



Koninklijke Marine

WHD -
"Hydrographic
information to drive
marine knowledge"

GNSS voor nieuwe
precisie toepassingen
-Crowd sourced
Bathymetry

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Director NLHO / Hydrographer RNLN

14 June 2019

Question



GNSS high precision in order to...?

GNSS high precision needed for good data ?

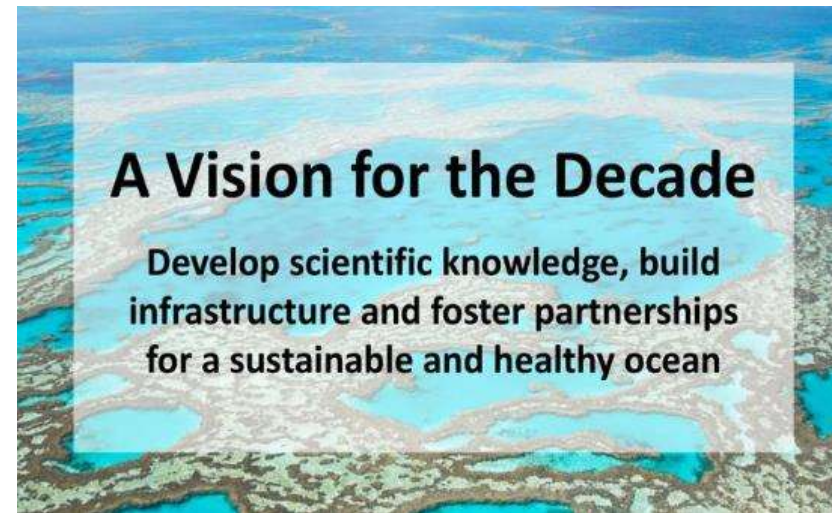
Problem?



UN Decade of Ocean Science for Sustainable Development

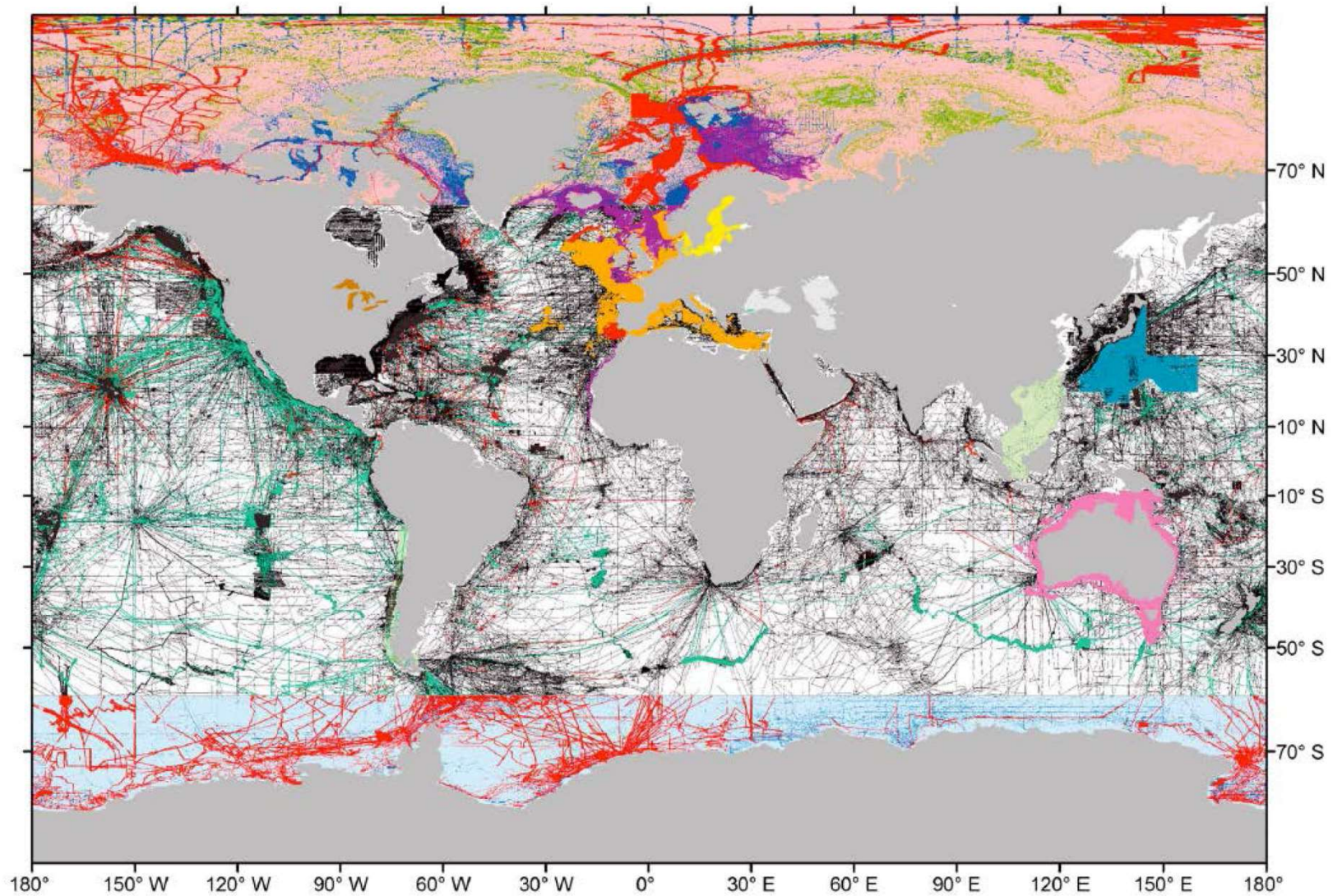
195 UN member states
have given their
support/approval

SDG14 will not be
achievable **without a**
comprehensive map of
the world ocean floor





