

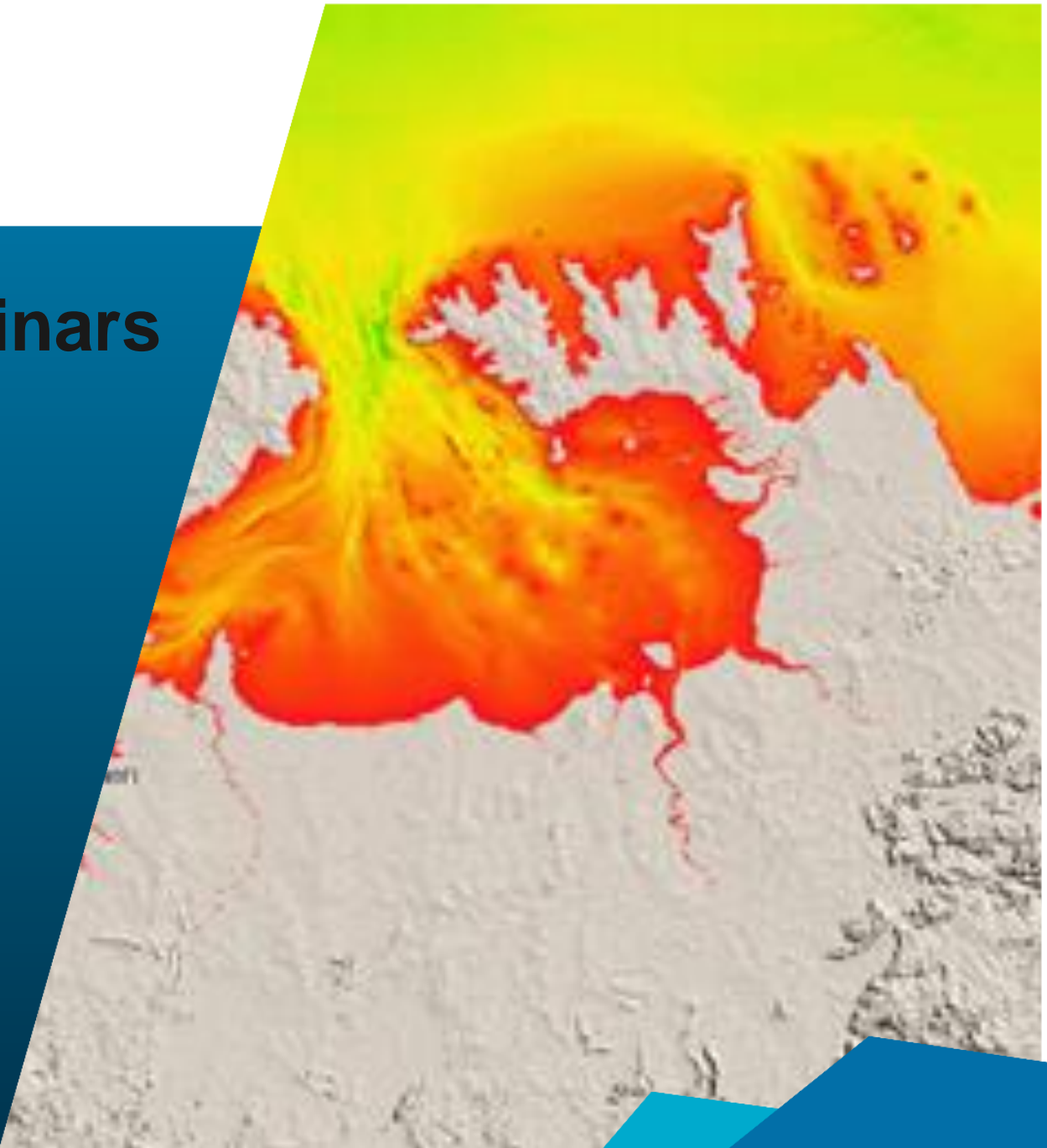


AUS
SEABED

AusSeabed Community Webinars

November 2023

1st November 2023





Working towards a **mapped** and **accessible** Australian seabed with the AusSeabed Strategy



Products

All seabed mapping data and products in the Australian region are guided by F.A.I.R principles and easily used



Coverage

Seabed data coverage in the Australian region provides maximum benefit to users



Awareness

Seabed mapping and AusSeabed is widely understood, valued and used across Government and the community

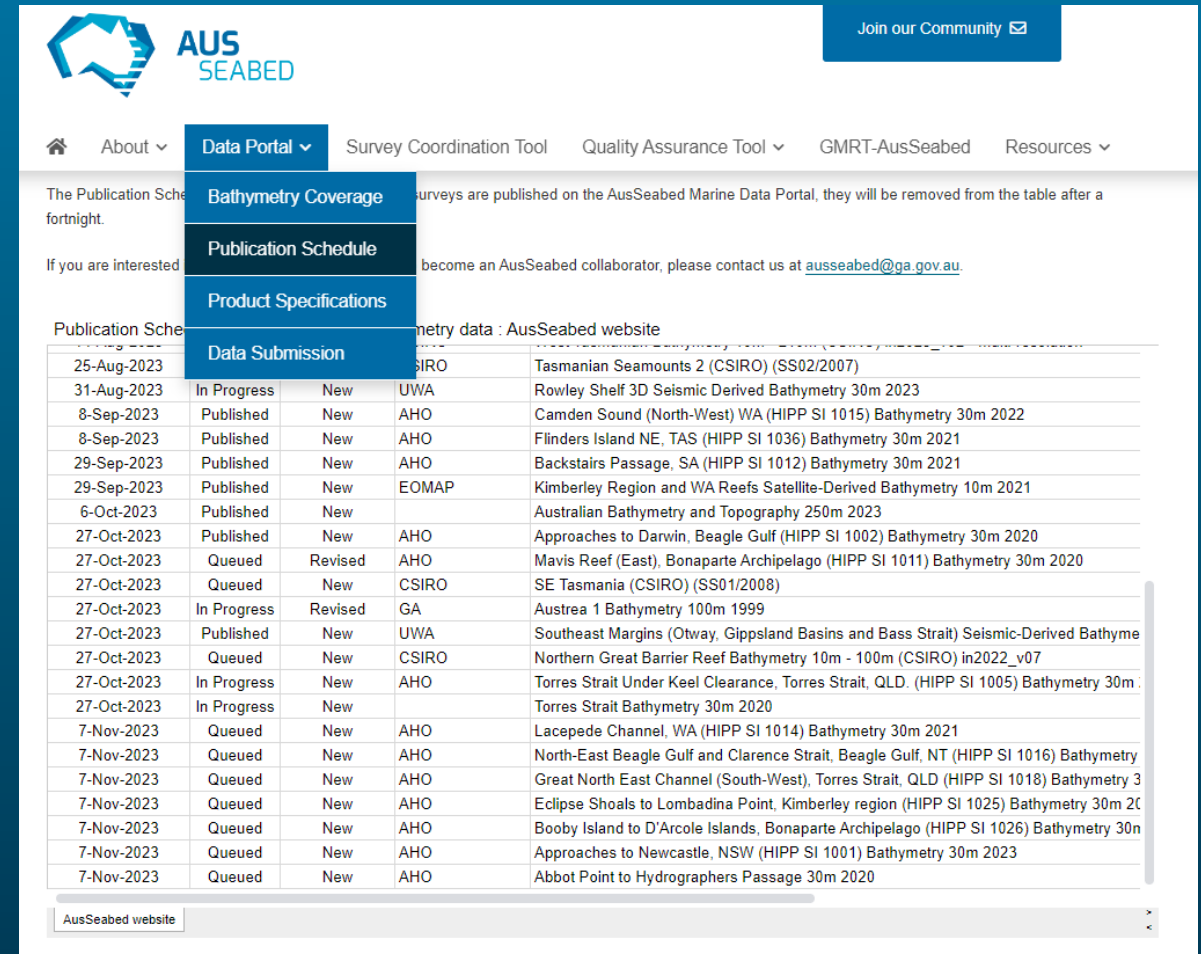
Data Publications

- 12 HIPP Surveys published
- AusBathyTopo 250m 2023
- 4x 3D Seismic derived bathy compilations

In the queue (to 7th November 2023)

- 7 new HIPP Surveys
- 2020 Torres Strait 30m
- 2023 Torres Strait 30m
- 7 AHO reference surfaces

[Publication Schedule | AusSeabed](#)



The screenshot shows the AusSeabed website interface. At the top, there is a navigation bar with the AusSeabed logo and a 'Join our Community' button. Below the navigation bar, there is a 'Data Portal' dropdown menu with options: Bathymetry Coverage, Publication Schedule, Product Specifications, and Data Submission. The 'Publication Schedule' option is selected, displaying a table of publications.

The table lists the following publications:

Publication Date	Status	Survey Type	Survey Name
25-Aug-2023	In Progress	New	CSIRO Tasmanian Seamounts 2 (CSIRO) (SS02/2007)
31-Aug-2023	In Progress	New	UWA Rowley Shelf 3D Seismic Derived Bathymetry 30m 2023
8-Sep-2023	Published	New	AHO Camden Sound (North-West) WA (HIPP SI 1015) Bathymetry 30m 2022
8-Sep-2023	Published	New	AHO Flinders Island NE, TAS (HIPP SI 1036) Bathymetry 30m 2021
29-Sep-2023	Published	New	AHO Backstairs Passage, SA (HIPP SI 1012) Bathymetry 30m 2021
29-Sep-2023	Published	New	EOMAP Kimberley Region and WA Reefs Satellite-Derived Bathymetry 10m 2021
6-Oct-2023	Published	New	Australian Bathymetry and Topography 250m 2023
27-Oct-2023	Published	New	AHO Approaches to Darwin, Beagle Gulf (HIPP SI 1002) Bathymetry 30m 2020
27-Oct-2023	Queued	Revised	AHO Mavis Reef (East), Bonaparte Archipelago (HIPP SI 1011) Bathymetry 30m 2020
27-Oct-2023	Queued	New	CSIRO SE Tasmania (CSIRO) (SS01/2008)
27-Oct-2023	In Progress	Revised	GA Austrea 1 Bathymetry 100m 1999
27-Oct-2023	Published	New	UWA Southeast Margins (Otway, Gippsland Basins and Bass Strait) Seismic-Derived Bathymetry 30m 2021
27-Oct-2023	Queued	New	CSIRO Northern Great Barrier Reef Bathymetry 10m - 100m (CSIRO) in2022_v07
27-Oct-2023	In Progress	New	AHO Torres Strait Under Keel Clearance, Torres Strait, QLD. (HIPP SI 1005) Bathymetry 30m 2020
27-Oct-2023	In Progress	New	Torres Strait Bathymetry 30m 2020
7-Nov-2023	Queued	New	AHO Lacepede Channel, WA (HIPP SI 1014) Bathymetry 30m 2021
7-Nov-2023	Queued	New	AHO North-East Beagle Gulf and Clarence Strait, Beagle Gulf, NT (HIPP SI 1016) Bathymetry 30m 2021
7-Nov-2023	Queued	New	AHO Great North East Channel (South-West), Torres Strait, QLD (HIPP SI 1018) Bathymetry 30m 2021
7-Nov-2023	Queued	New	AHO Eclipse Shoals to Lombadina Point, Kimberley region (HIPP SI 1025) Bathymetry 30m 2021
7-Nov-2023	Queued	New	AHO Booby Island to D'Arcole Islands, Bonaparte Archipelago (HIPP SI 1026) Bathymetry 30m 2021
7-Nov-2023	Queued	New	AHO Approaches to Newcastle, NSW (HIPP SI 1001) Bathymetry 30m 2023
7-Nov-2023	Queued	New	AHO Abbot Point to Hydrographers Passage 30m 2020

At the bottom of the page, there is a search bar labeled 'AusSeabed website'.

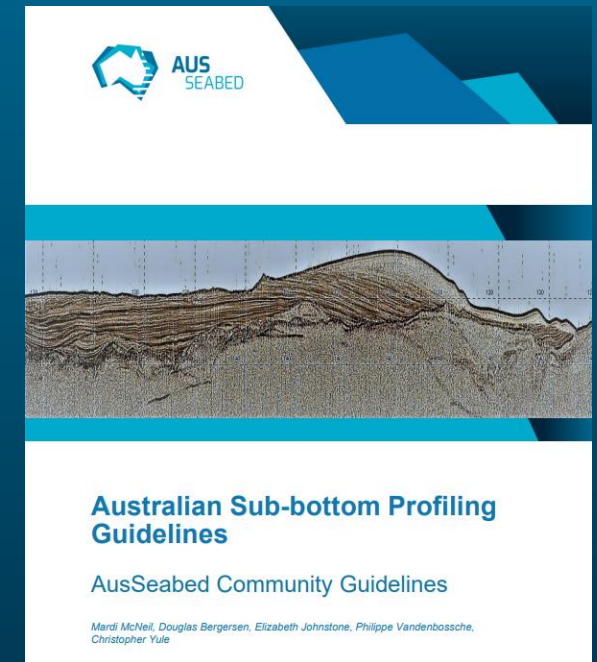
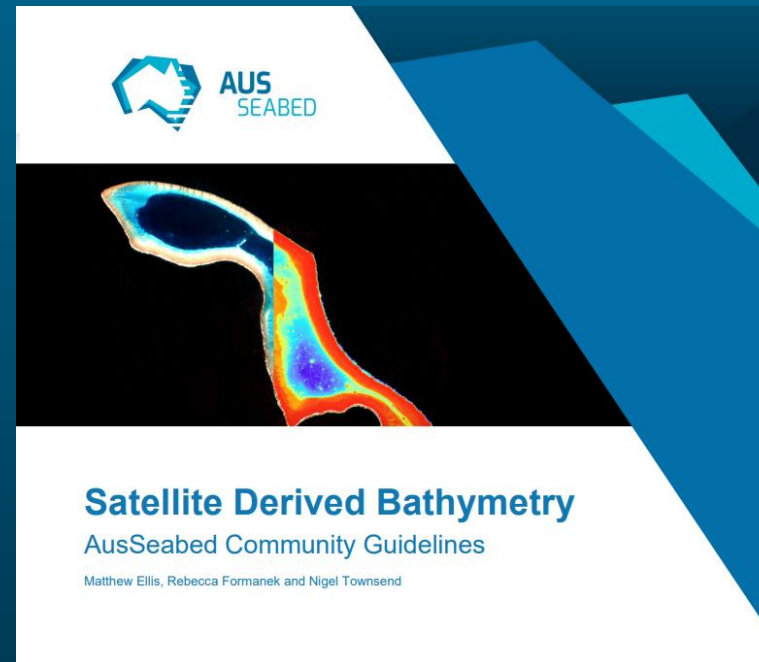
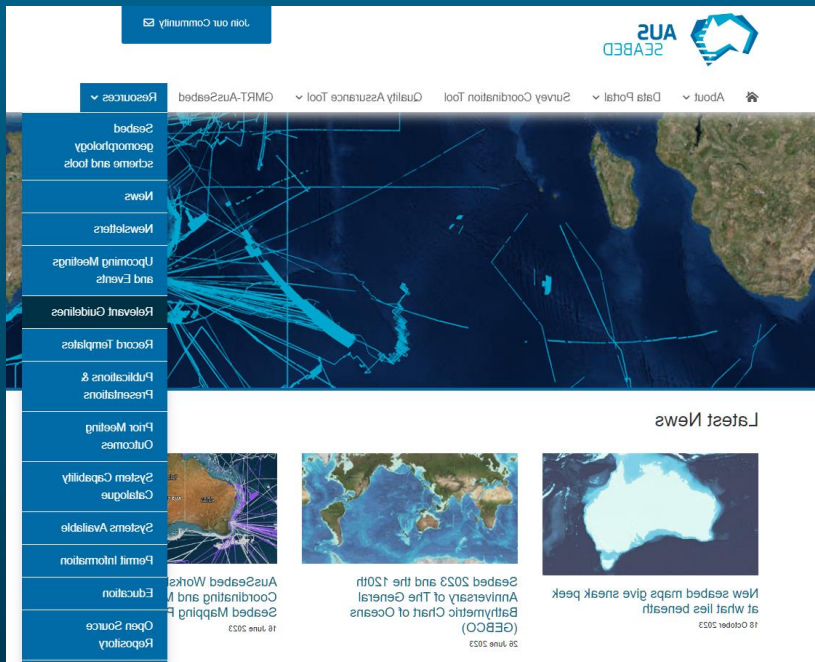


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Highlights

Standards and Guidelines

- Satellite Derived Bathymetry Guidelines
- Sub-Bottom Profiling Guidelines



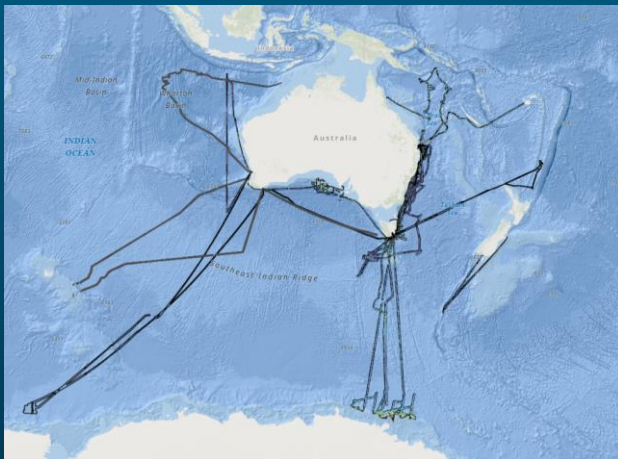
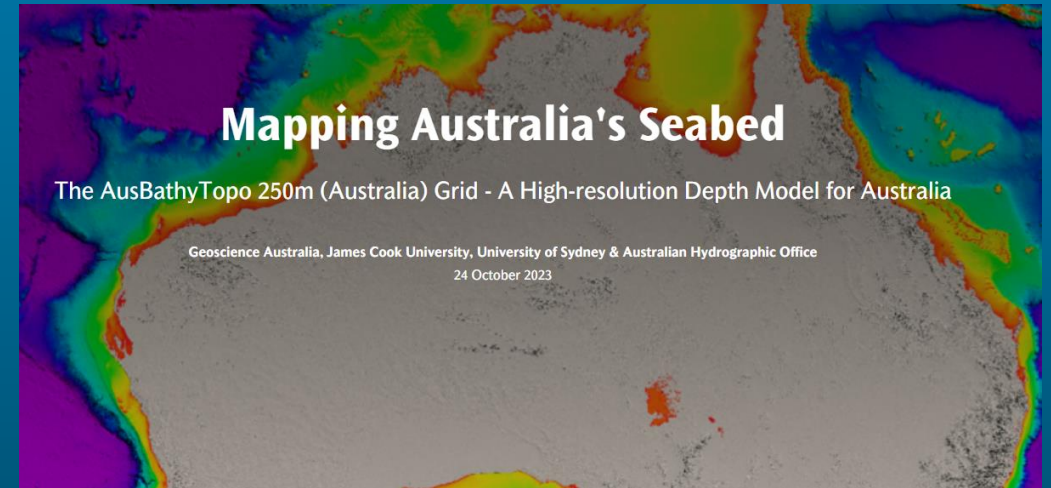


AUS
SEABED

Highlights

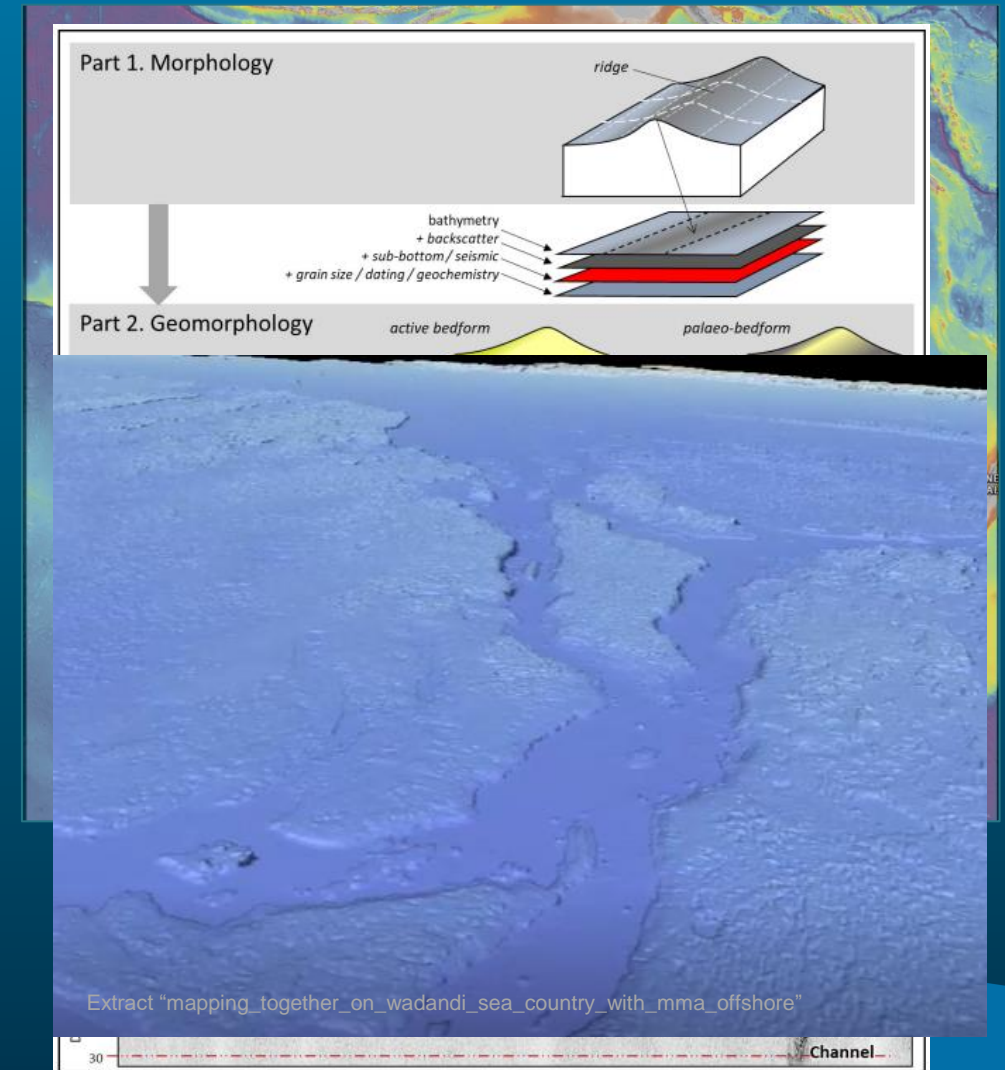
New Products

- Mapping Australia's Seabed Storymap
- CSIRO Multiresolution data services



Agenda

1. An introduction to the AusBathyTopo 250m 2023 – Dr Robin Beaman
2. Geomorphology – Dr Rachel Nanson
3. Mapping Together on Wadandi Sea Country



AusBathyTopo 250m 2023 grid

Dr Robin Beaman

College of Science and Engineering

robin.beaman@jcu.edu.au

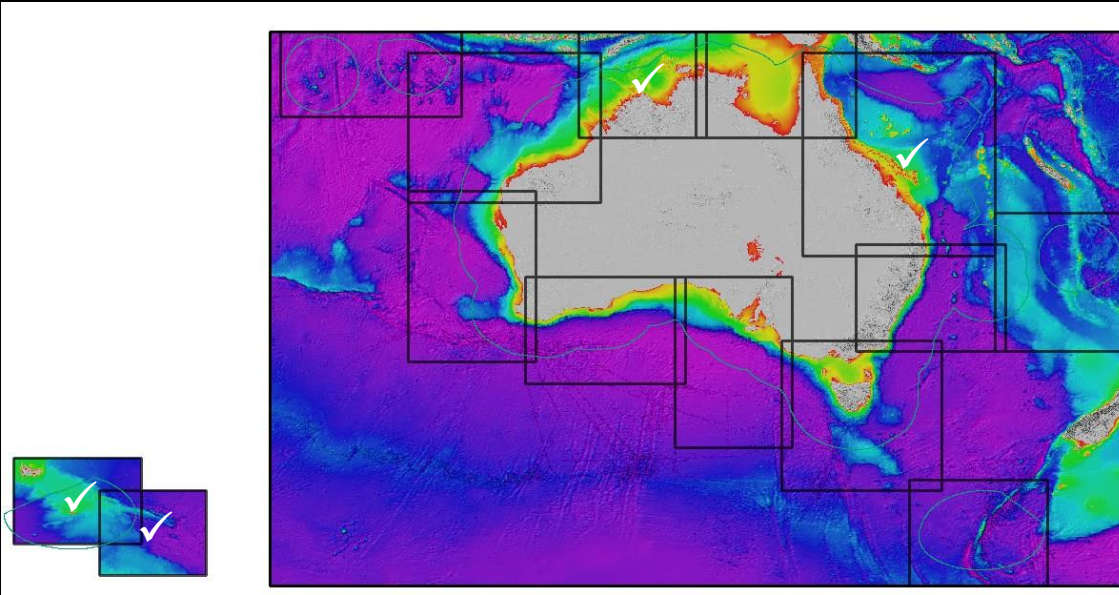


Objective

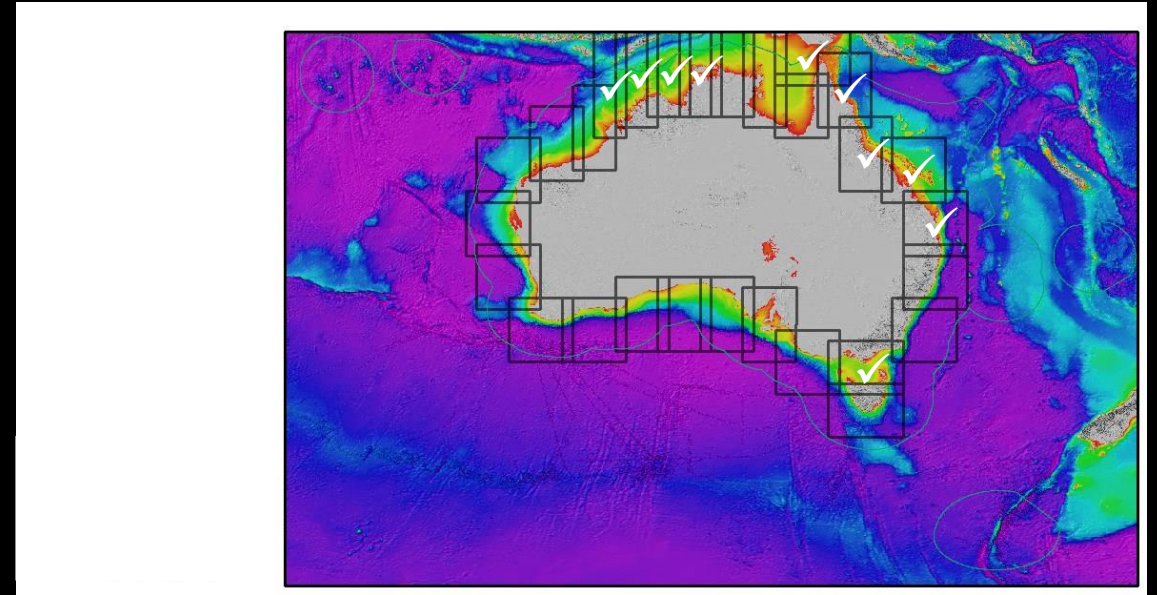
To develop a computer-interpolated, continuous bathymetry (depth) surface for Australia's marine region. In collaboration with other agencies and institutions, use available source bathymetry data to generate a seamless and noise-free 3D depth model of Australia's underwater landscape.

