12th North Indian Ocean Hydrographic Commission

Colombo, 22 March 2012

Shallow Water Surveys

(another tool in the bag)

A presentation by Dr Wyn Williams
Chairman, Pelydryn Ltd

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1. Why use Airborne Lidar Bathymetry?
2. How does it work?
3. Where can it be used?
4. Who can it be used for?
5. Examples
6. Pelydryn

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Surveys

Multi-beam Echo Sounder (MBES)

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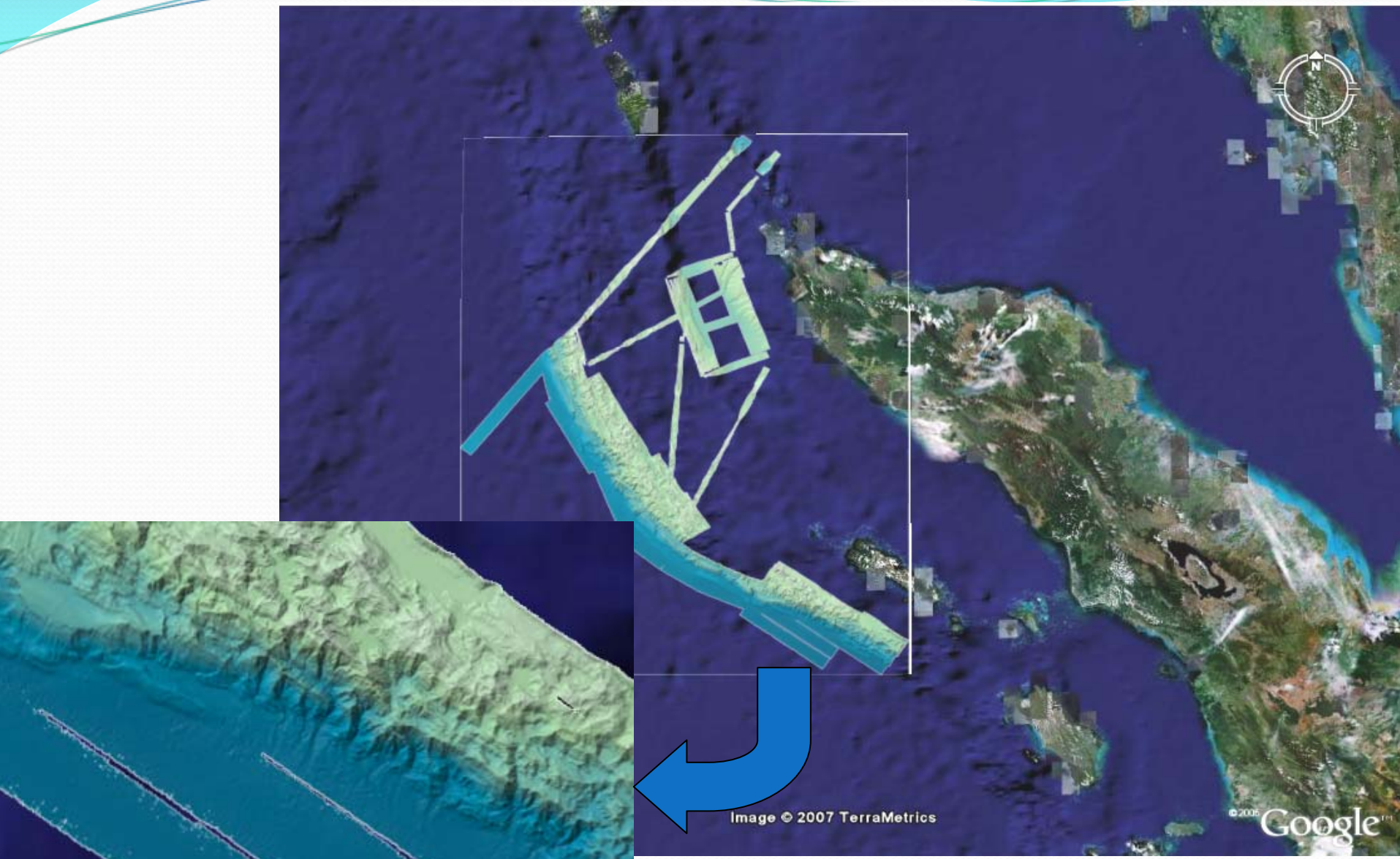
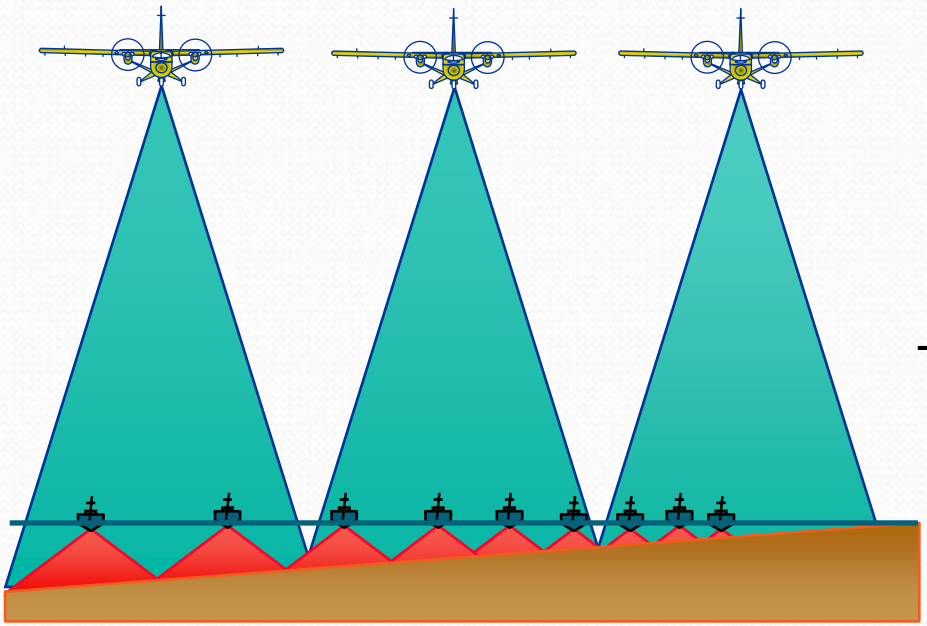
Surveys

Example of MBES Surveys:



HMS Scott Tsunami Data

Why use ALB?



In coastal regions, boat operations suffer from:

- reduced swathe width
- slow progress
- dangerous waters
- dependence on Mother ship
- high cost

The advantages of ALB are:

- fixed swathe width
- minimum presence on ground
- rapid progress
- seamless data from sea to land
- low cost

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Why use ALB?

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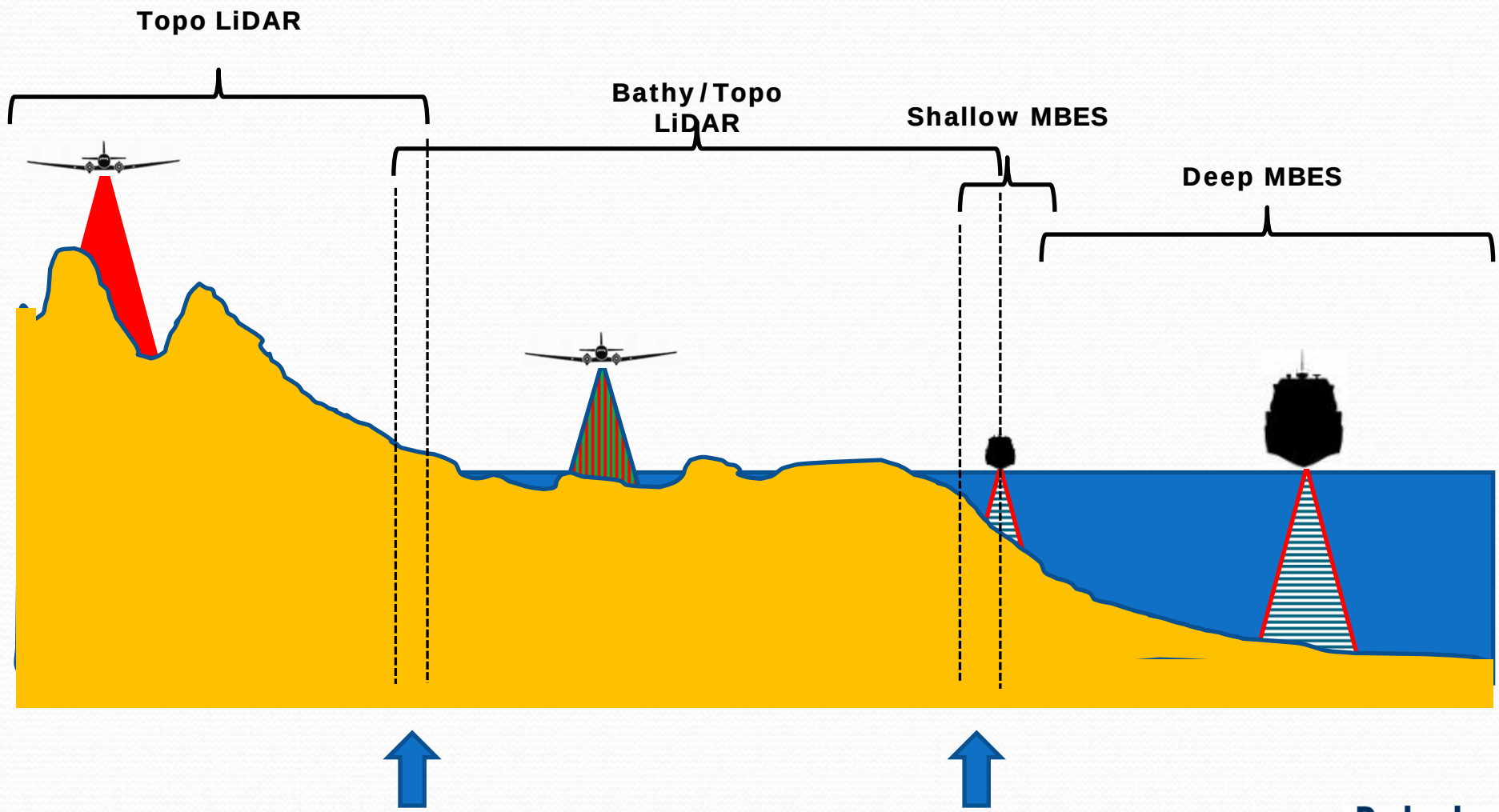
Overcoming The White Ribbon



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Why use ALB?