GEBCO – the most authoritative, publicly-available world ocean map

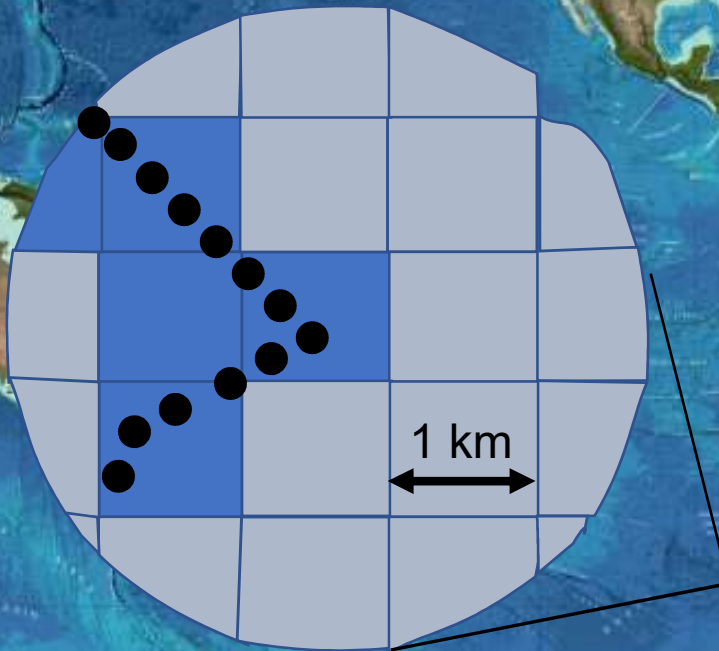


Completeness of GEBCO 2014 Grid



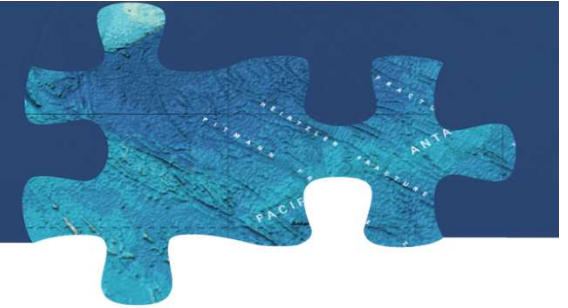
If the World Ocean is divided into 1x1 km blocks (grid cells), about **82 %** of them do not have depth values. (Based on GEBCO 2014 grid)

**18 %
complete**



**Target resolution of
New HIGH
RESOLUTION
GEBCO Grid?**

NF – GEBCO Seabed 2030



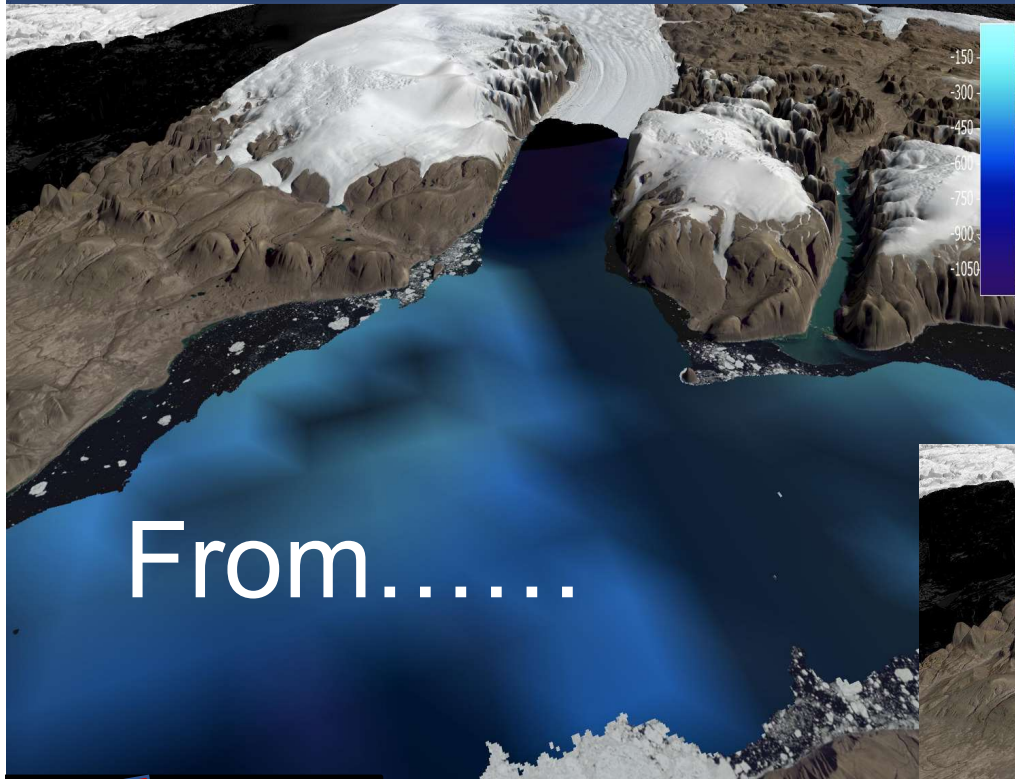
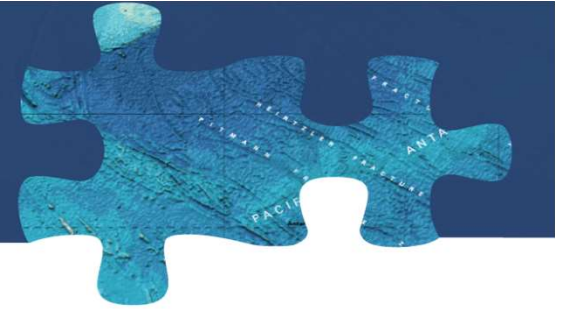
Collaborative project
Nippon Foundation and GEBCO