- Boundary limits: long 92°-172° E, lat 8°-60° S
- Grid pixel resolution: 0.0025° (~250m)
- Horizontal datum: WGS84 (unprojected)
- Vertical datum: approximate mean sea level (MSL)

Australia's series of bathy grids

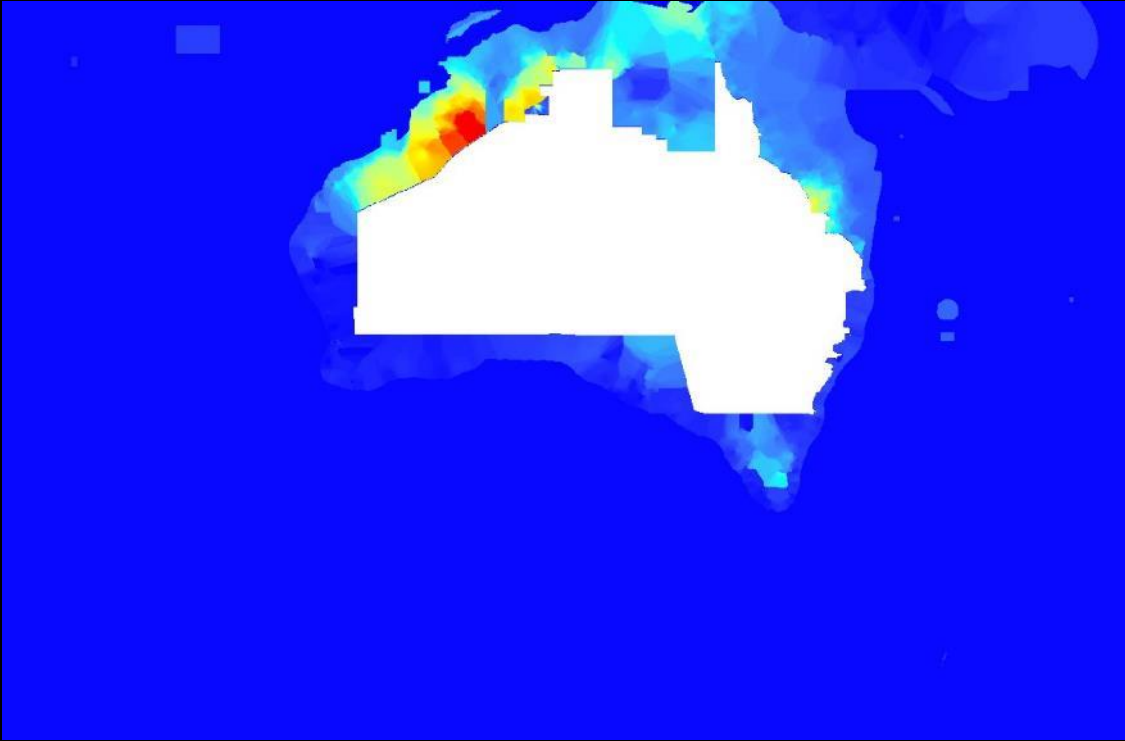


100m grids for Australia and offshore territories. Overlap by 1°, to cover EEZ, <2GB file size.



30m grids for Australian mainland shelf. Overlap by 1°, < 2GB file size.

LAT-MSL model

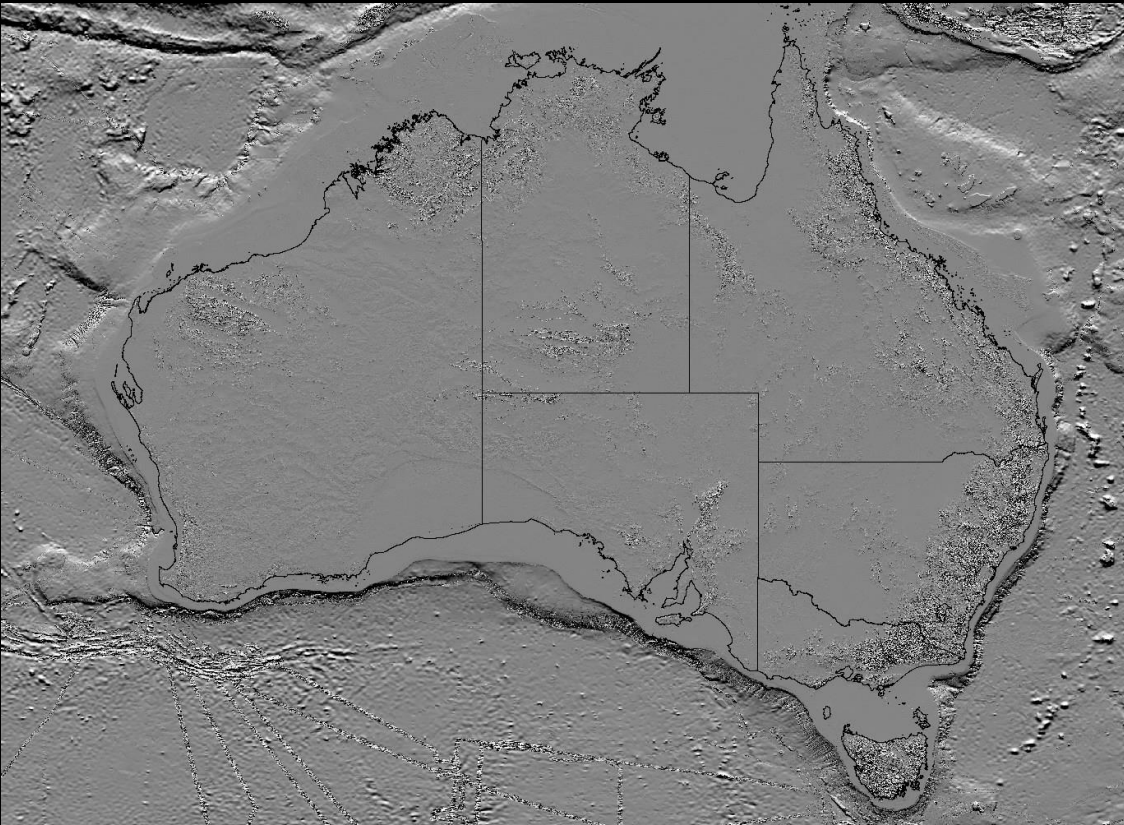


Used AHO-supplied 2023 LAT-MSL model for area: 21GB, 0.0005°, 36°N to 80°S, 24°E to 180°E, 0.6-501 m

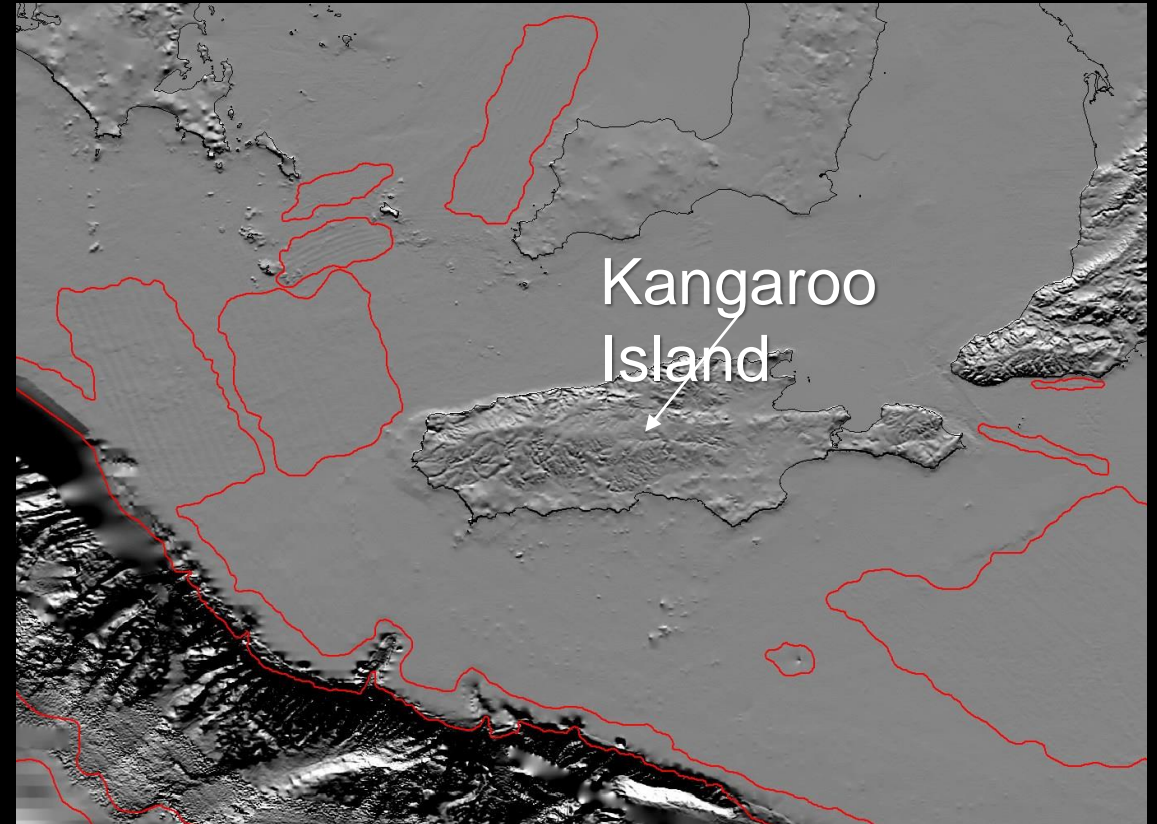


PowerShell script developed using GMT to apply LAT-MSL vertical adjustment to every single sounding

Ausbase

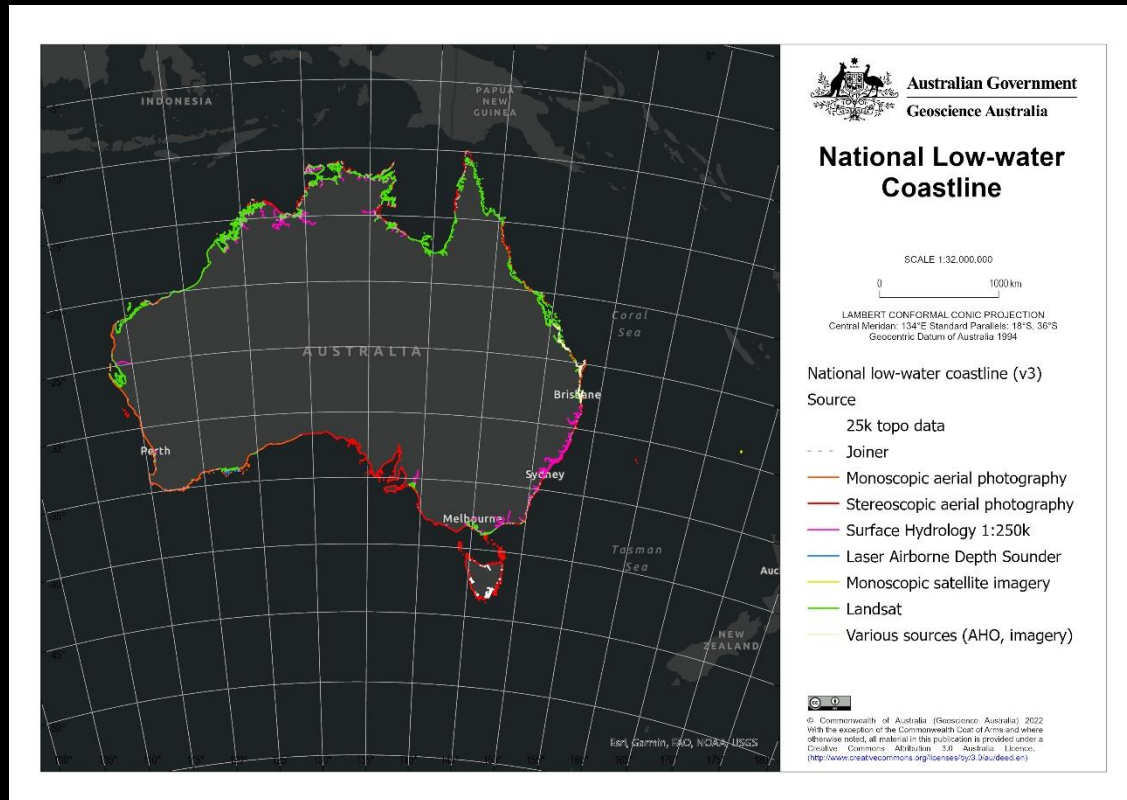


Ausbase is derived from 2009 AusBathyTopo250 grid. Used to fill in gaps between source bathy data.



Multiple area-based repairs of Ausbase to remove underlying

Coastline data

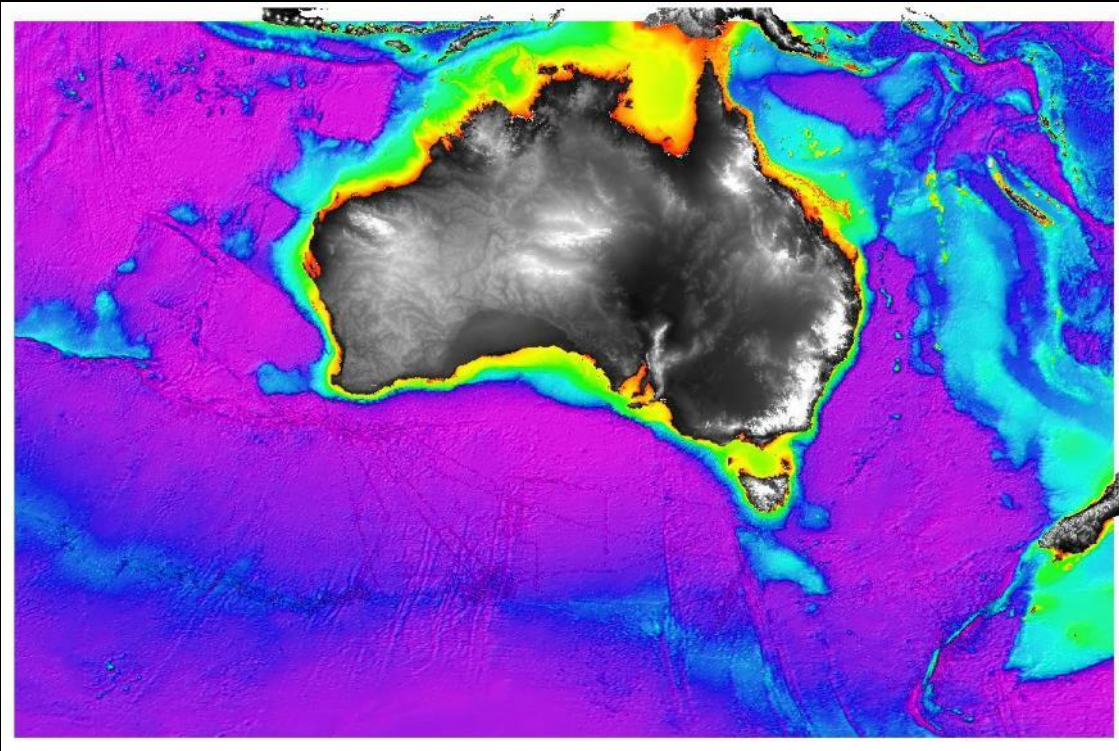


Used GA-supplied National Low-water Coastline: ~LAT, 210k line km (up from 34k km) mainland islands and reefs

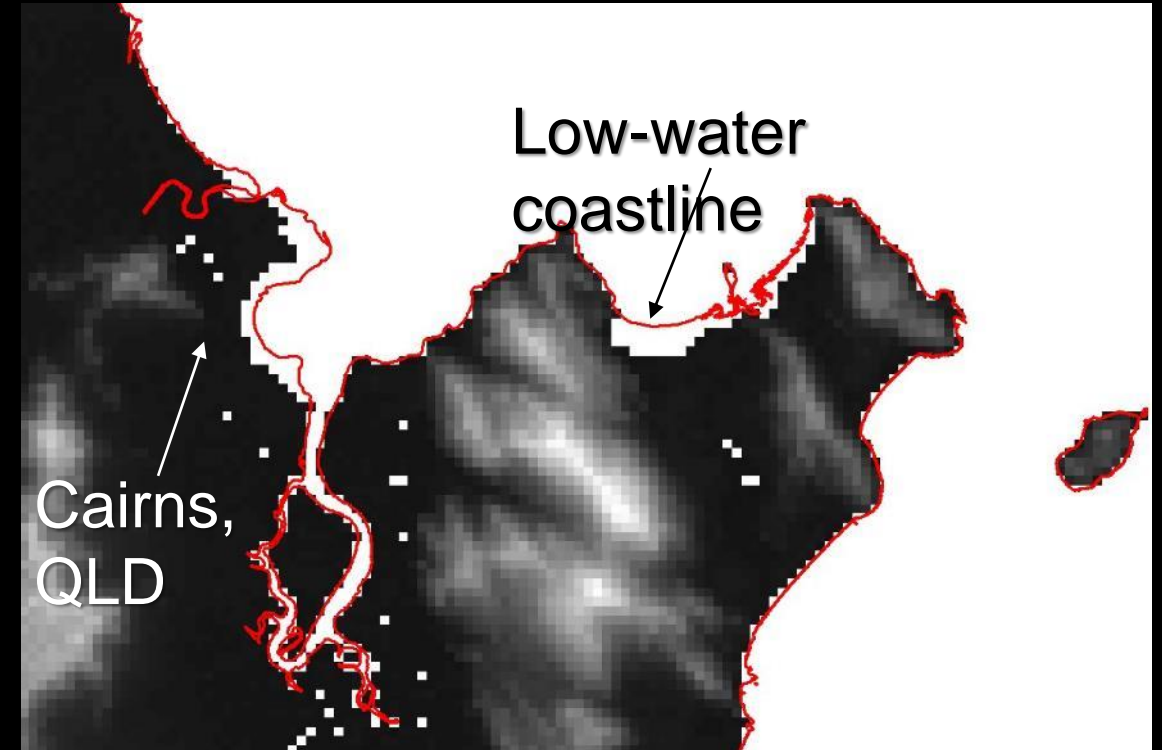


Example of Sydney harbour region. Low-water line rasterized then LAT-MSL values applied to

SRTM land data

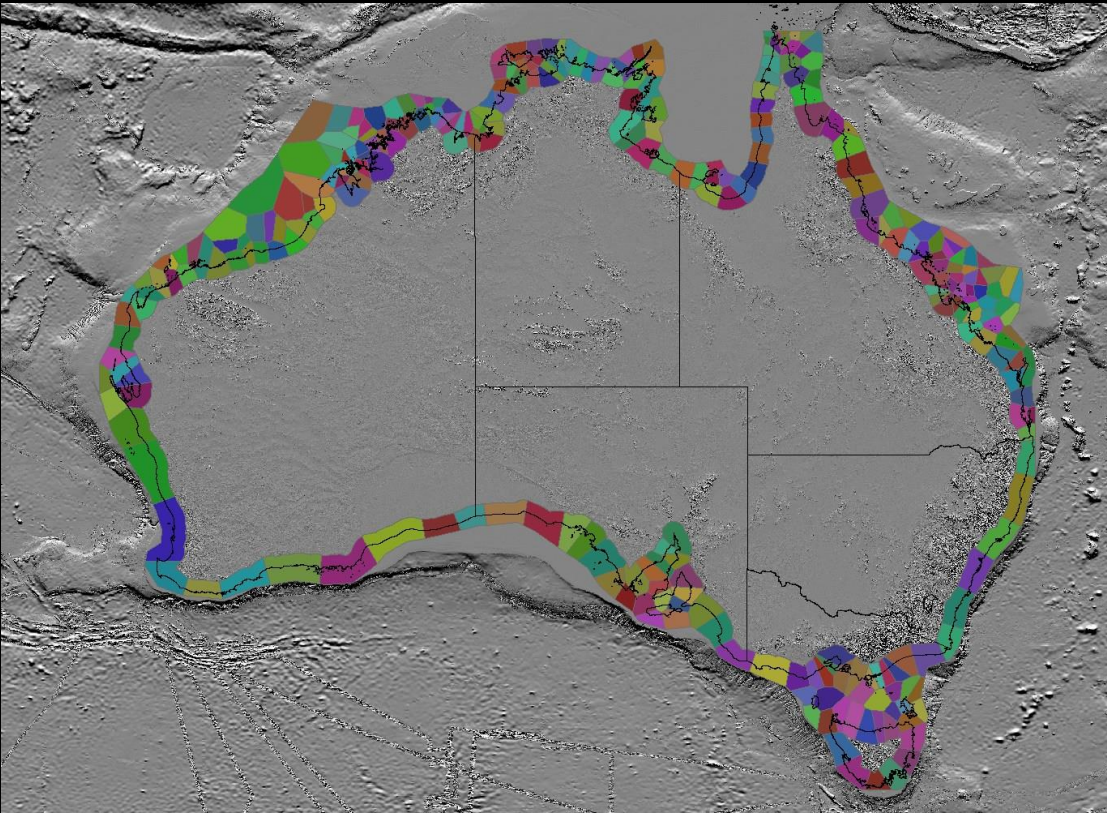


Used GA-supplied 841 ($1^\circ \times 1^\circ$) 1-arcsec ($\sim 27\text{m}$) tiles for Australian mainland. Downloaded remaining 216

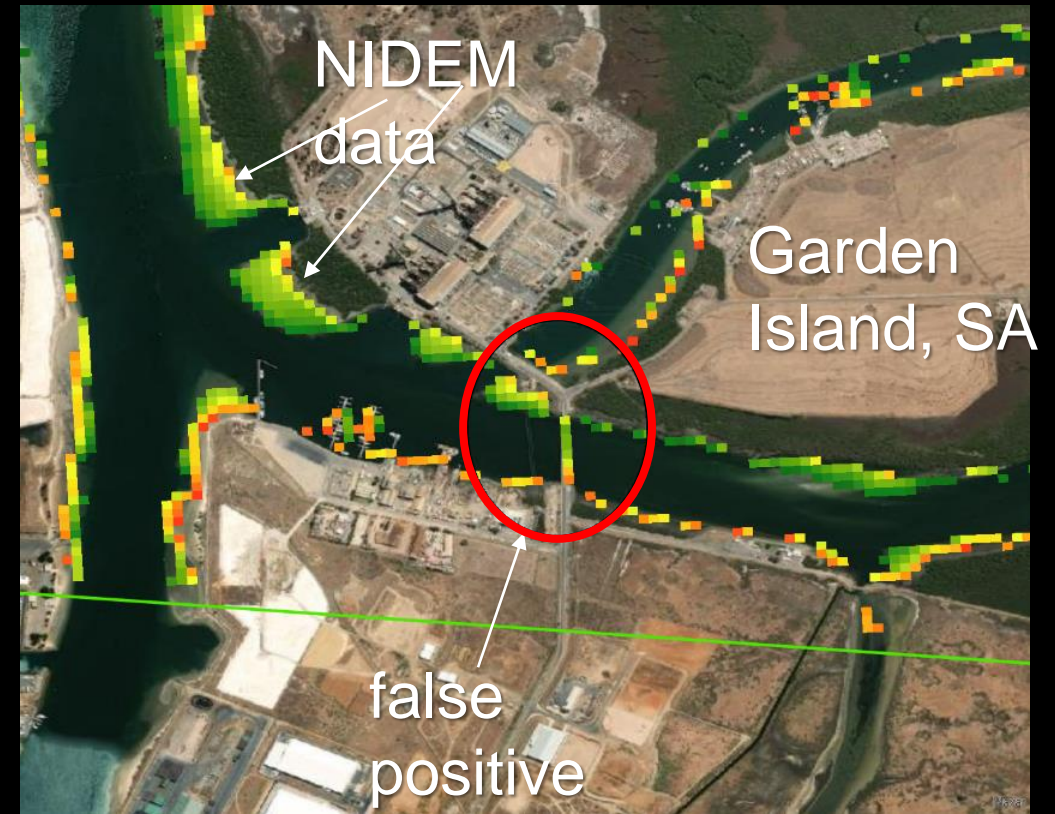


Minus 0m values were set null. Masked out pixels that extended beyond National Low-water Coastline

