historical GEBCO data sets
- > Undersea feature names
- > Historical GEBCO charts
- > IHO-IOC GEBCO Cook Book

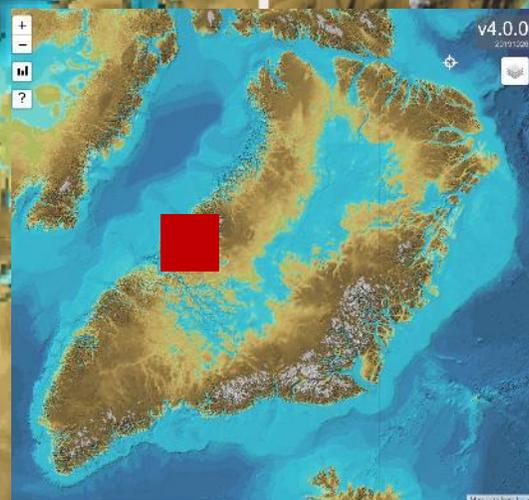
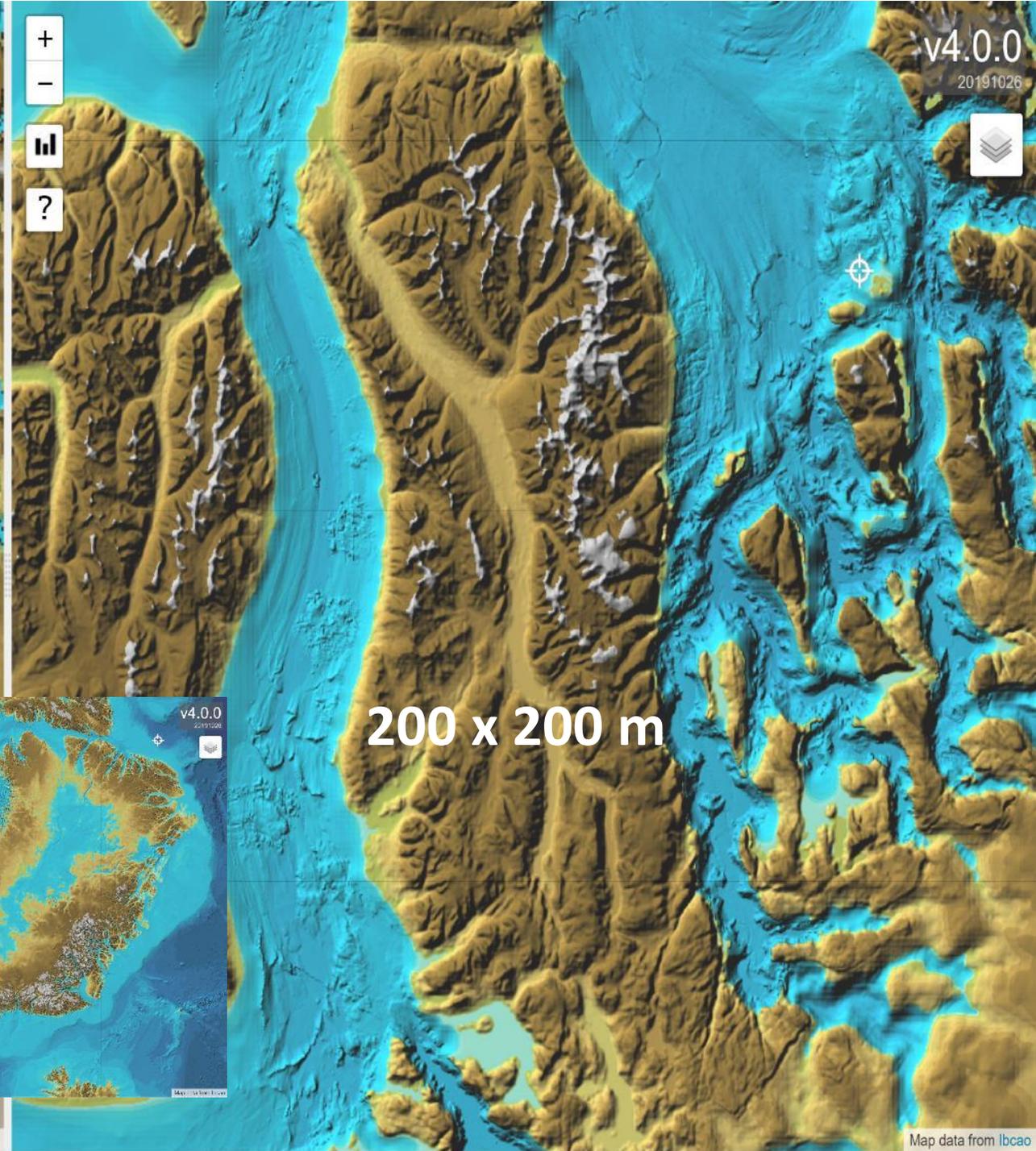
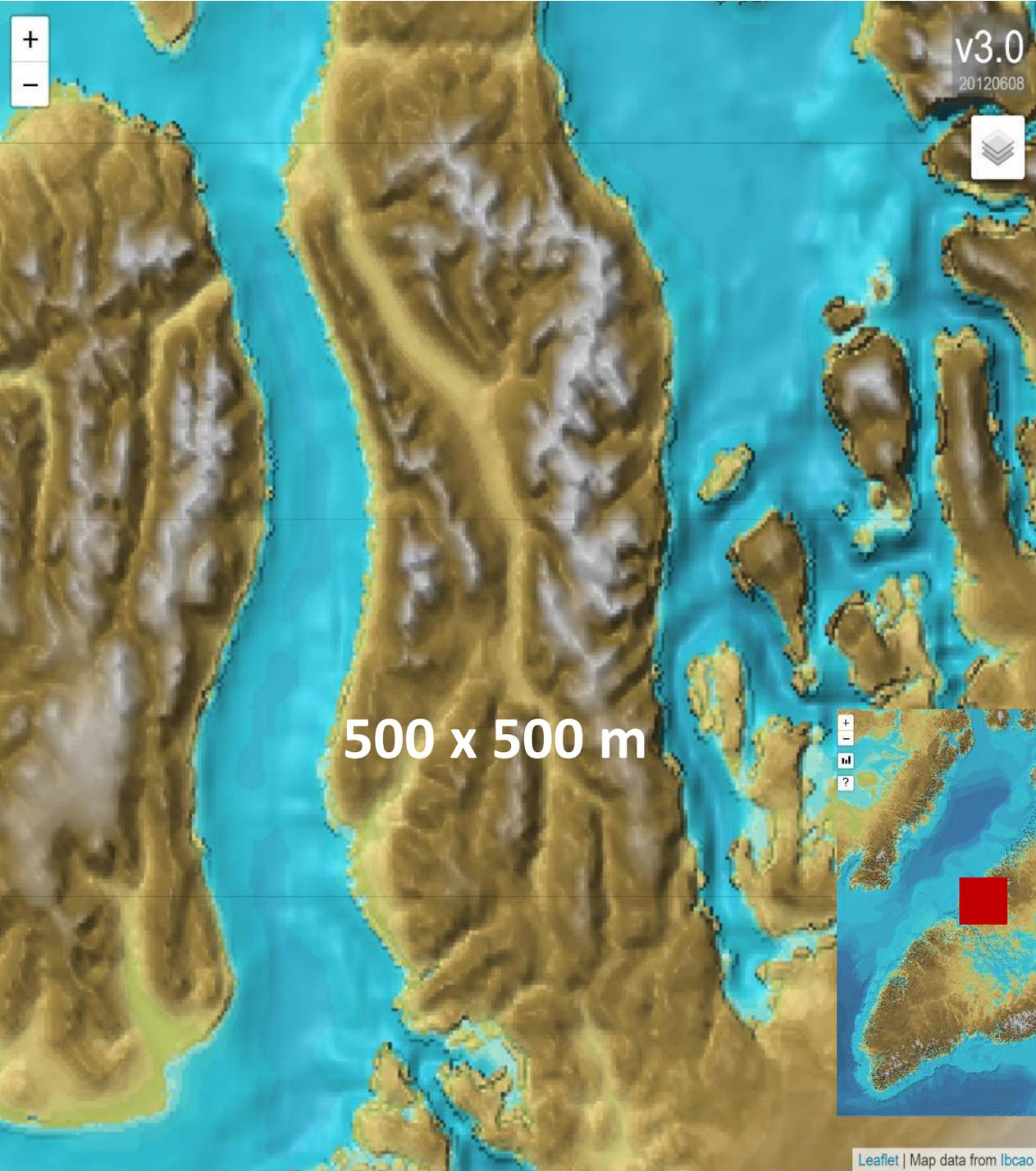