Mr Sasakawa, Chairman of the Nippon Foundation proposed

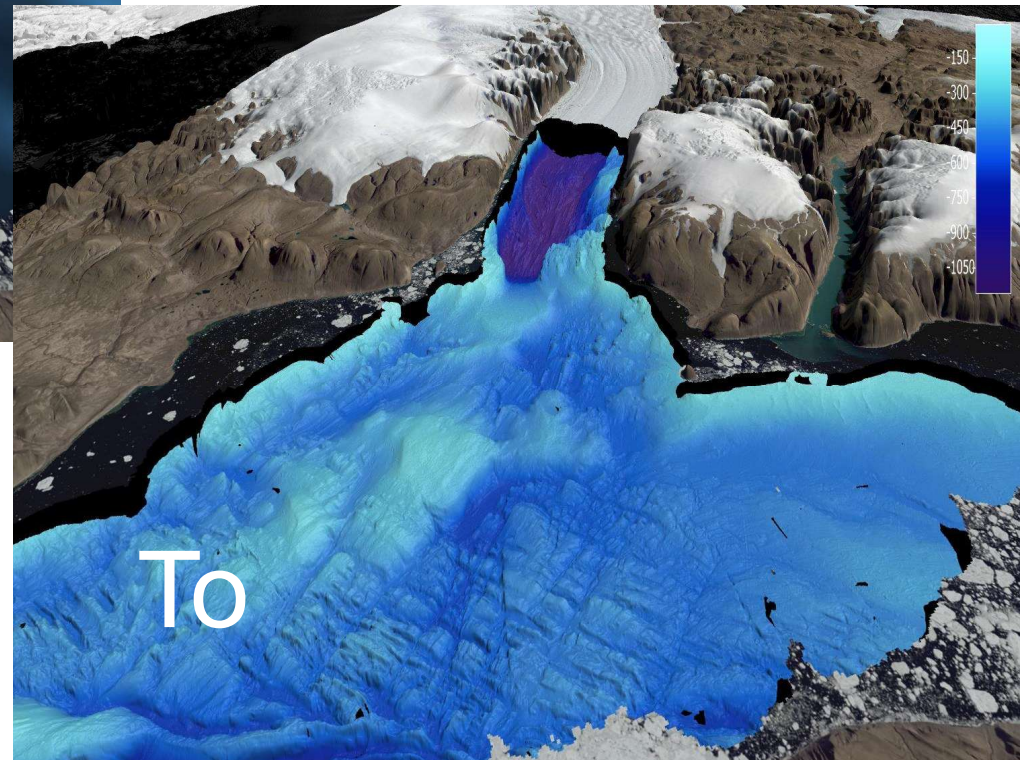
'...to map 100% of the topography of the World Ocean by 2030'

Complete the GEBCO Grid at high resolution by 2030

GEBCO - the most authoritative, publicly-available world ocean map

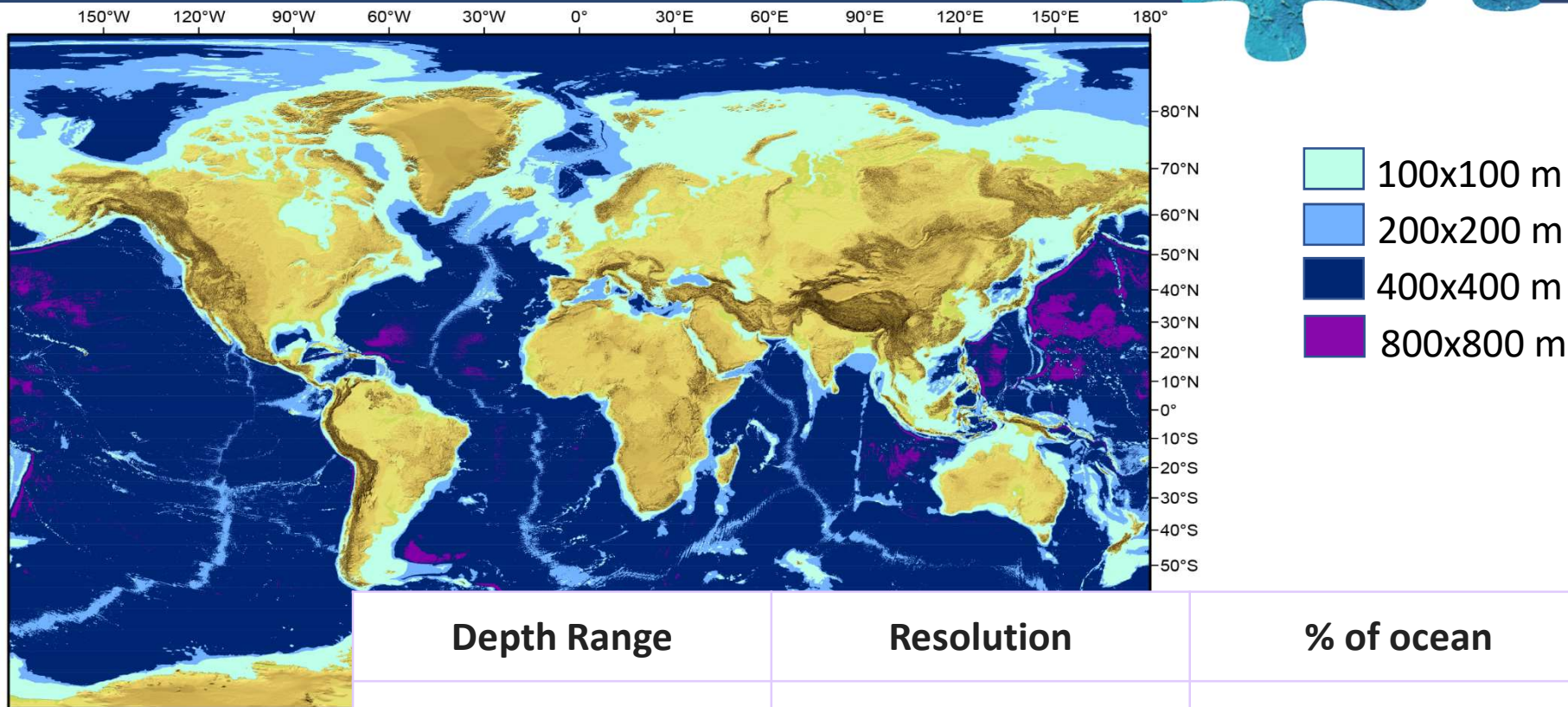
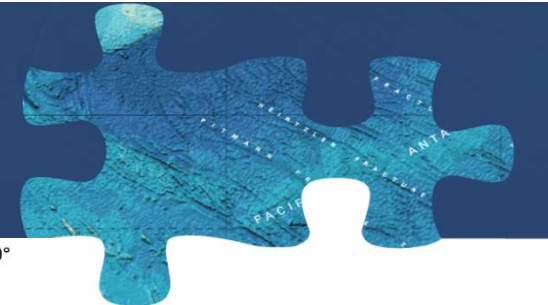


From.....