NIDEM data

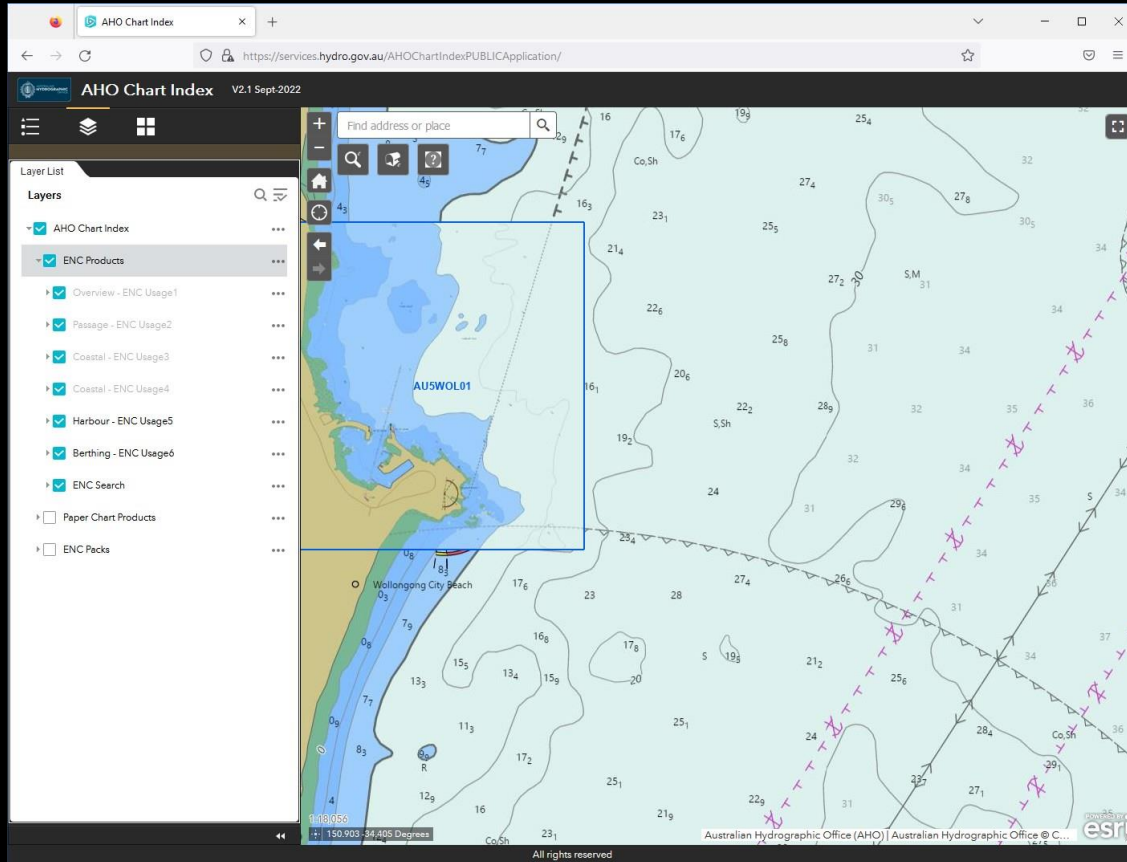


~260 cells, 30-year time series Landsat
(Bishop-Taylor et al. 2019. Between the
tides: modelling the elevation of

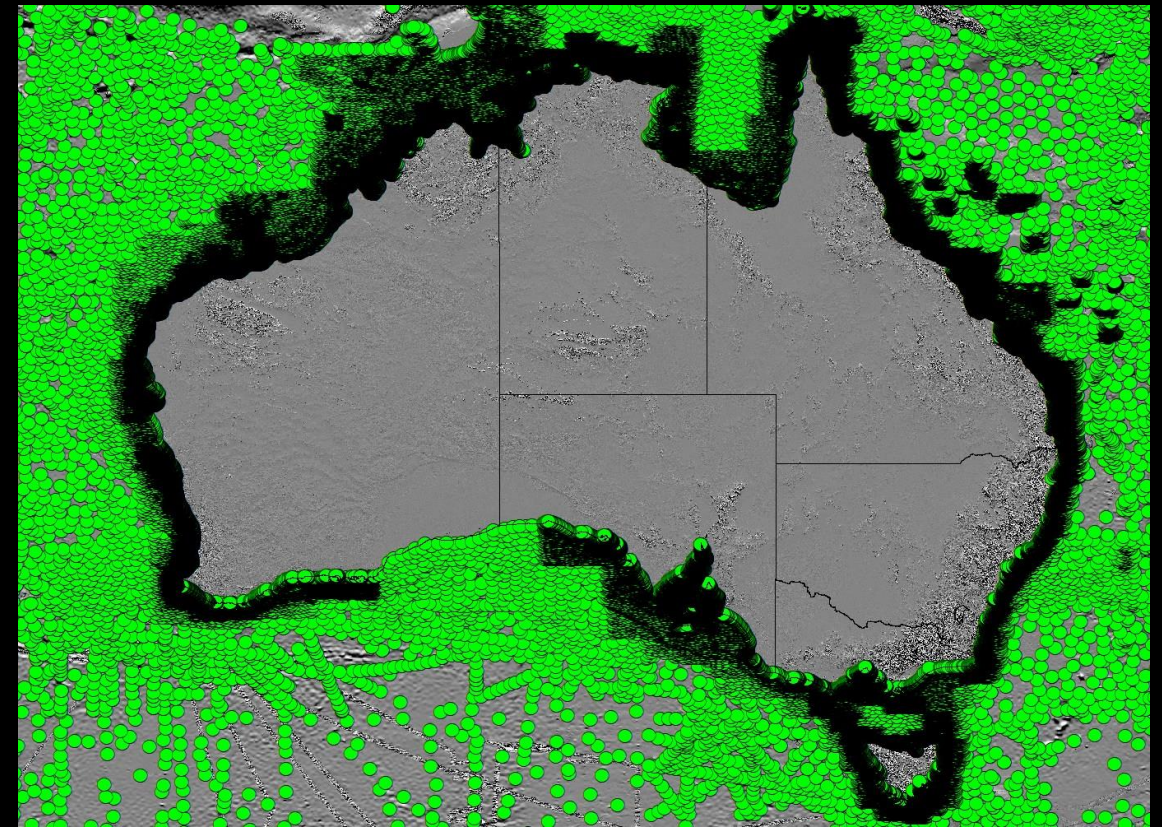


USydney team conducted national-
scale QC checks against satellite
imagery for any false positive pixels,

ENC spot depths

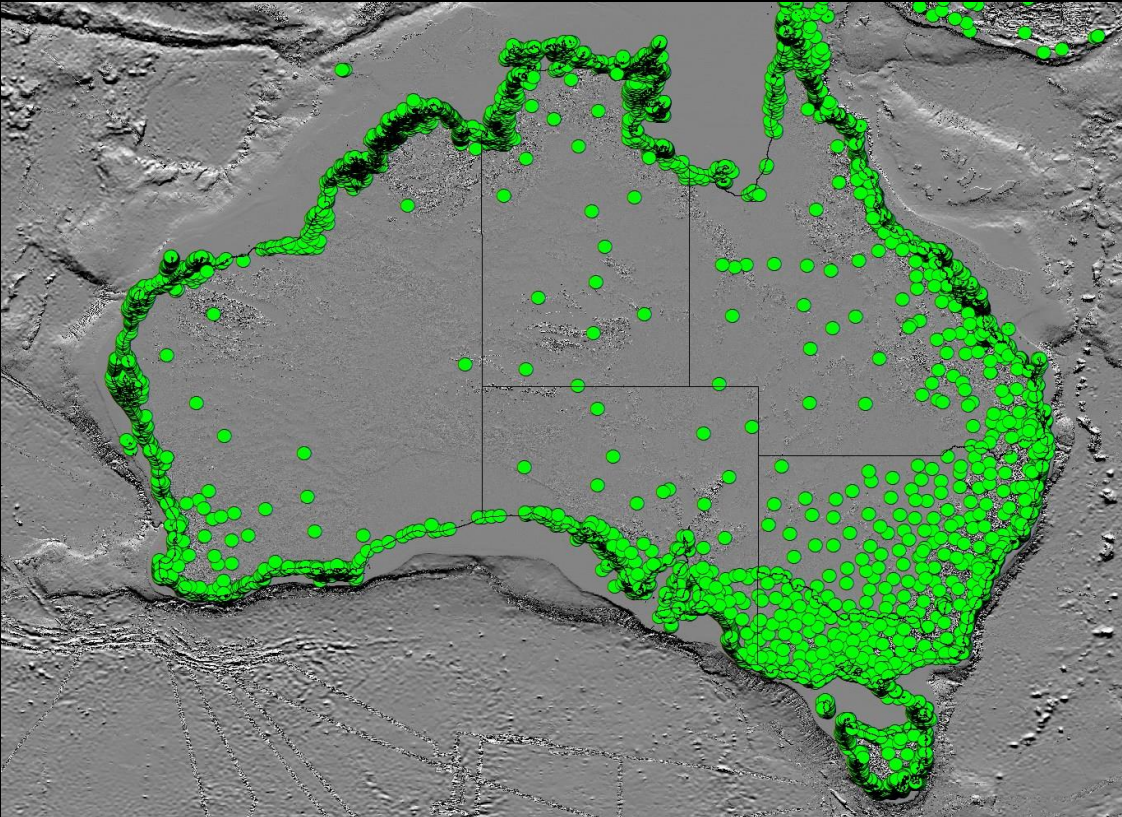


Received ENC spot depths from GA,
extracted as a point shapefile from AHO-
supplied S 53 tiles. 630K depth points

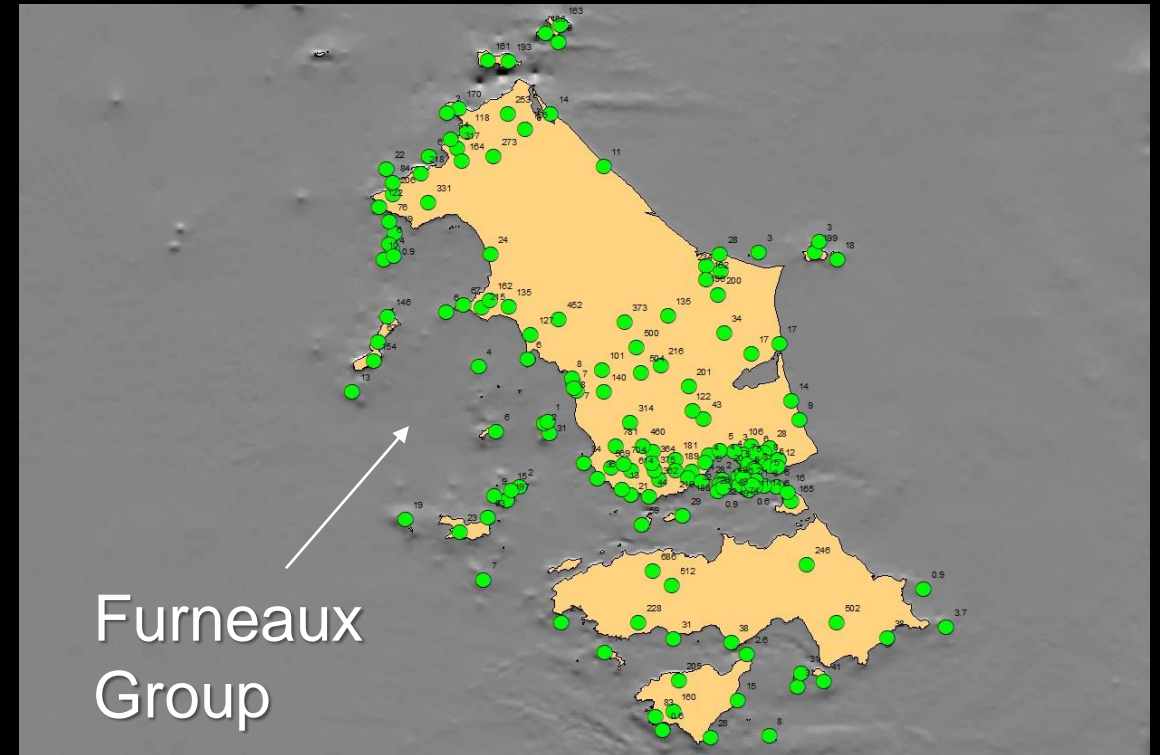


Imported data into Fledermaus for 3D
point cloud editing to remove any odd
spikes (mainly in deep-water).

ENC spot elevations

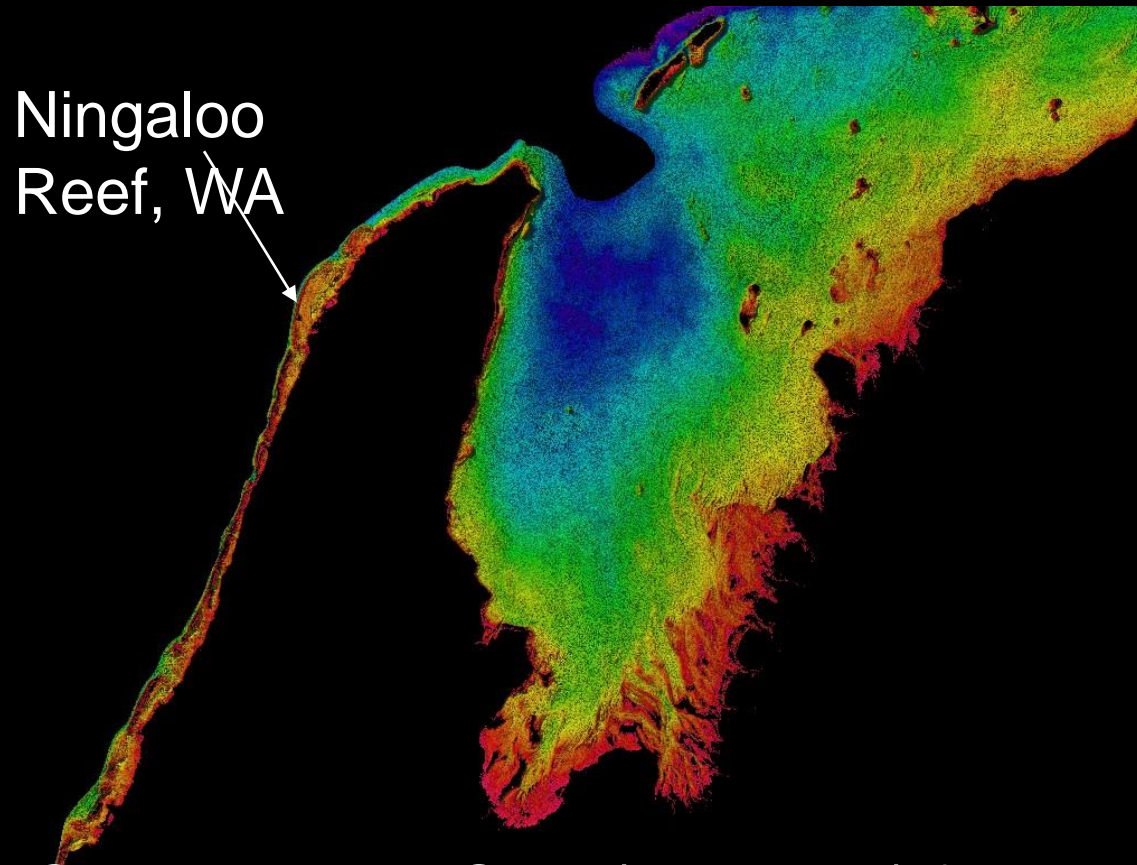


Used ENC spot elevations from AHO-supplied S-57 tiles + CORS spot elevation from GA GNSS Network Map:

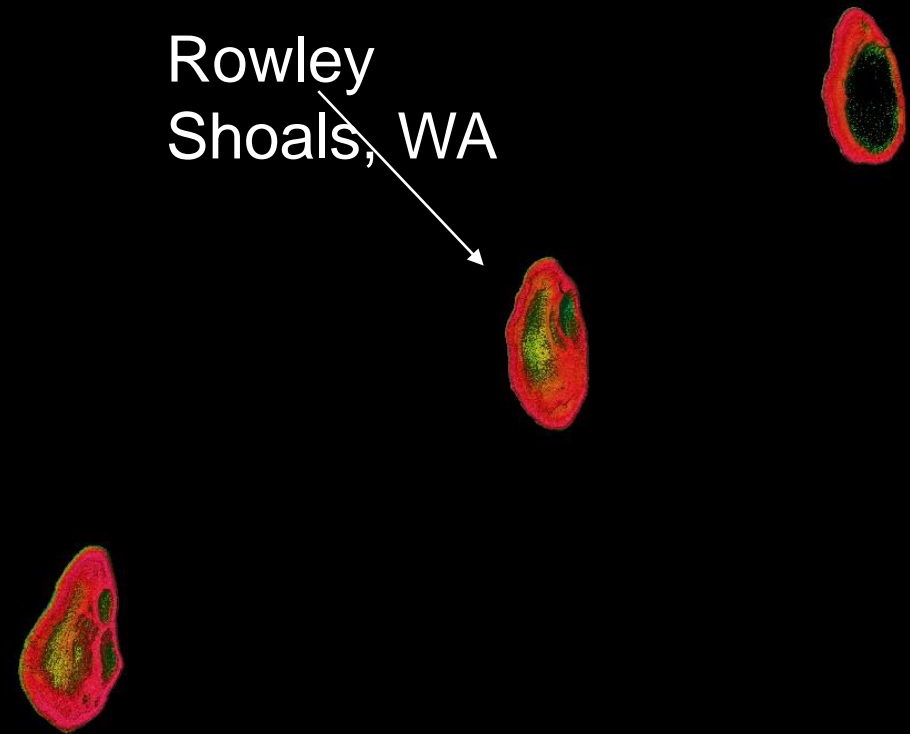


Elevation source data extends around coast and across Australian mainland. Assists improving grid interpolation

SDB data

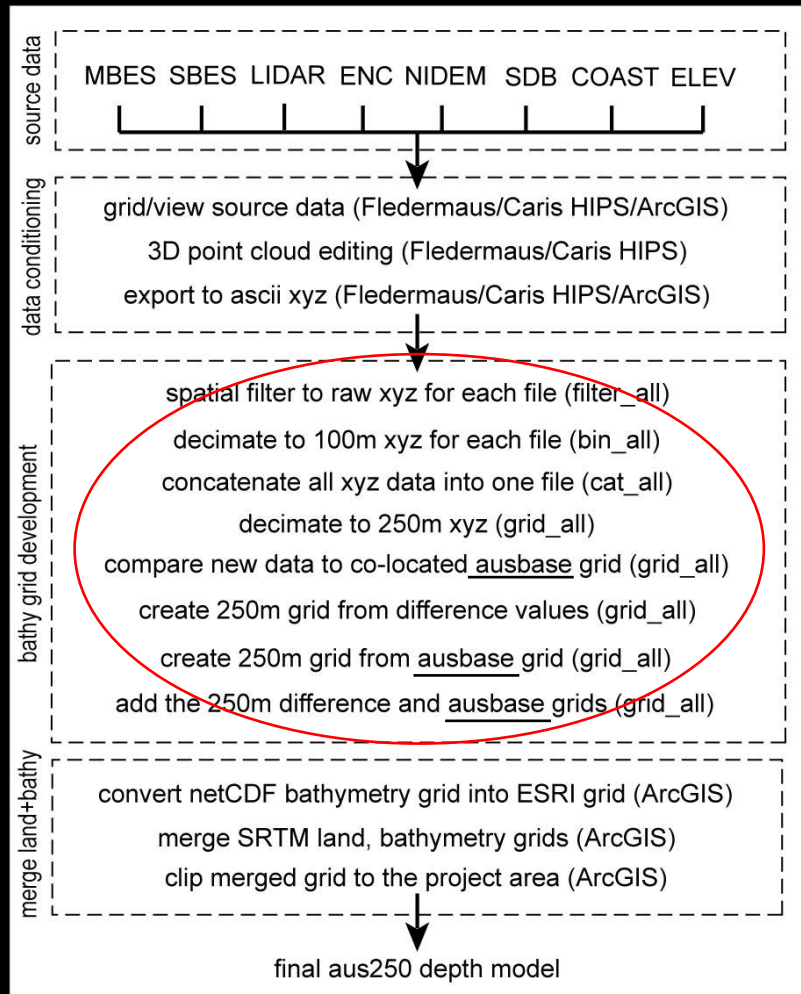


JCU-developed SDB (Landsat8) for Northern Australia, Torres Strait, Great Barrier Reef and Bass Strait. Also, UWA



Also, extensive EOMAP supplied SDB (Sentinal2) for Kimberley coastline and offshore WA reefs. SDB

Batch process

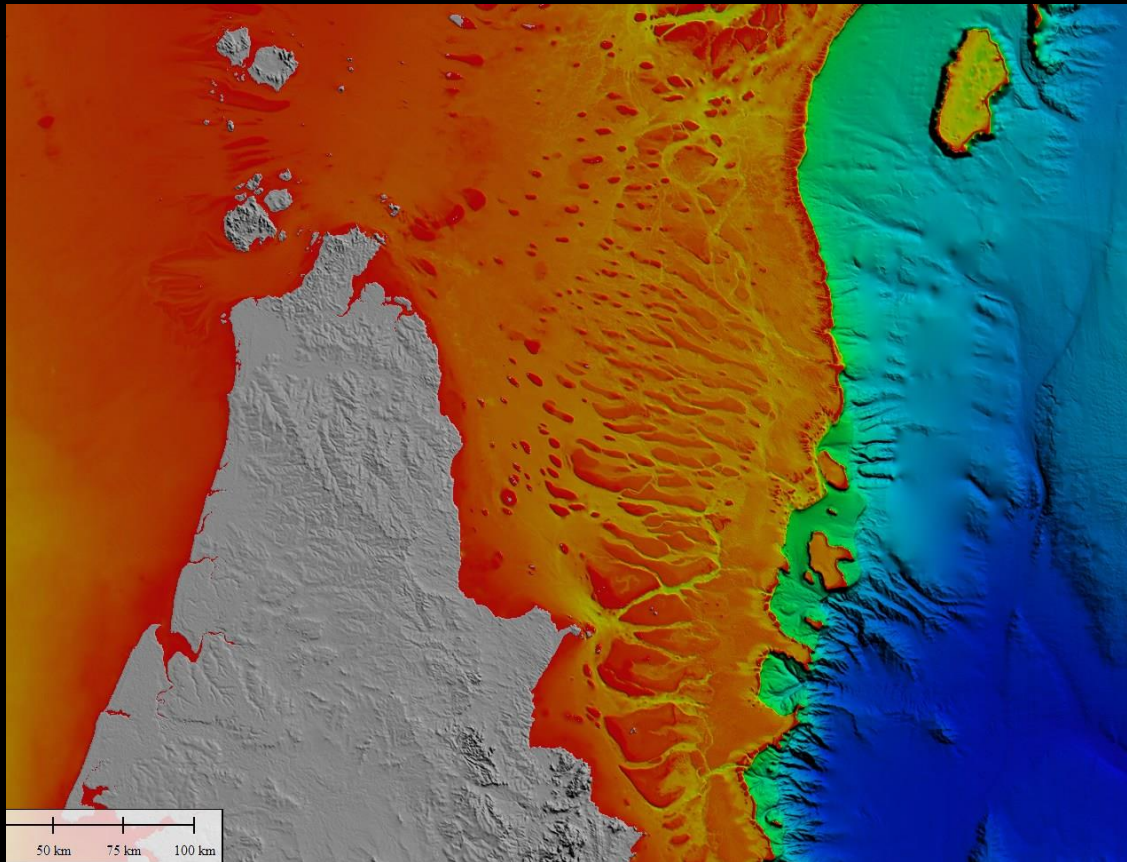


Name	Date modified	Type
GA2461_SS062008_LordHowelsland_final	25/07/2023 9:12 PM	File folder
GA4421_MH370_IndianOcean_final	22/07/2023 12:08 PM	File folder
GA4848_NESP_ElizabethMiddletonReefs_final	25/07/2023 10:45 AM	File folder
HI593_Maningrida_final	14/06/2023 10:53 AM	File folder
HI597_GulfStVincent_final	13/06/2023 1:43 PM	File folder
HI603_ArnhemLand_final	14/06/2023 11:33 AM	File folder
HI605_TimorSea_final	14/06/2023 11:58 AM	File folder
HI611_YorkSound_final	14/06/2023 12:36 PM	File folder

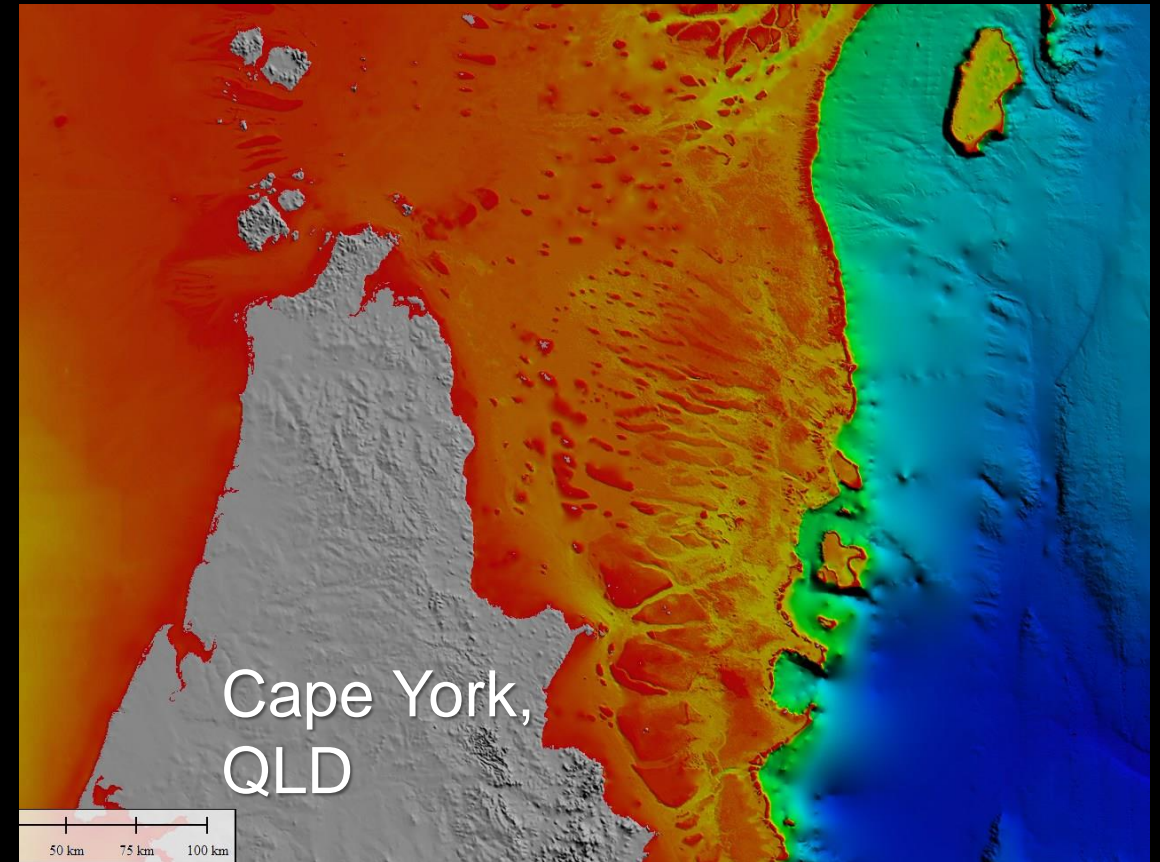
Name	Date modified	Type	Size
AIMS2014_GBR_final.xyz	27/08/2023 4:04 PM	XYZ File	26,644 KB
AIMS6352_Biggelsland_final.xyz	28/08/2023 4:27 PM	XYZ File	2,459 KB
AIMS6396_HolothuriaReef_final.xyz	28/08/2023 4:29 PM	XYZ File	3,965 KB
all.xyz	29/08/2023 7:22 PM	XYZ File	10,049,400 KB
AllenCoralAtlas_ChristmasIsland_final.xyz	28/08/2023 6:07 AM	XYZ File	42 KB
AllenCoralAtlas_Cocosisland_final.xyz	28/08/2023 6:07 AM	XYZ File	334 KB
AllenCoralAtlas_CrocodileIslands_final.xyz	28/08/2023 6:07 AM	XYZ File	119 KB
AllenCoralAtlas_ElizabethReef_final.xyz	28/08/2023 6:07 AM	XYZ File	155 KB
AllenCoralAtlas_EntrancelIsland_final.xyz	28/08/2023 6:07 AM	XYZ File	16 KB