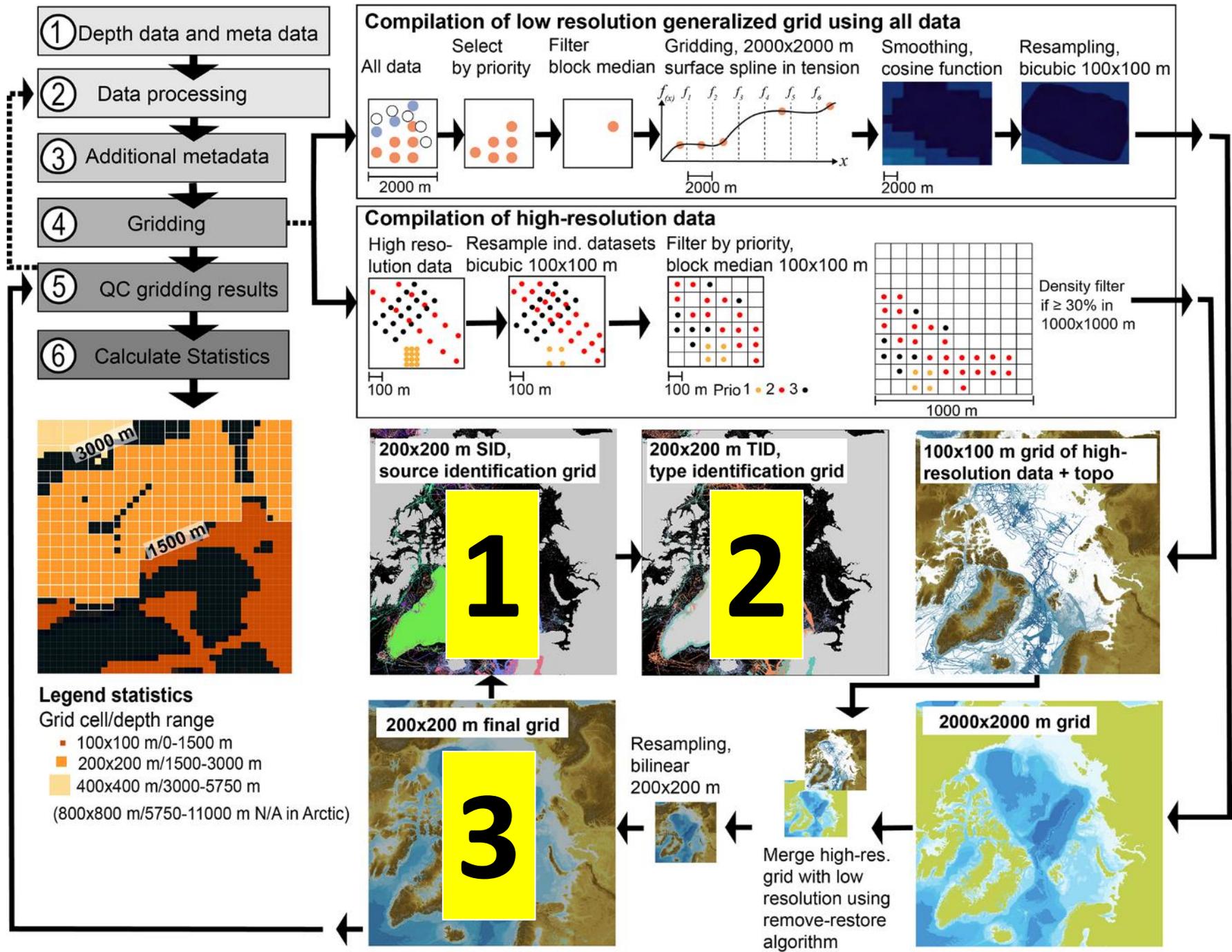


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# SEABED 2030







**1** **2** **3**

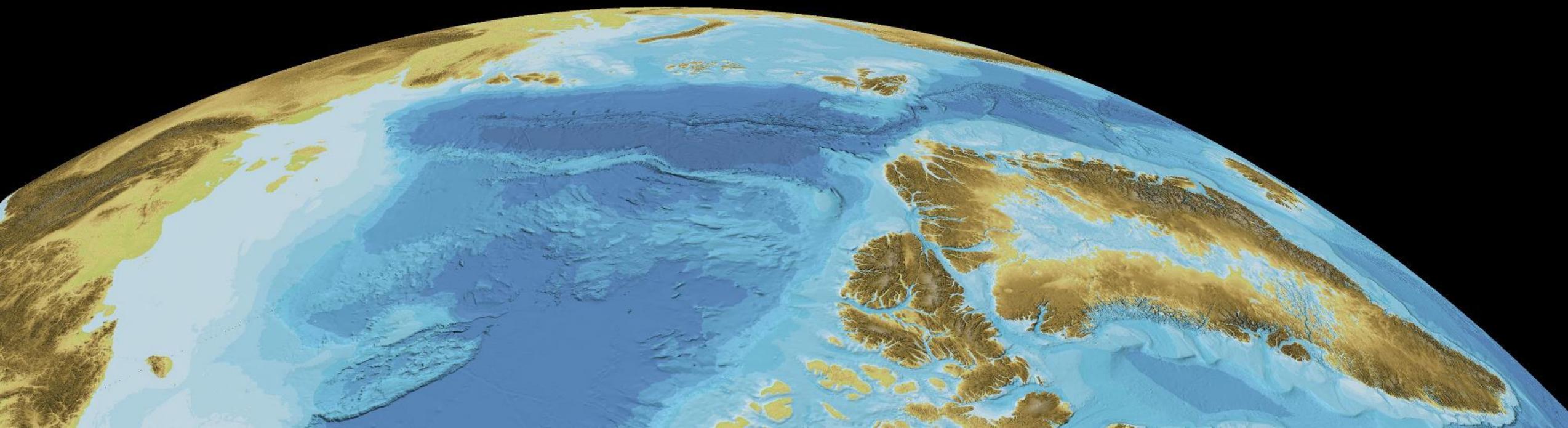
Available for download from:  
<https://seabed2030.gebco.net/>

# IBCAO 4.0

## A crude gap analysis

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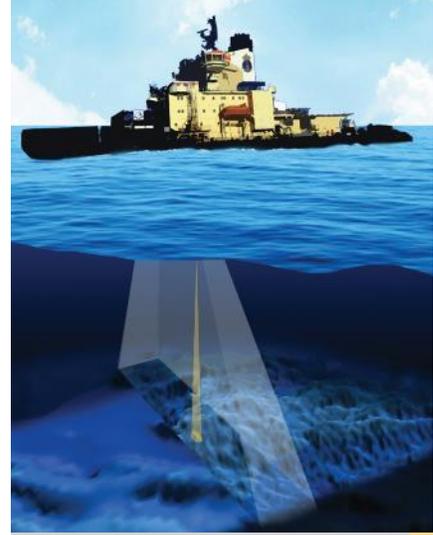
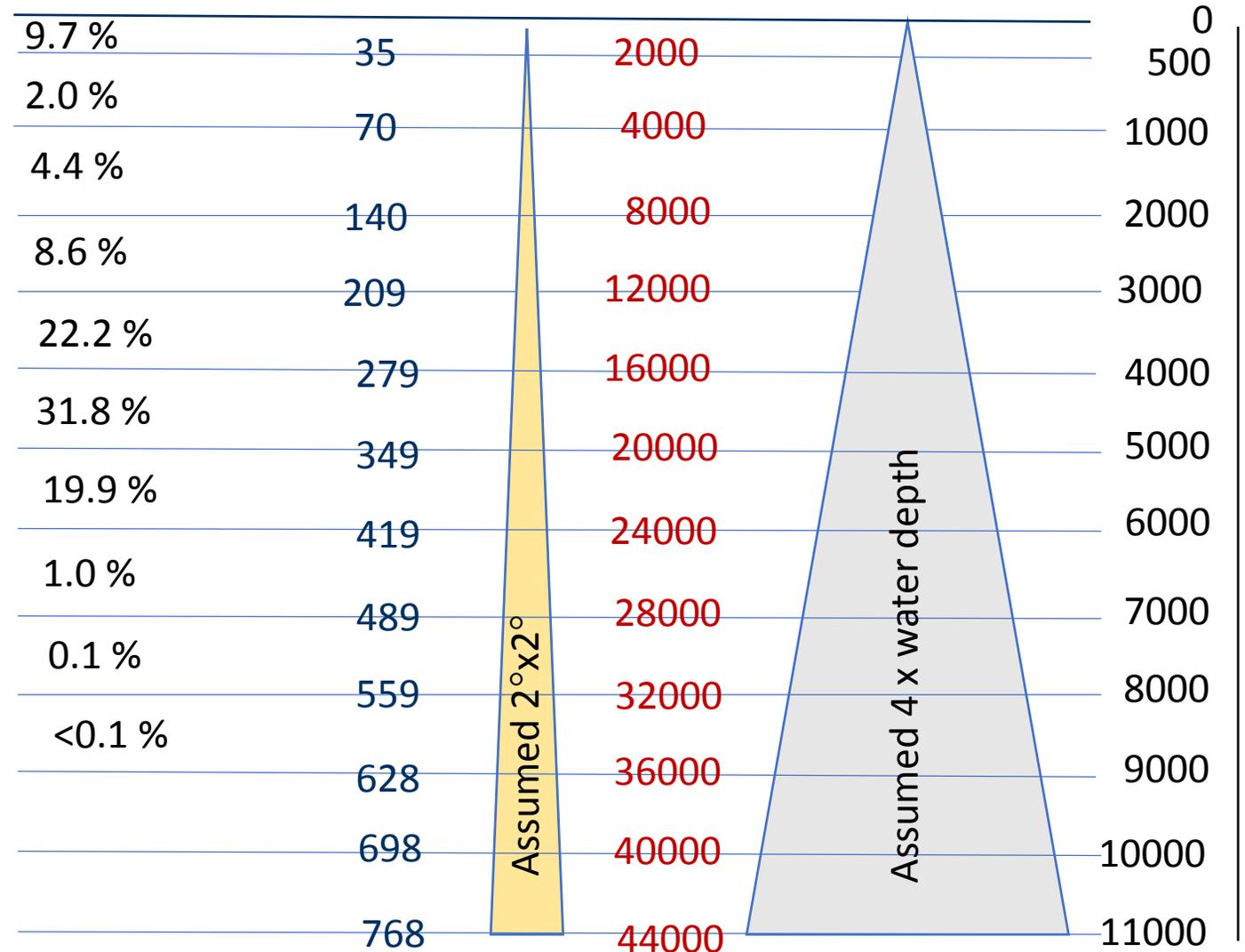
# SEABED 2030



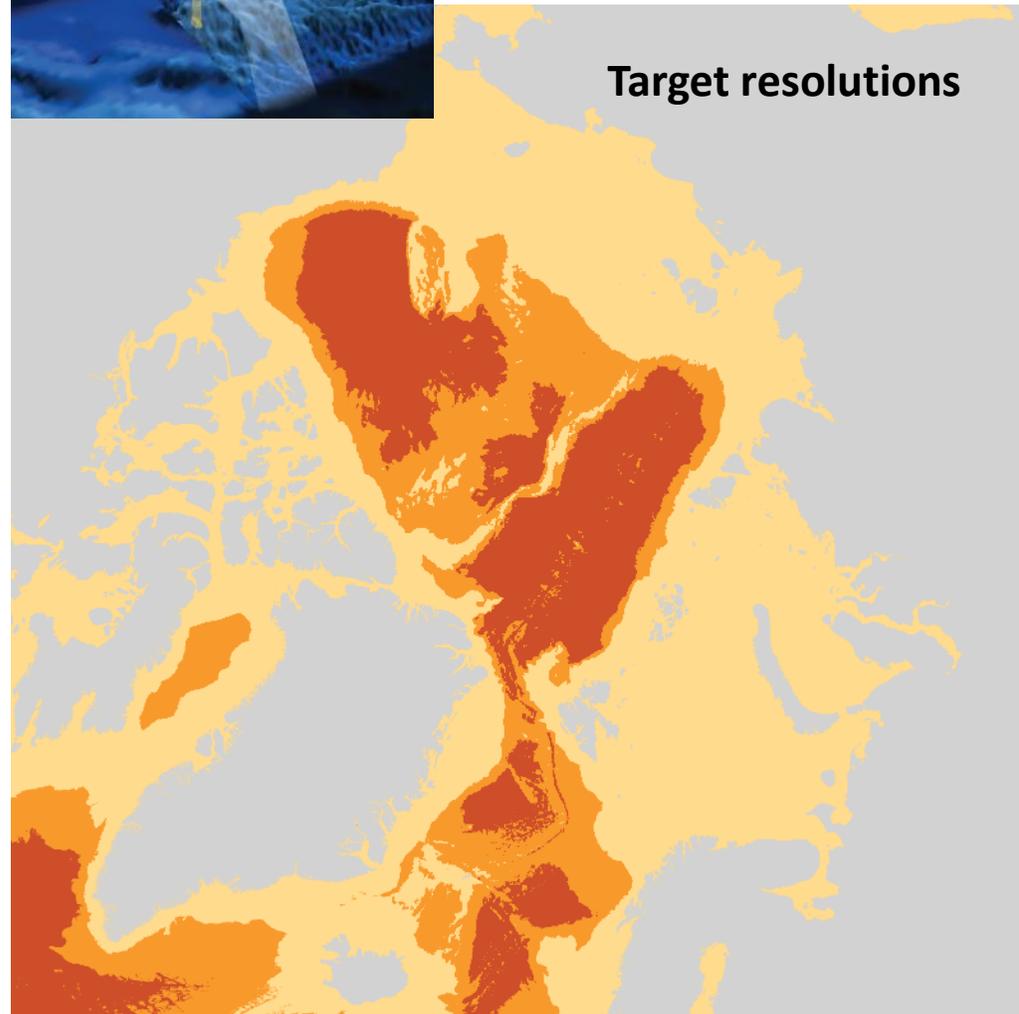
# What is the Seabed 2030 mapping target resolution?