To

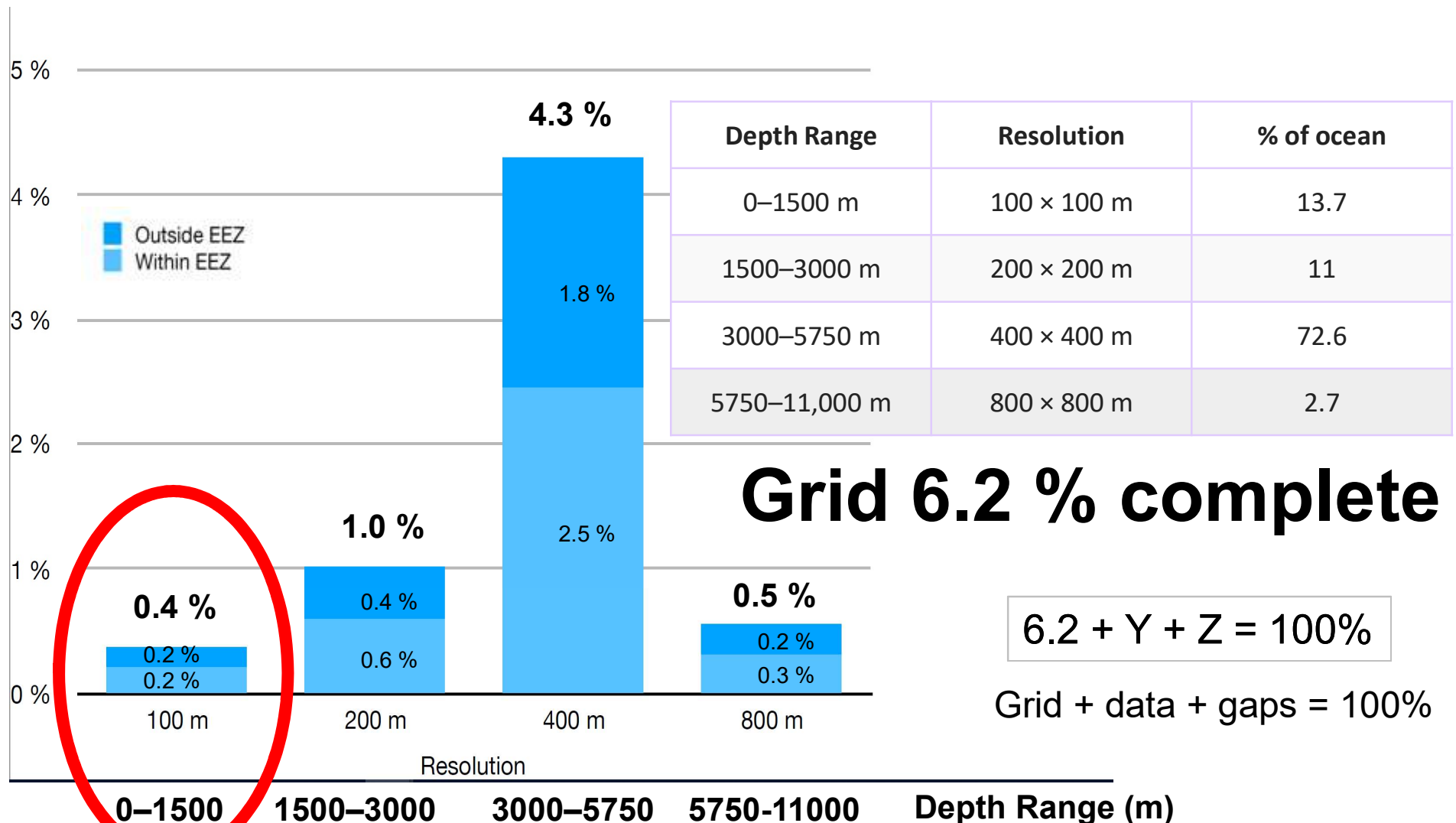
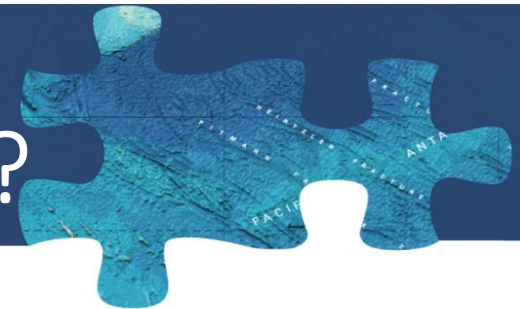
Target GEBCO Grid Variable Resolution



Depth-dependent,
variable resolution

Depth Range	Resolution	% of ocean
0–1500 m	100 × 100 m	13.7
1500–3000 m	200 × 200 m	11
3000–5750 m	400 × 400 m	72.6
5750–11,000 m	800 × 800 m	2.7

How complete is the variable res GEBCO Grid?



Seabed 2030 Phases



$$X + Y + Z = 100\%$$

GEBCO Grid
Now

Data NOT in
Grid

‘Map the Gaps’

A solution



to map the Gap

Crowd Source Bathymetry (CSB)

Standard GNSS receiver

- Horizontal ✓
- Vertical ✗

Commercial Echosounder

Logger

Post processing

- Cookbook (reduction)





International Hydrographic Organization

Draft IHO publication on policy for trusted crowdsourced bathymetry (CSB)

Provides guidelines on the collection and assessment of CSB data for inclusion in the global bathymetric data set which is maintained in the:

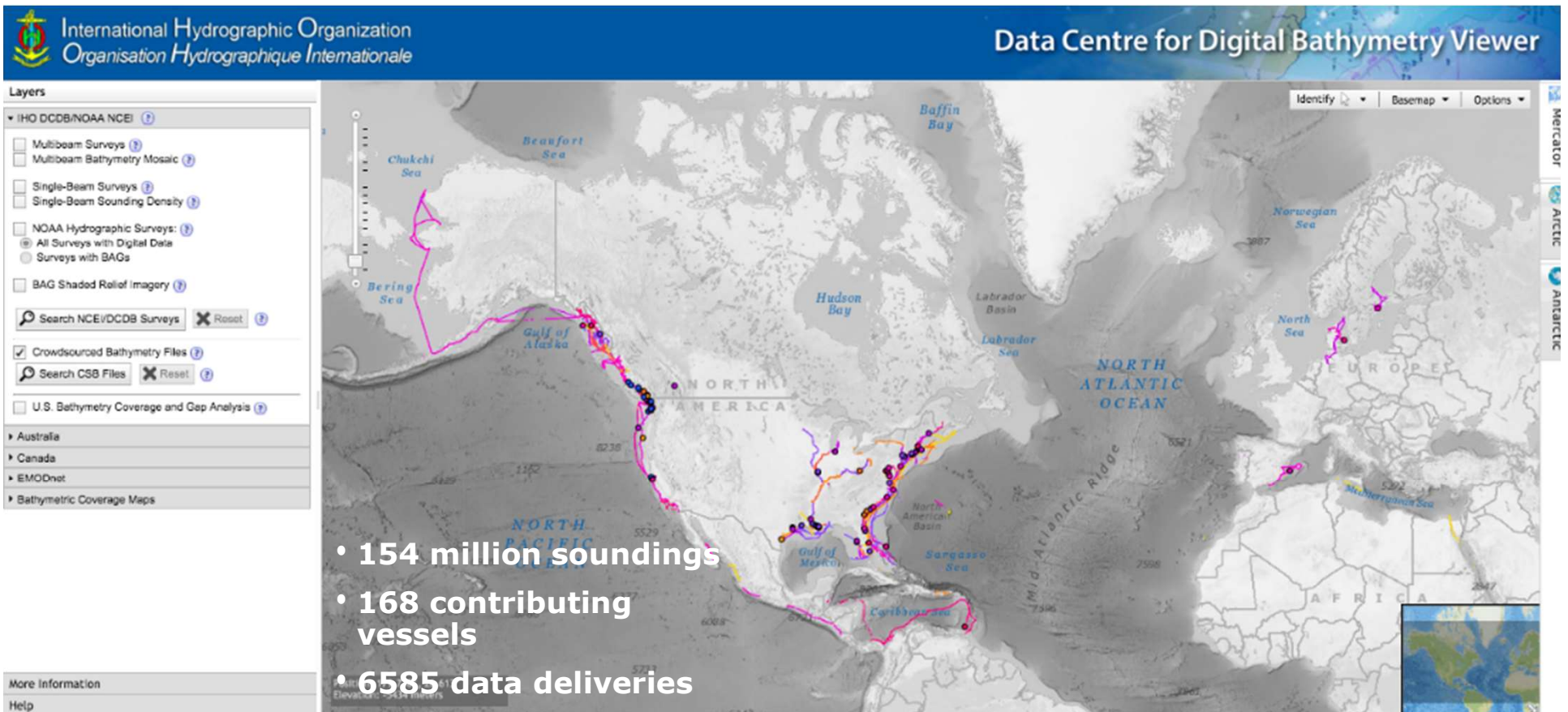
“IHO Data Centre for Digital Bathymetry (DCDB)”



Guidance on Crowdsourced
Bathymetry



IHO DCDB Database





CSB Working Group - Significant Highlights

Cruise Liner: Carnival Cruise Line & MacGregor

- The Macgregor Maritime Data Engine is a data normaliser that collects, standardizes and stores data

Marine Survey: Fugro

- Signed data submission agreement with DCDB
- Contributed over 20 transit surveys





CSB Working Group - Significant Highlights cont...

Seismic Survey: PGS

- MoU signed by PGS CEO

Research Vessel: Antarctic Treaty Consultative Meeting 42 (Prague, Jul '19)

- Stronger resolution for countries to commit their research vessels to contribute to bathymetric data collection.



XLII Antarctic Treaty
Consultative Meeting
Prague • Czech Republic • 2019

(type) (number)

ENG

Agenda Item: 15
Presented by: Norway, Italy,
New Zealand, the
United States
Original: English
Submitted: (date submission)

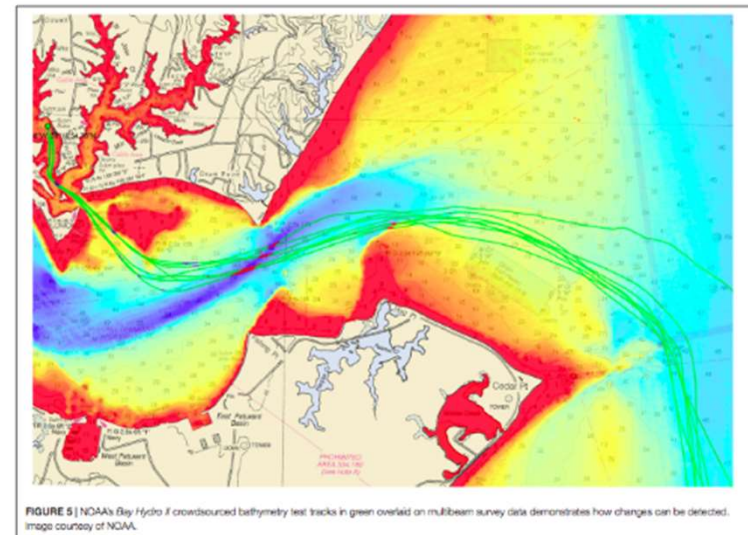
Hydrographic Surveying of Antarctic Waters
Working Paper submitted by Norway, Italy, New Zealand, and the
United States



CSB Use Cases – NOAA Chart Adequacy Assessment

Describes NOAA & George Mason University collaboration to:

- Use CSB to assess NOAA nautical chart adequacy
- Determine when areas require updated survey information
- Identify chart discrepancies before an incident occurs.