Name	Date modified	Type	Size
.gmtcommands4	29/08/2023 9:26 PM	GMTCOMMANDS...	1 KB
all.xyz	29/08/2023 7:22 PM	XYZ File	10,049,400 KB
all_plot.grd	29/08/2023 9:33 PM	Grapher Grid	2,600,620 KB
ausbase08.grd	11/08/2023 7:30 PM	Grapher Grid	1,317,174 KB
block.xyd	29/08/2023 7:51 PM	XYD File	1,544,939 KB
block.xyz	29/08/2023 7:43 PM	XYZ File	1,575,242 KB
diff.grd	29/08/2023 8:32 PM	Grapher Grid	2,617,147 KB
final_topo.grd	29/08/2023 8:34 PM	Grapher Grid	2,617,147 KB
global.grd	28/08/2023 9:17 PM	Grapher Grid	2,617,147 KB
global.xyz	3/10/2023 1:37 PM	XYZ File	22,733,533 KB

Compare



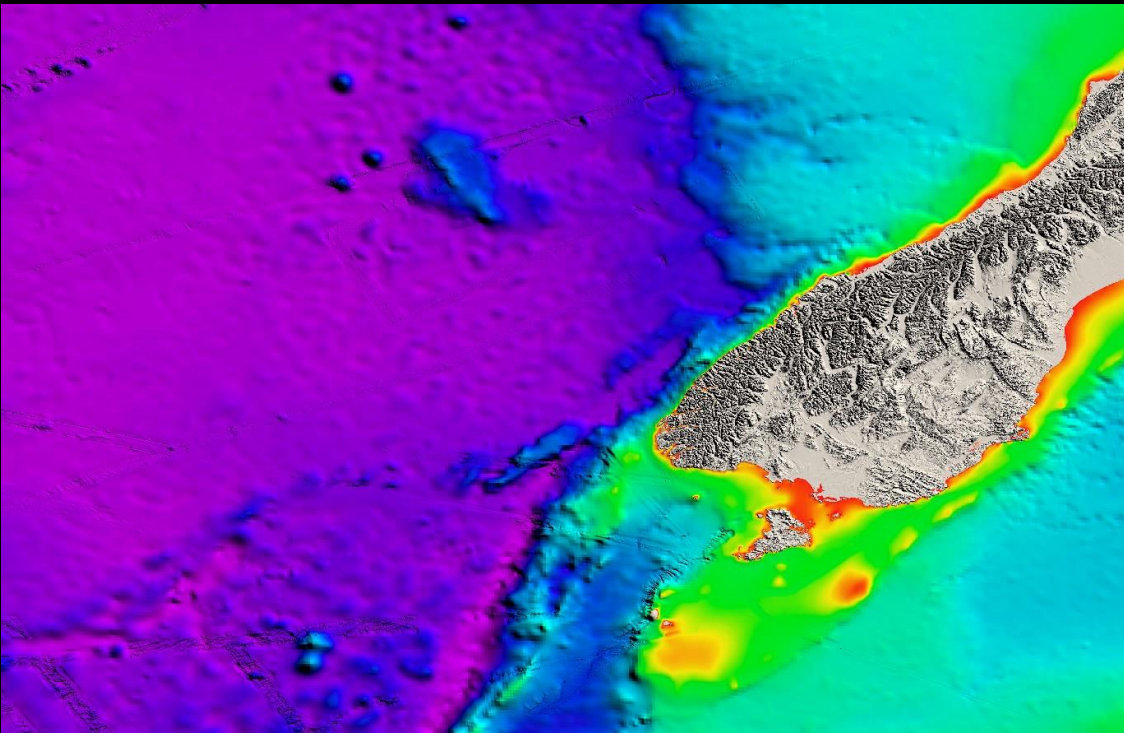
AusBathyTopo250_2
023 (after)



AusBathyTopo250_200
9 (before)

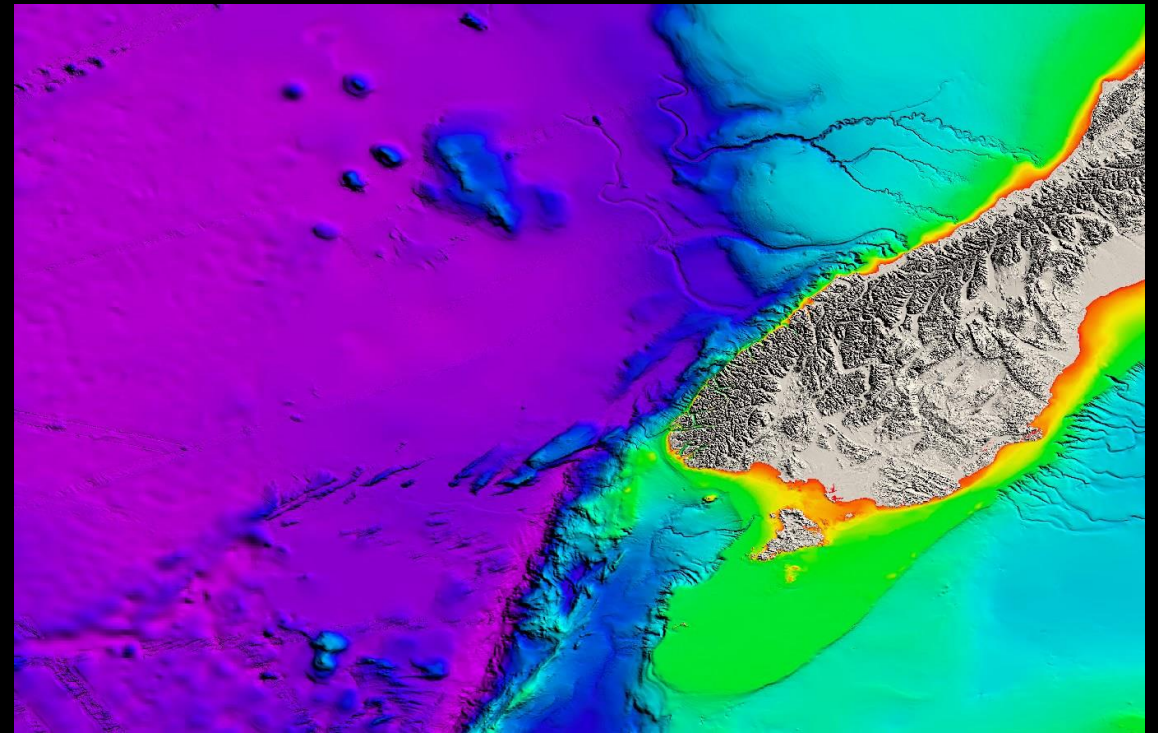
Future work

- Training of GA staff in batch processing techniques, prioritizing surveys
- Training of SE Asian states through DFAT Marine Resources Initiative
- Improving grid to incorporate neighbouring grids, e.g. nzbathy_2016



AusBathyTopo25

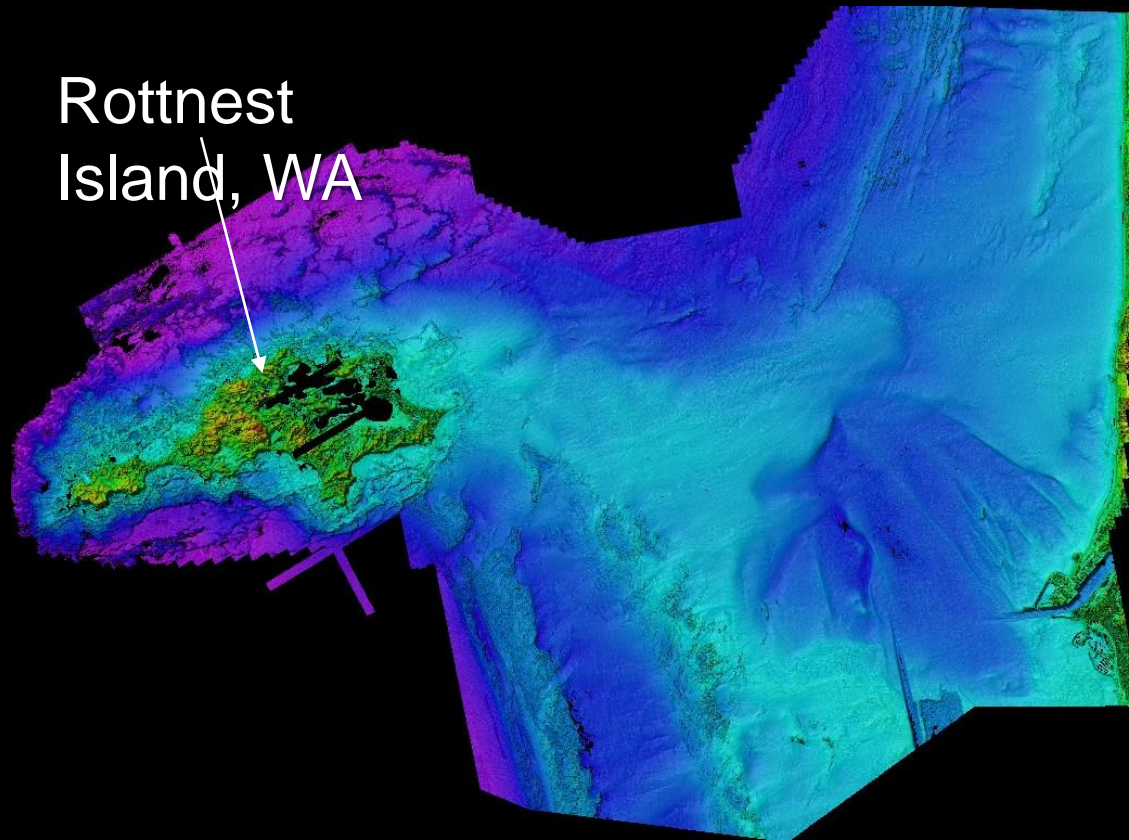
6/2022



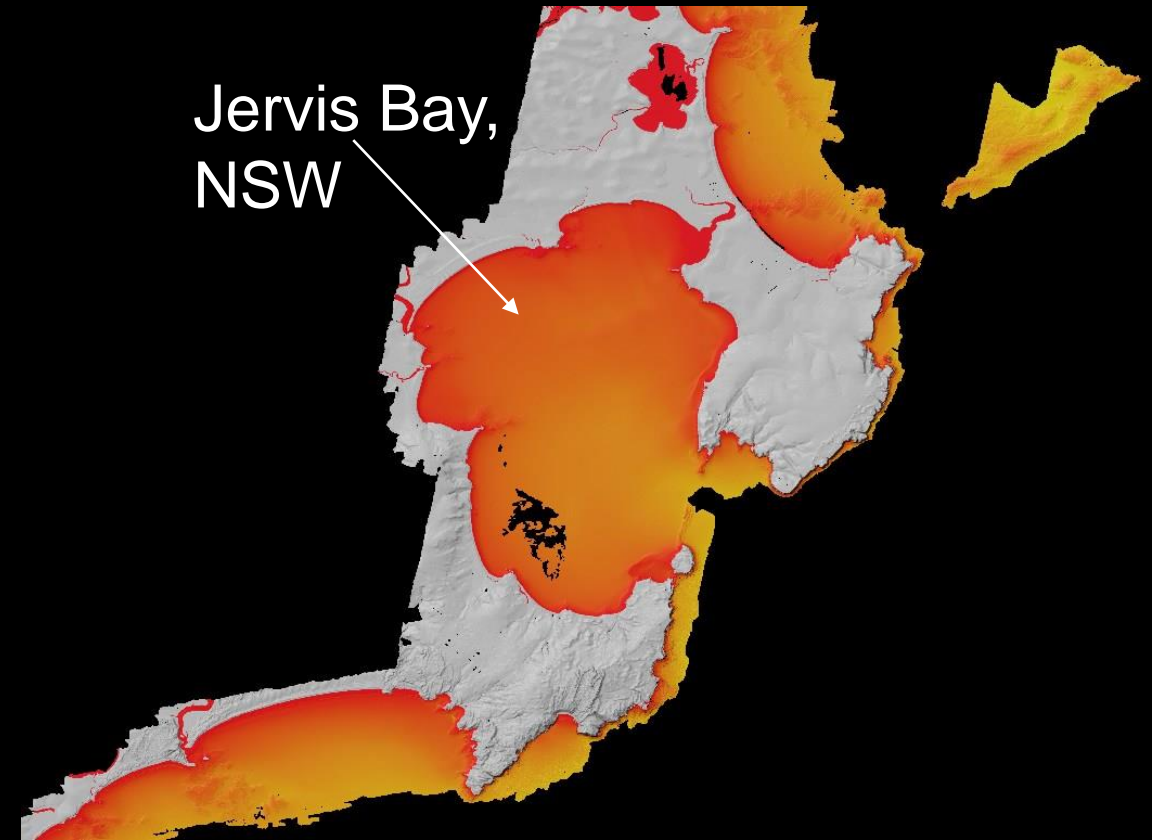
(draft) AusBathyTopo250_2024

11/2024

Lidar data

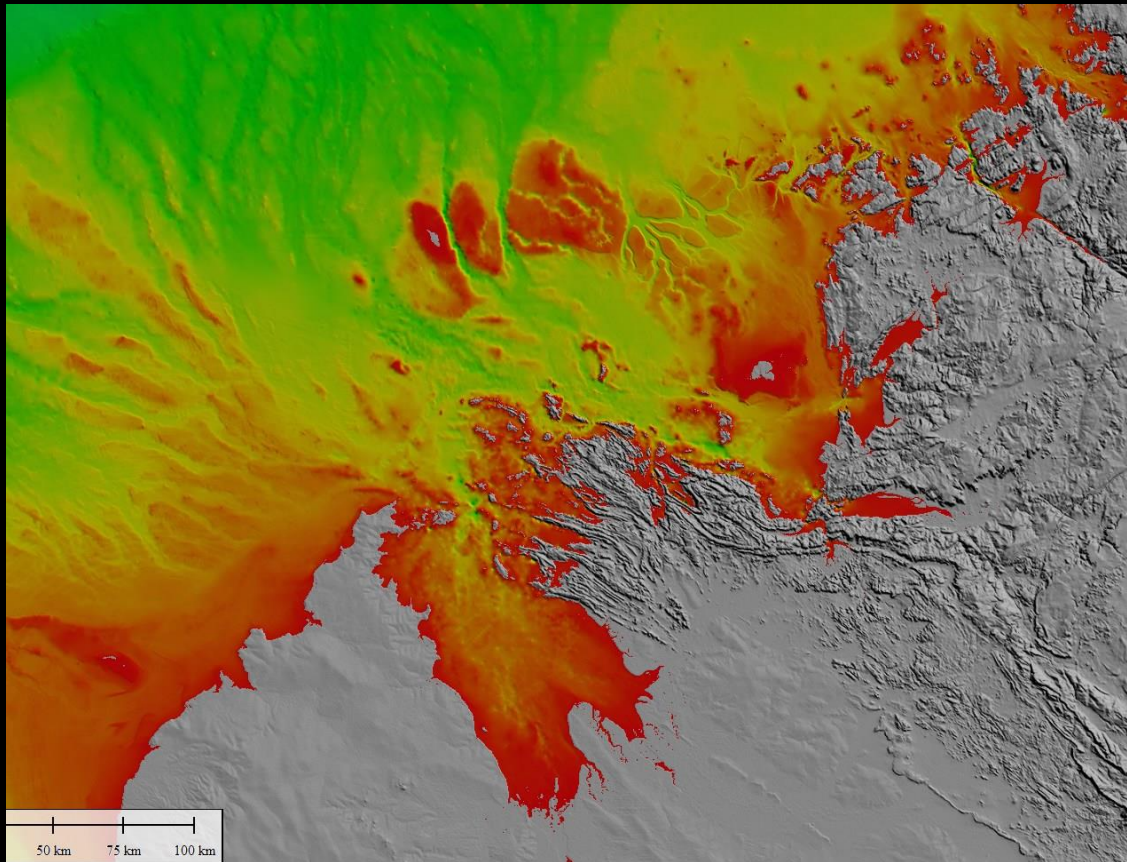


AHO-supplied bathy lidar collected for Northern Australia, Torres Strait, Great Barrier Reef and Bass Strait. Also, WA

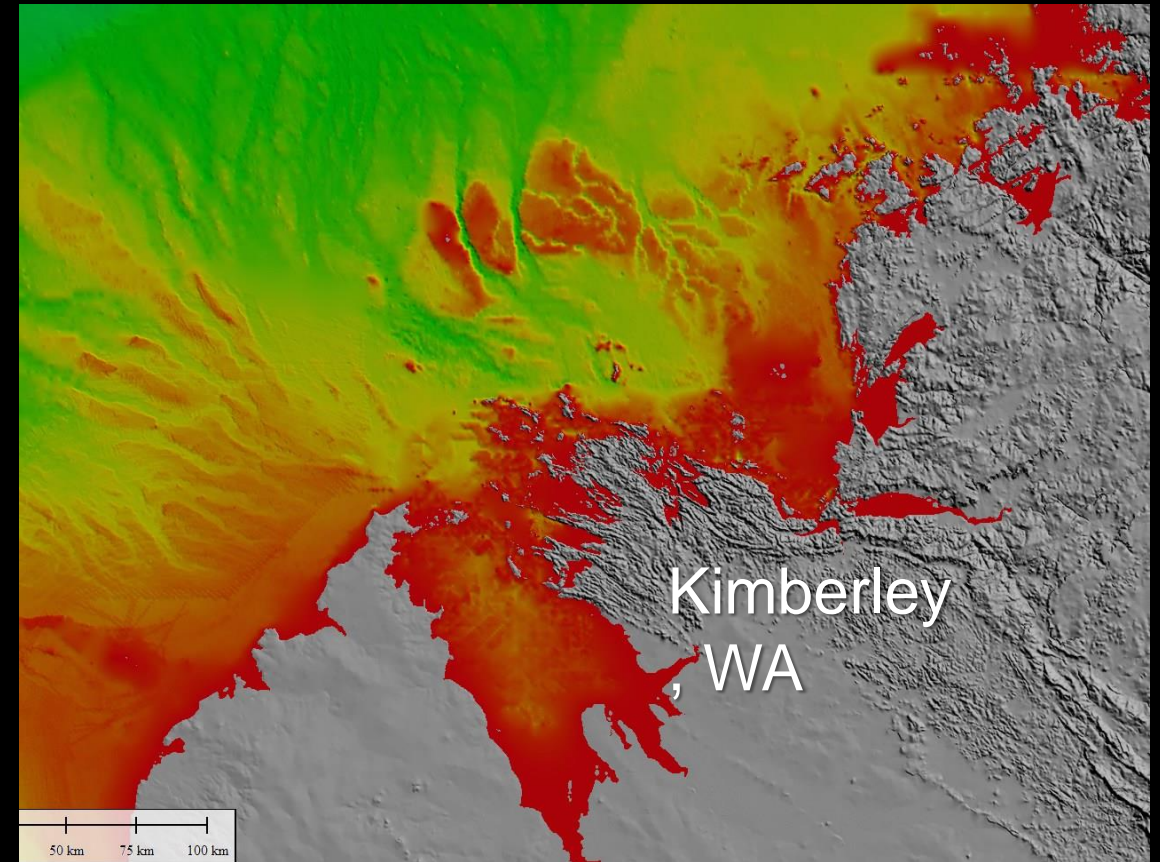


Other State Govt-supplied bathy topo lidar included NSW-DPIE data for the entire NSW coast and Victoria

Compare

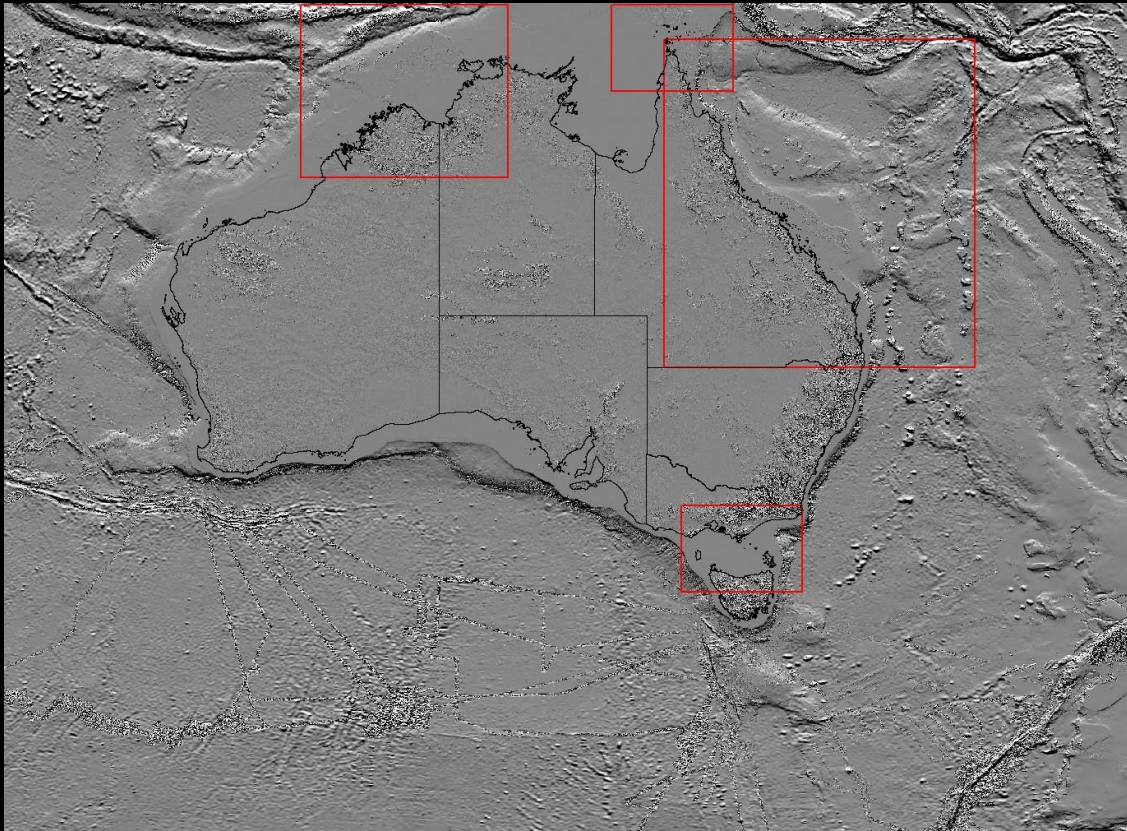


AusBathyTopo250_2
023 (after)

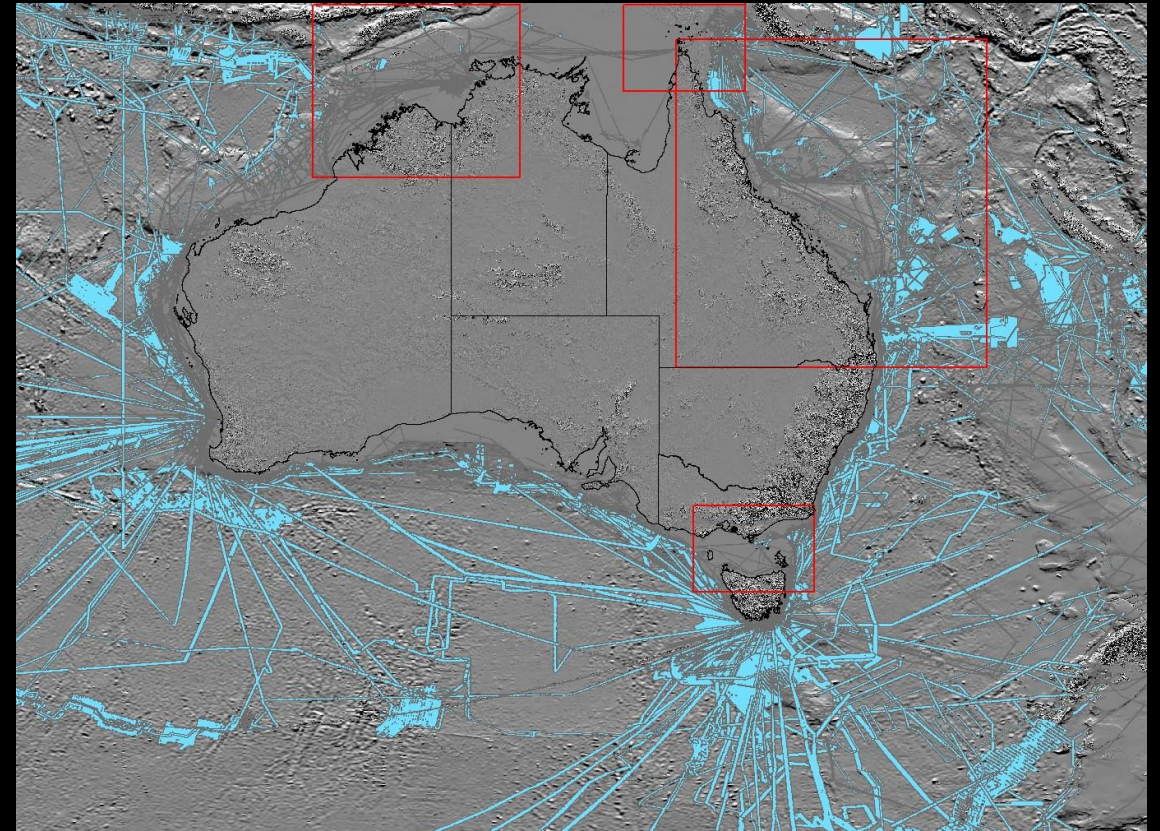


AusBathyTopo250_200
9 (before)

MBES and SBES data



Used AHO-supplied MBES and SBES source data provided under licence for Northern Australia. Terra



Much of GA's multibeam archive was not used in the 2023 grid due to time constraints. Future efforts will be to