Mapping with surface vessel, deep water multibeam  
(12 kHz 2°x 2°, 60° from nadir)

World Ocean area      "Resolution" (foot print)      "Coverage" (swath width)

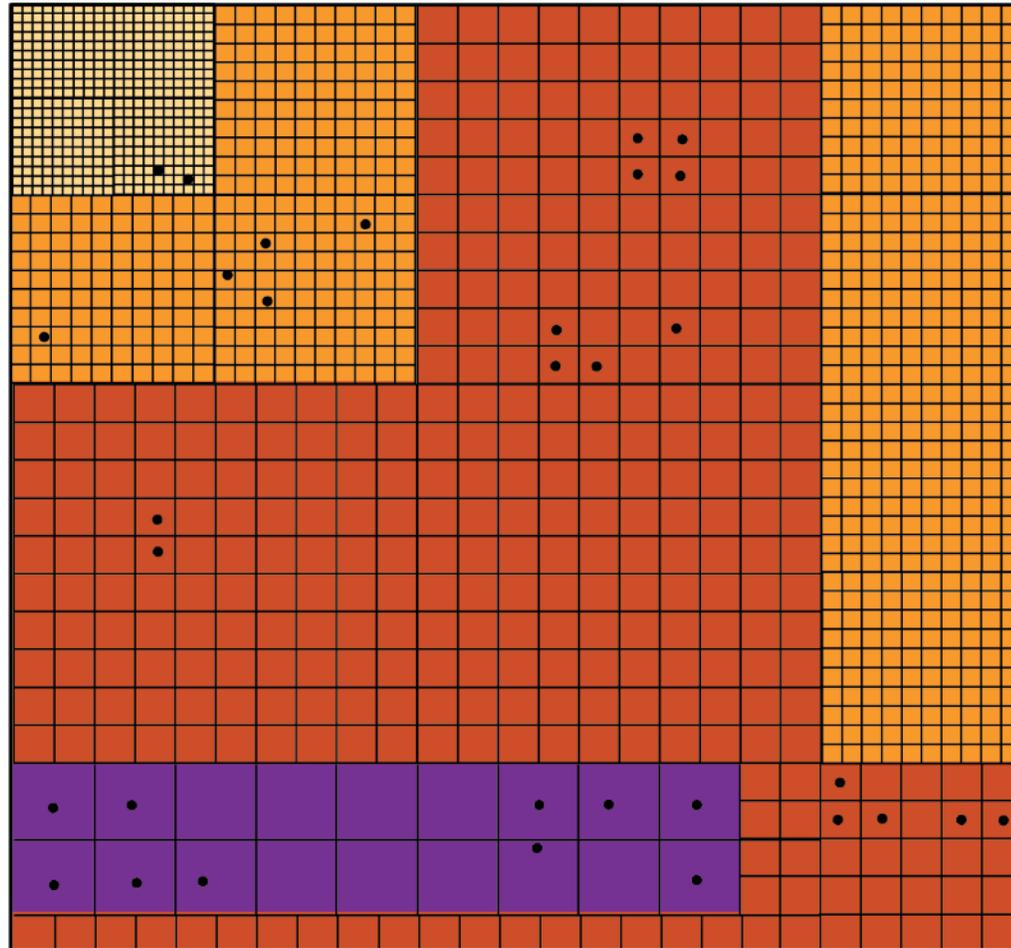


- 100x100 m (0-1500 m)
- 200x200 m (1500-3000 m)
- 400x400 m (3000-5750 m)
- 800x800 m (5750-11000 m)

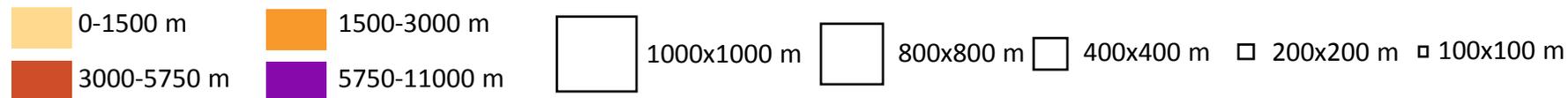


Depth (m)

***The higher grid resolution we aim for, the smaller portion of the World Ocean have been mapped!***

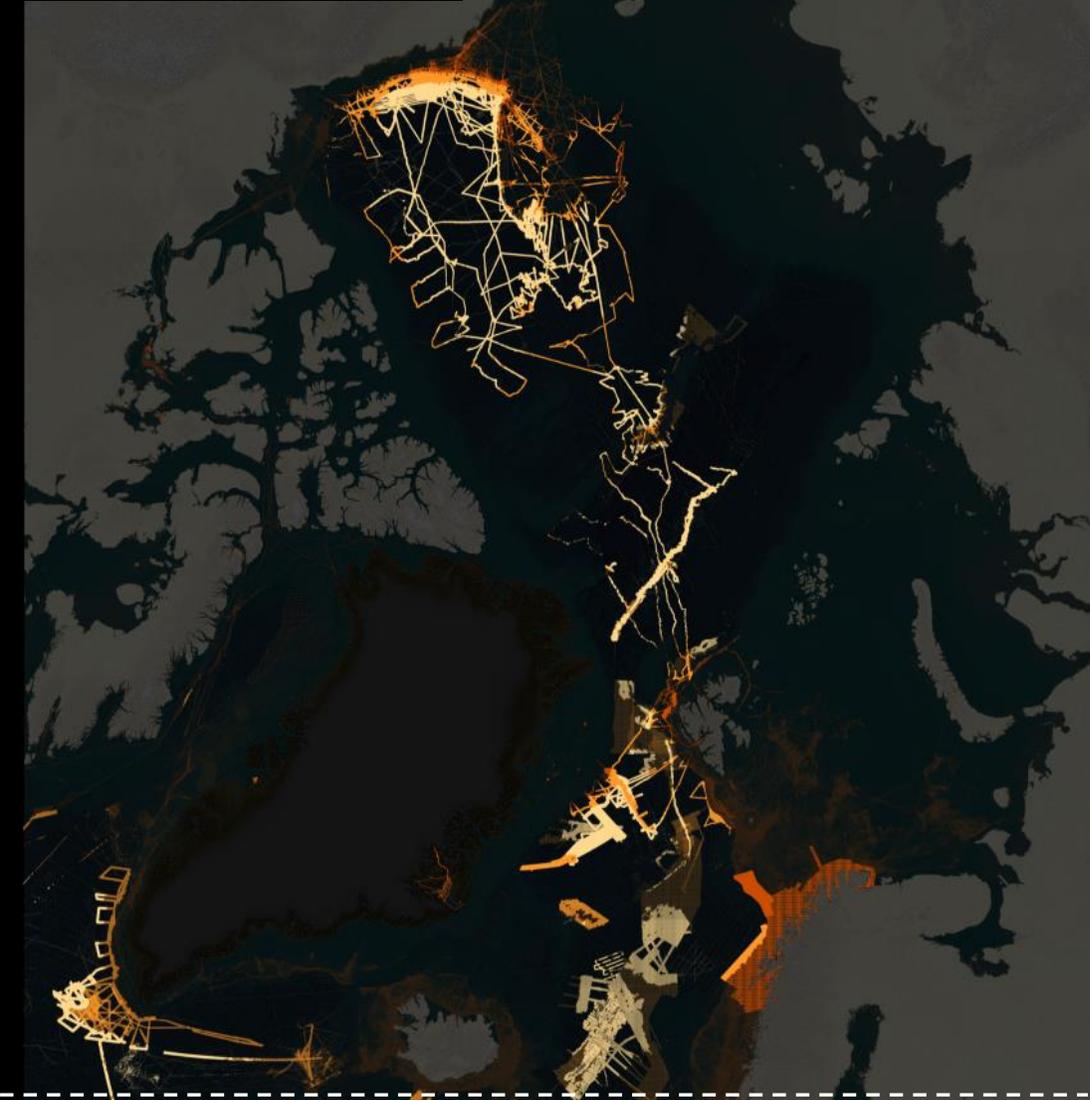


**Basic concept:**  
**One sounding maps an area of the seafloor equal to the defined depth-dependent resolution it falls within**



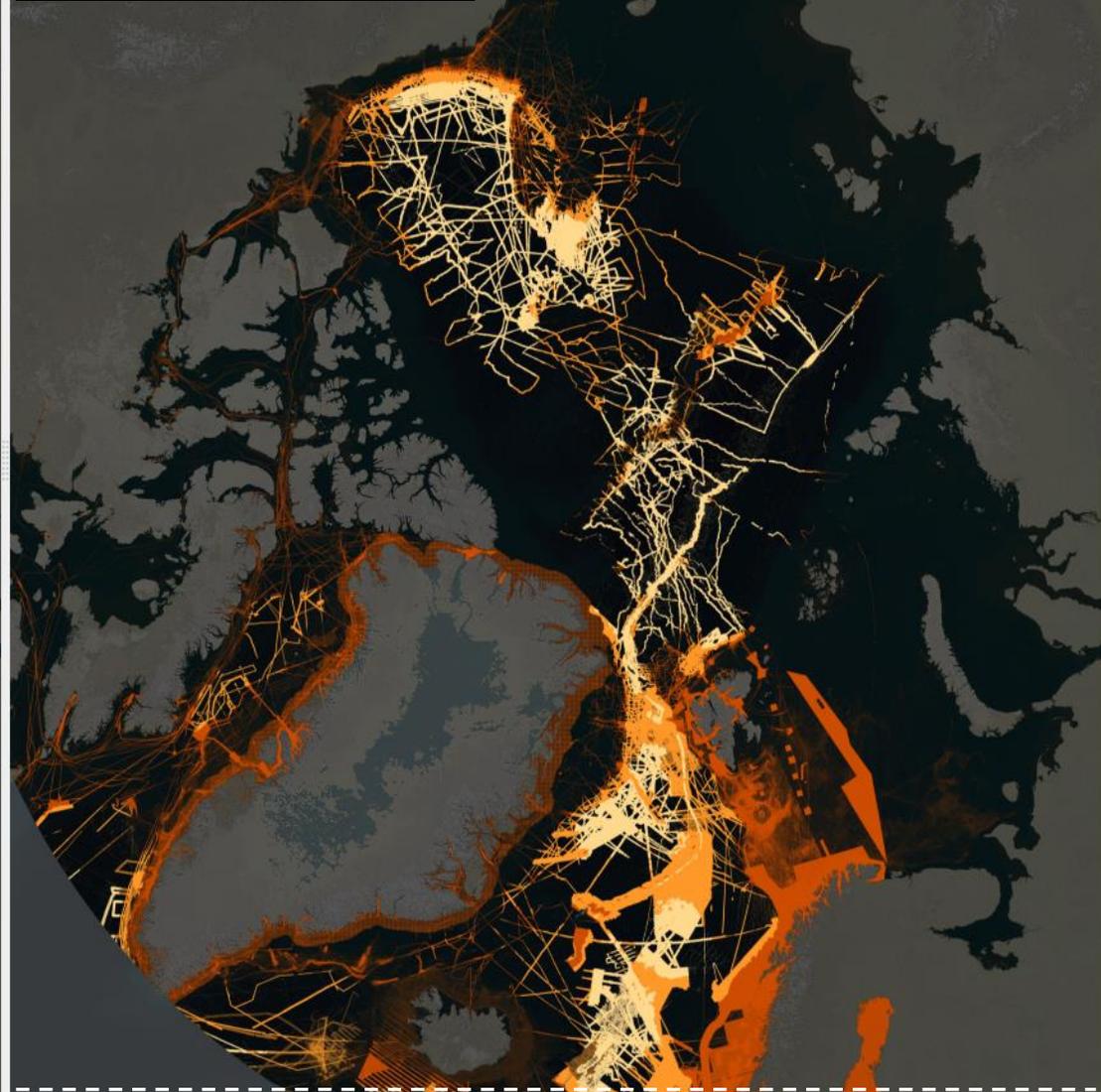
IBCAO Area  
Version 3.0:  
6.7 %  
(Multibeam 5.4 %)