	MBES	ALB
No. of commercial systems in operation	800	5
Data richness (points per 2x2 m area)	10	3 *
Accuracy – vertical	2cm	10cm *
Discrimination – horizontal	0.1 m	1 m *
IHO Order achievable in survey	Special	1a *
Depth range for surveys	20-10,000 m	0-50 m *
Cost – per 1km^2 of survey	$3,000	$1,500
Speed - time taken to survey 200km^2	20 days	1 day *

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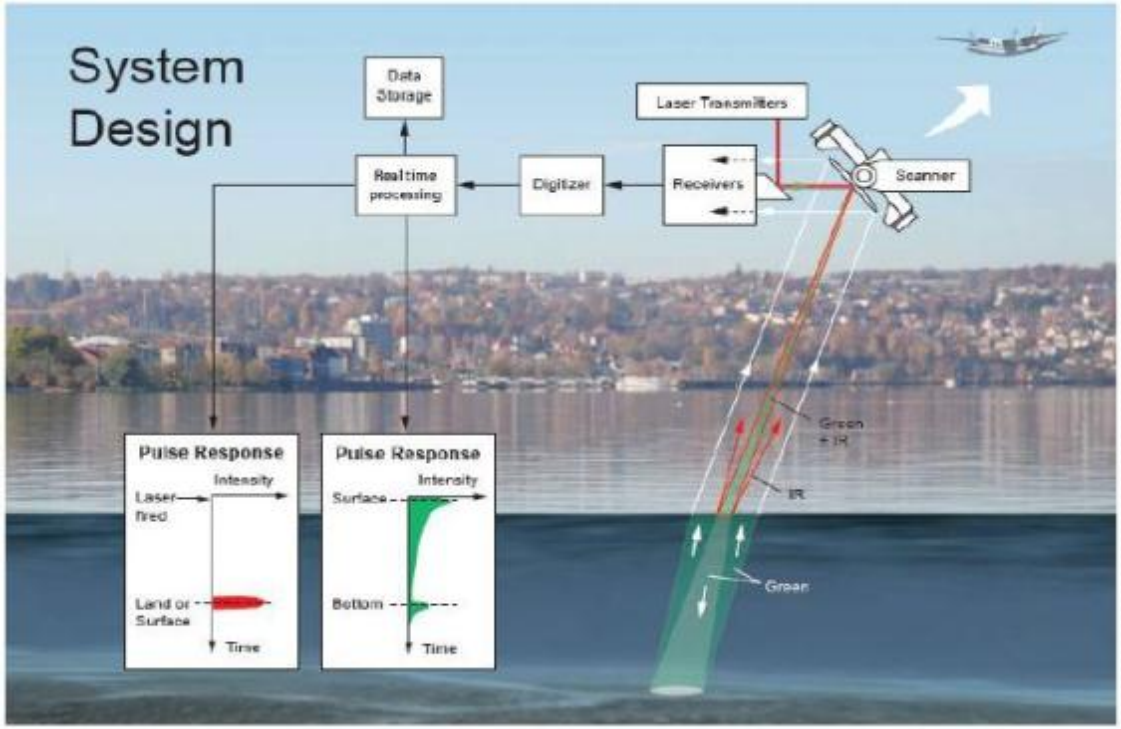
How does ALB work?



- The depth of water and height of land is measured by laser pulses of two wavelengths: Green (532nm) and Infra-Red (1064nm)
- The green beam penetrates the water, whereas the IR laser is reflected at the surface. The time difference between the green (bottom) and the IR (water surface) laser reflections is used to calculate the depth.

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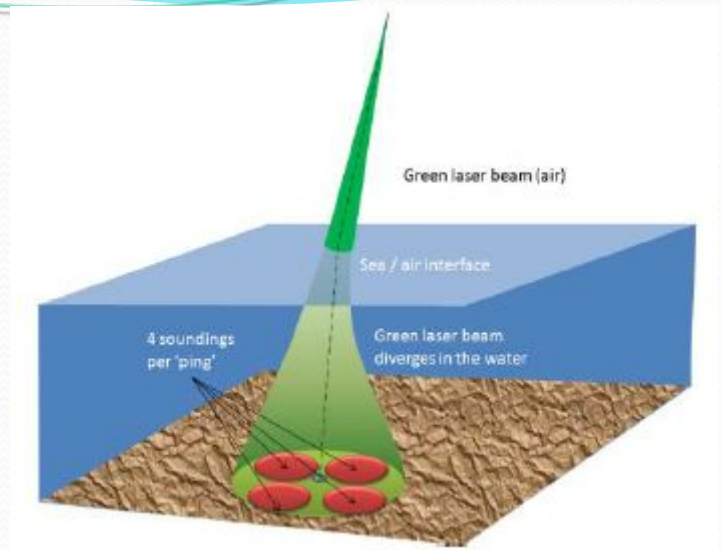
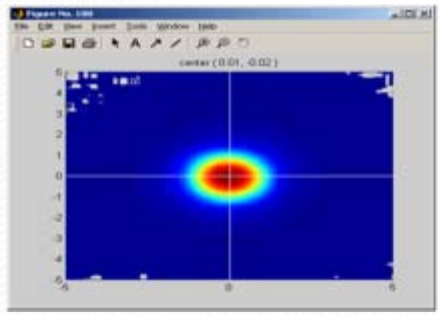
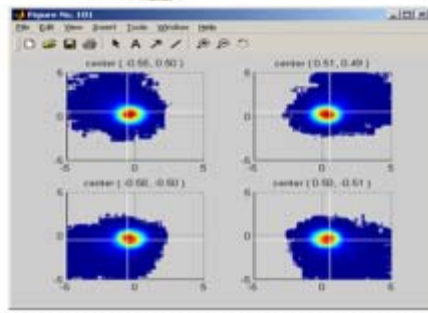
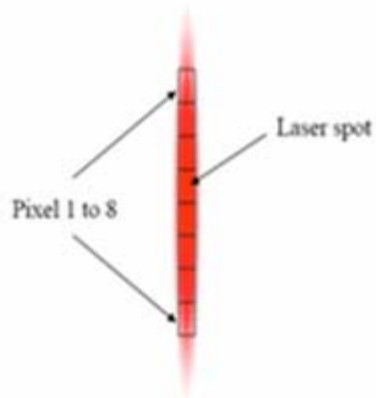
How does ALB work?

- The HawkEye IIB system is unique in its use of pixelated discrimination.
- The receivers are divided into :
  - 4 sections for the Hydro receivers
  - 8 sections for the Topo receivers
- The use of multi pixel technology allows improvements on:
  - data density
  - Contrast
  - object detection
  - object discrimination









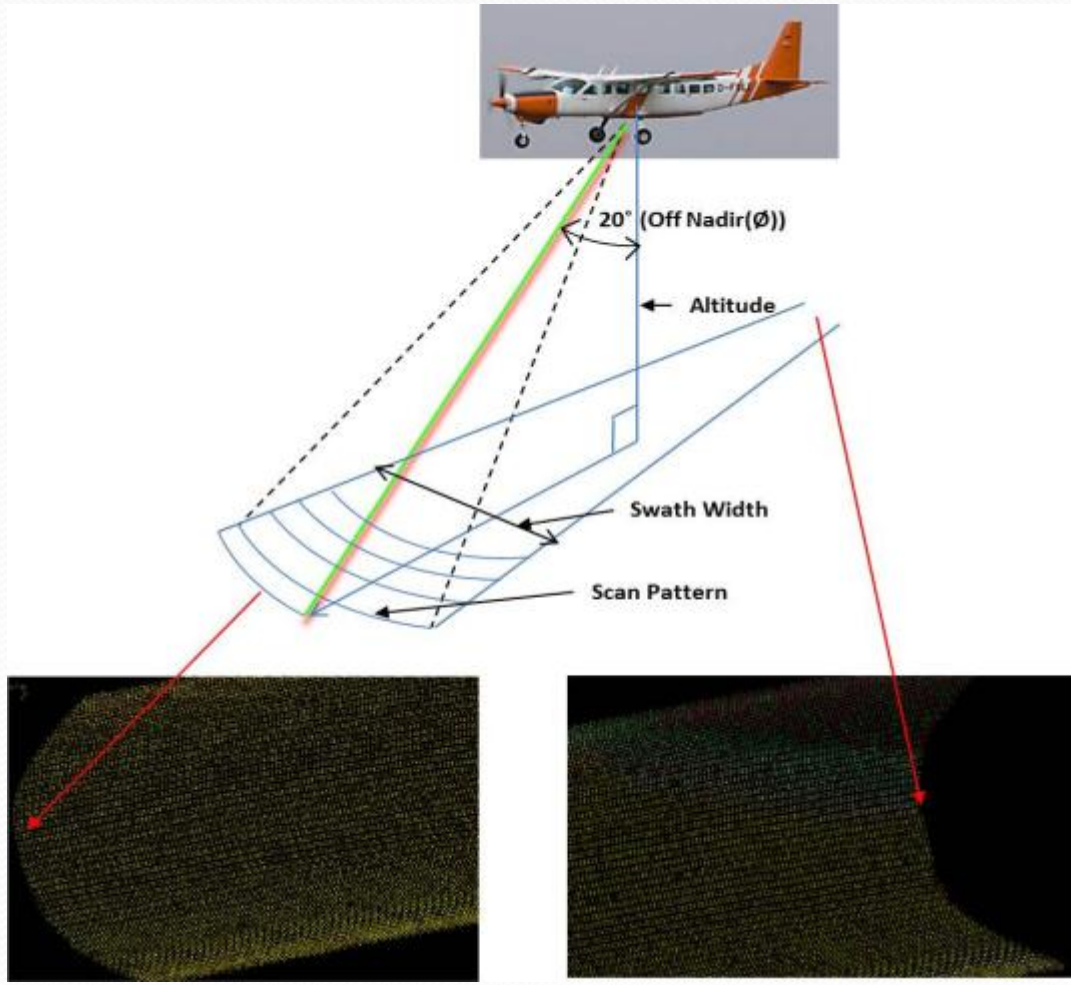
How does ALB work?