Australian Government
Geoscience Australia



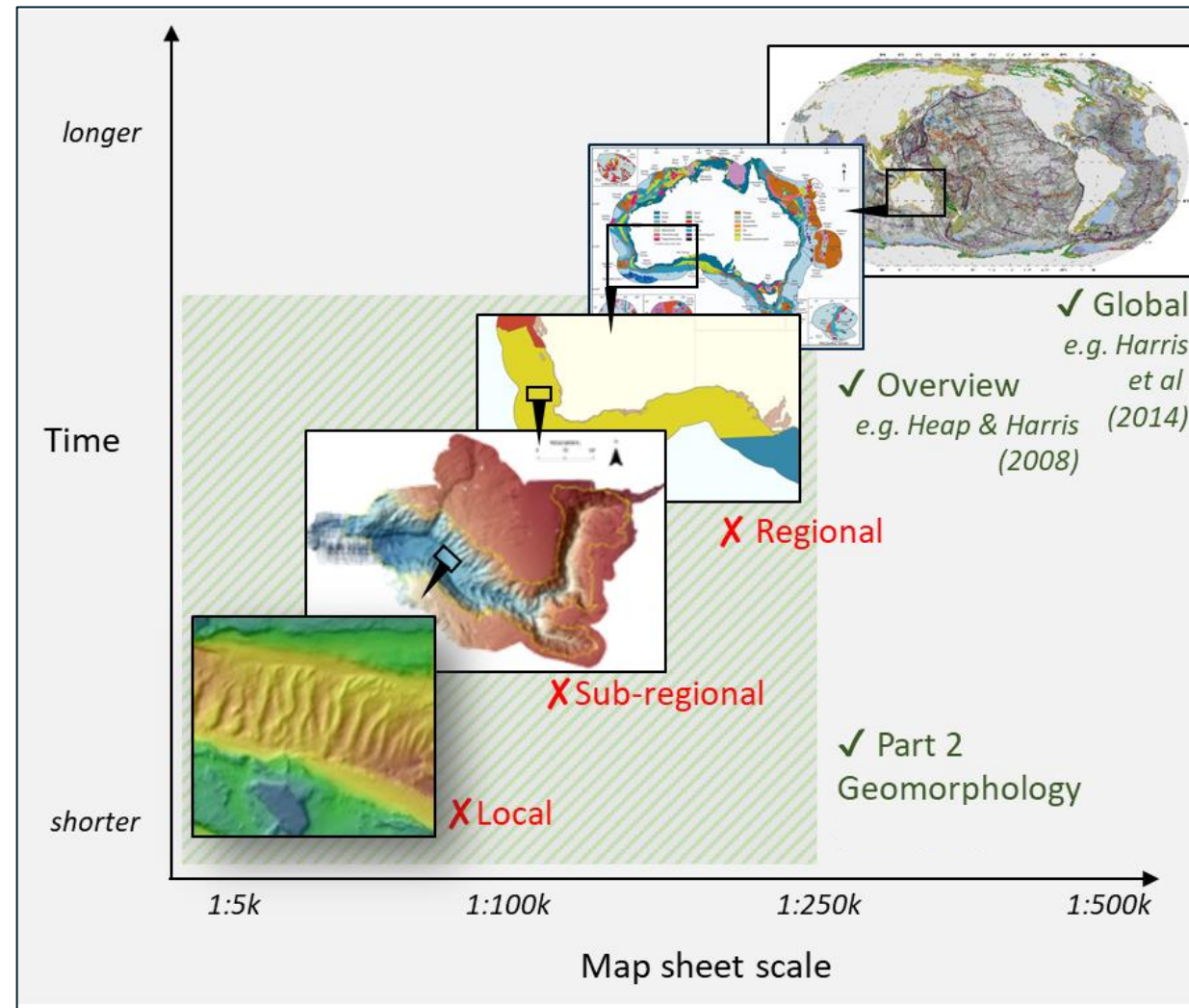
Two Part Geomorphology Scheme for Seabed Mapping

Rachel Nanson
ORCA Branch, Geoscience Australia

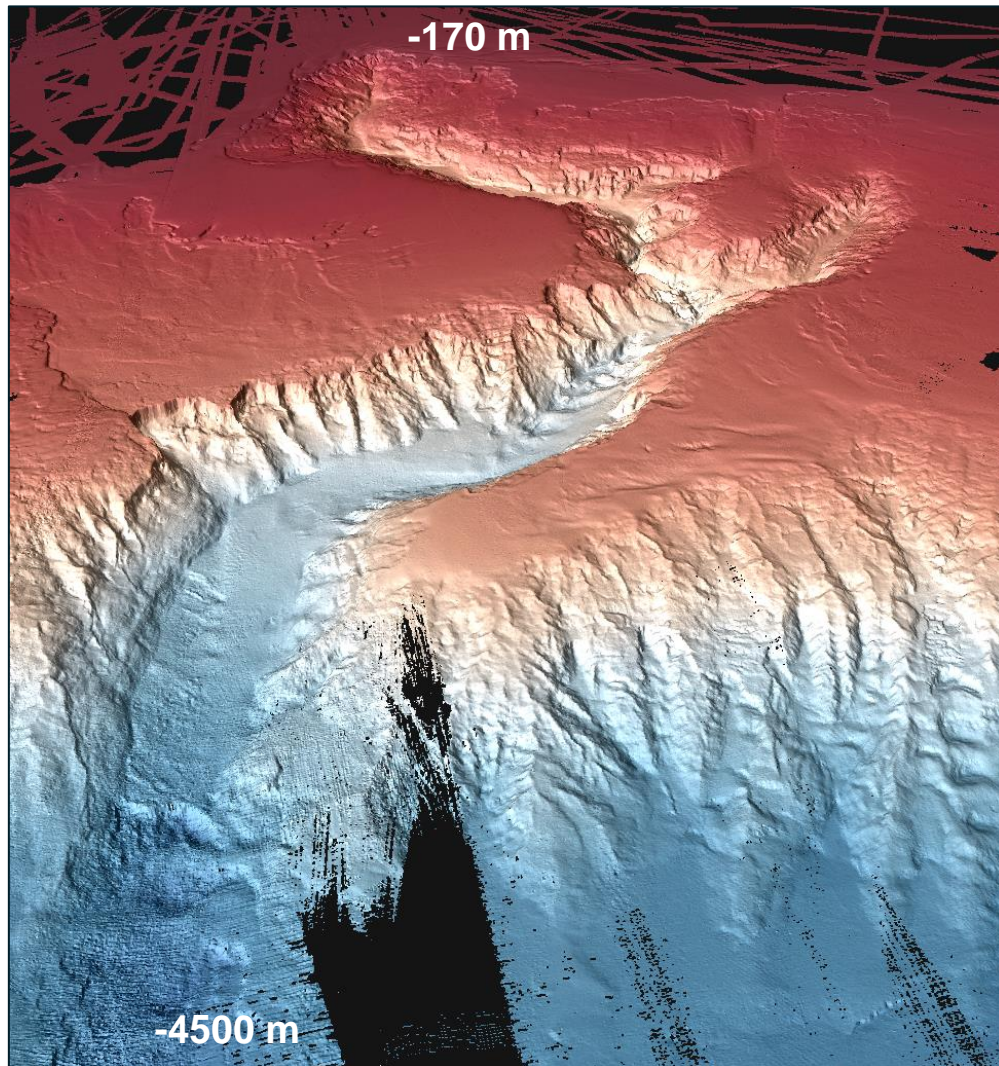
McNeil M. ¹, Huang, Z. ¹, Wenderlich M. ¹, Arosio R. ², Gafeira J. ³, Dove D. ³, Bjarnadóttir L.R. ⁴, Dolan M.F.J. ⁴, Guinan J. ⁵, Post A. ¹, Webb J. ⁶, Orr M. ¹, Bishop-Taylor ¹, Sagar, S. ¹, Nichol S. ¹, and Carroll A. ¹

1. Geoscience Australia;
2. University College Cork;
3. British Geological Survey;
4. Geological Survey of Norway;
5. Geological Survey of Ireland;
6. Latrobe University.

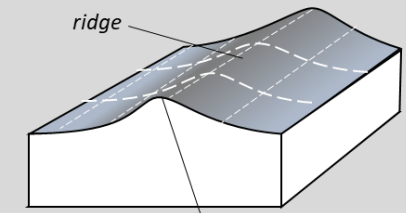
Marine geomorphology maps - diverse users, diverse scales



Marine geomorphology mapping: a two-part approach

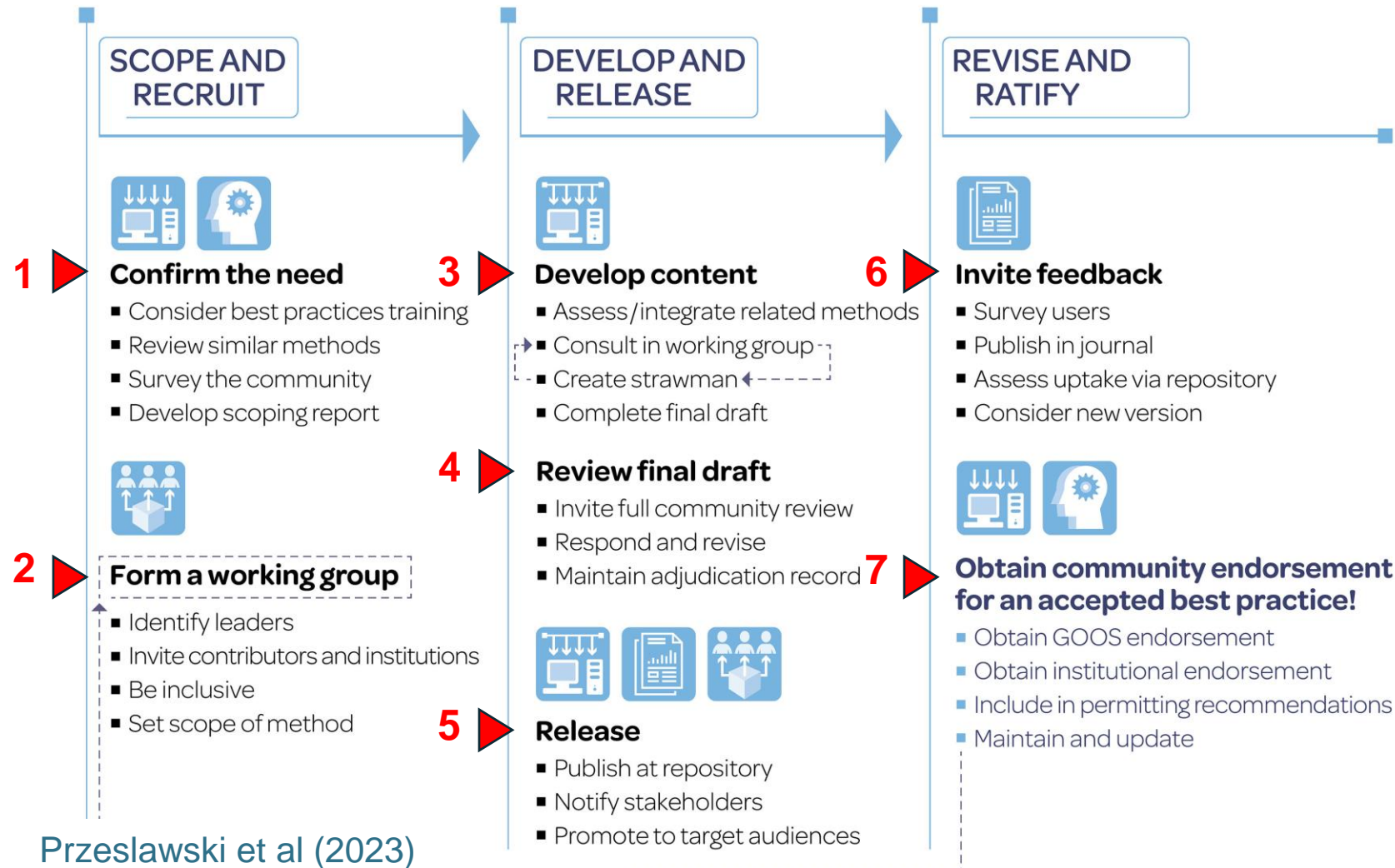


Part 1. Morphology

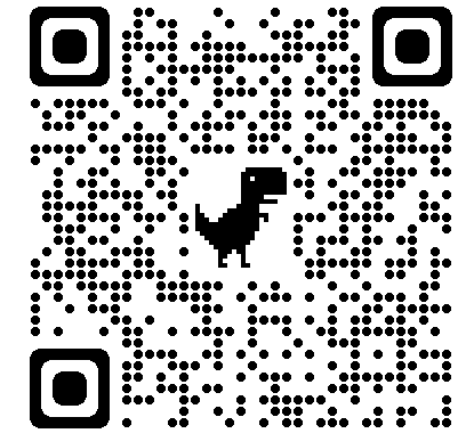


Steps to developing an ocean best practice

Download via:
<https://www.oceanbestpractices.org/repository/>



Przeslawski et al (2023)



Benefits of using a best practice

- Collaborative opportunities
- Efficient use of time
- Improved systems interoperability
- Data comparability and collatability
- Greater trust in data
- Streamlined regulatory approval
- Higher funding success

Part 1

A two-part Seabed Geomorphology classification scheme: (v.2)

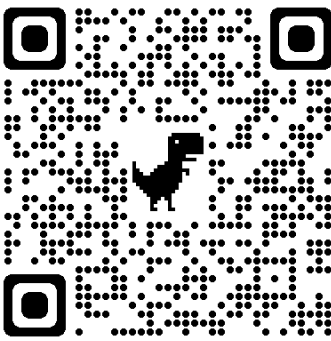
PART 1: MORPHOLOGY FEATURES GLOSSARY

October 2020

Dove, D., Nanson, R., Bjarnadóttir, L.R., Guinan, J., Gafeira, J., Post, A., Dolan, M.F.J., Stewart, H., Arc...

OPEN REPORT PREPARED BY T...

DOI: 10.5281/ZENODO.4071940



Part 1 GIS paper and Tools

frontiers in Marine Science

1701 Original Research
published: 28 August 2023
doi: 10.3389/fmars.2023.1236788

Check for updates

OPEN ACCESS

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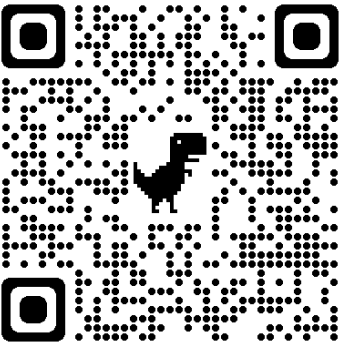
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Rule-based semi-automated tools for mapping seabed morphology from bathymetry data

Zhi Huang^{1*}, Rachel Nanson¹, Mardi McNeil¹, Michal Wenderlich¹, Joana Gafeira¹, Alexandra Post¹ and Scott Nichol¹

¹Oceans, Reefs, Coasts and the Antarctic Branch, Geoscience Australia, Canberra, ACT, Australia, ²British Geological Survey, Edinburgh, United Kingdom

Seabed morphology maps and data are critical for knowledge-building and best practice management of marine environments. To facilitate objective and repeatable production of these maps, we have developed a number of semi-automated, rule-based GIS tools (Geoscience Australia's Semi-automated Morphological Mapping Tools - GA-SAMMT) to operationalise the mapping of a common set of bathymetric high and bathymetric low seabed Morphological Features. The tools have a graphical user interface and were developed using Python scripts under the widely-adopted proprietary ArcGIS Pro platform. The utility of these tools was tested across nine case study areas that represent a diverse range of complex bathymetric and physiographic settings. Overall, the mapping results are found to be more consistent than manual mapping and allow for capture of greater detail across a range of spatial scales. The mapping results demonstrate a number of advantages of GA-SAMMT, including: 1) requirement of only a bathymetry grid as sole data input; 2) flexibility to apply domain knowledge to user-defined tool parameters, or to instead use the default parameter settings; 3) repeatability and consistency in the mapping outputs when using a consistent set of tool parameters (user defined or default); 4) high degree of objectivity; and 5) efficiency in mapping a large number (thousands) of seabed morphology



Part 2



A two-part seabed geomorphology classification scheme

PART 2: GEOMORPHOLOGY CLASSIFICATION FRAMEWORK AND GLOSSARY - Version 1.0

April 2023

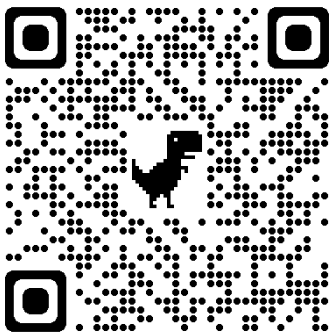
Nanson, R.¹, Arosio, R.², Gafeira, J.³, McNeil, M.¹, Dove, D.³, Bjarnadóttir, L.R.⁴, Dolan, M.F.J.⁴, Guinan, J.⁵, Post, A.¹, Webb, J.⁶, and S. Nichol¹

1. Geoscience Australia; 2. University College Cork; 3. British Geological Survey; 4. Geological Survey of Norway; 5. Geological Survey of Ireland; 6. Latrobe University.

OPEN REPORT FROM THE MAREANO-INFOMAR-MAREMAP

* MAREANO-INFOMAR-MAREMAP

DOI: 10.5281/zenodo.7804019



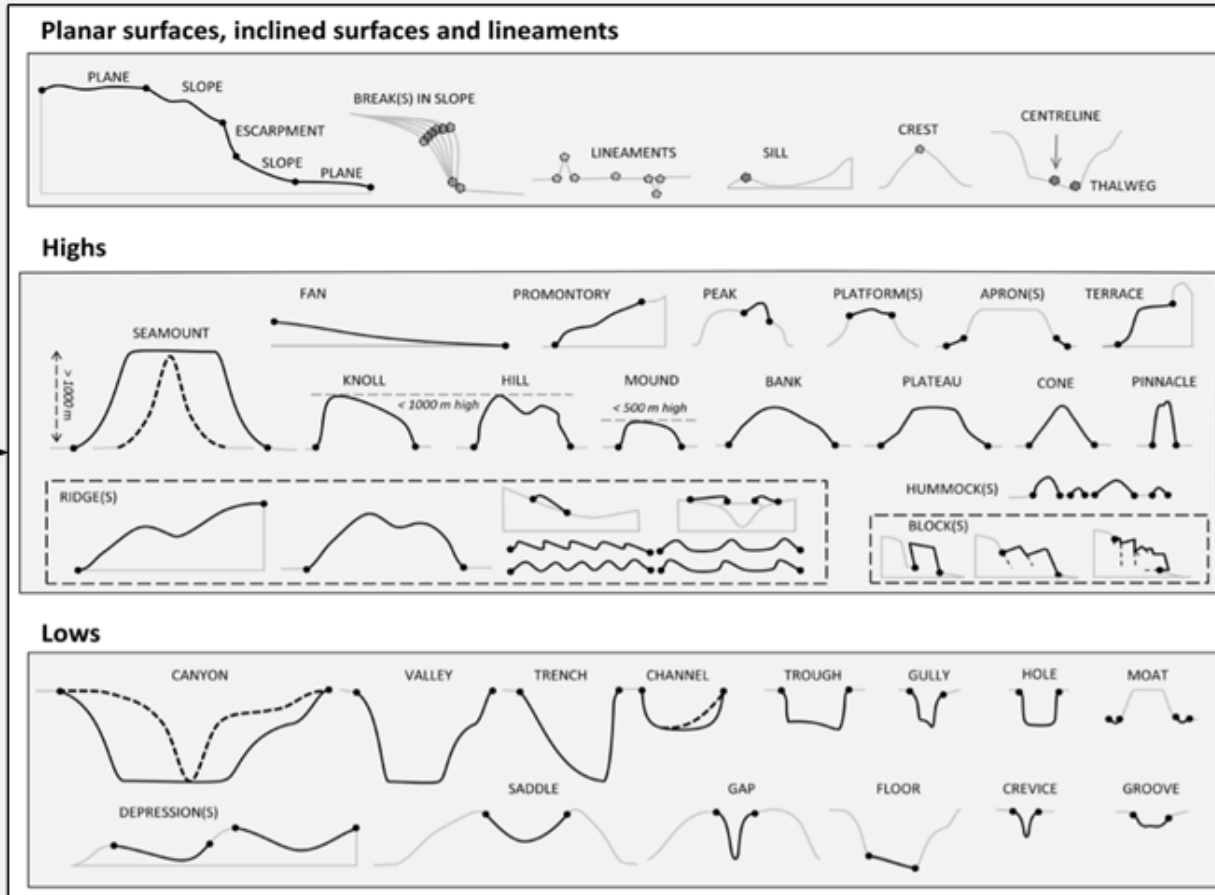
Part 2 paper and GIS Tools

Submit 2024

Tools coming soon...



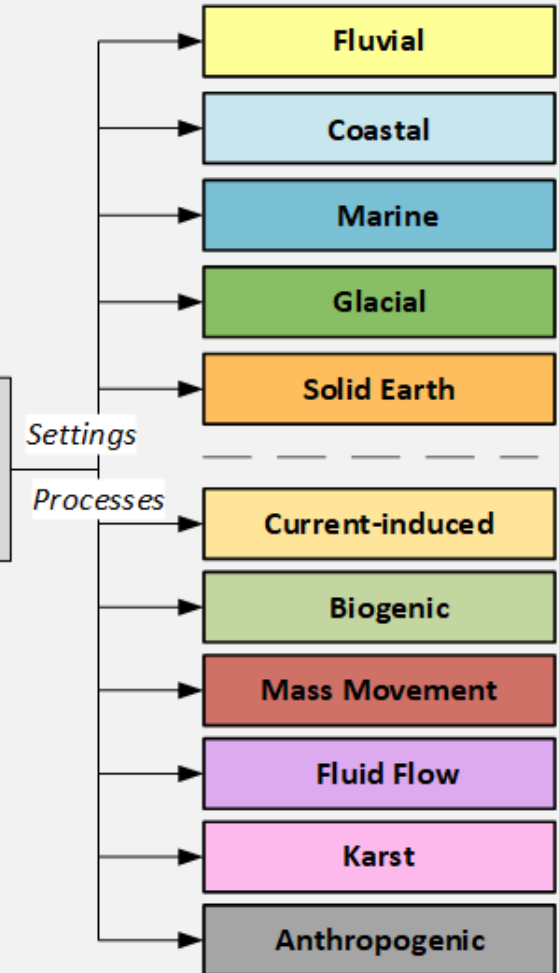
Part 1: Morphology

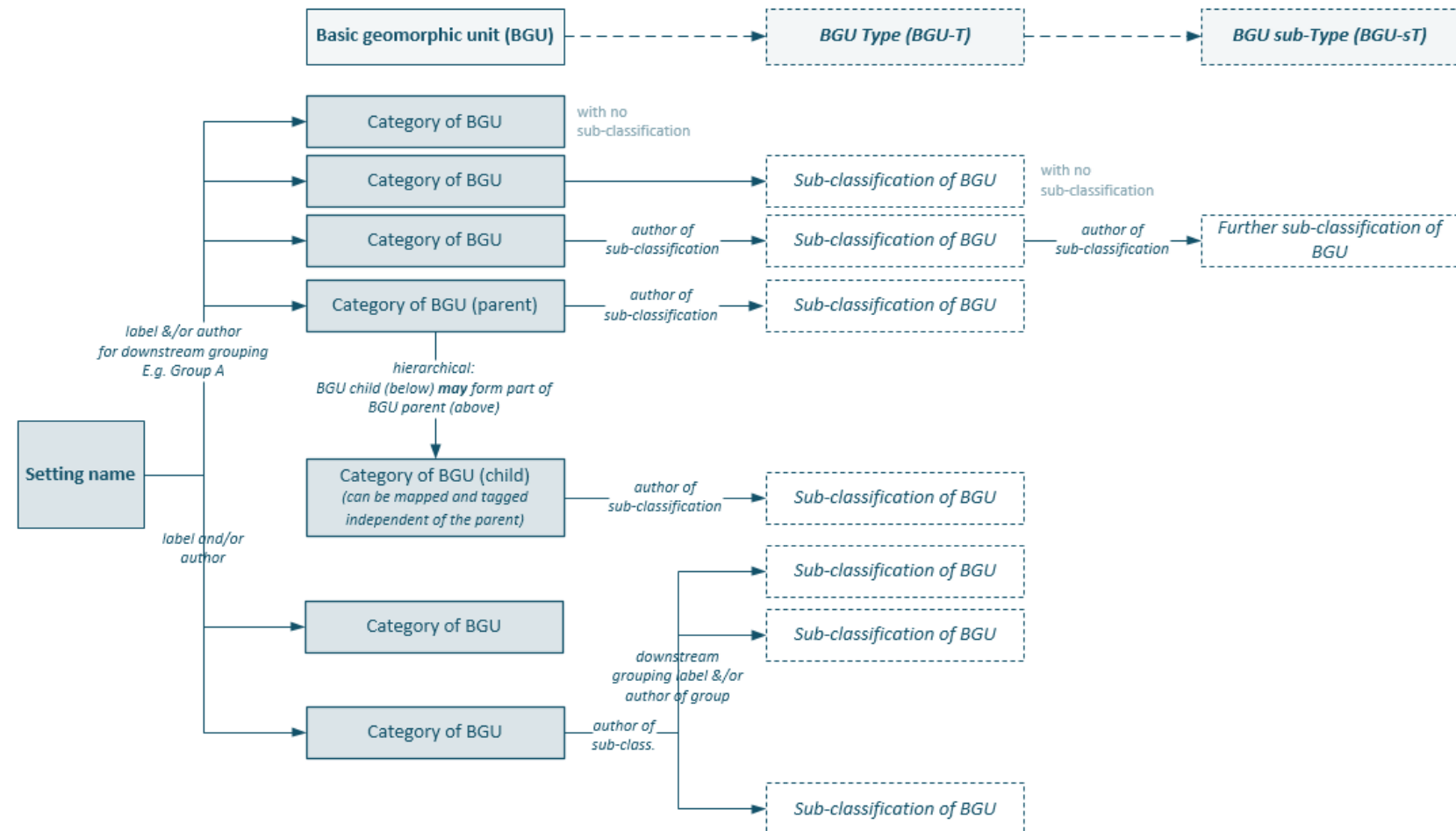
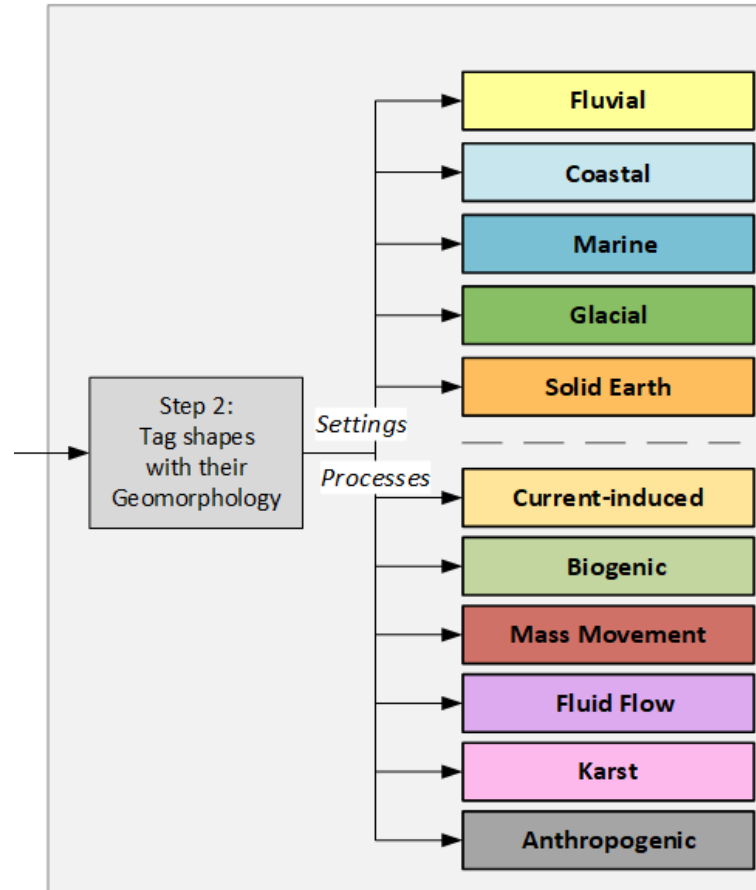