<https://www.frontiersin.org/articles/10.3389/fmars.2019.00225/full#h5>

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Why CSB? – by Pete Wills (CHS)

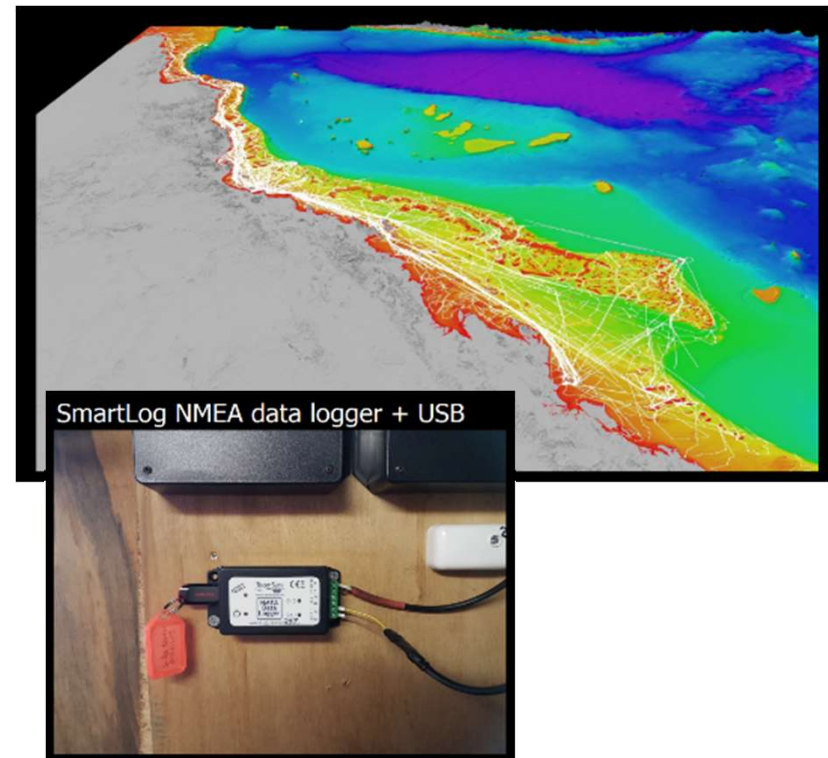
- The potential is enormous as is our coastline.
- We have always received reported shoals from mariners and put them on charts.
- CSB is an evolution of the mariners reporting system.
- We still need to assess the quality of data however it comes in.
- We have very old sparse surveys or no surveys in many areas.
- Mariners have better positioning and sonars today than much of the older data.
- Free

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Use Case – Great Barrier Reef Project (James Cook U.)

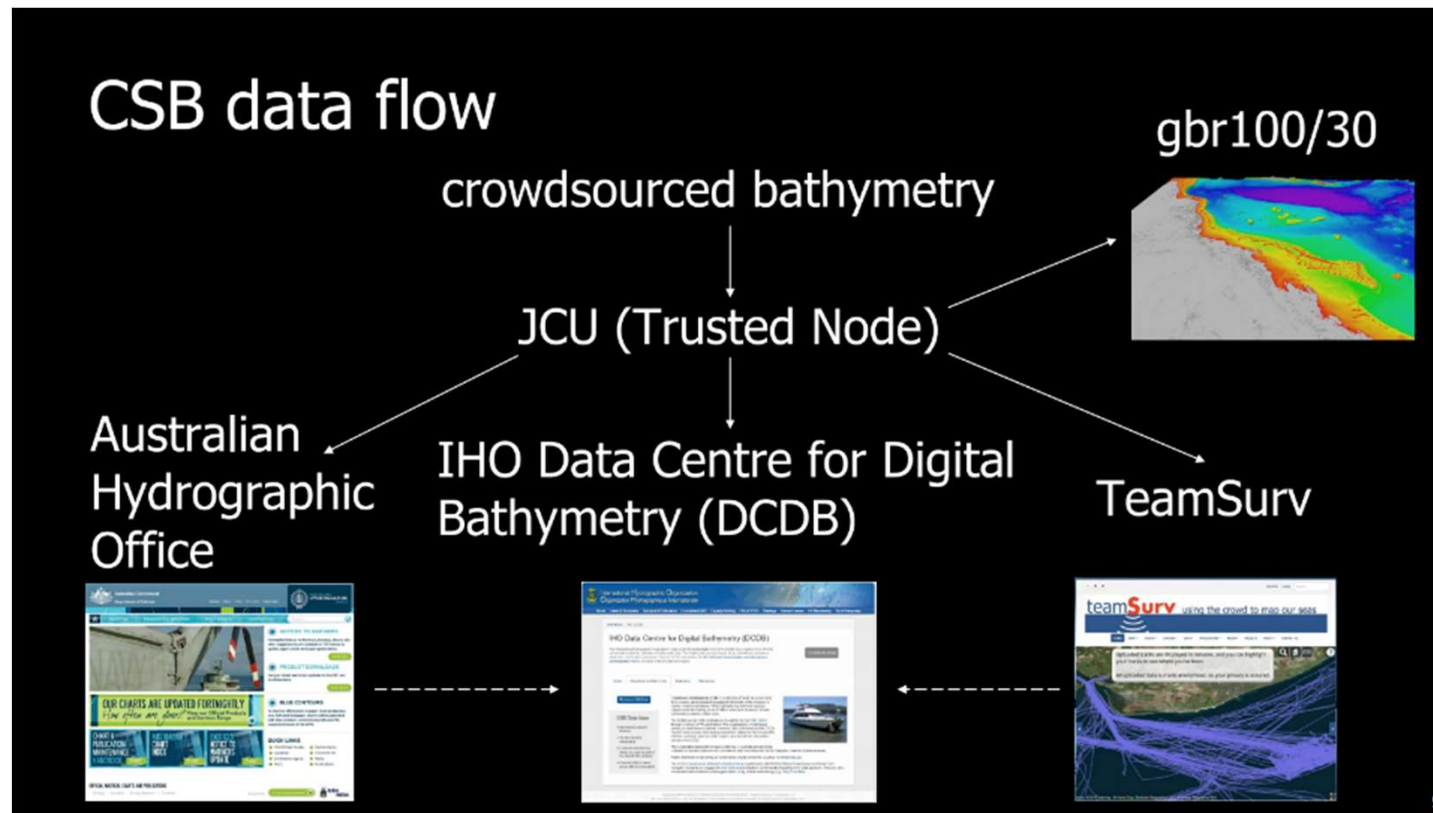
- ~40% of GBR shelf is mapped with in situ depth soundings, with a need to preserve, share and fill the data gaps
- In 2018, James Cook U. started the 'CSB on the GBR Reef' project to collect CSB from voluntary vessels
- Partnered with the Great Barrier Reef Foundation to establish a pool of TeamSurv SmartLog USB data loggers.