HEIIb Technical Specification	
Bathymetric data rate	4 kHz
Topographic data rate	64 kHz
Scan Pattern	Elliptical
Set Angle	20°
Pulse Rate, Topo Laser	8k pulse/sec (8pixels per return)
Pulse Rate, Hydro Laser	1k pulse/sec (4pixels per return)
Positioning and Navigation	Applanix POS AV 510 GPS/IMU
Integrated digital camera system	uEye UI-2250-C/M
Reflectivity	0-255 value per pulse reflectivity

How does ALB work?

Scan Pattern

- The laser beams are scanned in a pattern on the water surface.
- The scanning mirror compensates for pitch, roll and yaw, ensuring that the beams are transmitted ahead of the aircraft at an off-nadir angle of 20˚ and scan left and right either side of the line of advance of the aircraft.
- The result is an evenly spaced pattern covering the seabed.



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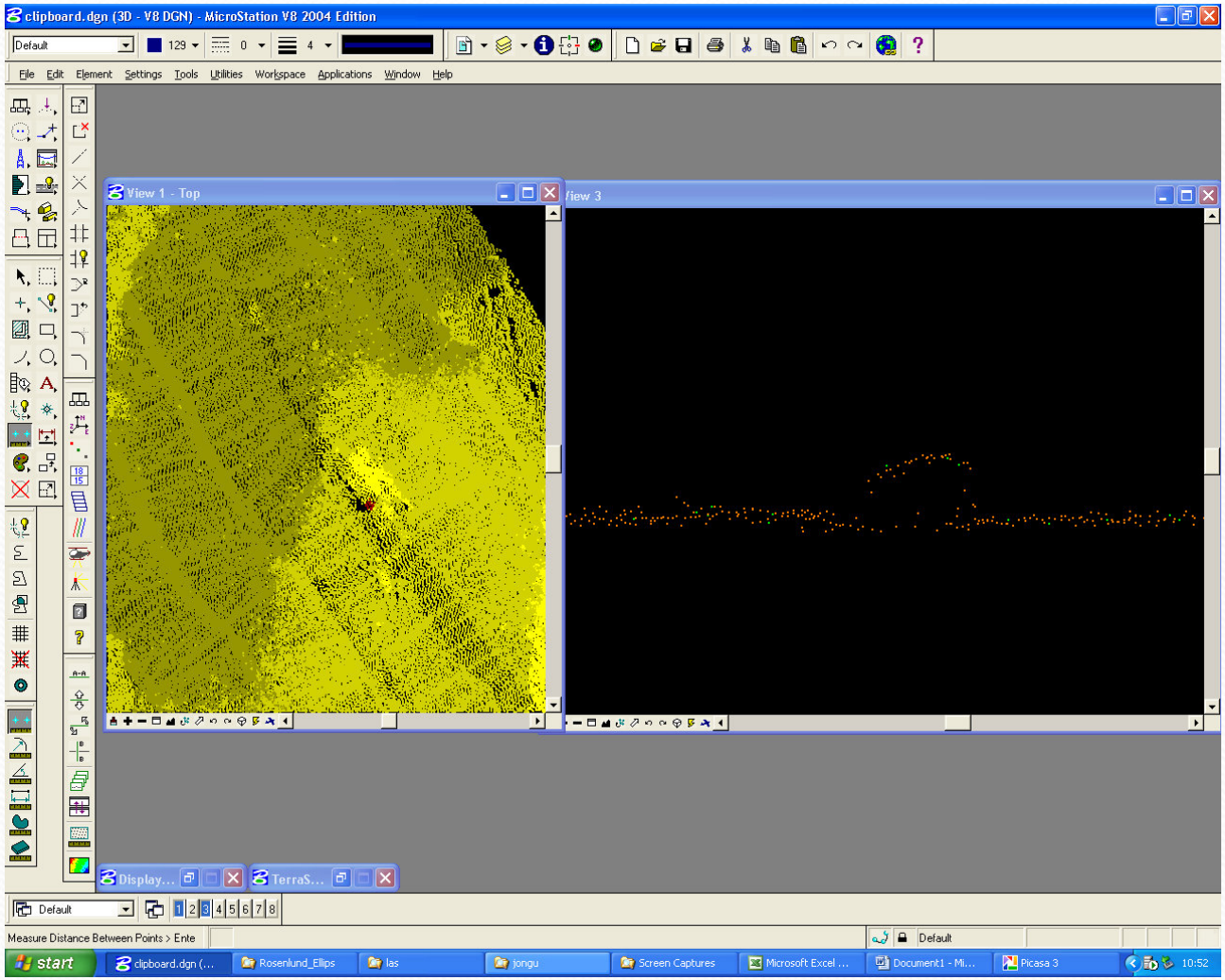
How does ALB work?

Object identification

- Size 2x2 m
- Height 1.5 m

- Corresponds very well to multibeam data
- Green dots = HawkEye



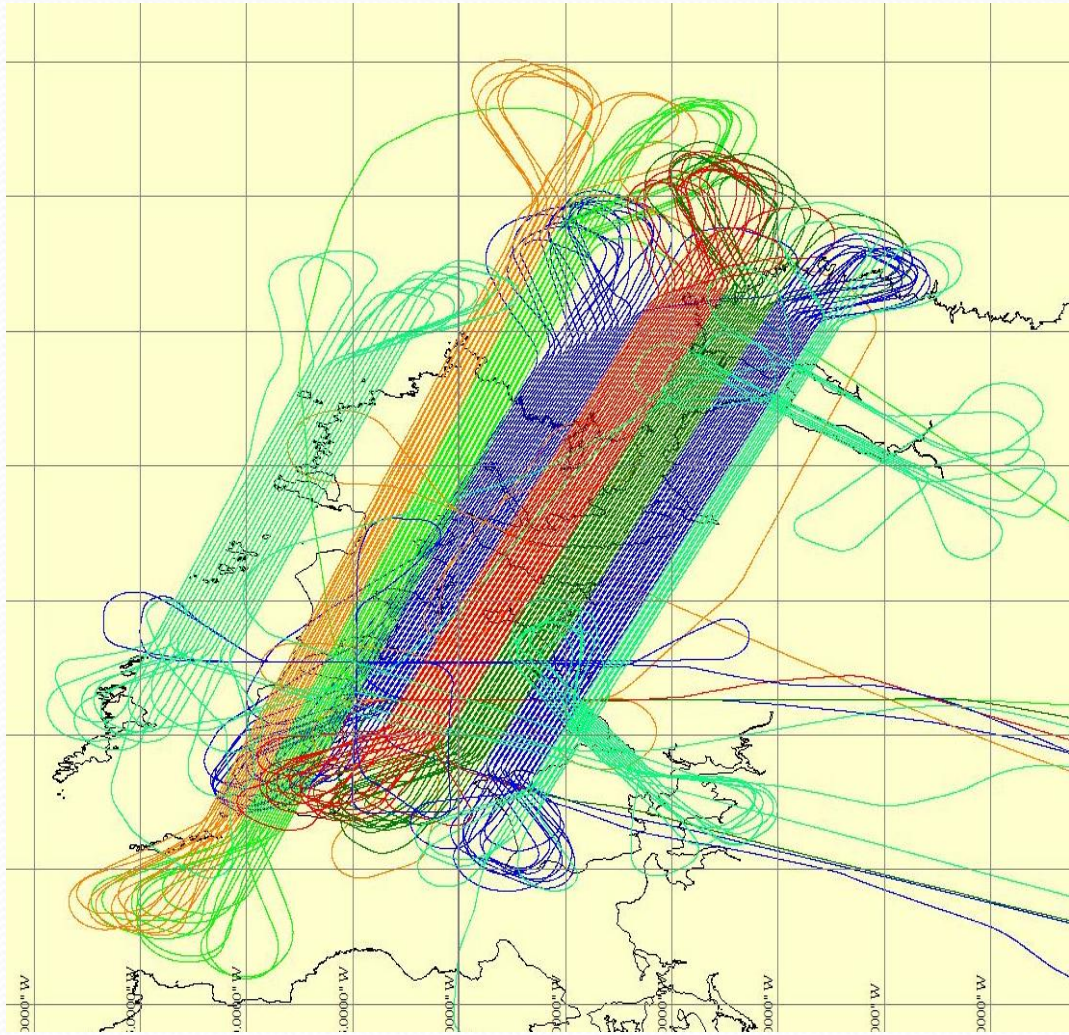
How does ALB work?

Track plots

- The aircraft flies a series of straight lines, its position being recorded to within 5cm using an Applanix 510 (IMU 31) high-order INS system and dual frequency GNSS

- Turns at the end of the lines are tightly controlled to minimise non-survey time.

- Aircraft sortie times are ~ 4-5 hours . If possible, two sorties per day are scheduled.



Broadhaven and Blacksod Bays – March 5th-10th 2010

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How does ALB work?