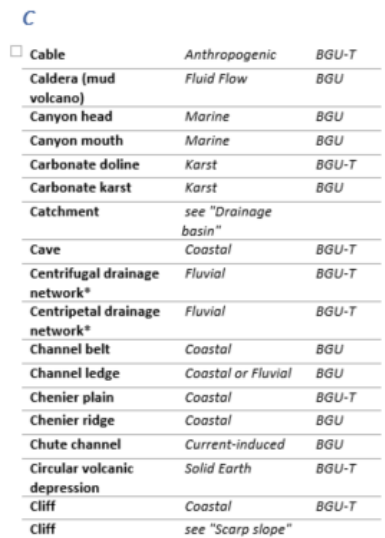
Step 1:
map shapes
& define
Morphology

Part 2: Geomorphology

Step 2:
Tag shapes
with their
Geomorphology

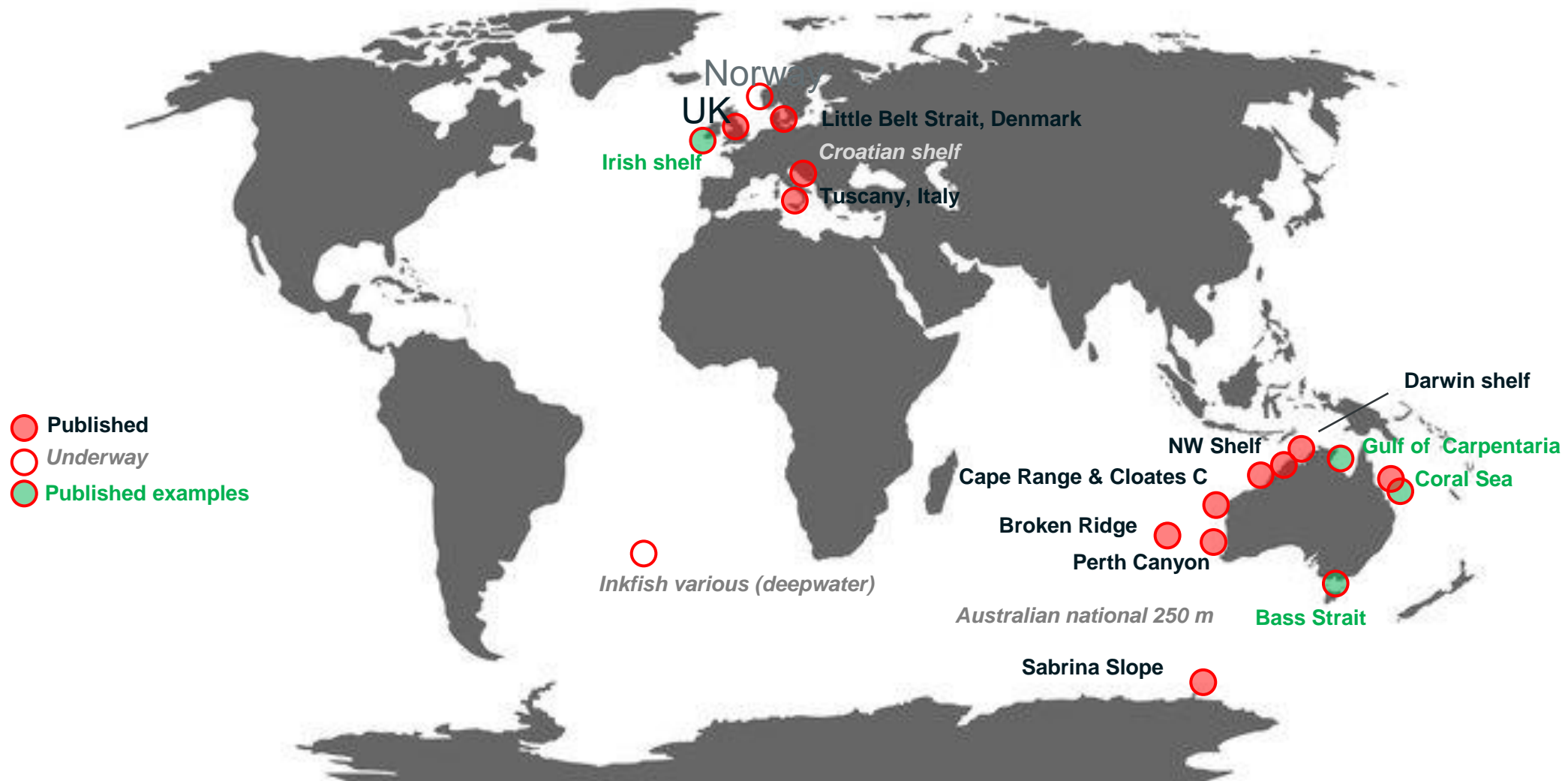






Classification tree

Global applications (to October 2023)





Foras na Mara
Marine Institute

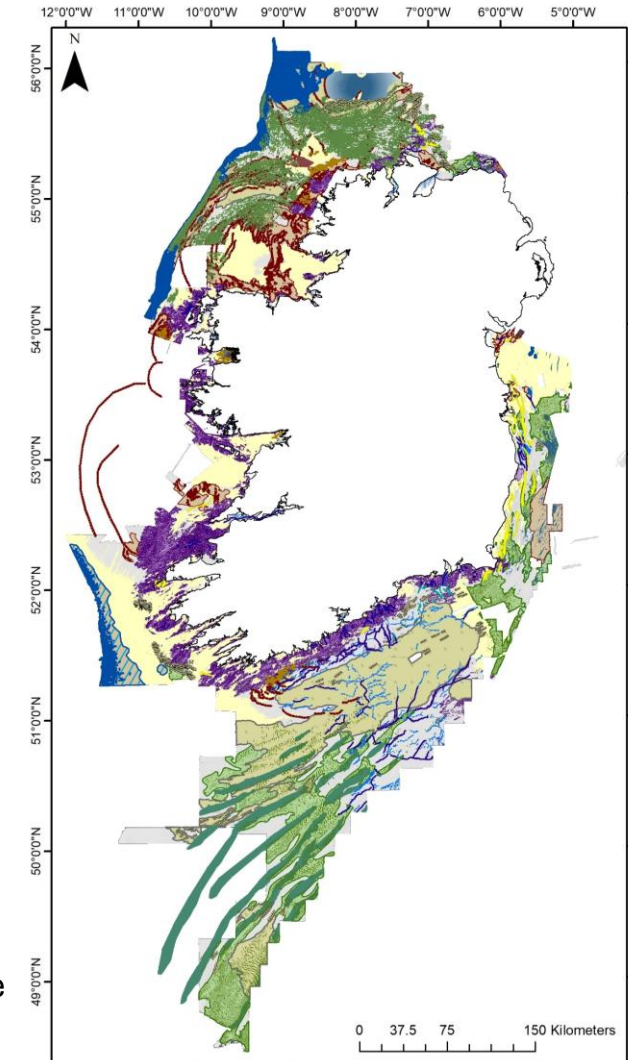
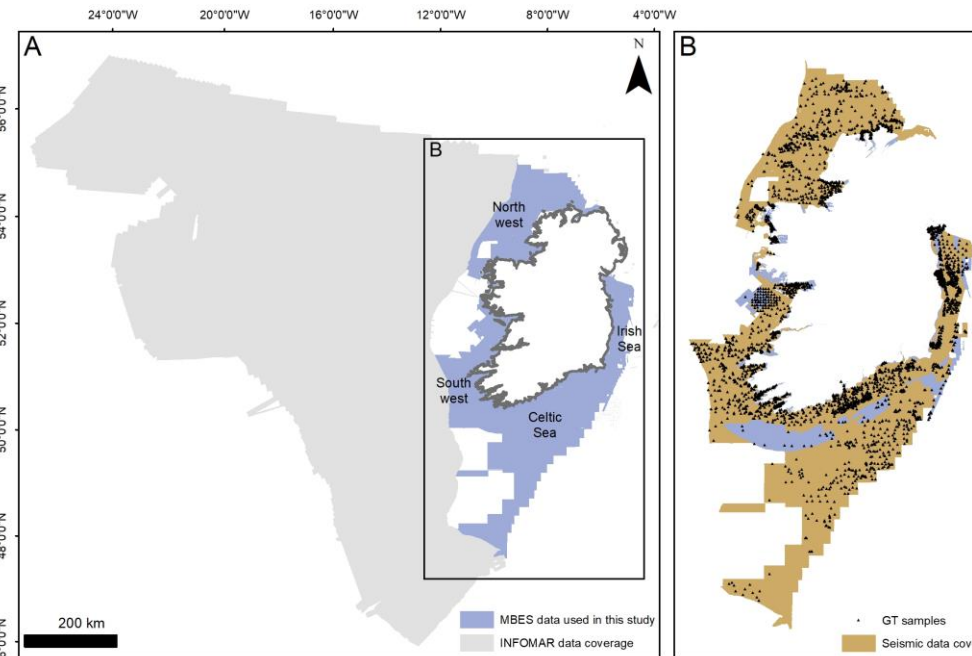
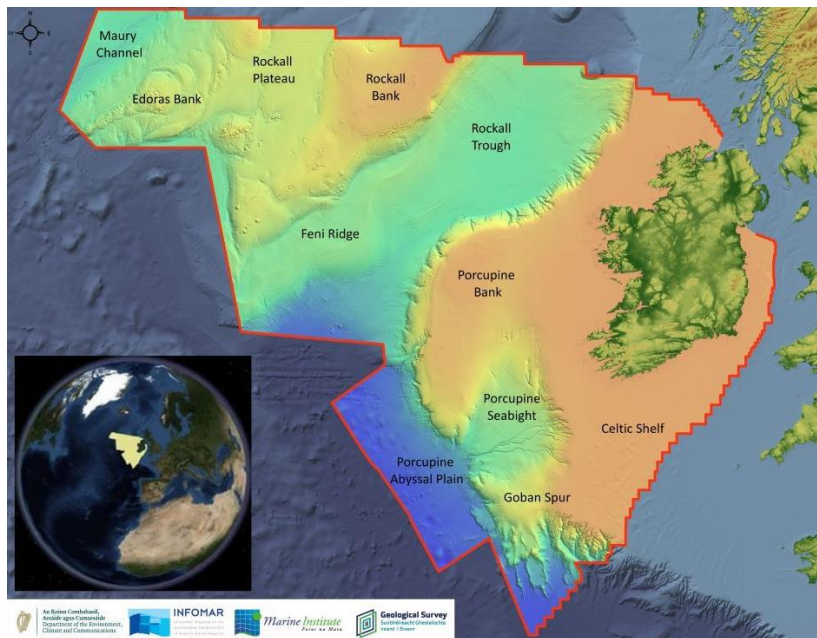
INFOMAR Programme: more than 85% seabed mapped at high resolution.



UCC
University College Cork, Ireland



**Marine Geosciences
Research Group**
University College Cork



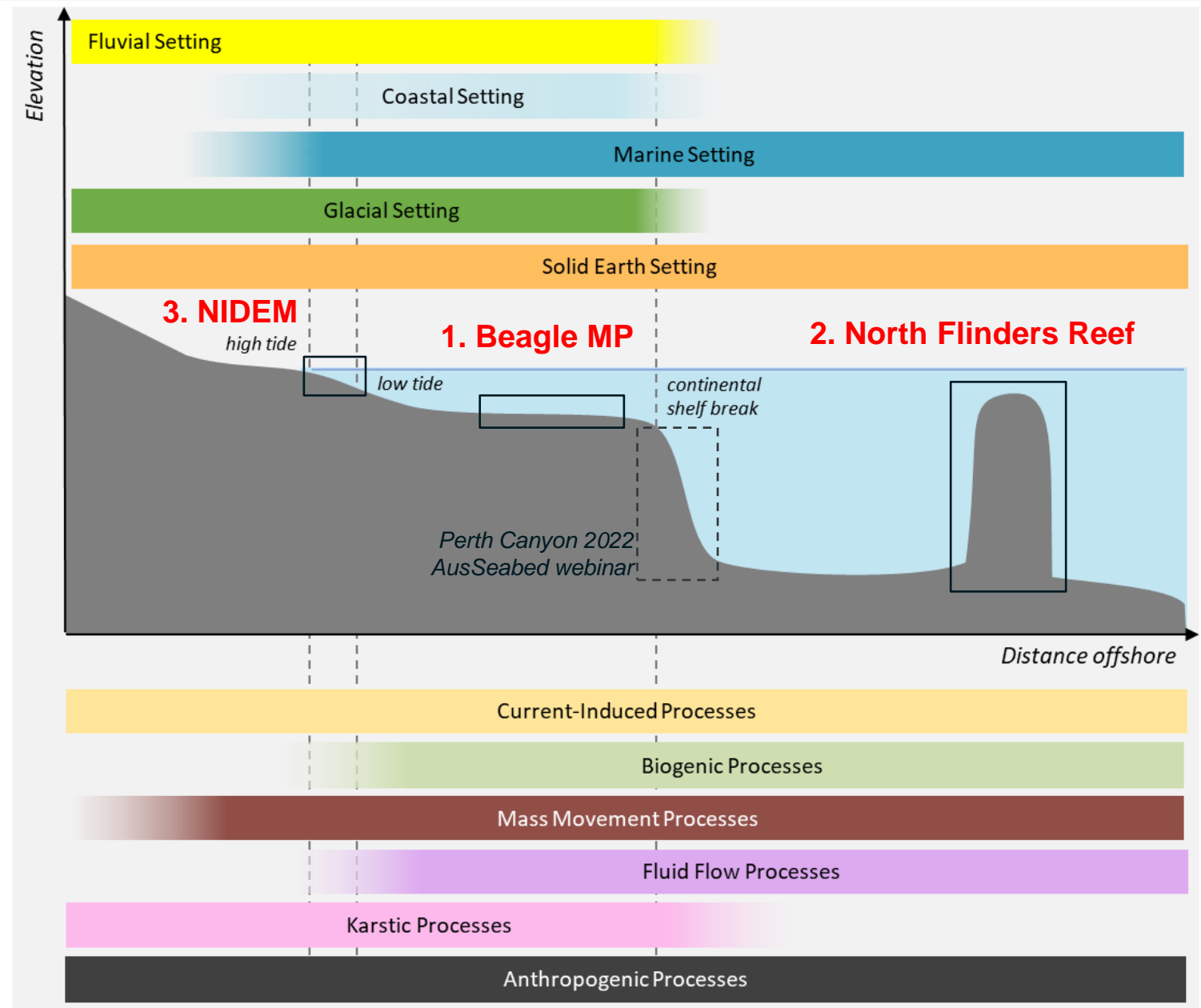
- includes 33 different geomorphic units and 3 substrate types;
- adopted the **MIM-GA (two-part) classification scheme**;

<https://atlas.marine.ie>



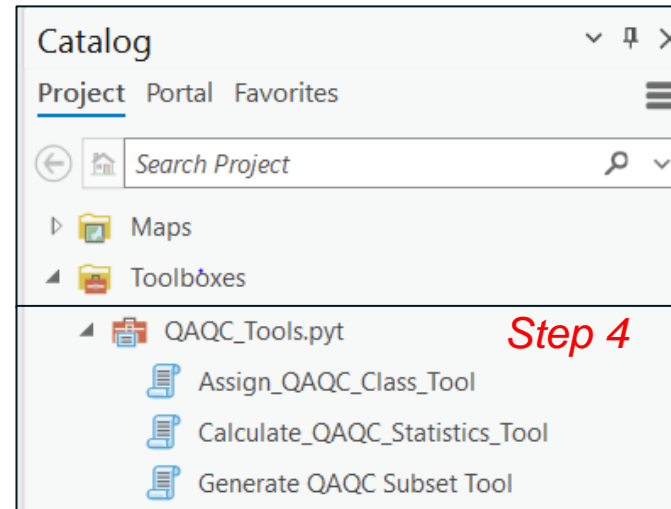
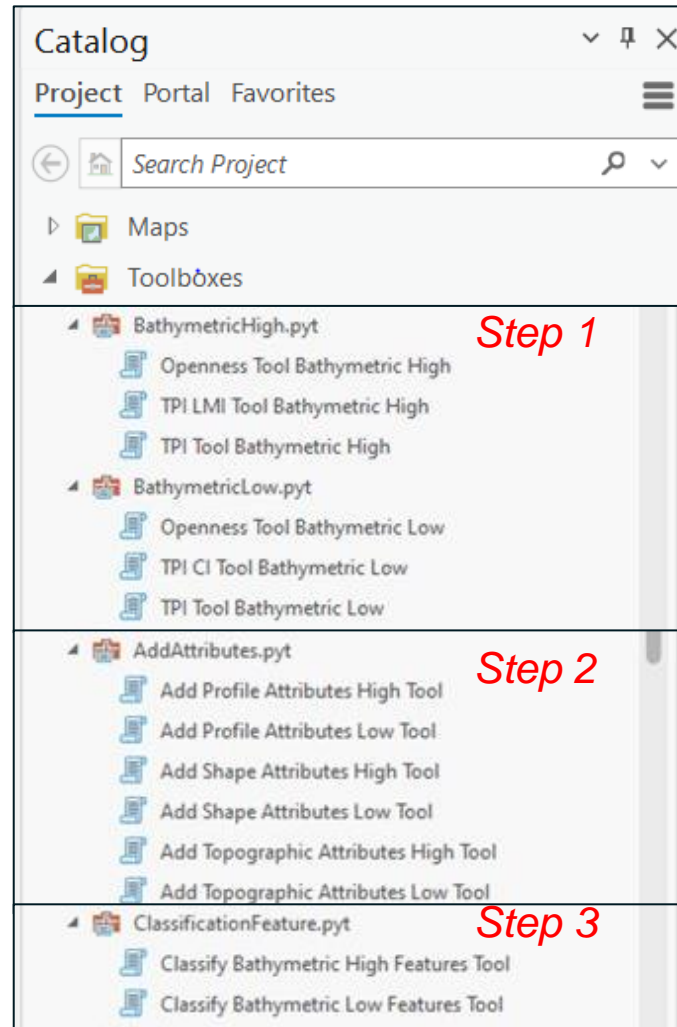
Ireland's Marine Atlas

Access to Ireland's marine data and related information

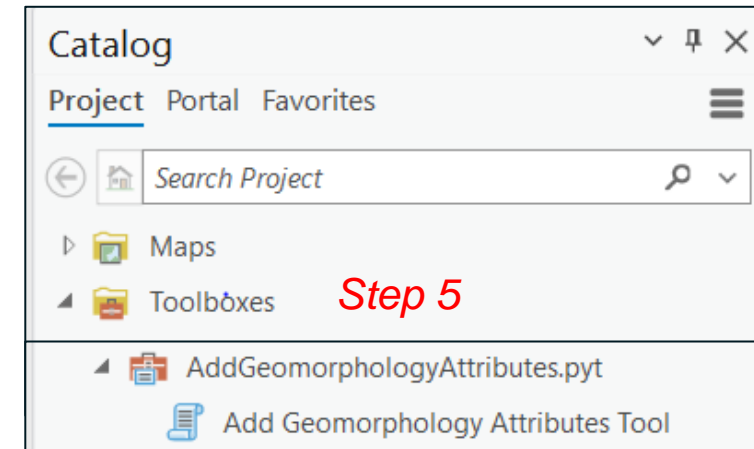


Operationalising the two-part scheme – ESRI

Part 1 Morphology mapping tools - published



Part 2 Geomorphology tool (DRAFT)



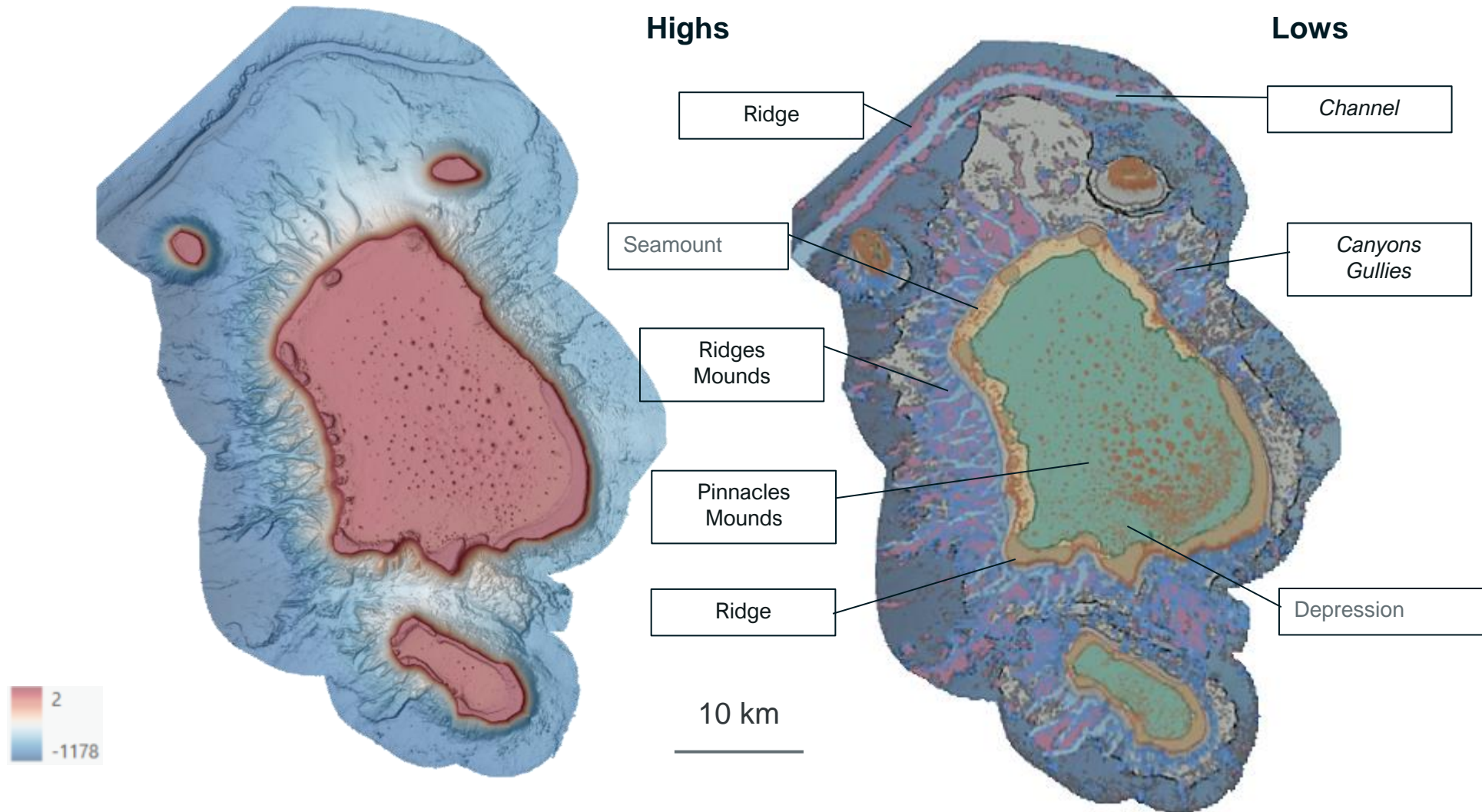
Cartographic style (DRAFT)