<https://www.deepreef.org/publications/conference/242-crowdsourced-bathy.html>



Use Case – Great Barrier Reef



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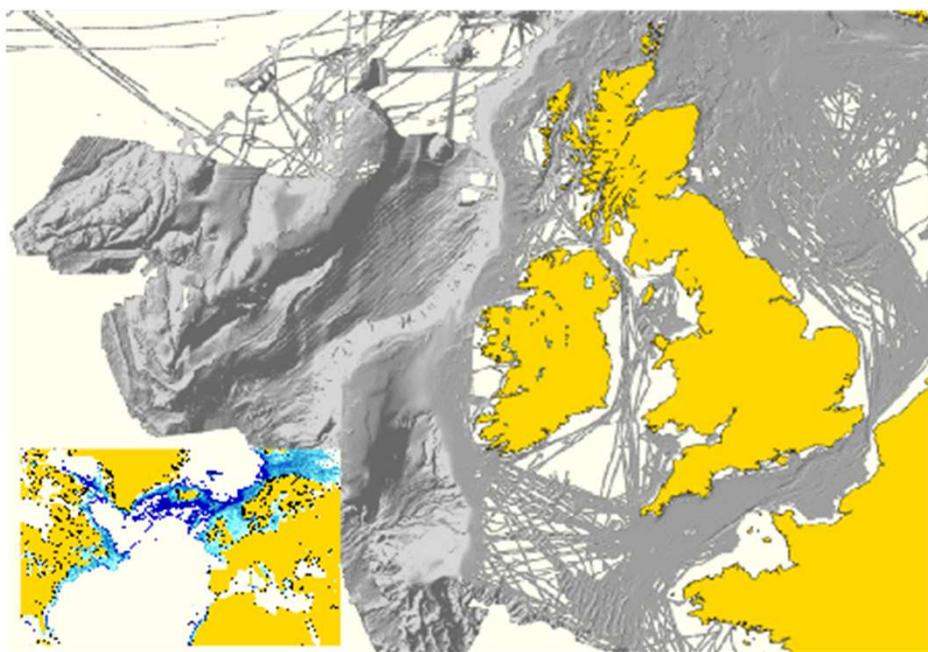
Problems Encountered

Skepticism within parts of the IHO community and sections of the marine domain where an overly cautious focus on potential, although untested, legal issues and concerns on commercial exploitation of data is observed.

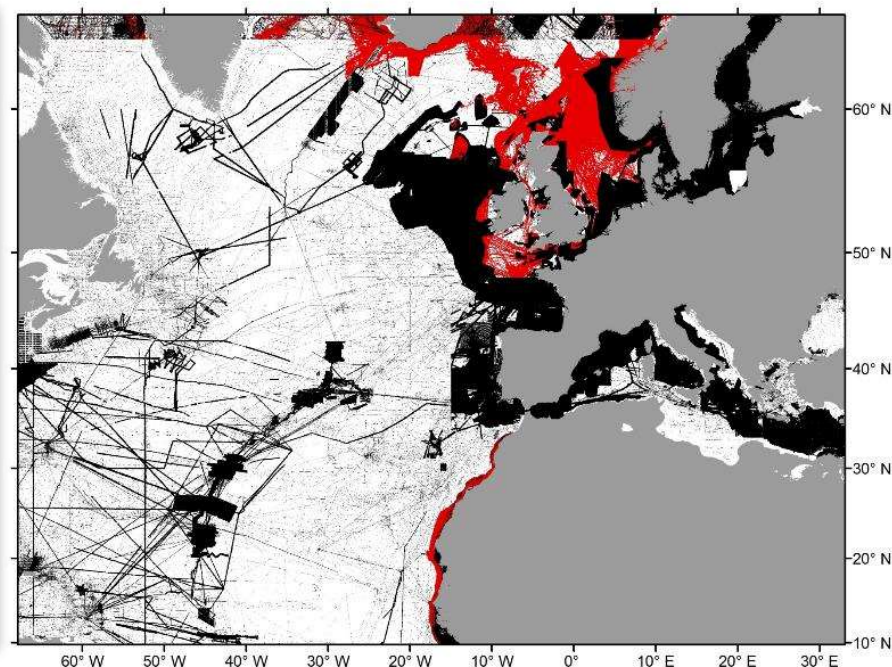
Resources available within national HOs to process data available via the DCDB.



Coverage



Coverage of Olex data (red) included in the GEBCO_2014 Grid in the North Atlantic Ocean region