Aircraft

- Small
- Local
- Photogrammetry hatch
- 50A, 24V dc

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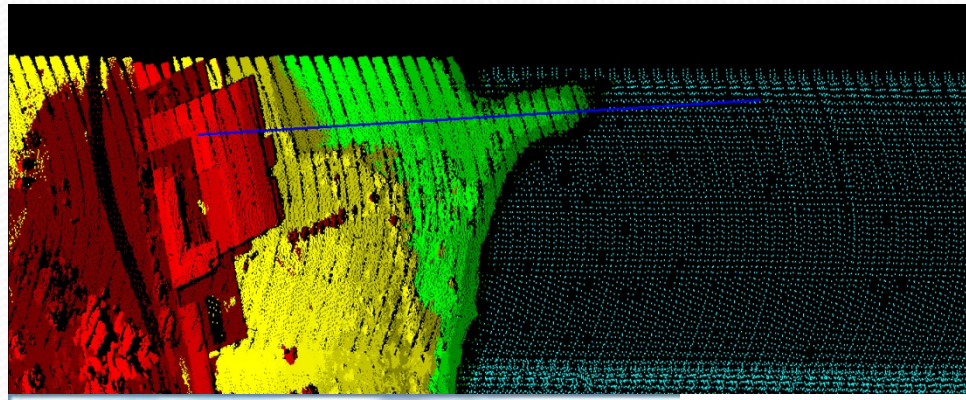
Where can ALB be used?

Land-sea interface



Shallow water (<50m depth)

Clear water (3 x Secchi disc depth)

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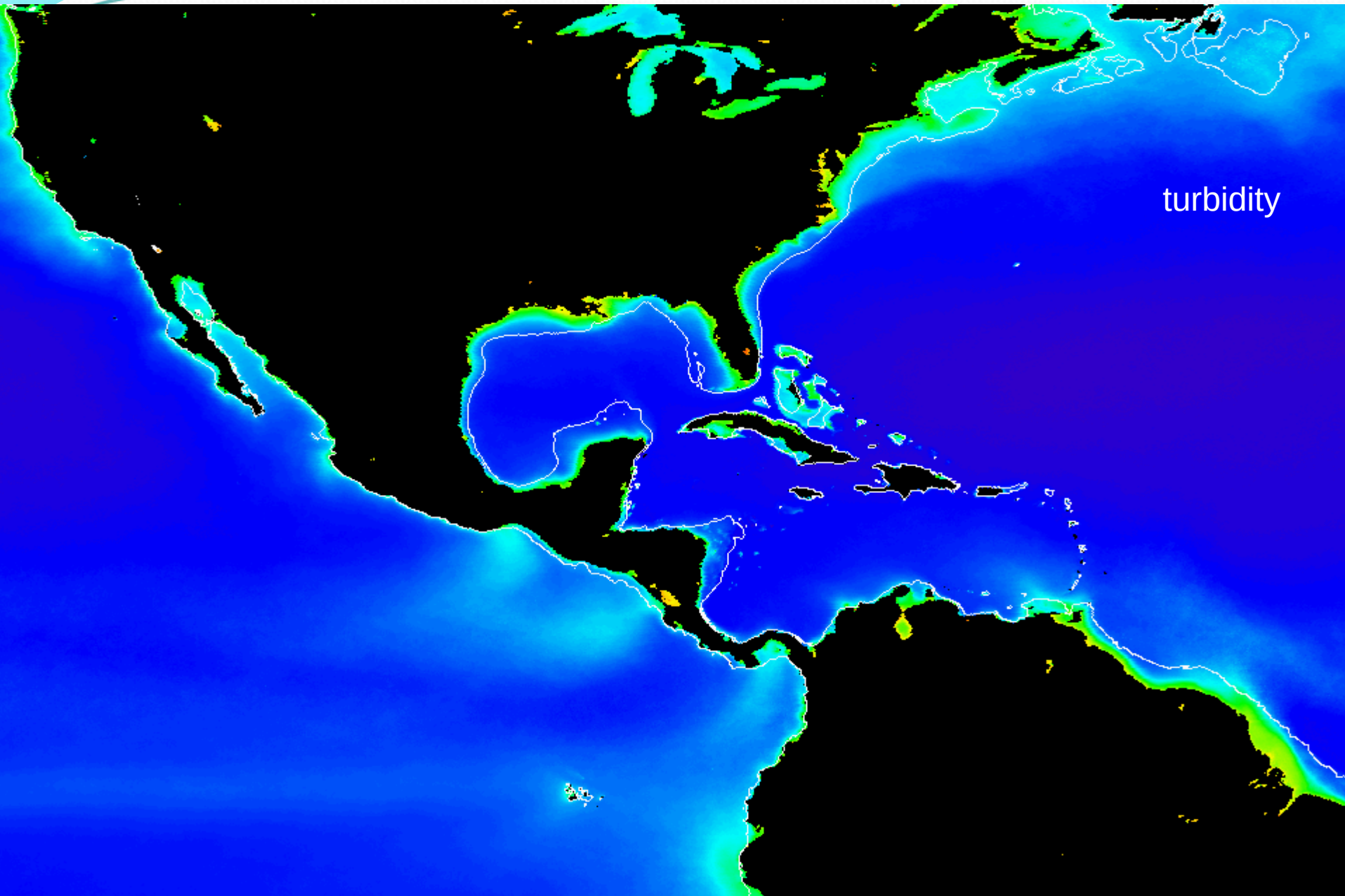
Where can ALB be used?



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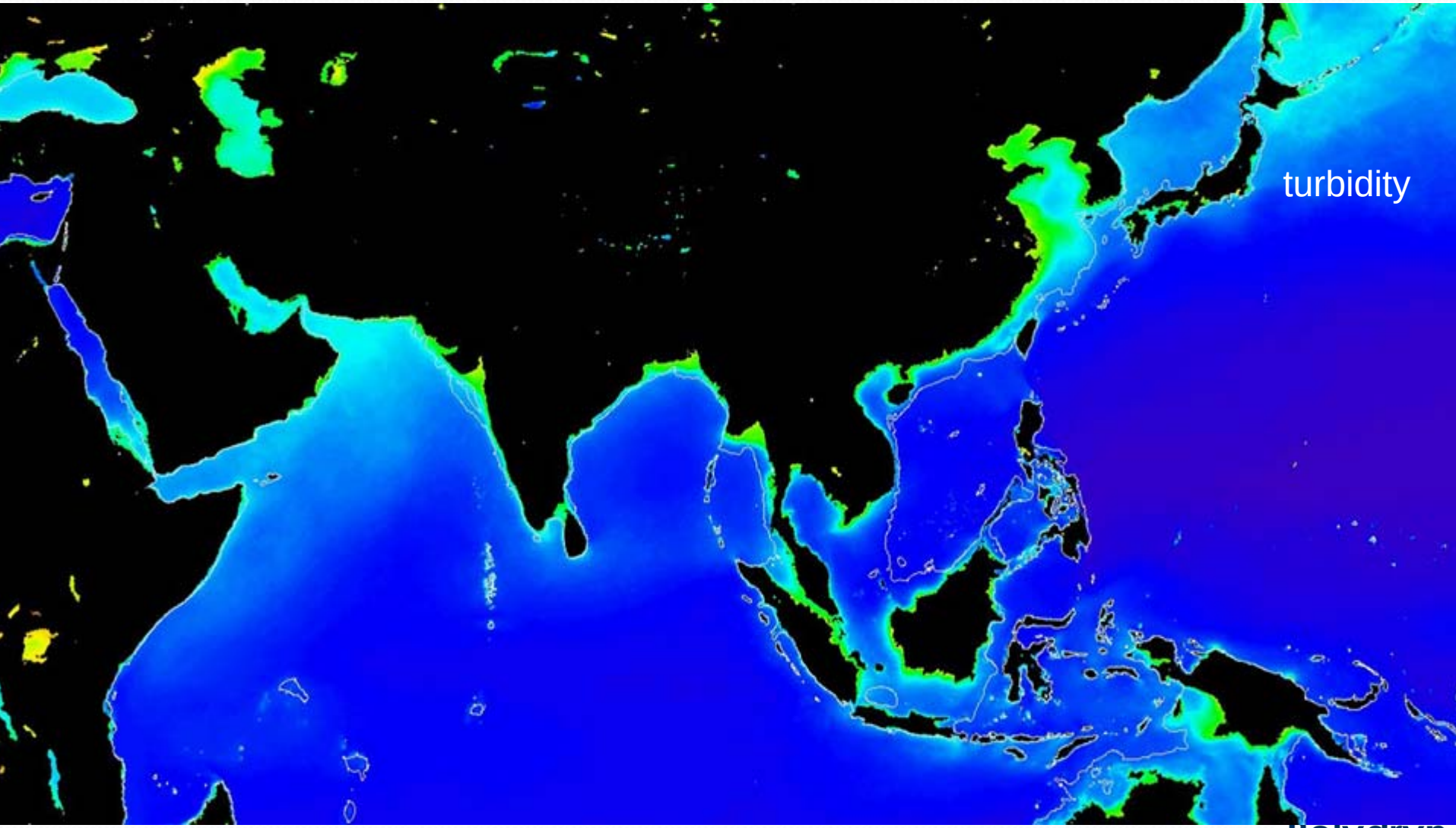