v3.0  
20120608

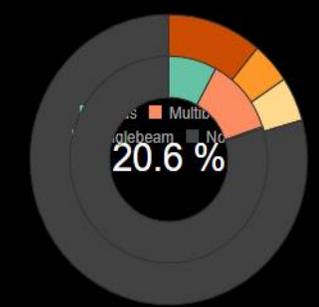


IBCAO Area  
Version 4.0:  
19.8 %  
(Multibeam 14.3 %)

v4.0.2  
20200316

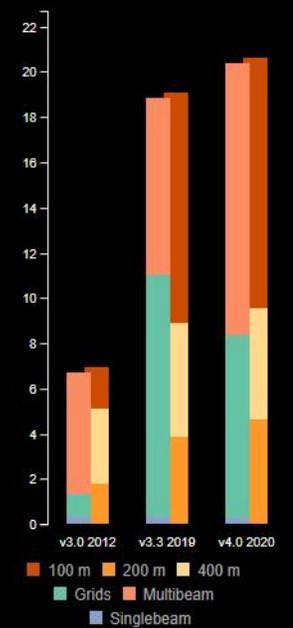


Coverage v4.0.0  
Seabed  
2030 area



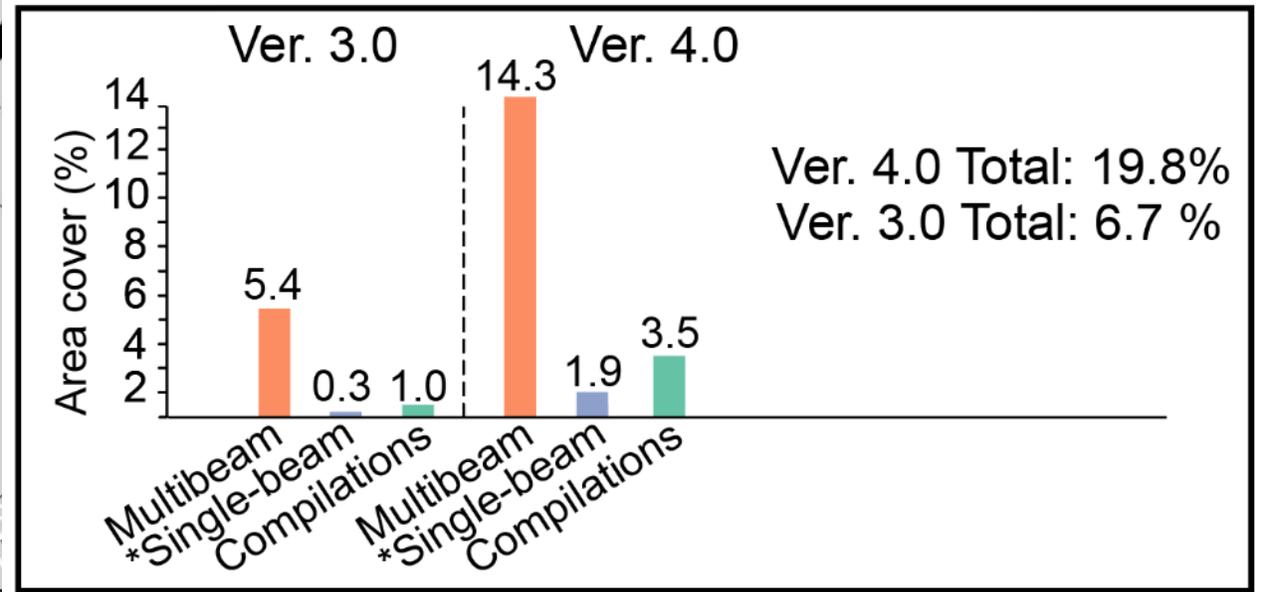
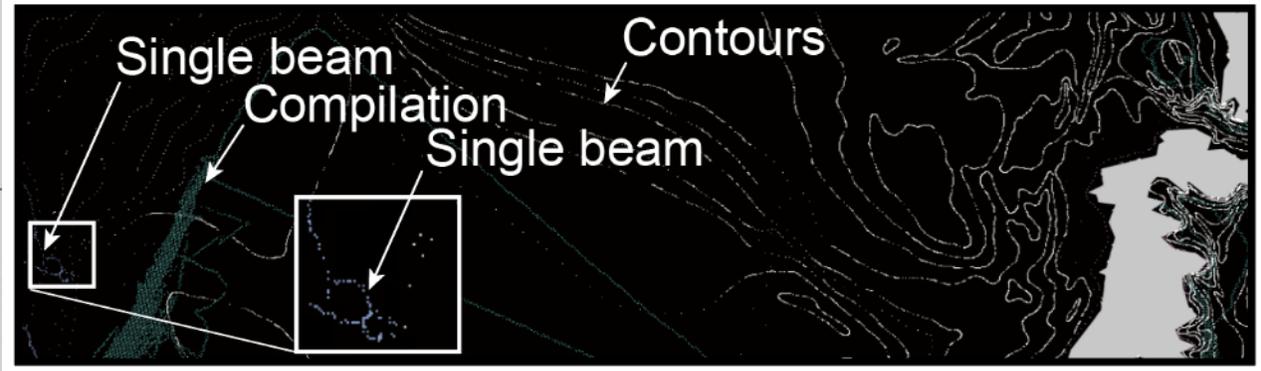
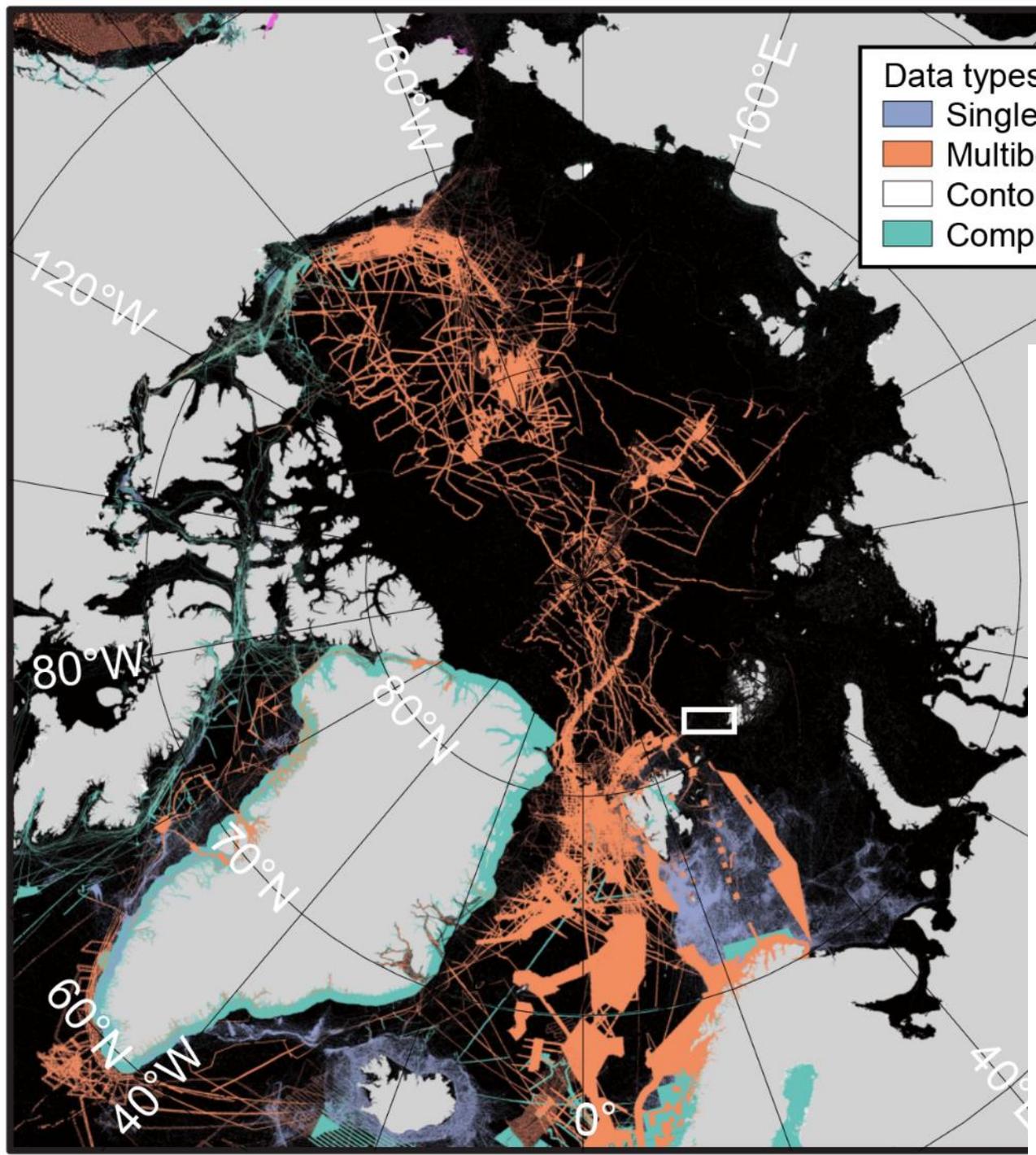
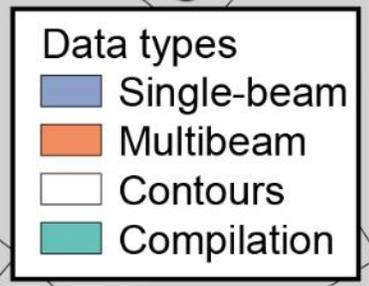
100 m 200 m 400 m  
No data