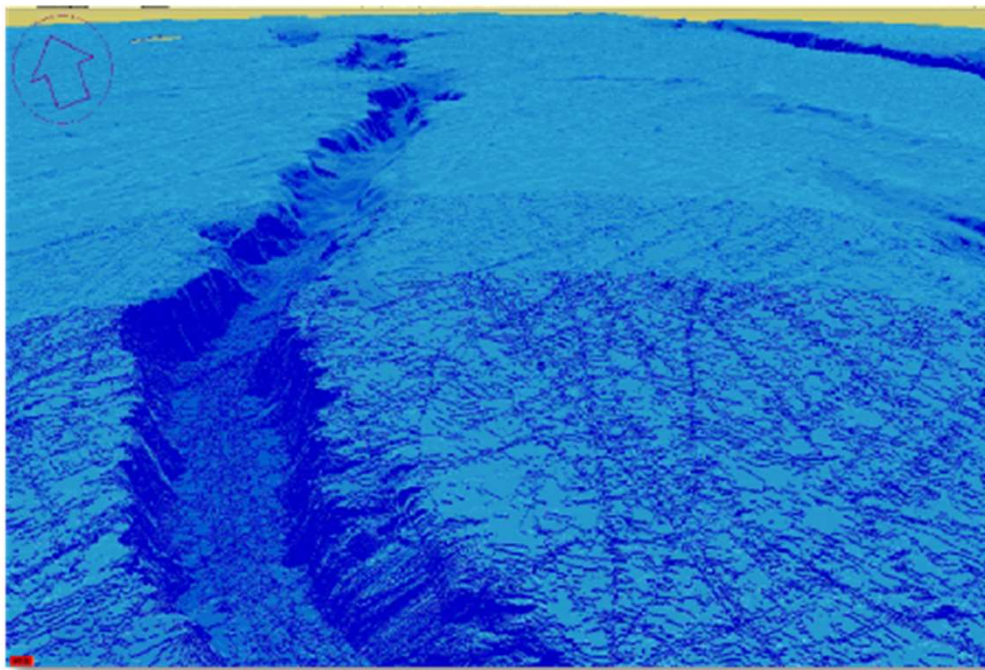


The Olex global bathymetric database

- Two billion soundings
- Quid pro quo



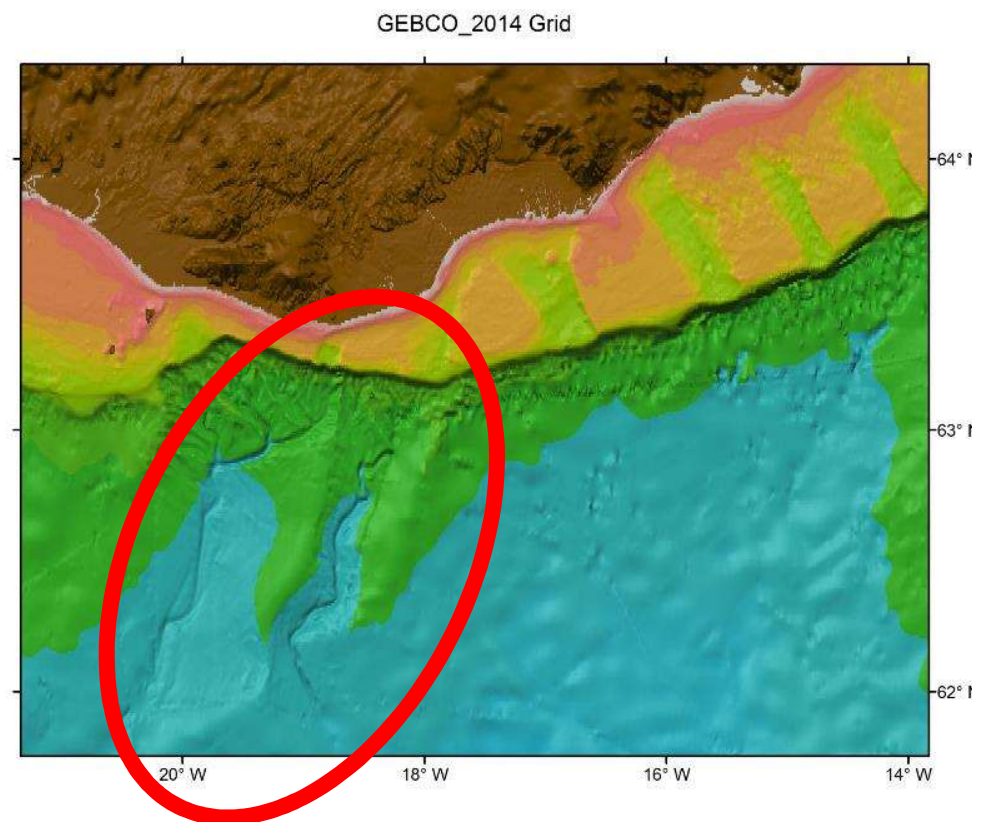
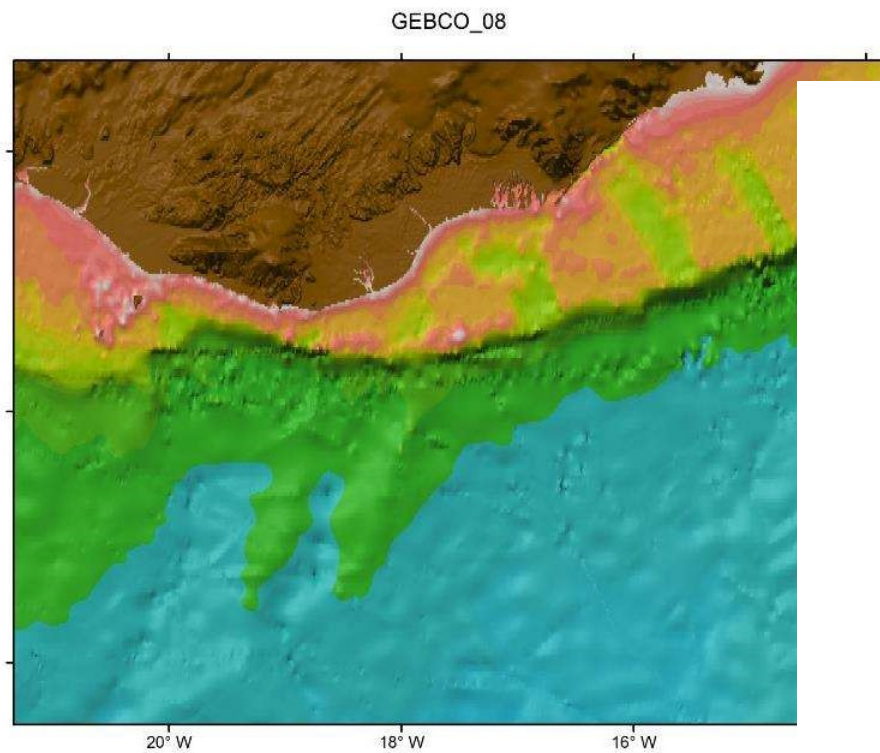
Resolution



The Olex data set is of a very high resolution (5 metres)



Example



Conclusions



No High precision GNSS needed to MAP THE GAP

Commercial GNSS itself is an essential ingredient

"Good Data Quality does not mean that the quality of the data has to be good....

It means that the end user is well informed how good the Quality of the Data is"