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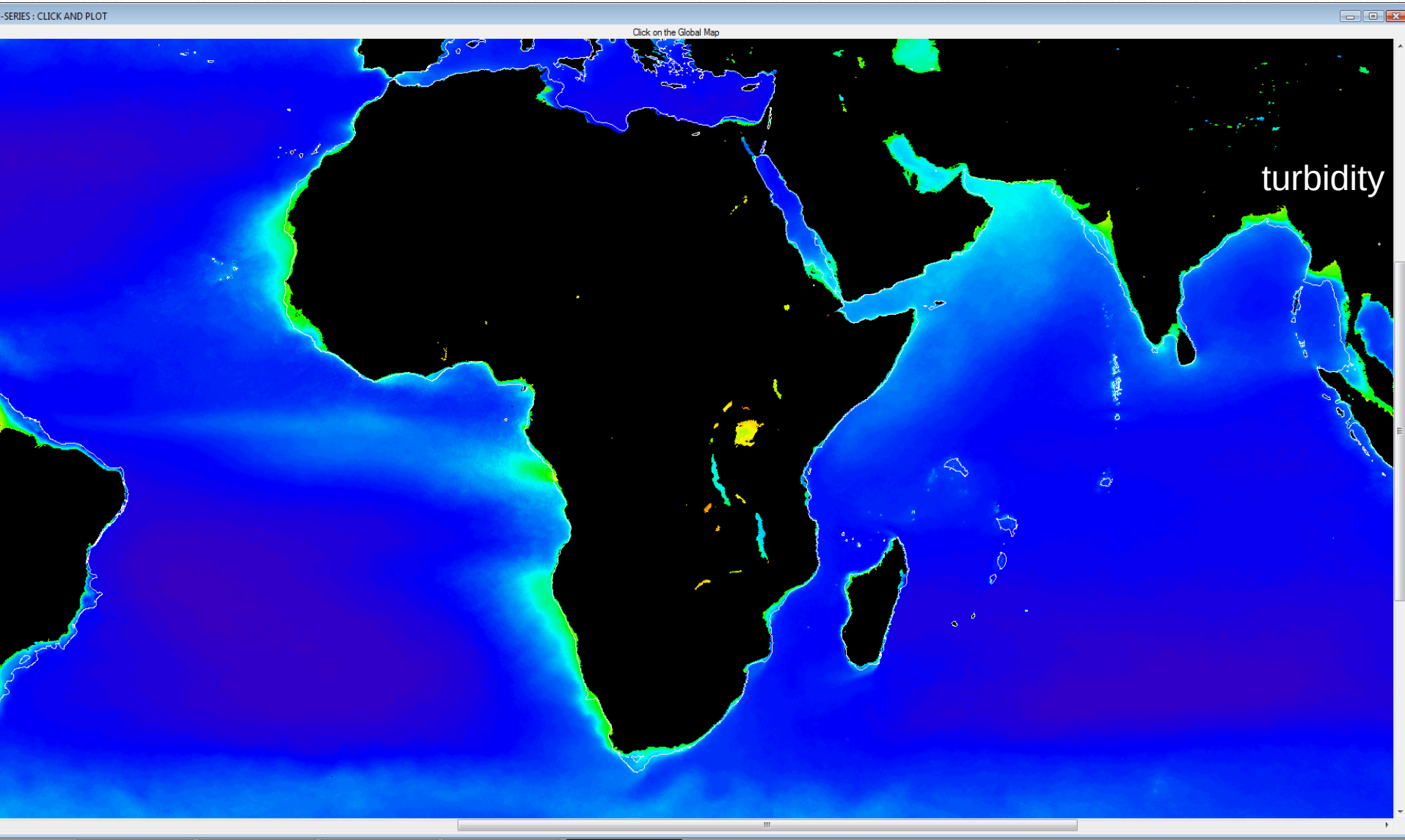

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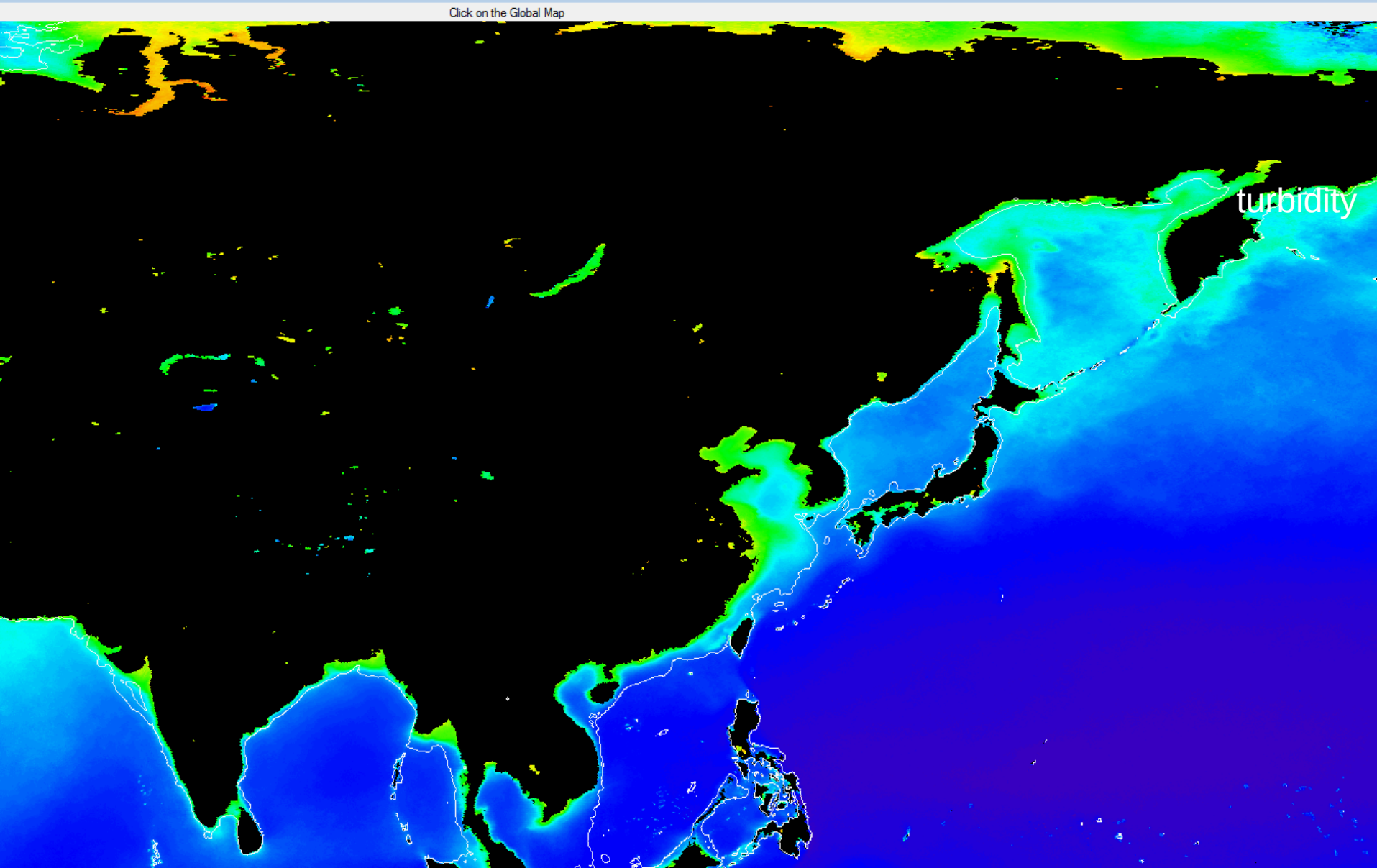

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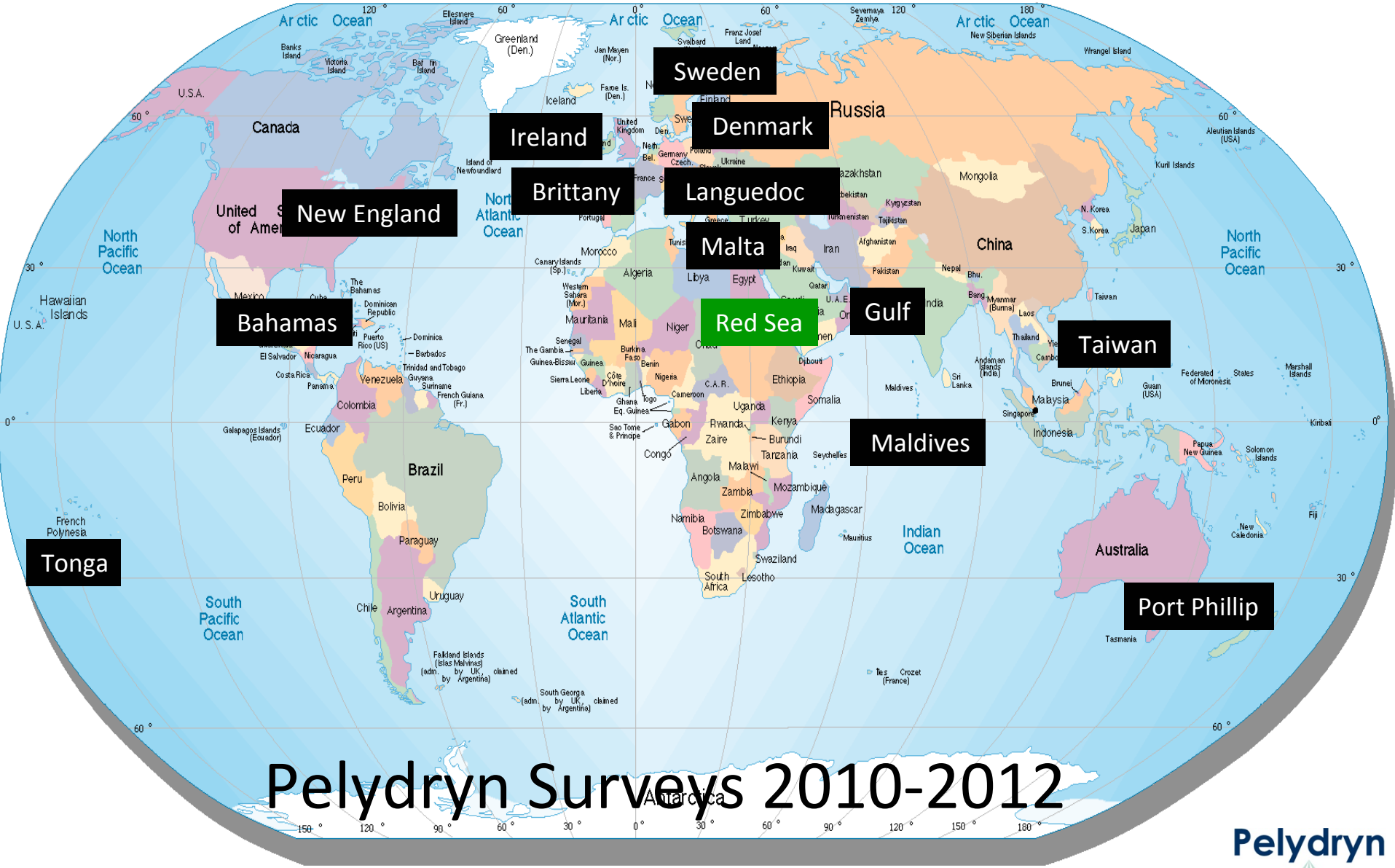

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Who can it be used for?