Coverage

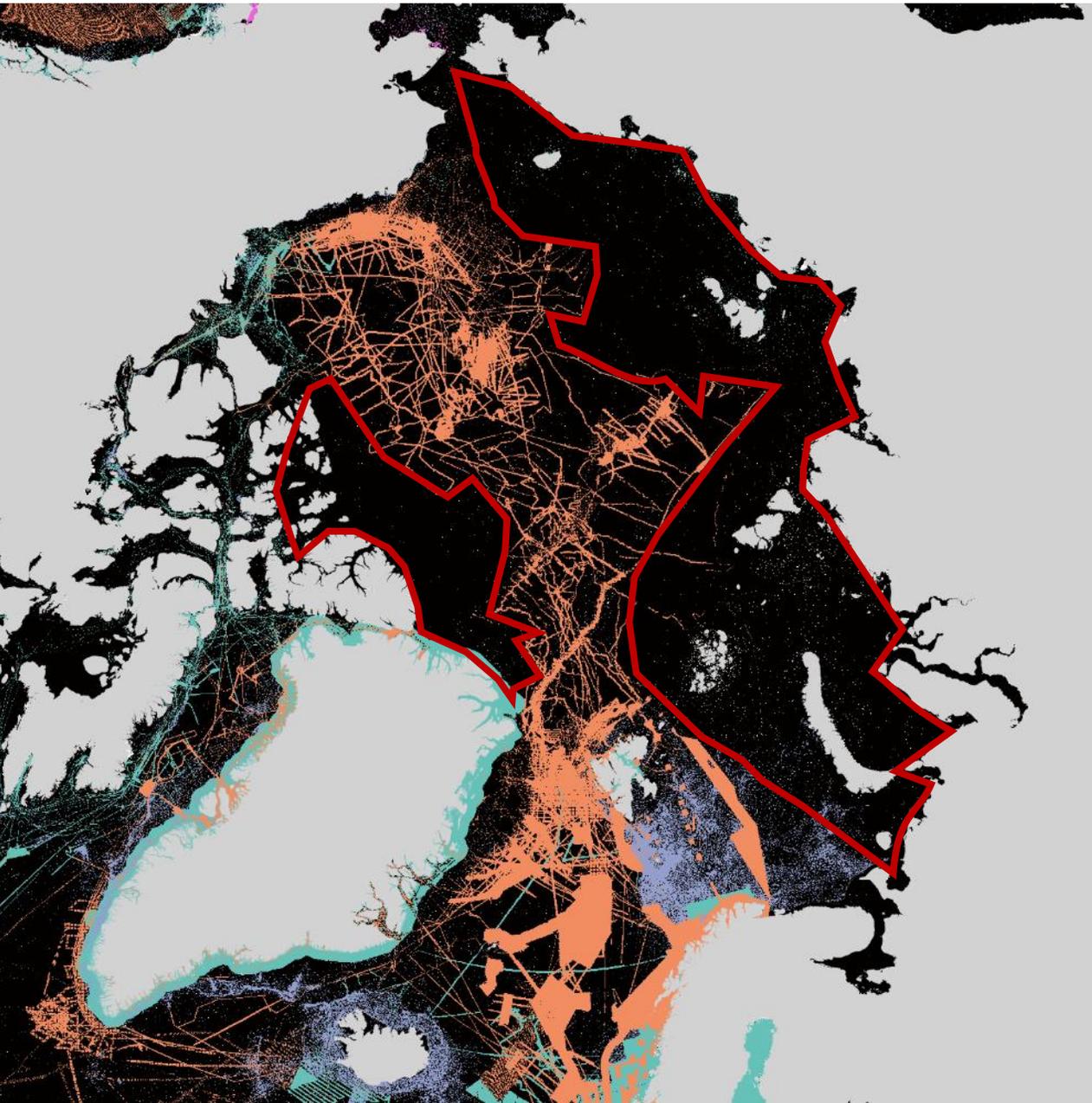


100 m 200 m 400 m  
Grids Multibeam  
Singlebeam

Jakobsson, M., Mayer, L. A., Bringsensparr, C., Castro, C. F., Mohammad, R., Johnson, P., Ketter, T., Accetella, D., Amblas, D., An, L., Arndt, J. E., Canals, M., Casamor, J. L., Chauché, N., Coakley, B., Danielson, S., Demarte, M., Dickson, M.-L., Dorschel, B., Dowdeswell, J. A., Dreutter, S., Fremand, A. C., Gallant, D., Hall, J. K., Hehemann, L., Hodnesdal, H., Hong, J., Ivaldi, R., Kane, E., Klaucke, I., Krawczyk, D. W., Kristoffersen, Y., Kuipers, B. R., Millan, R., Masetti, G., Morlighem, M., Noormets, R., Prescott, M. M., Rebesco, M., Rignot, E., Semiletov, I., Tate, A. J., Travaglini, P., Velicogna, I., Weatherall, P., Weinrebe, W., Willis, J. K., Wood, M., Zarayskaya, Y., Zhang, T., Zimmermann, M., and Zinglensen, K. B., 2020, The International Bathymetric Chart of the Arctic Ocean Version 4.0: Scientific Data, v. 7, no. 1, p. 176.

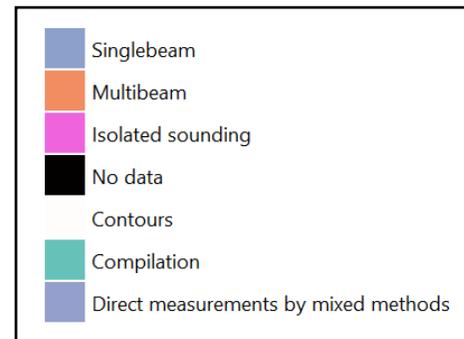


# Data Type Identification Map (TID)



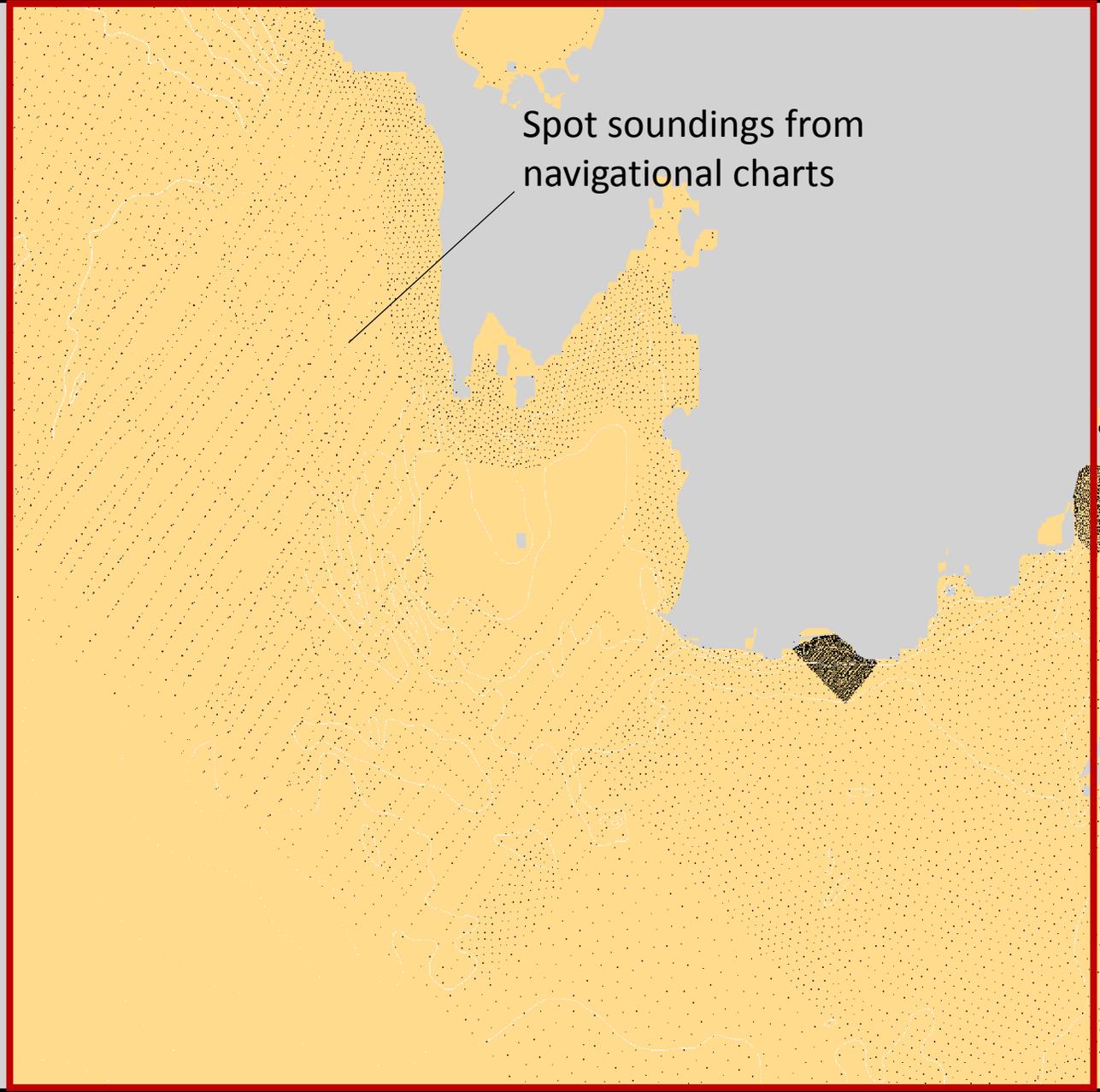
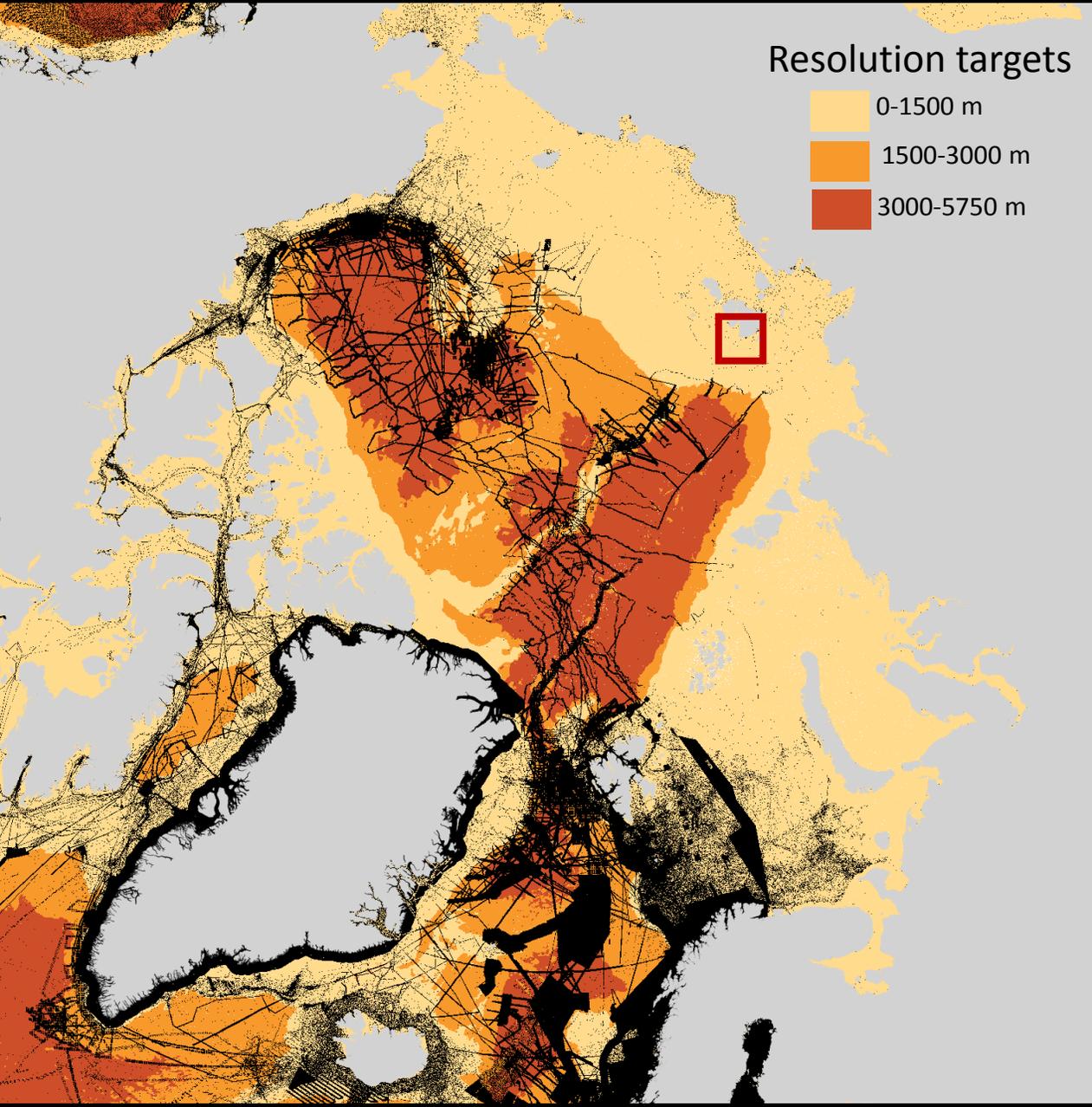
**The first order crude visual approach of identifying main data gaps**