Step 6



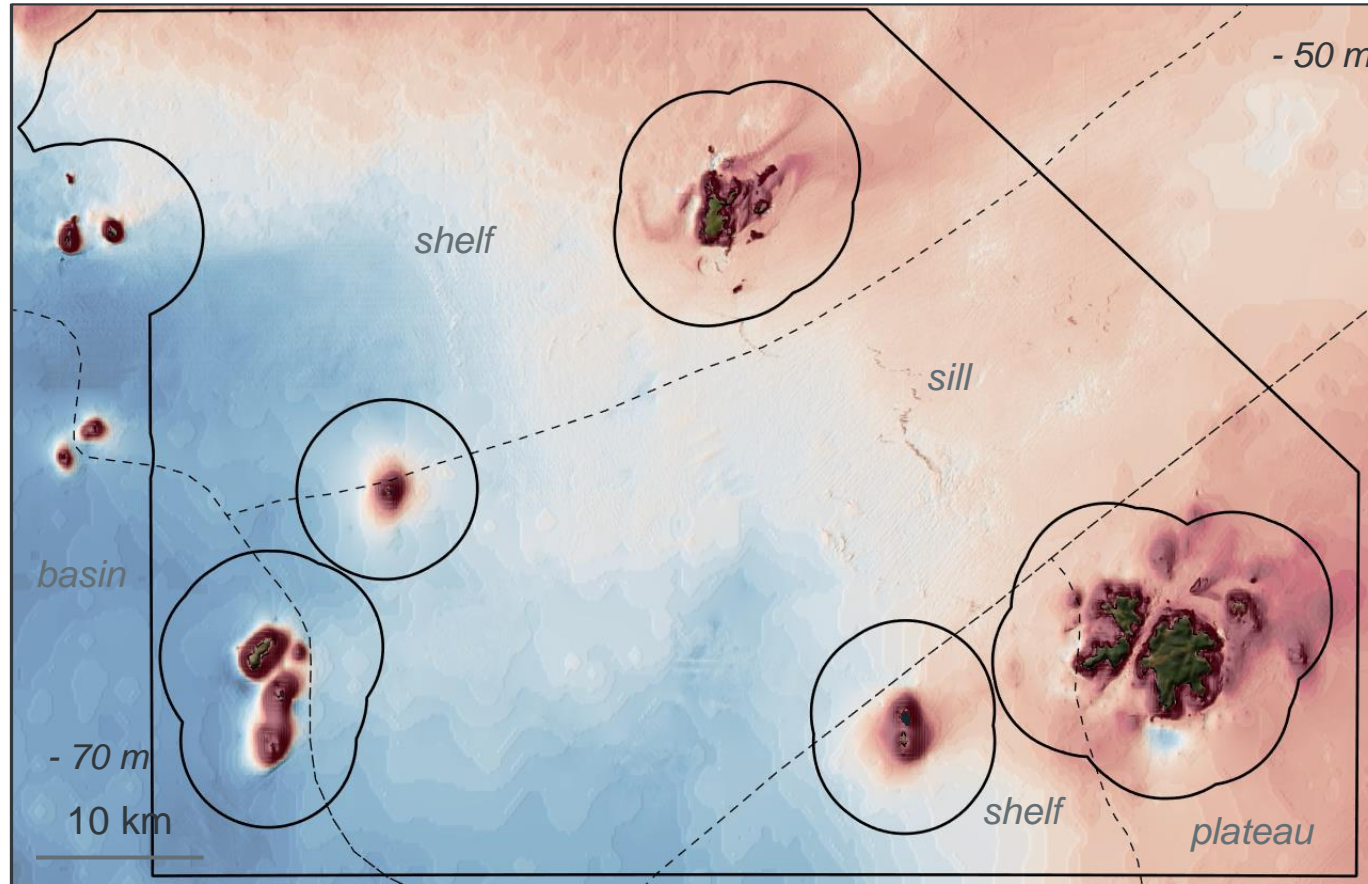
1. North Flinders, Coral Sea Marine Park

Part 1: Morphology



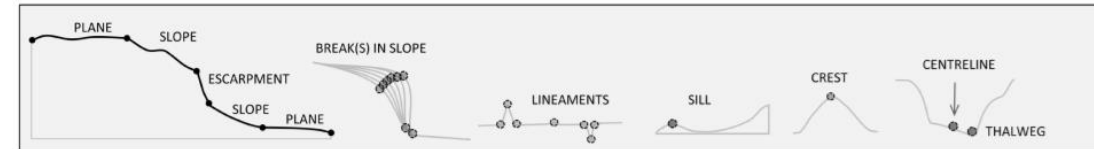
1. Beagle Marine Park

Part 1: Morphology (bathymetry)

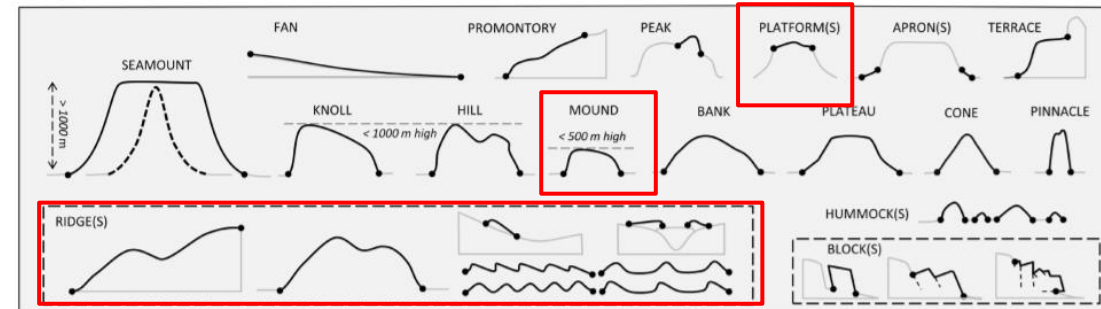


Heap and Harris (2008)

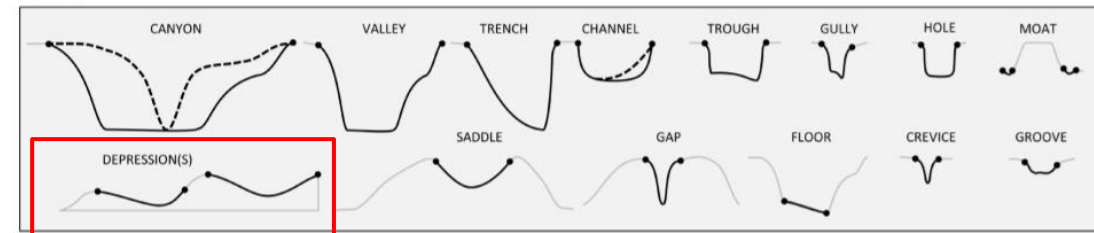
Planar surfaces, inclined surfaces and lineaments



Highs

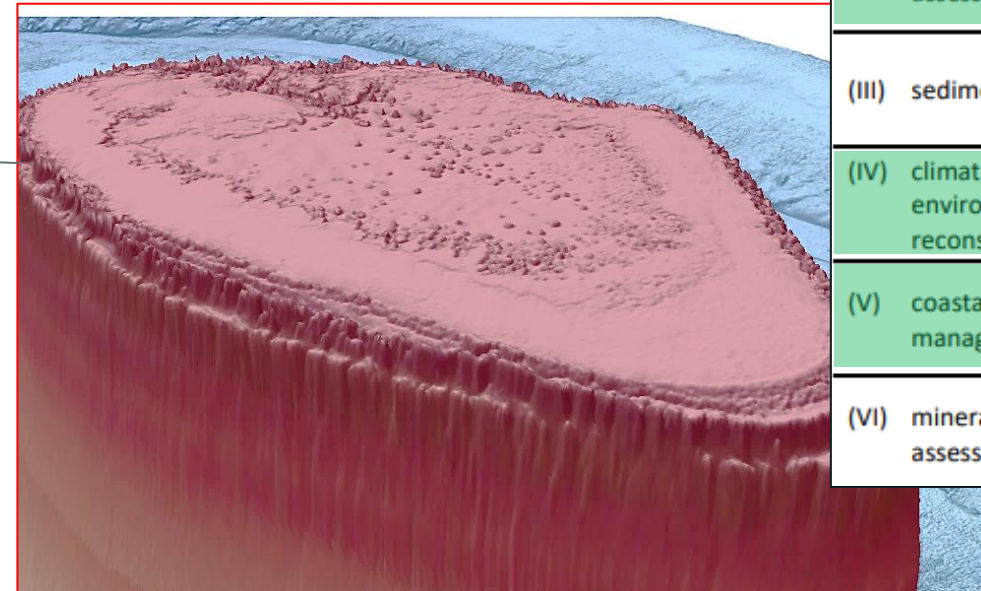
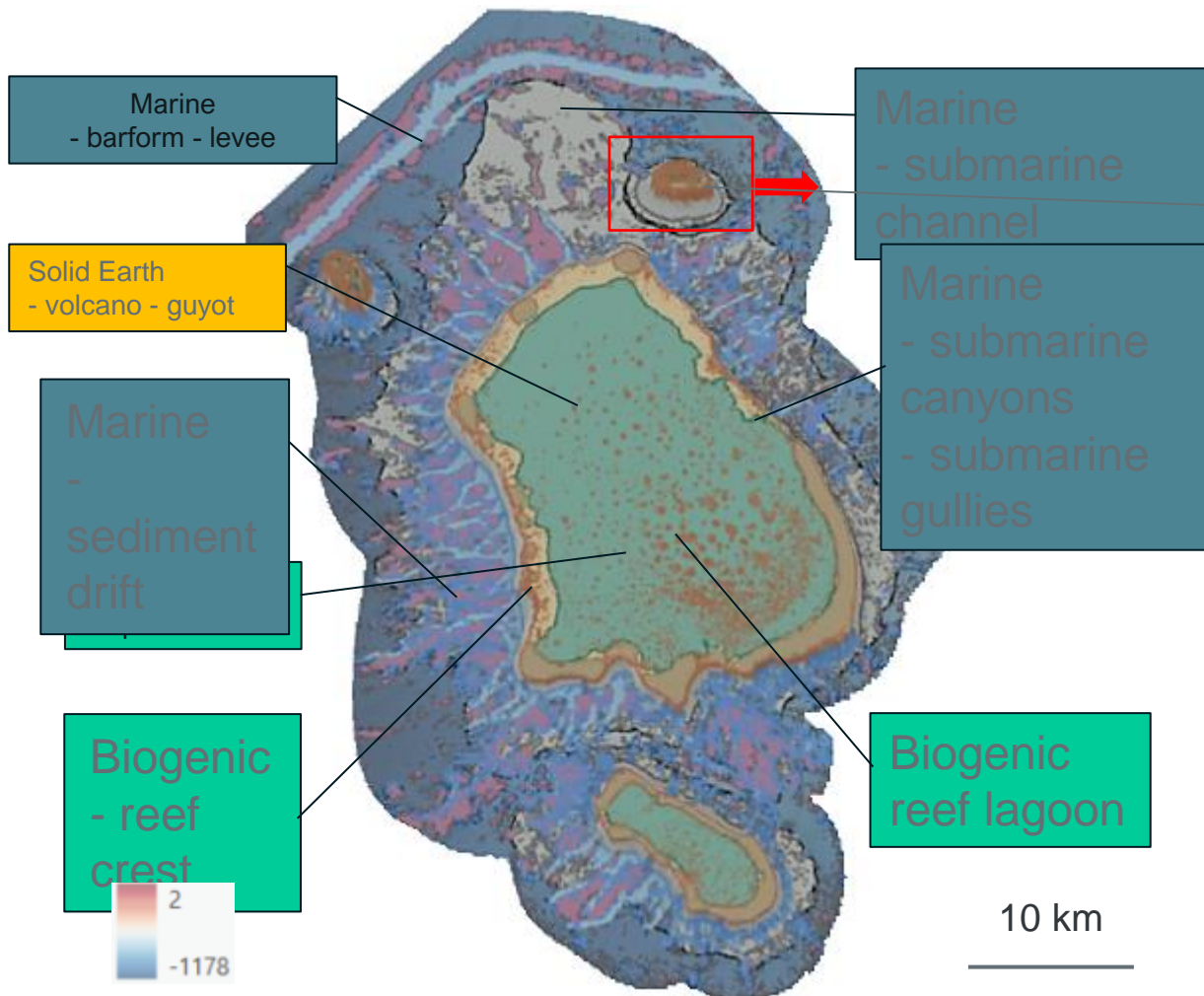


Lows



1. North Flinders, Coral Sea Marine Park

Part 2: Geomorphology



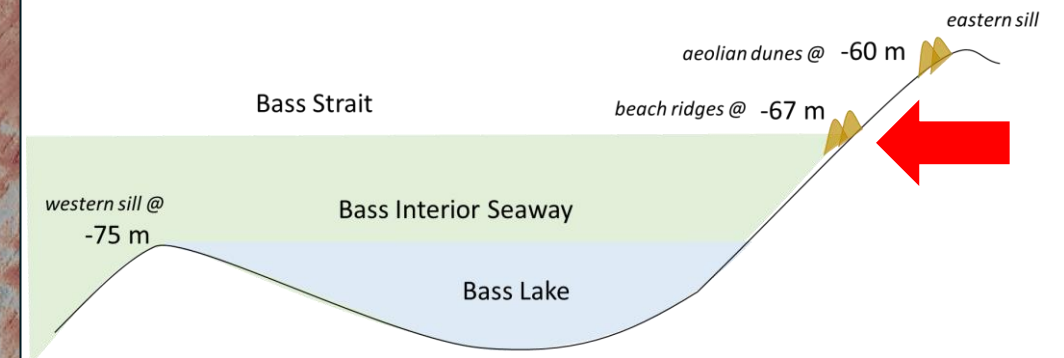
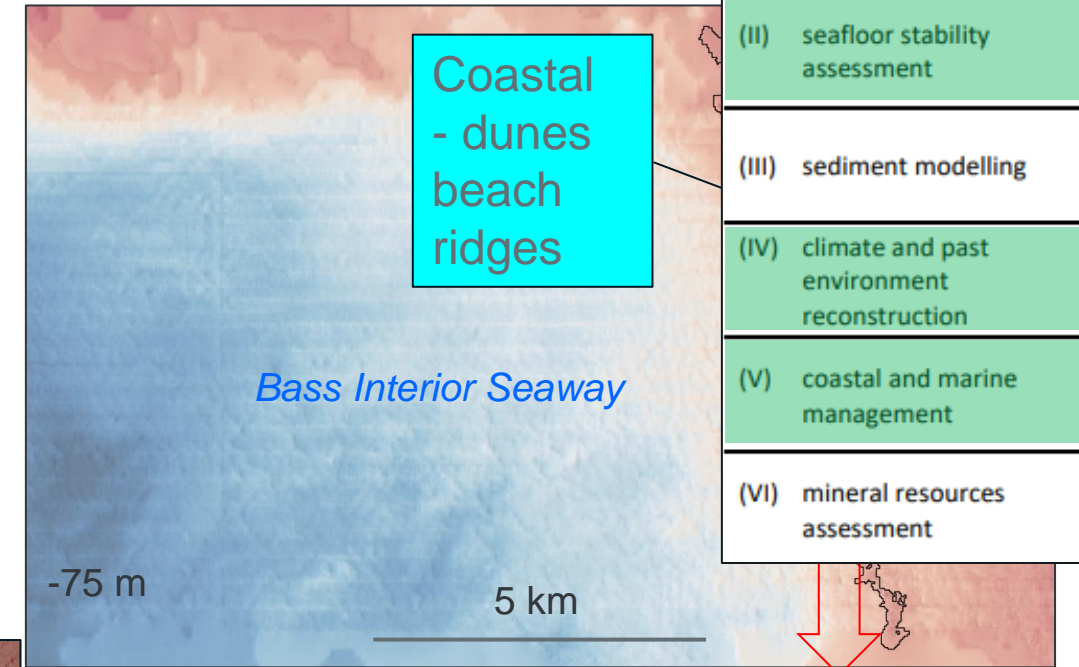
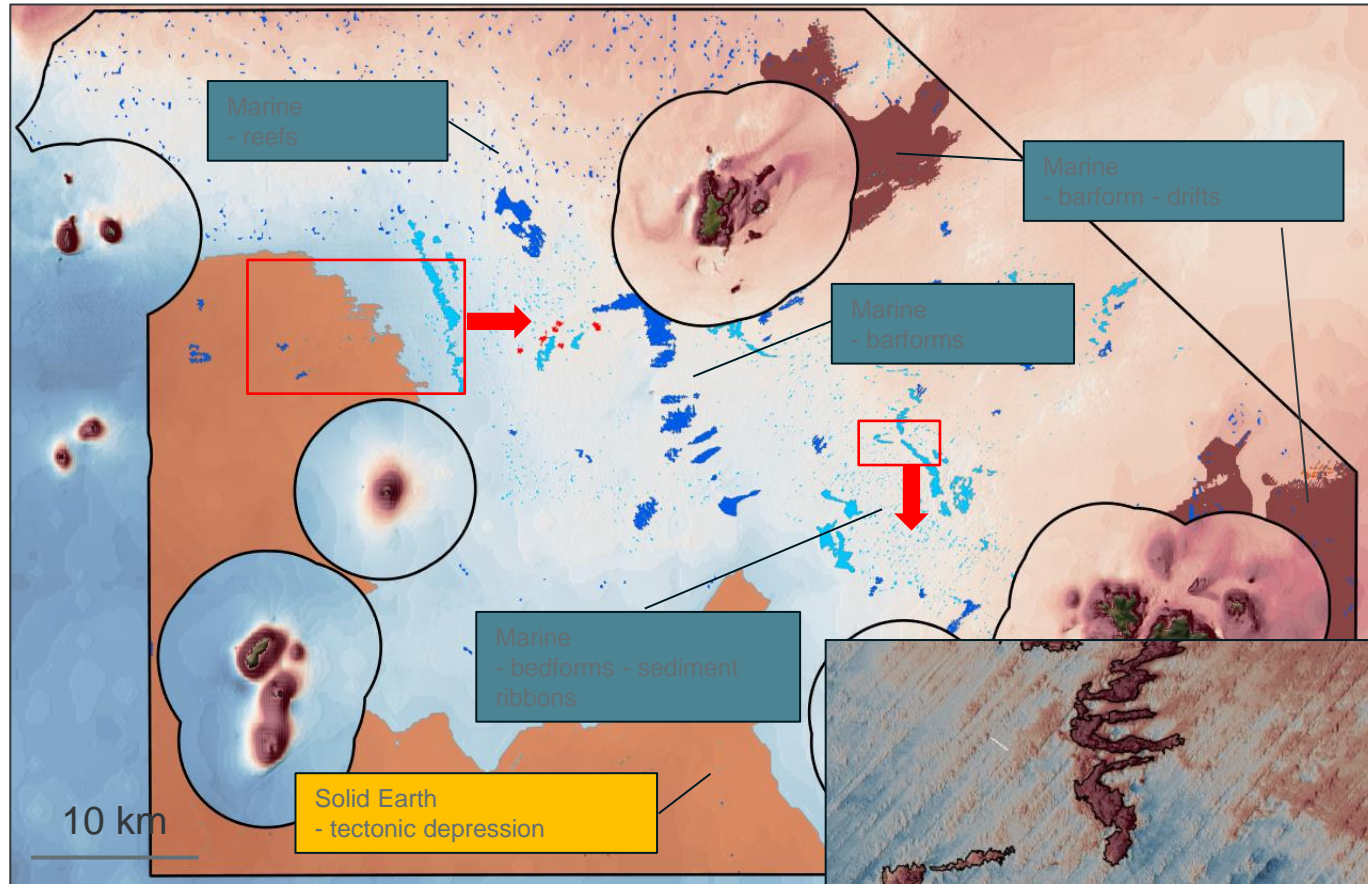
Multiple palaeo-reef crests (BGU)

- indicate former sea levels
- now comprise the *fore-reef* (BGU)

Potential applications
(I) to infer potential habitat
(II) seafloor stability assessment
(III) sediment modelling
(IV) climate and past environment reconstruction
(V) coastal and marine management
(VI) mineral resources assessment

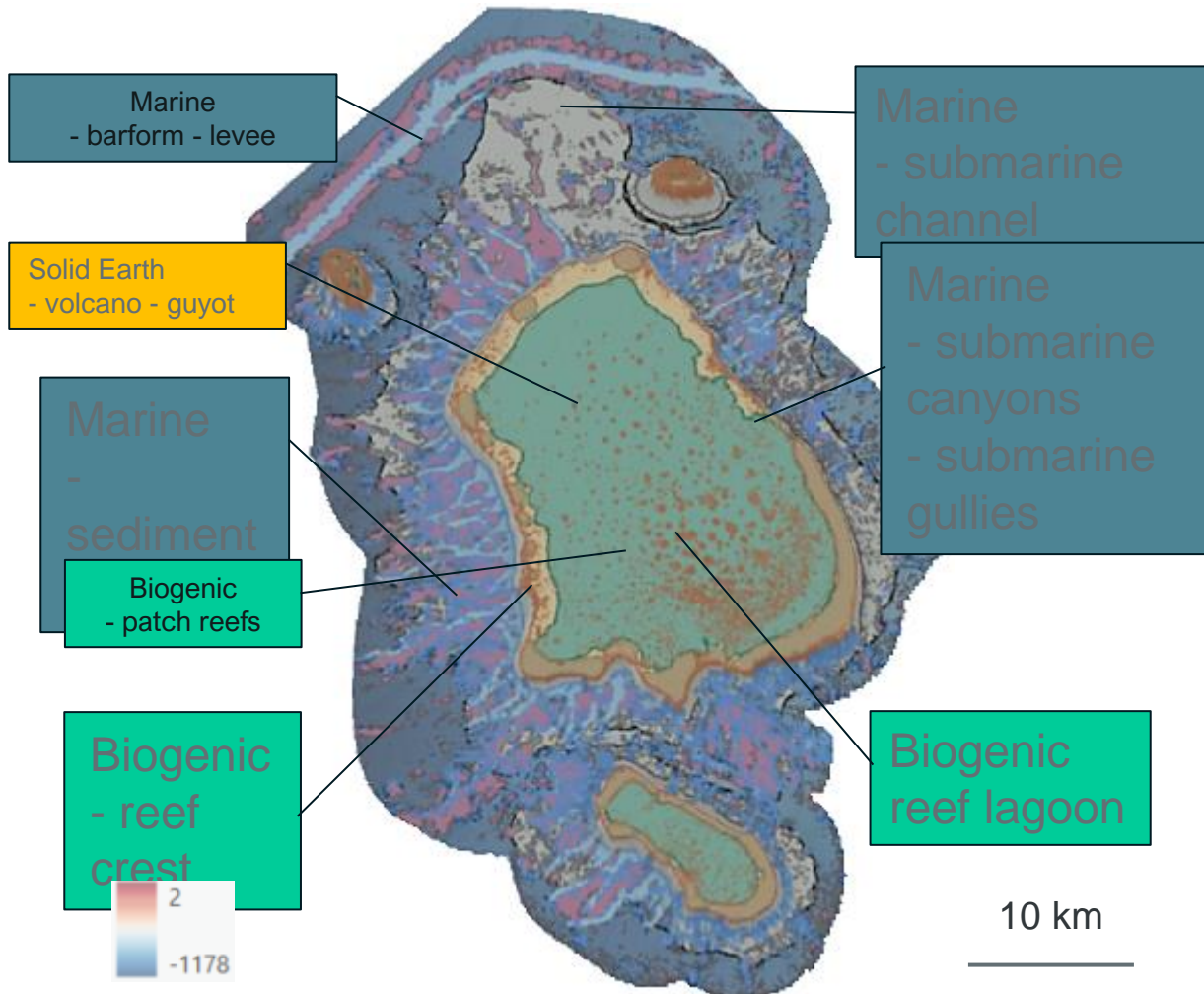
1. Beagle Marine Park

Part 2: Geomorphology

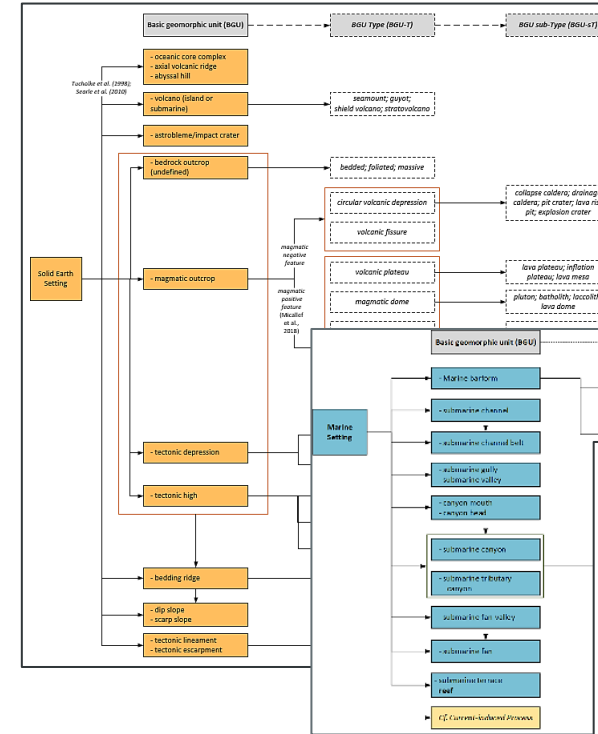


1. North Flinders, Coral Sea Marine Park

Part 2: Geomorphology

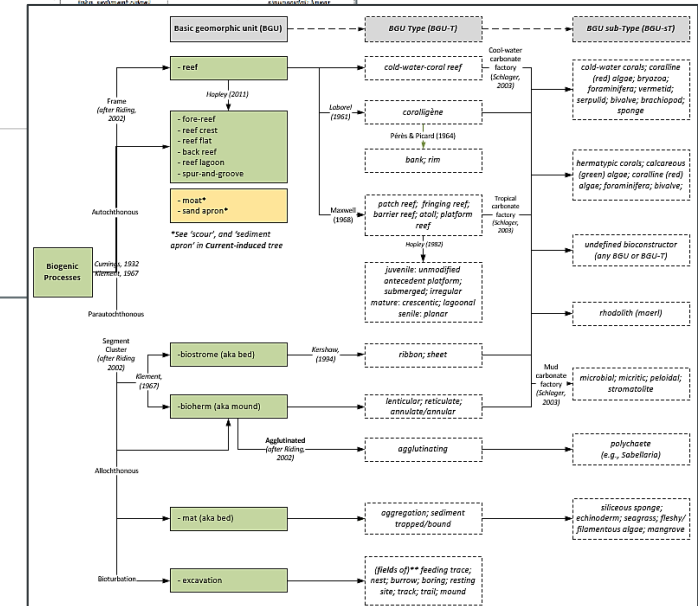


Solid Earth Setting



Marine Setting

Biogenic Processes





3. Groote Eylandt (NT)

DEA Intertidal DEM pilot project – the new NIDEM

Integrating Indigenous priorities in spatially enabled planning of the Indigenous Estate project

The Anindilyakwa Land Council from Groote Eylandt (NT)

CRC for Developing Northern Australia
Geoscience Australia
Australian National University
Aerometrex Ltd

Geoscience Australia supports the project through the *Exploring for the Future* program's *Geoscience Knowledge Sharing* project in the Office of the Chief Scientist.