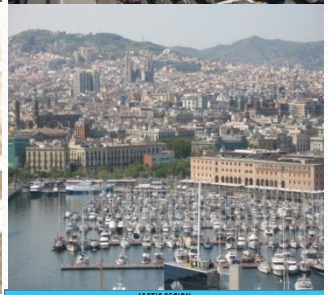
National Hydrographic Offices

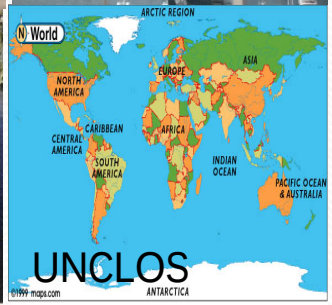
Oil, Gas, Energy Companies

Environmental Agencies

Chart Companies









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TREGOR DEMO.exe

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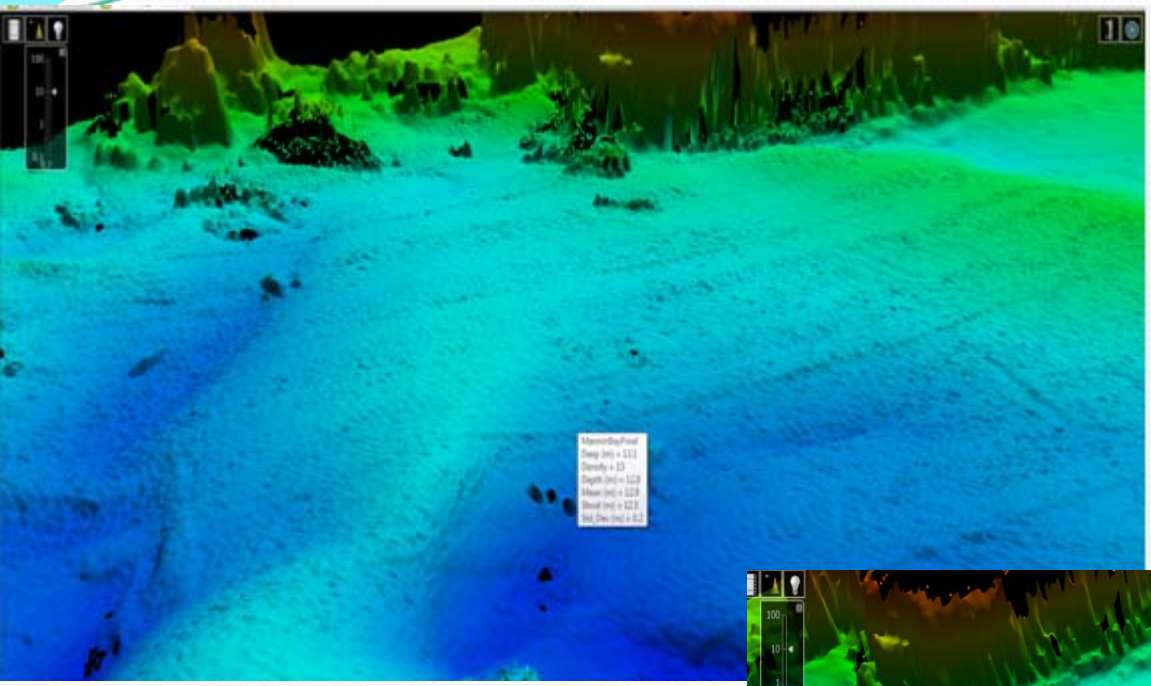
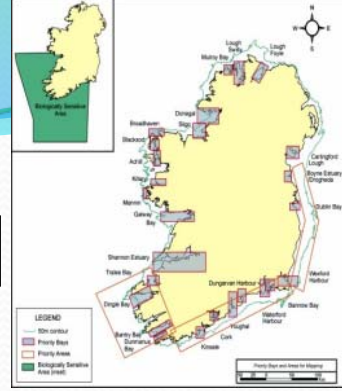
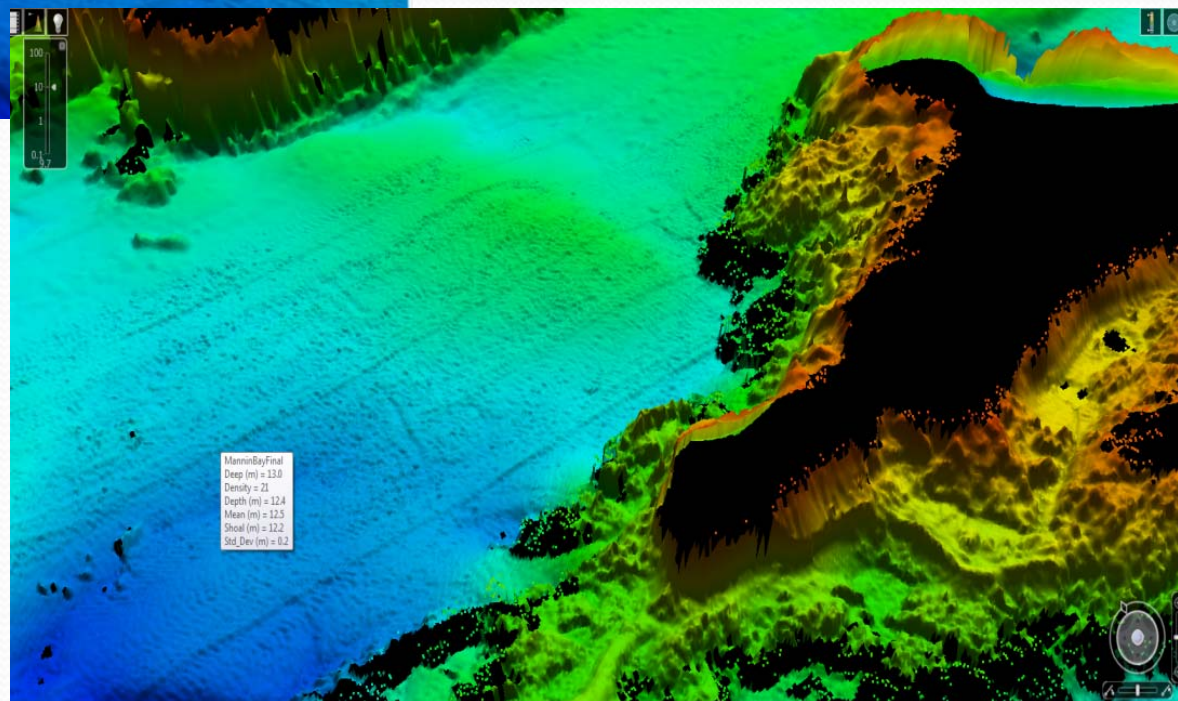