**Do we get an accurate view?**



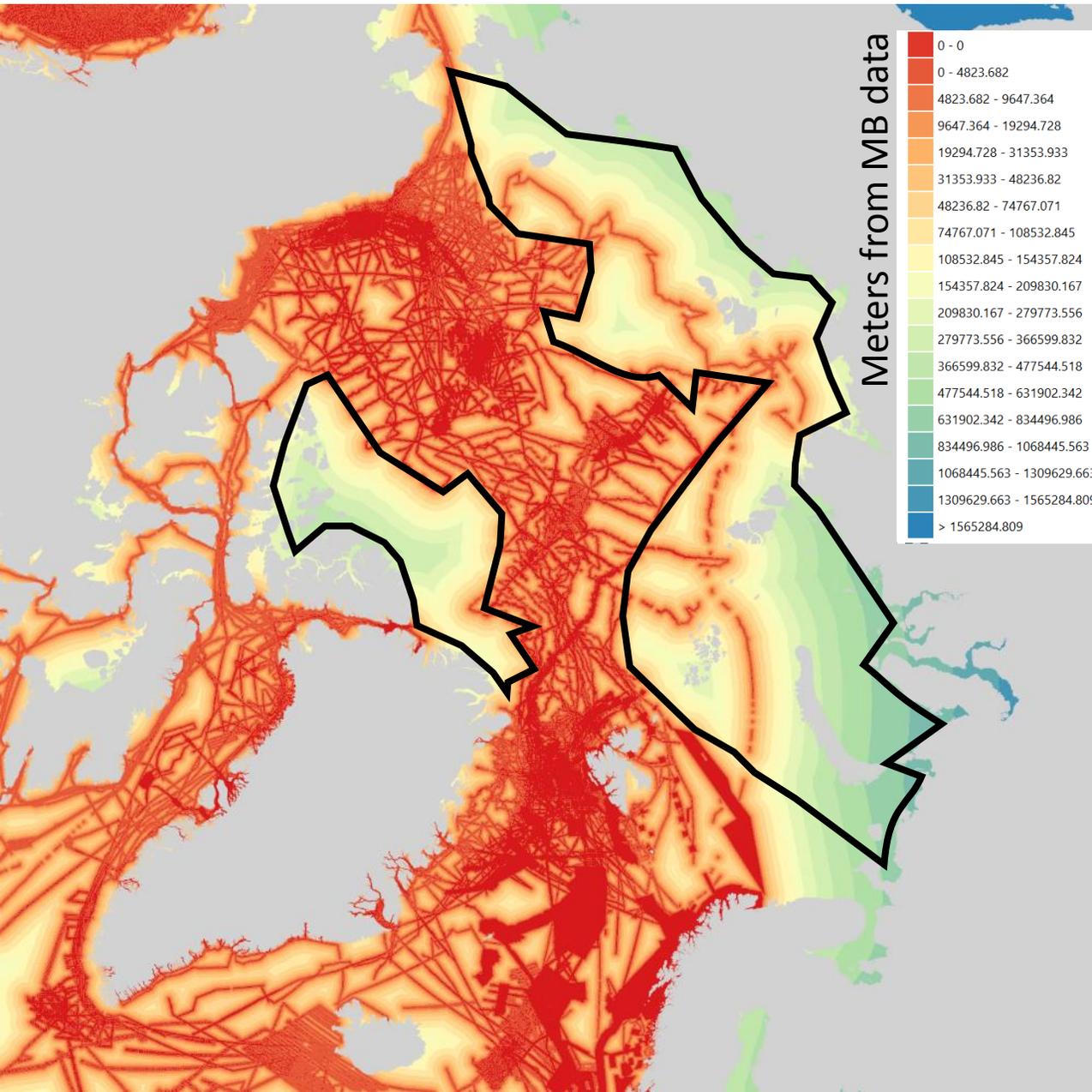
### Resolution targets

- 0-1500 m
- 1500-3000 m
- 3000-5750 m

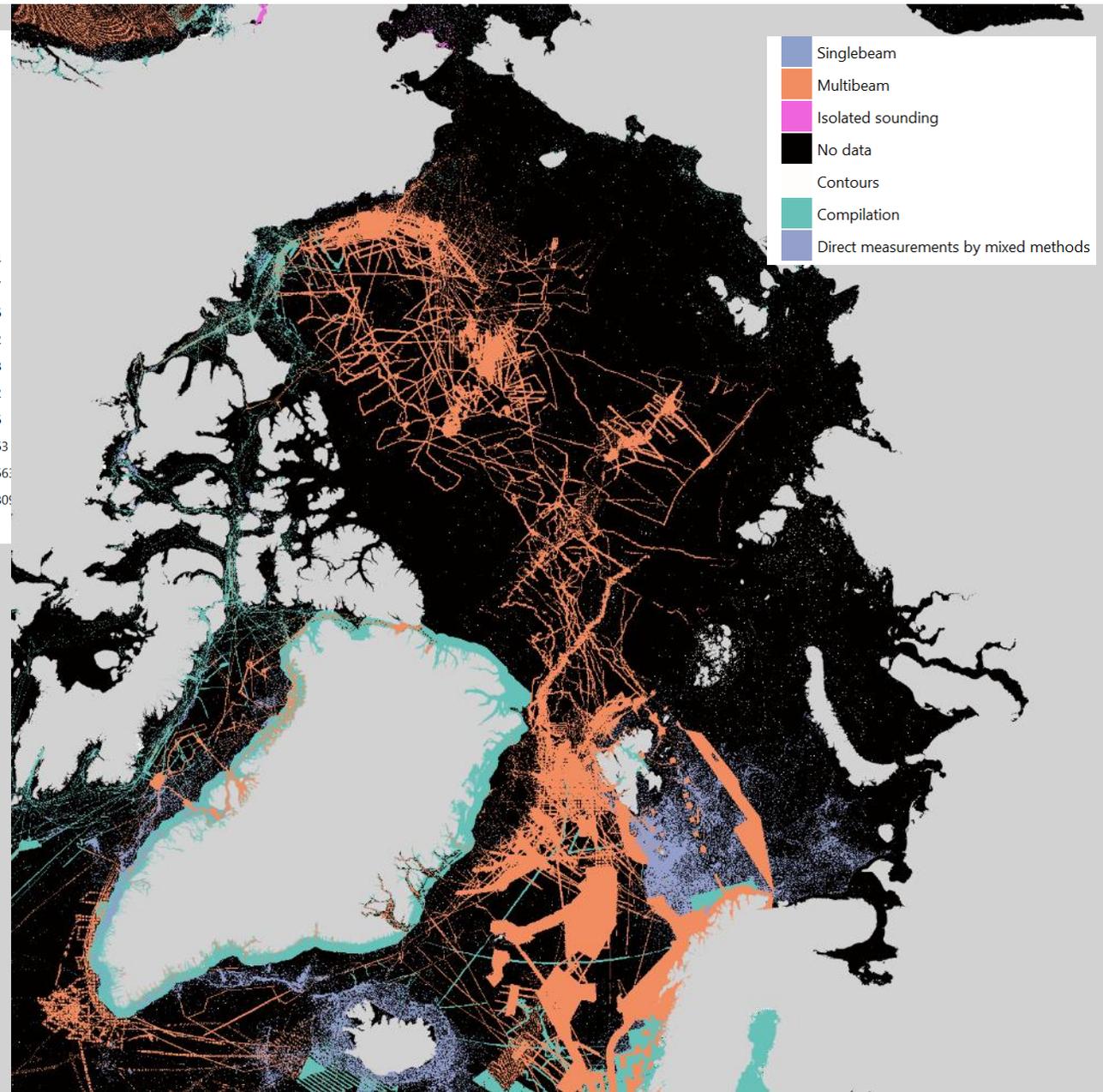


Spot soundings from  
navigational charts