Groote Eylandt Archipelago



Alyingberma Community

Annual coastlines

2019
2015
2010
2005
2000
1995
1990
1988

Coastline elevation data points (m ± error):

- 0.3 m (± 0.1)
- 0.3 m (± 0.1)
- 0.4 m (± 0.1)
- 0.4 m (± 0.1)
- 0.5 m (± 0.3)
- 0.6 m (± 0.1)
- 0.8 m (± 0.2)
- 0.9 m (± 0.2)
- 0.5 m (± 0.1)
- 0.6 m (± 0.1)
- 0.8 m (± 0.3)
- 2.0 m (± 0.3)
- 0.7 m (± 0.2)
- 0.3 m (± 0.1)
- 0.4 m (± 0.2)
- 1.2 m (± 0.4)
- 0.4 m (± 0.1)
- 0.3 m (± 0.2)
- 0.4 m (± 0.2)
- 0.6 m (± 0.2)
- 0.6 m (± 0.1)
- 0.5 m (± 0.3)
- 0.8 m (± 0.3)
- 0.4 m (± 0.2)
- 0.6 m (± 0.2)
- 0.6 m (± 0.1)
- 0.5 m (± 0.3)
- 1.4 m (± 0.2)
- 3.5 m (± 0.3)
- 5.5 m (± 0.3)
- 0.3 m (± 0.2)
- 0.9 m (± 0.6)
- 0.4 m (± 0.2)

Insekumba Settlement

5 km

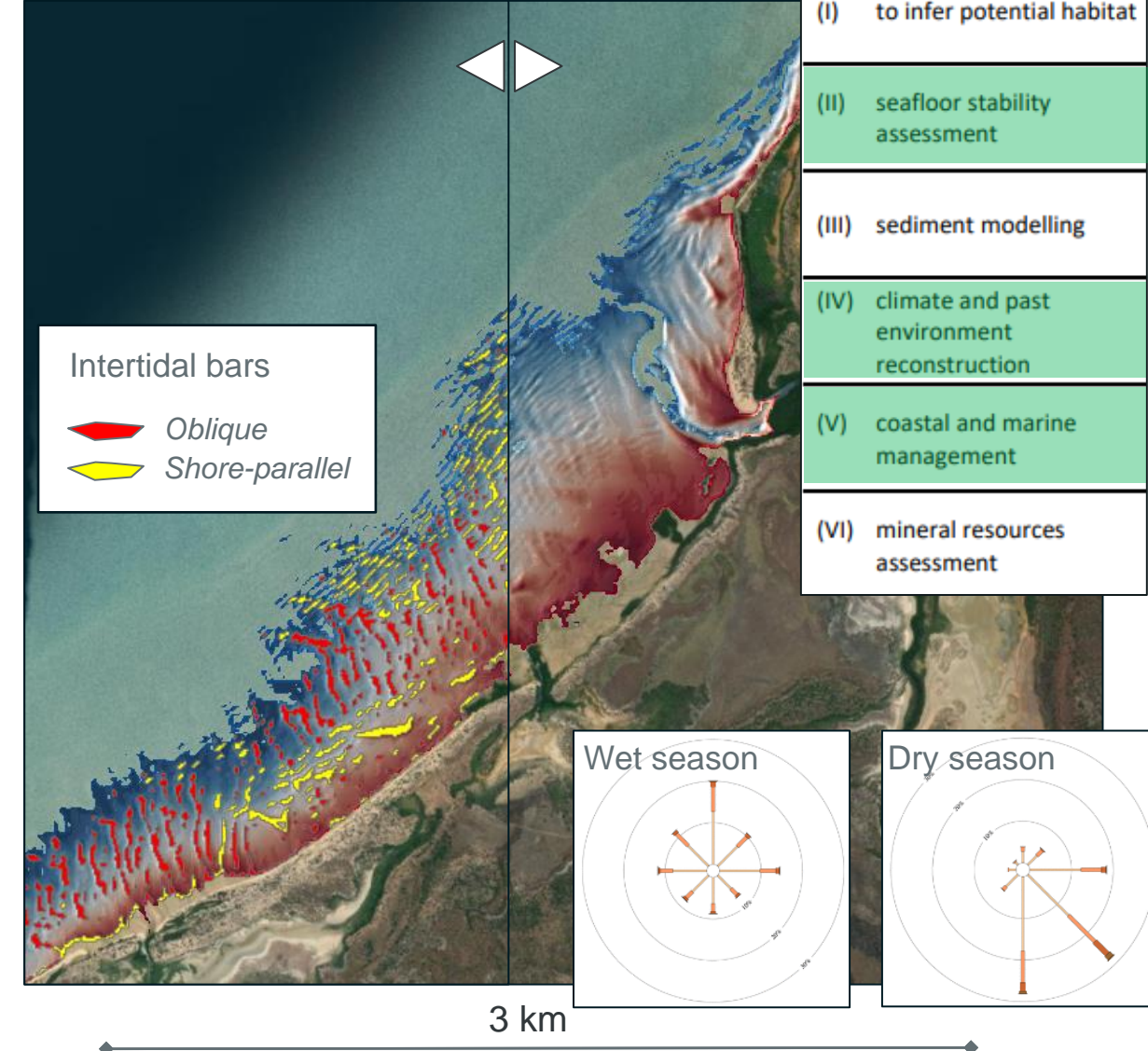
3. Groote Eylandt (NT)

DEA Intertidal DEM pilot project – the new NIDEM

Groote Eylandt Archipelago



Preliminary NIDEM (2021) and geomorphology





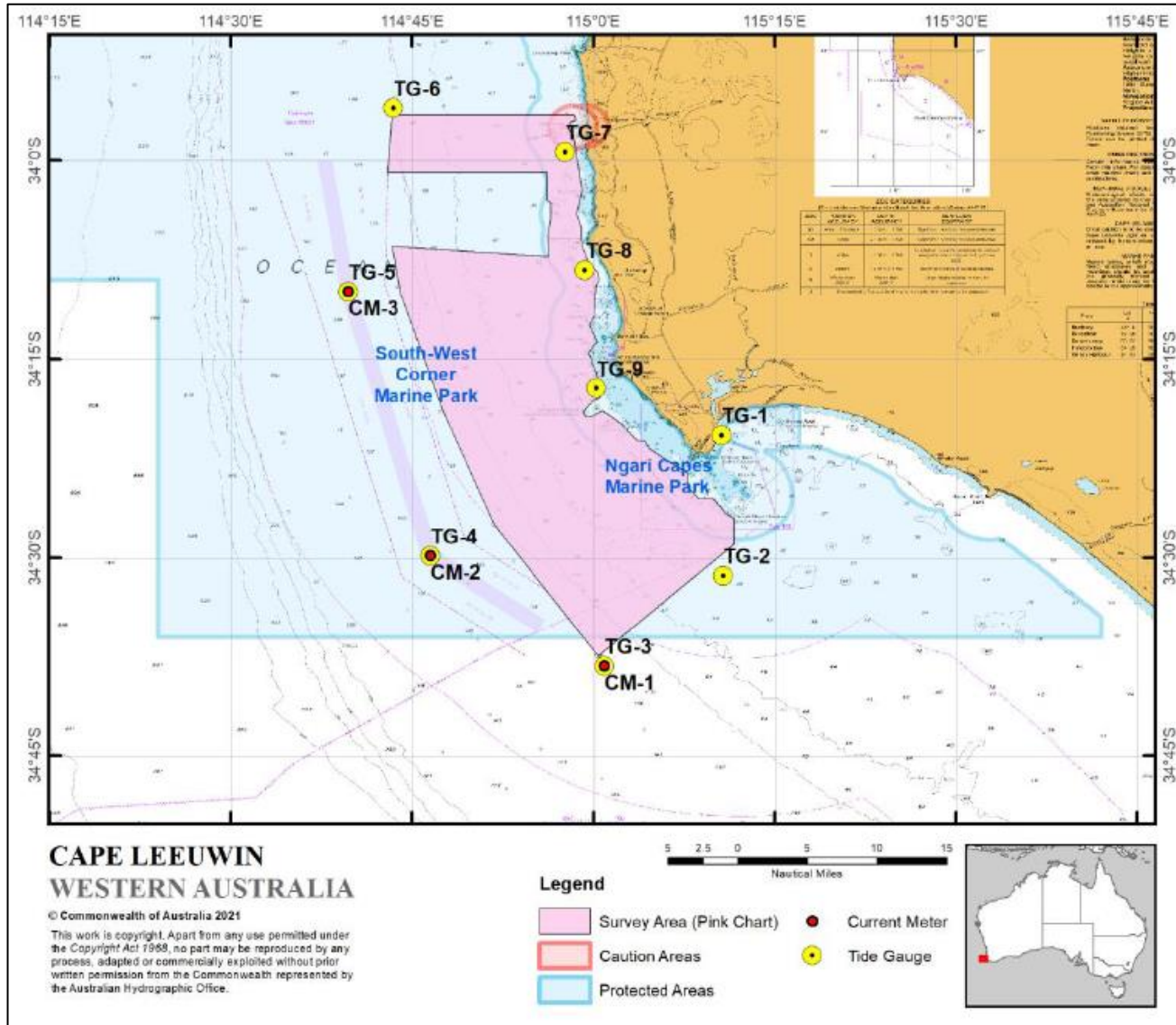
MMA
OFFSHORE

**MAPPING TOGETHER ON
WADANDI SEACOUNTRY:
COLLABORATION
THROUGH A HIPPI
SURVEY & TRAINING
PROGRAM**

**ORIGINAL PRESENTATION BY ISZAAC WEBB,
CHRIS KENNEDY 4/7/2023**

AUSSEABED PRESENTATION BY ANDY DILLEY 01/11/2023

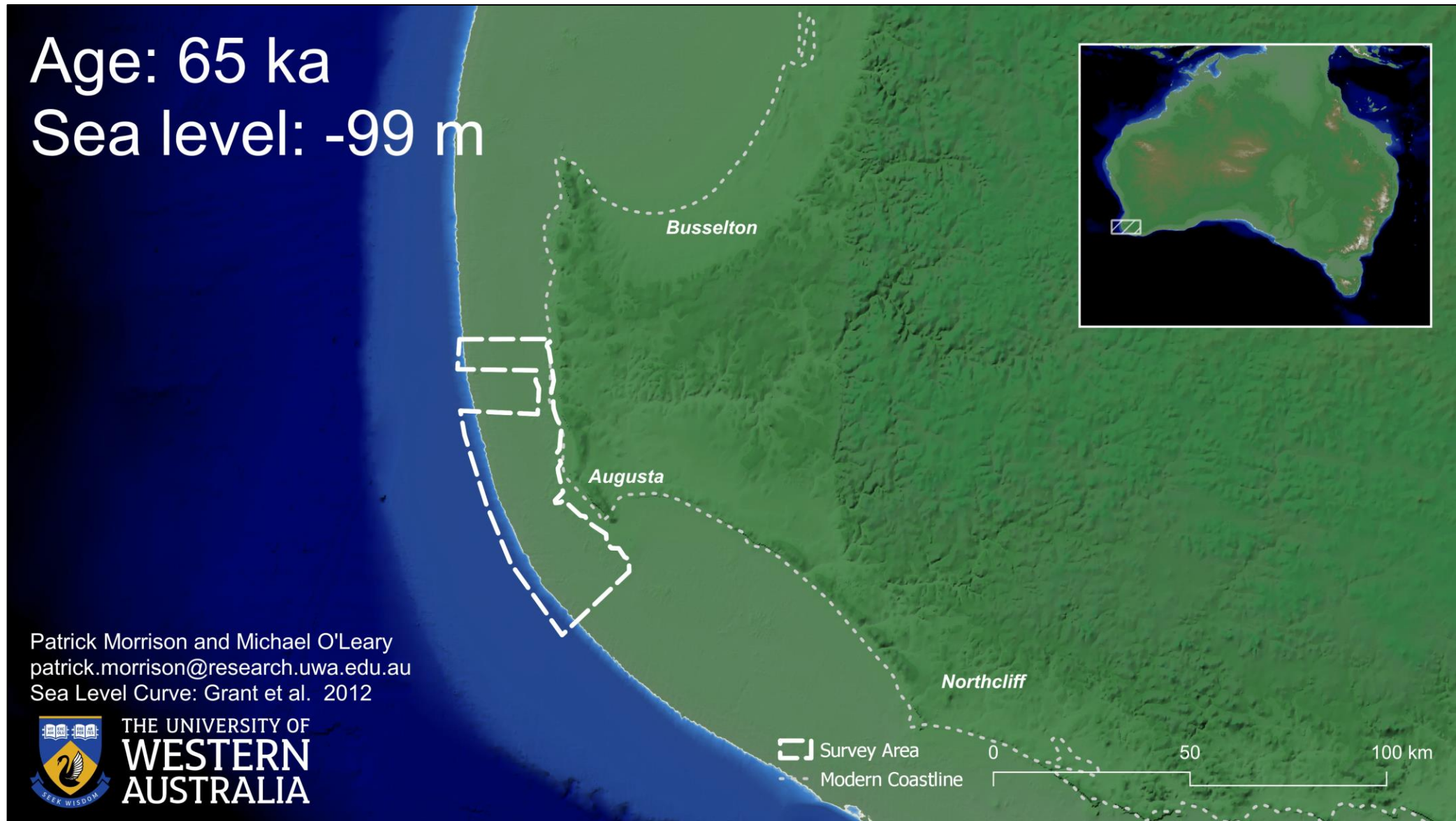
MAPPING TOGETHER ON SEA COUNTRY



- Survey Instruction 1031 - 421 NM²
- West of Margaret River to South of Flinders Bay
- Approx. 80km long x 25km wide
- Water Depths 5m to 140m
- Very Exposed Coast
 - Long Period Swells
 - S-SE Trade Winds in Summer Months
- Environmentally Sensitive Area (Protected)
- Significant Cultural Value to Wadandi Traditional Owners and Custodians in the region
- Significant Interest in Biodiversity within Australian Marine Parks area

MAPPING TOGETHER ON SEA COUNTRY

Age: 65 ka
Sea level: -99 m



Patrick Morrison and Michael O'Leary
patrick.morrison@research.uwa.edu.au
Sea Level Curve: Grant et al. 2012



THE UNIVERSITY OF
**WESTERN
AUSTRALIA**

MAPPING TOGETHER ON SEA COUNTRY

Collaboration between The University of Western Australia, the Undalup Association (Wadandi Knowledge Custodians) and MMA.

Summary of Key Objectives from Collaboration:

- Identify submerged ancient coastline features seen in bathy data of cultural significance, contribute towards existing Cultural Seascape mapping program.
- Enhance biodiversity Mapping with Australian Marine Parks
- Passive backscatter data ground truthing in over sensitive seabed using UWA drop camera

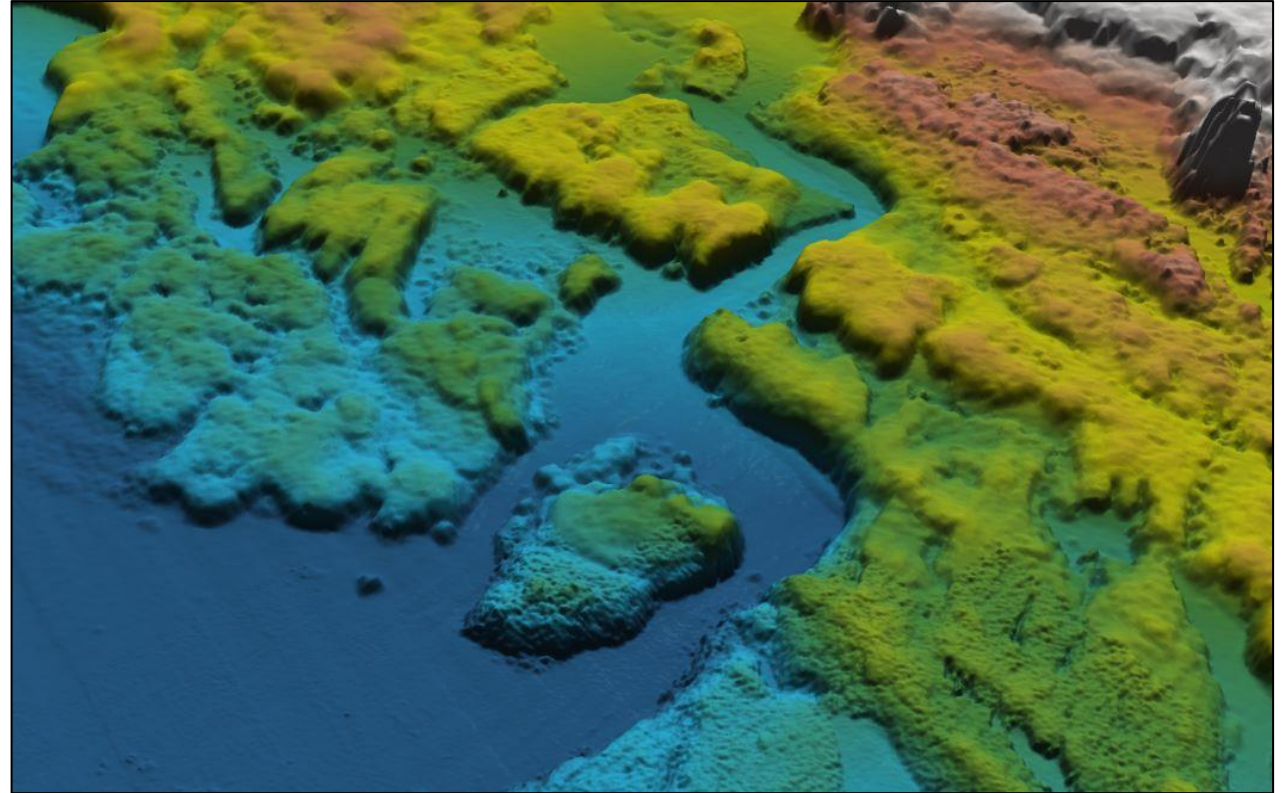
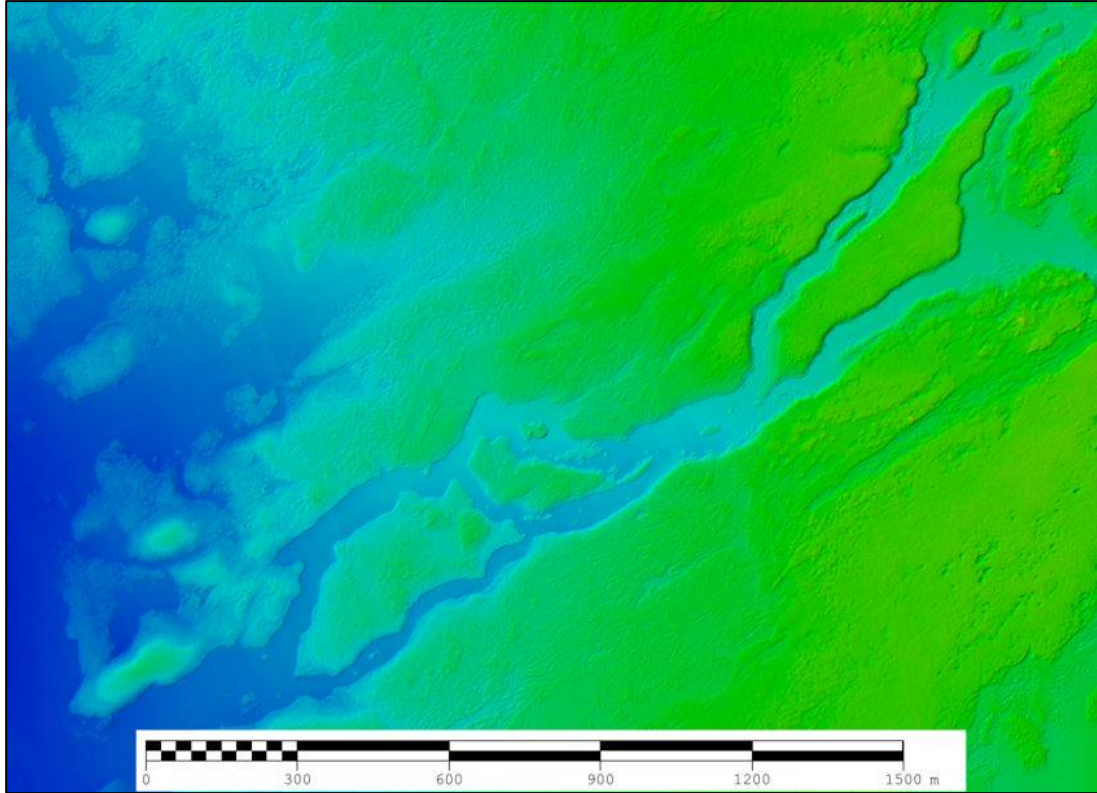
Video...

MAPPING TOGETHER ON SEA COUNTRY

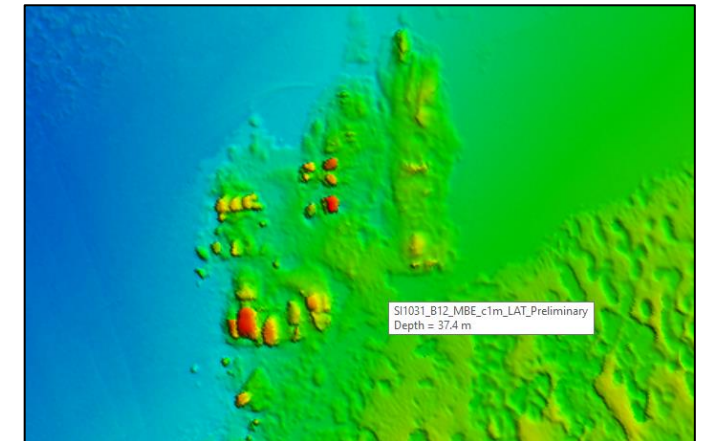
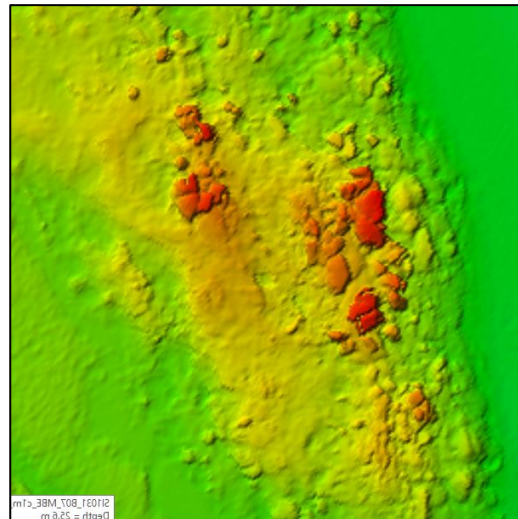
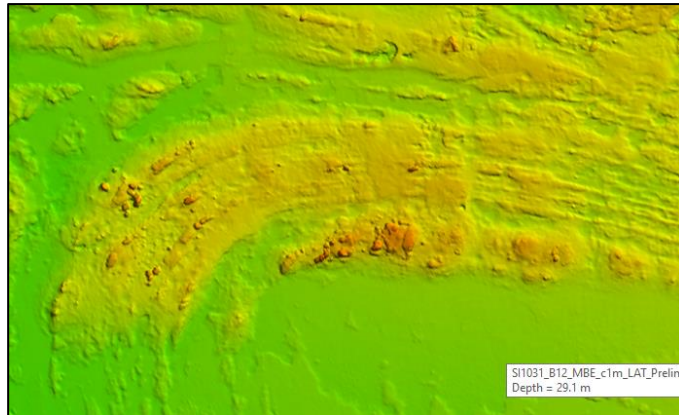
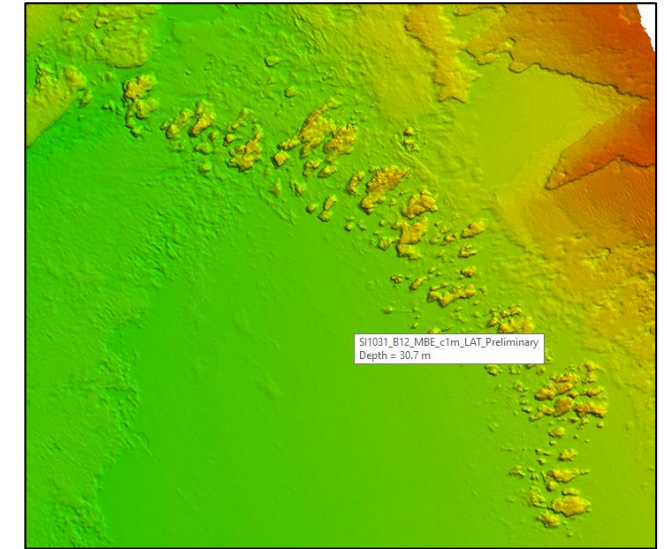
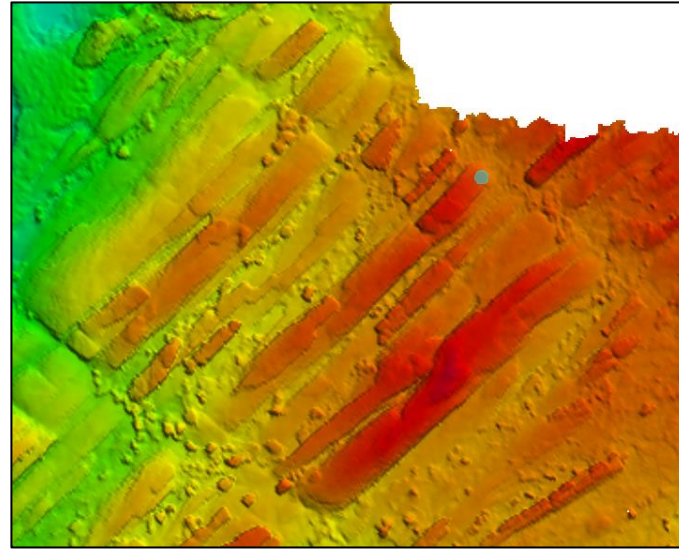
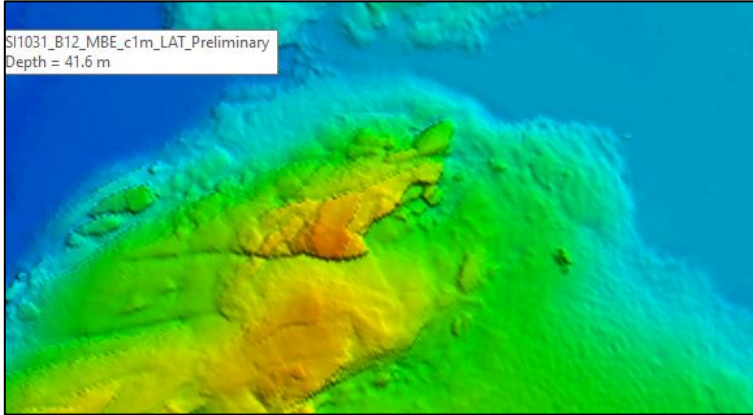


Source: Davies H N, Webb W, Webb I, Webb T, Guilfoyle D, Clohessy S, Griffin K, Langlois T (2022). The Cultural Seascape of Wadandi Boodja. Report to the National Environmental Science Program, Marine Biodiversity Hub. The University of Western Australia.

MAPPING TOGETHER ON SEA COUNTRY



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Thankyou

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