Ireland





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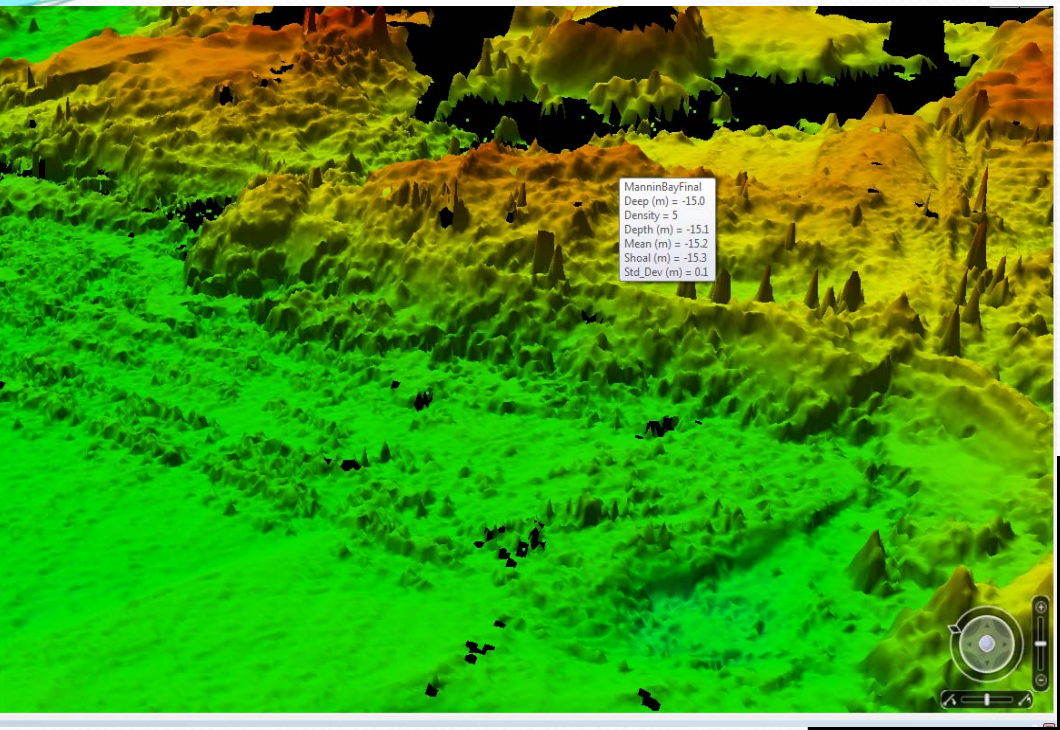
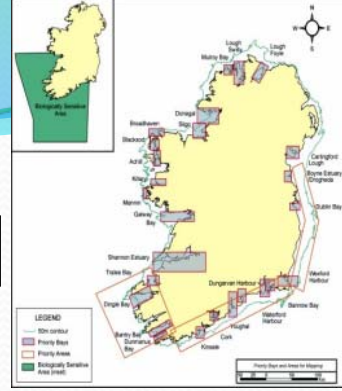
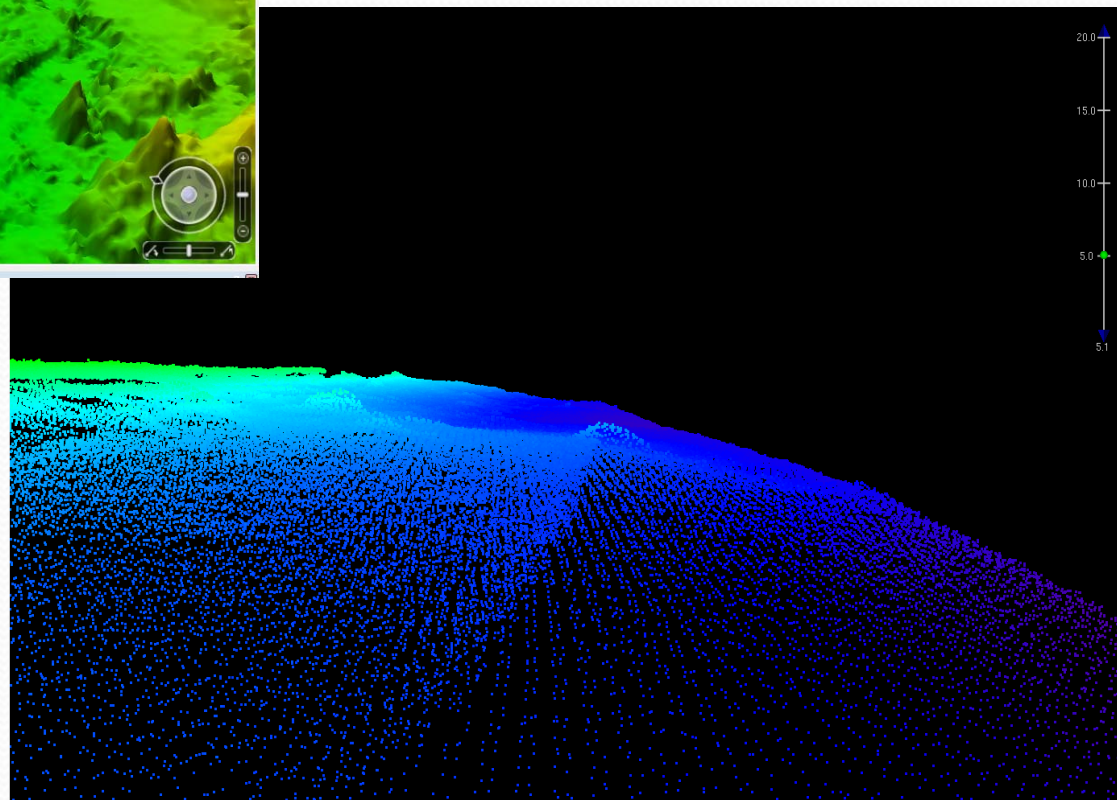
Ireland







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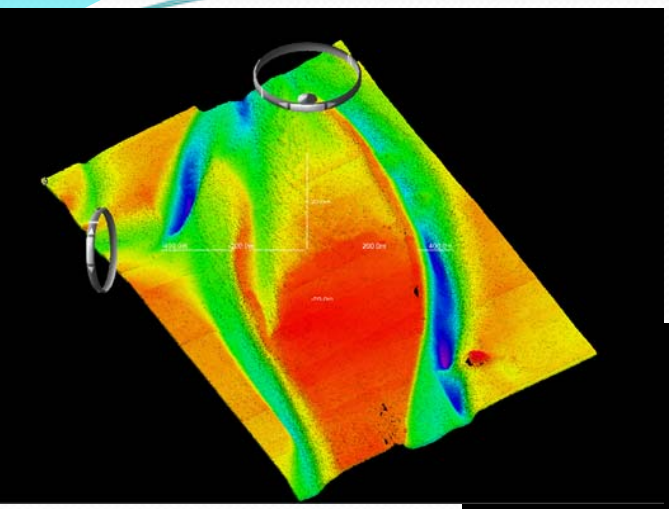