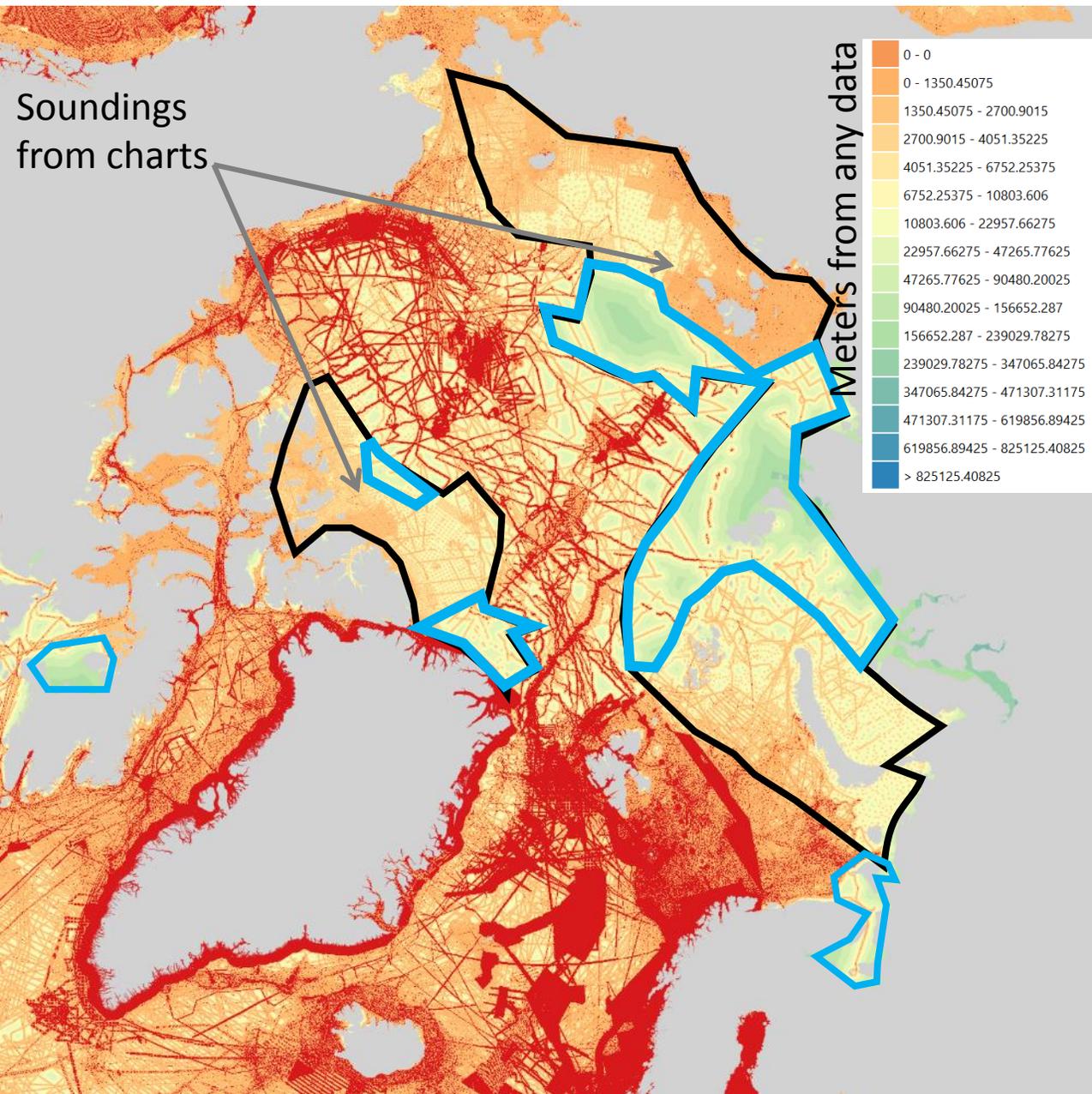
Distance in meters from multibeam data (TID=11)



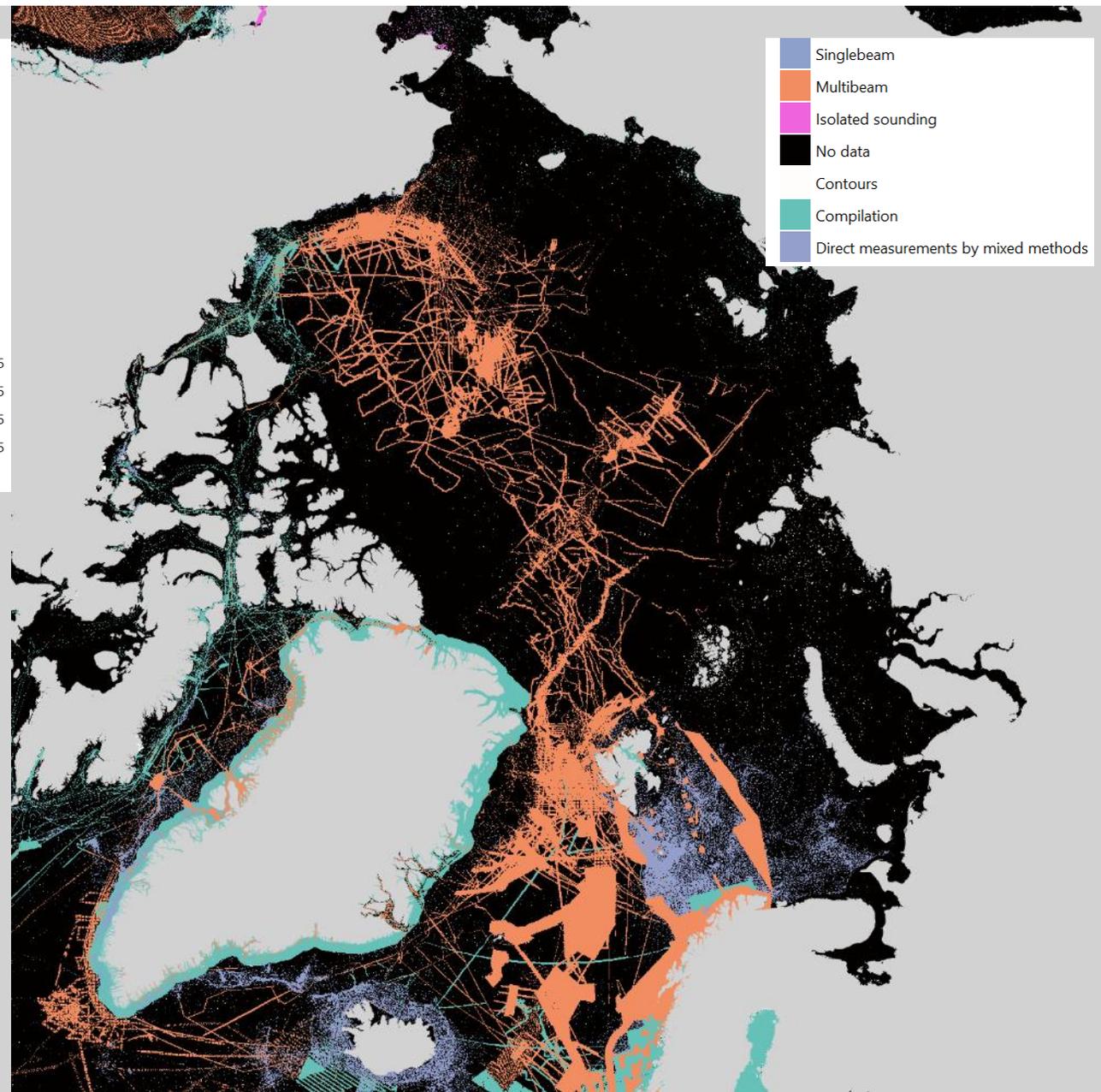
Source Identification grid (TID)



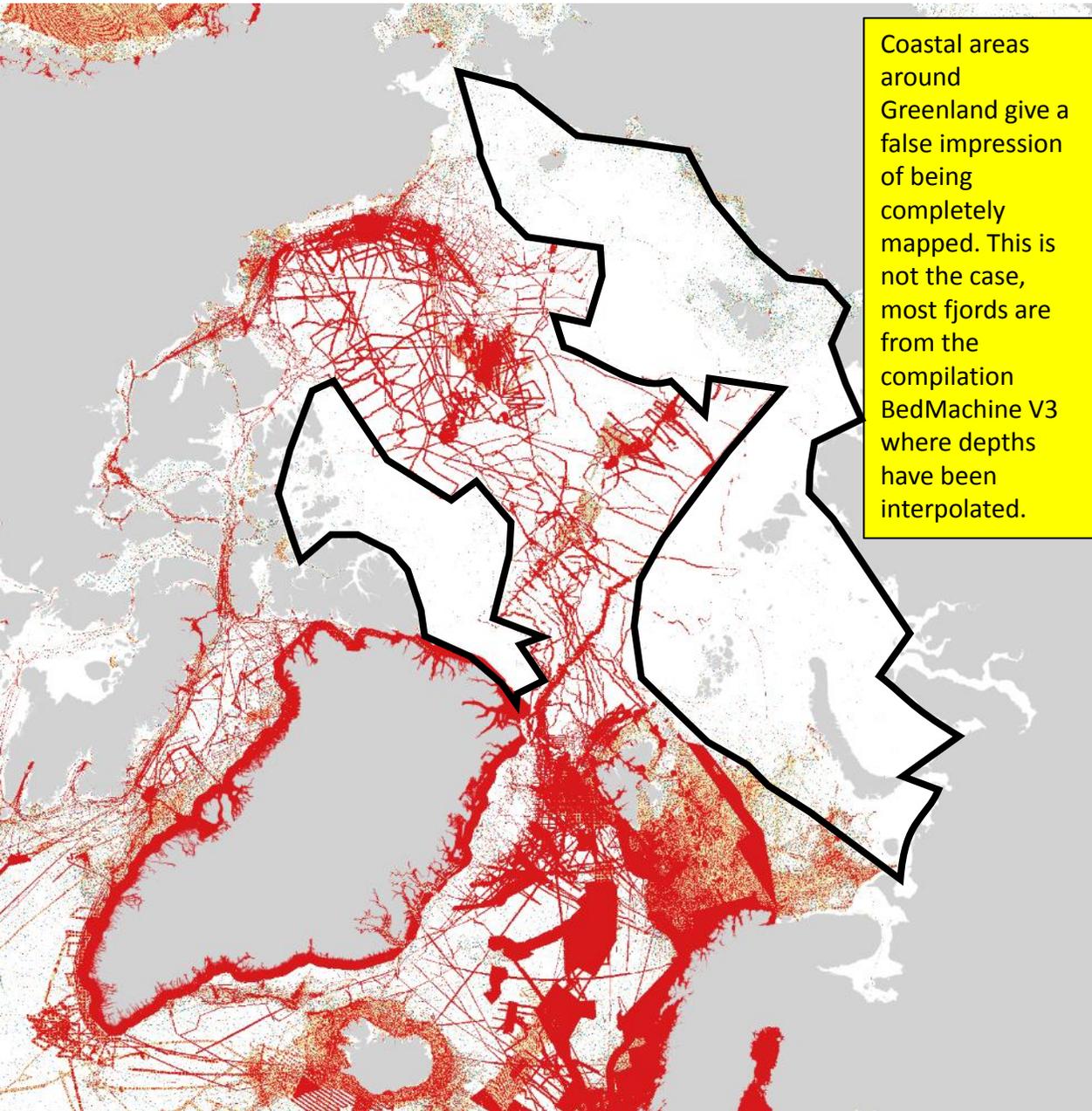
# Distance in meters from any data point



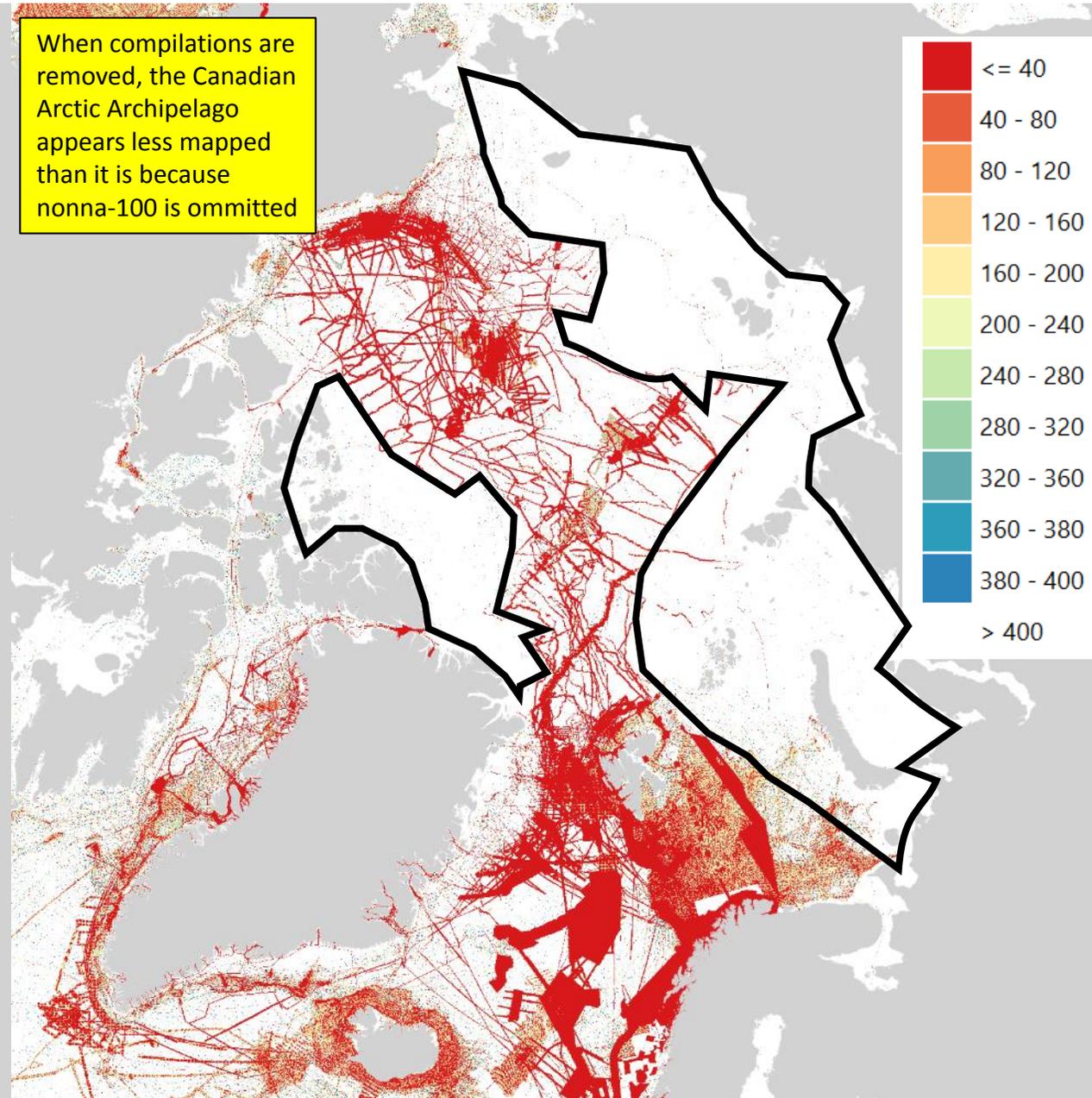
# Source Identification grid (TID)



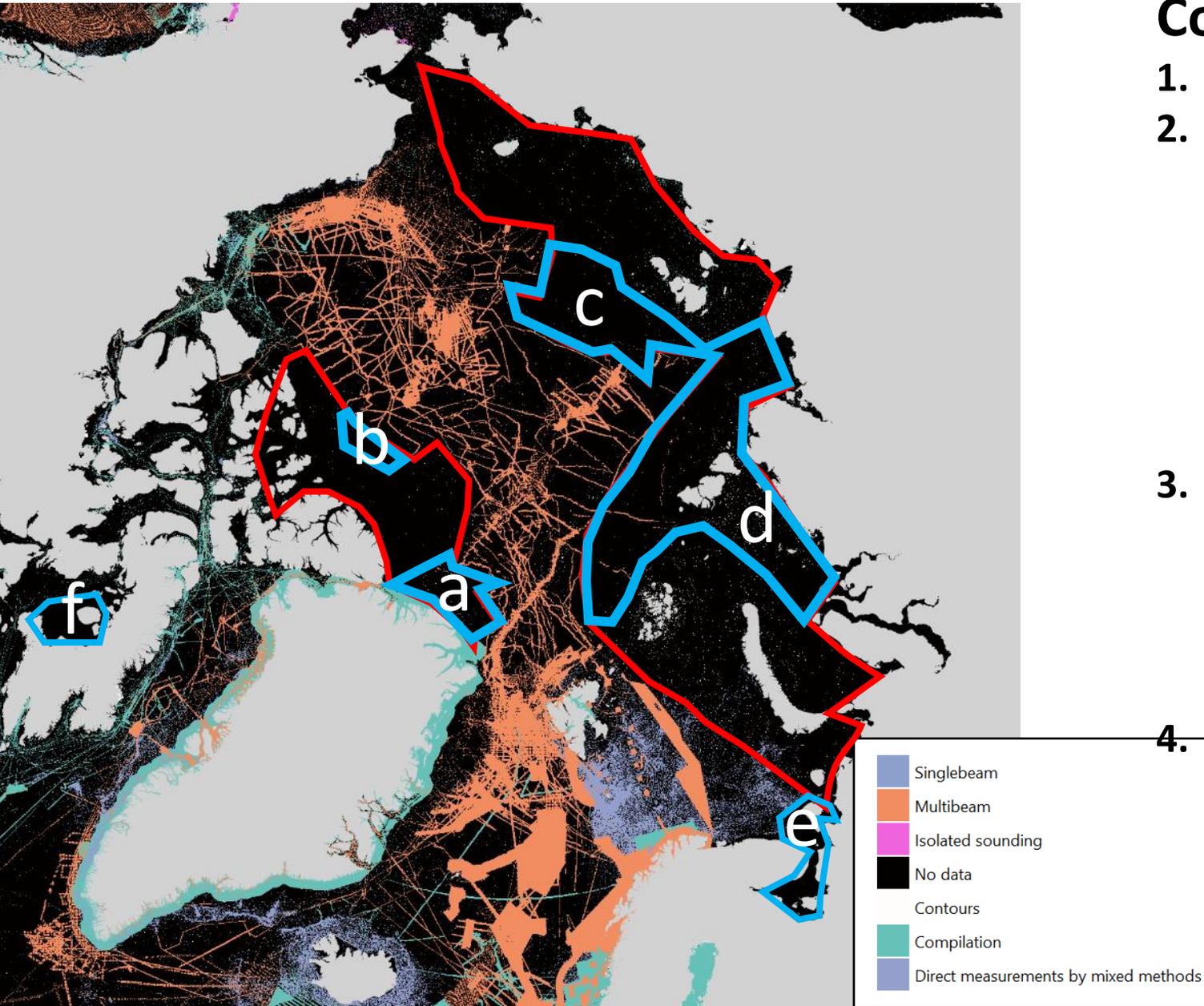
**White areas are >400 m from any data point,  
including provided compilations**



**White areas are >400 m from any data point,  
Excluding provided compilations**



# Data Type Identification Map (TID)



## Conclusions of gap analysis

1. Ca 80 % left to map!
2. Least data constrained areas in IBCAO 4.0:  
a) North of Greenland, b) North of the Canadian Arctic Archipelago, c) East Siberian-Laptev-Kara seas' outer margins and slopes, c) Kara sea (based on contours with unknown underlying data), e) White Sea, f) Around Prince Charles Island
3. To fulfil the Seabed 2030 target resolution criteria, multibeam bathymetry and some areas of crowd sourced bathymetry (Olex) are high-resolution enough to meet the criteria.
4. Provided compilations are key to IBCAO, but difficult to handle in a gap analysis if the location and type of underlying data points are not made available. Can TIDs be provided for future releases?

# IBCAO 4.0

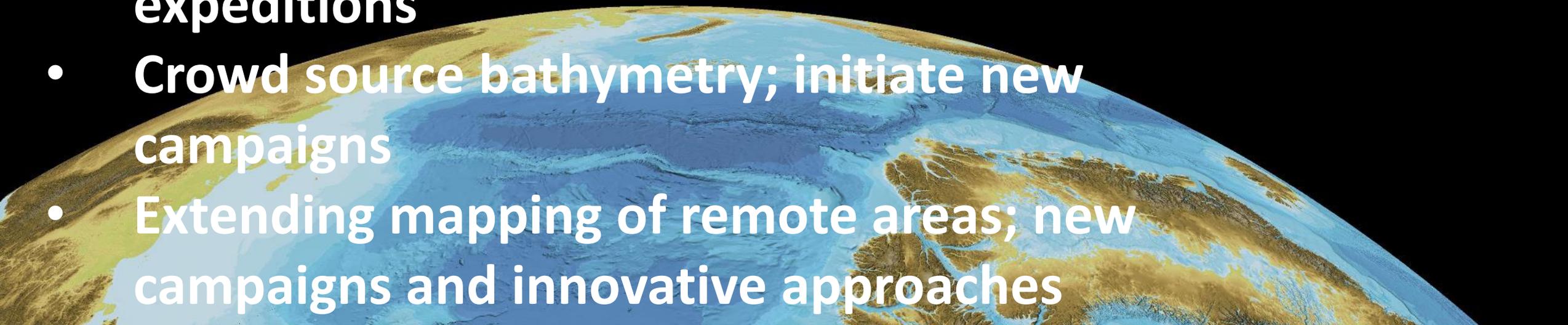
## Way ahead

- Collaboration between all; industry, nations, scientific communities.....
- Always collect mapping data during expeditions
- Crowd source bathymetry; initiate new campaigns
- Extending mapping of remote areas; new campaigns and innovative approaches

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# SEABED

# 2030



IHO

International  
Hydrographic  
Organization



United Nations  
Educational, Scientific and  
Cultural Organization



Intergovernmental  
Oceanographic  
Commission