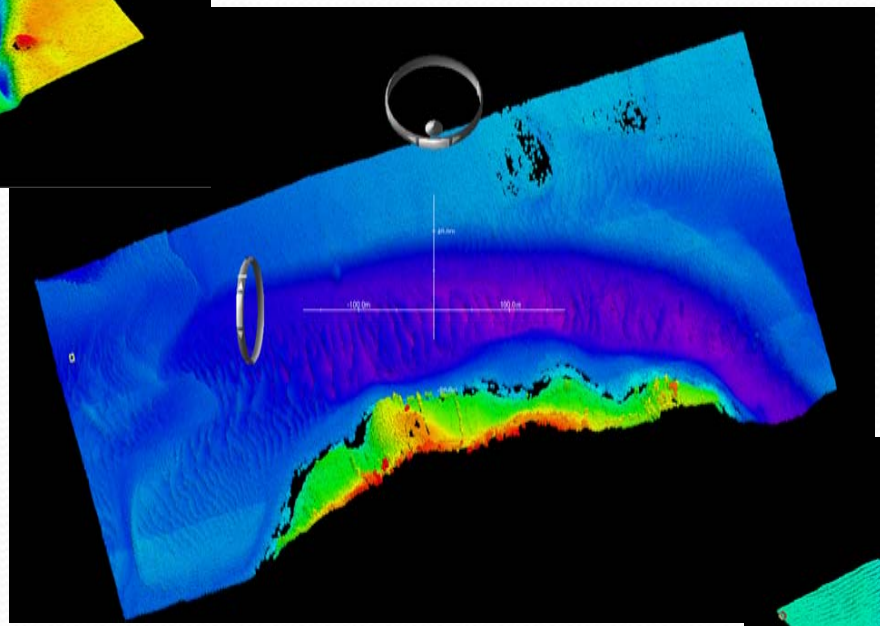

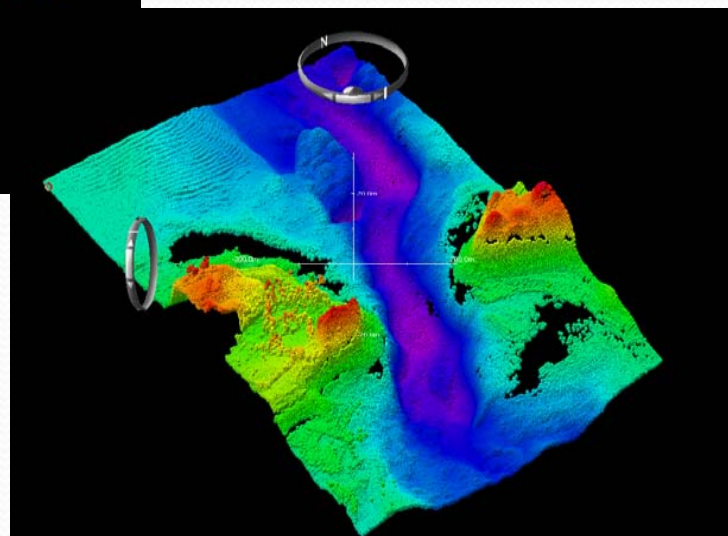

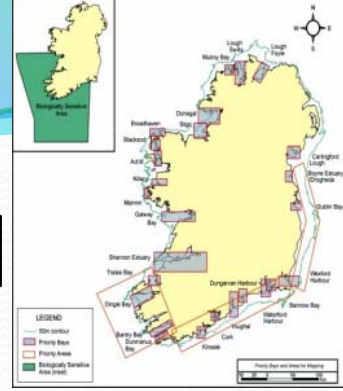

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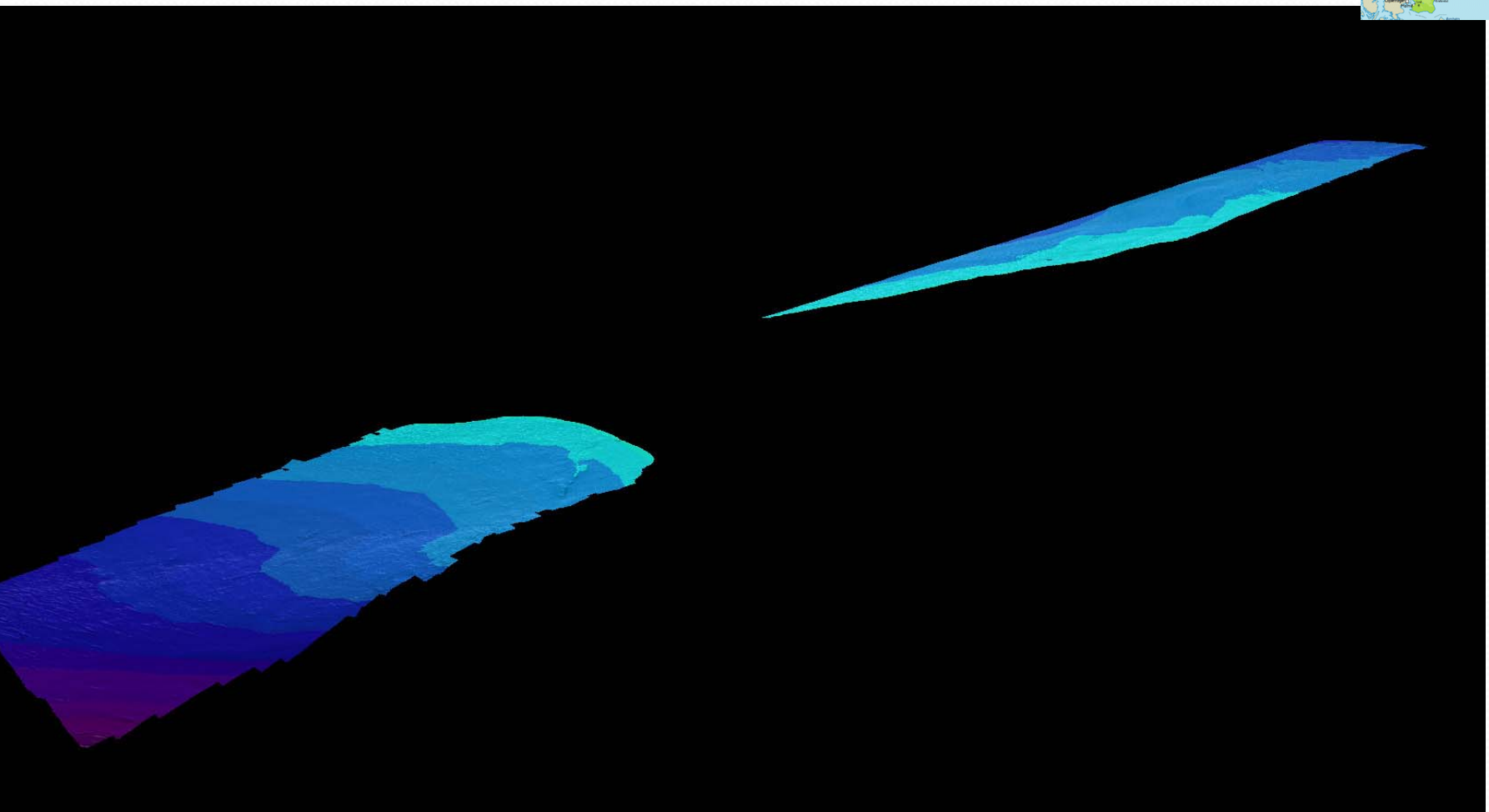
Sweden

Multibeam



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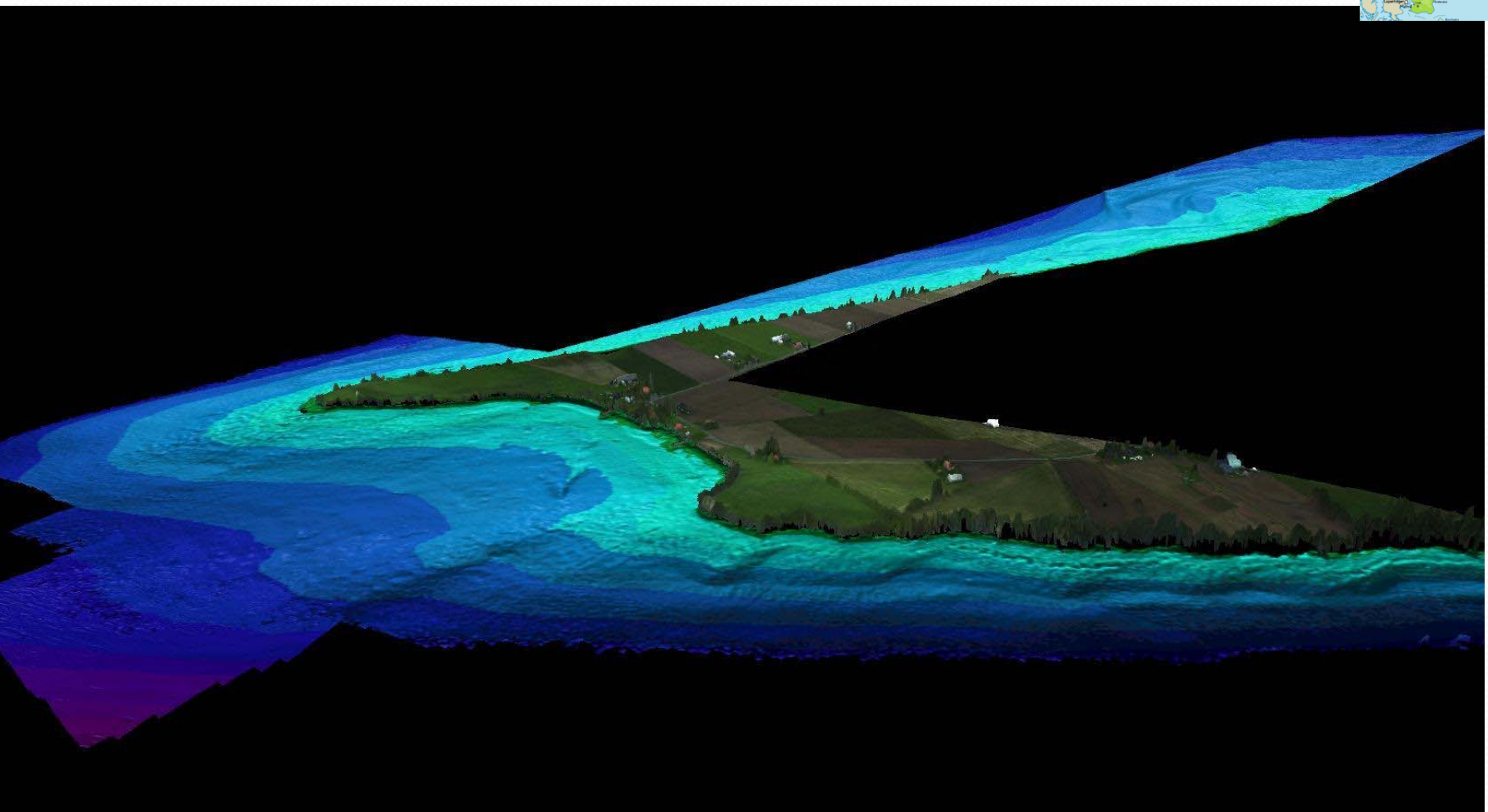
Sweden

HawkEye II



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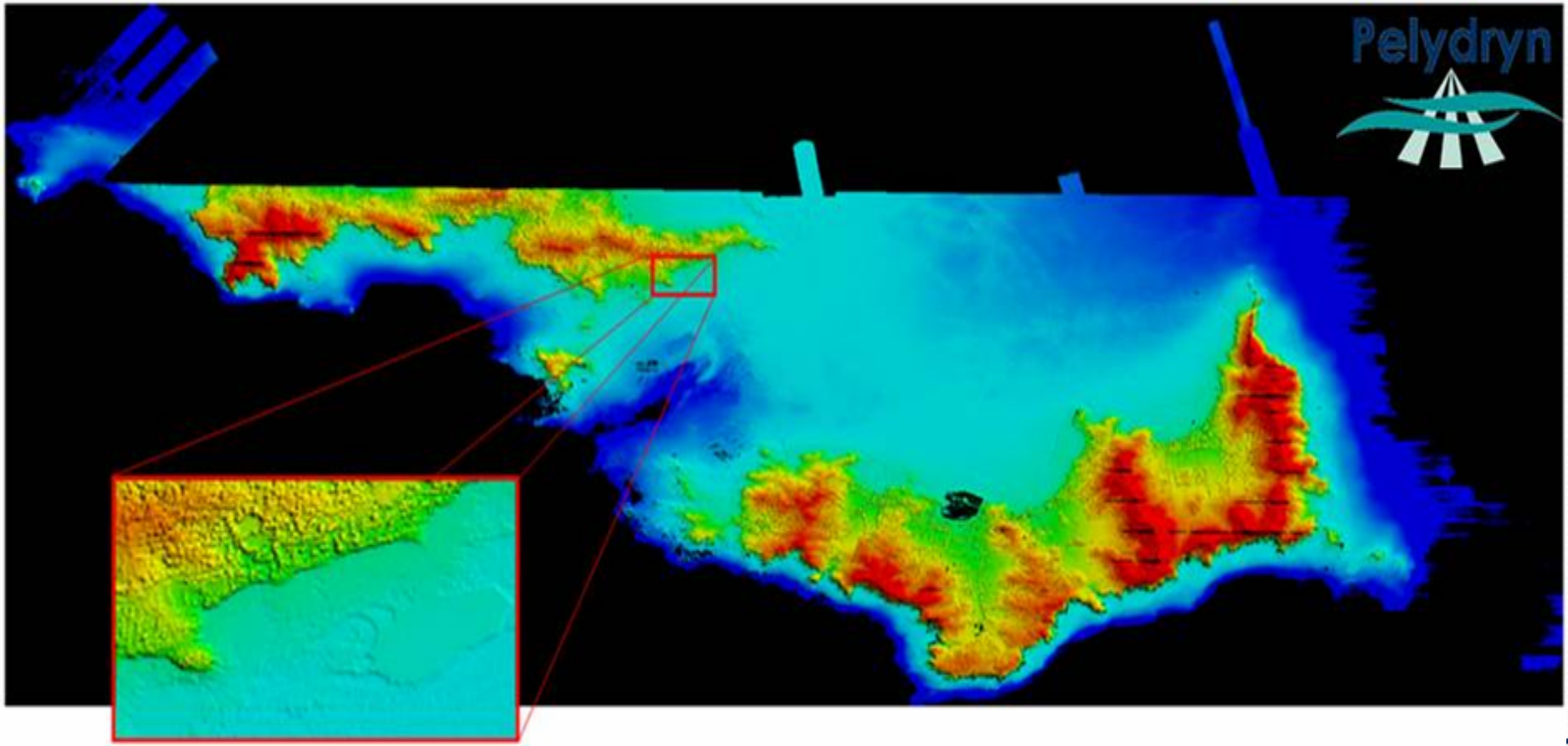
France



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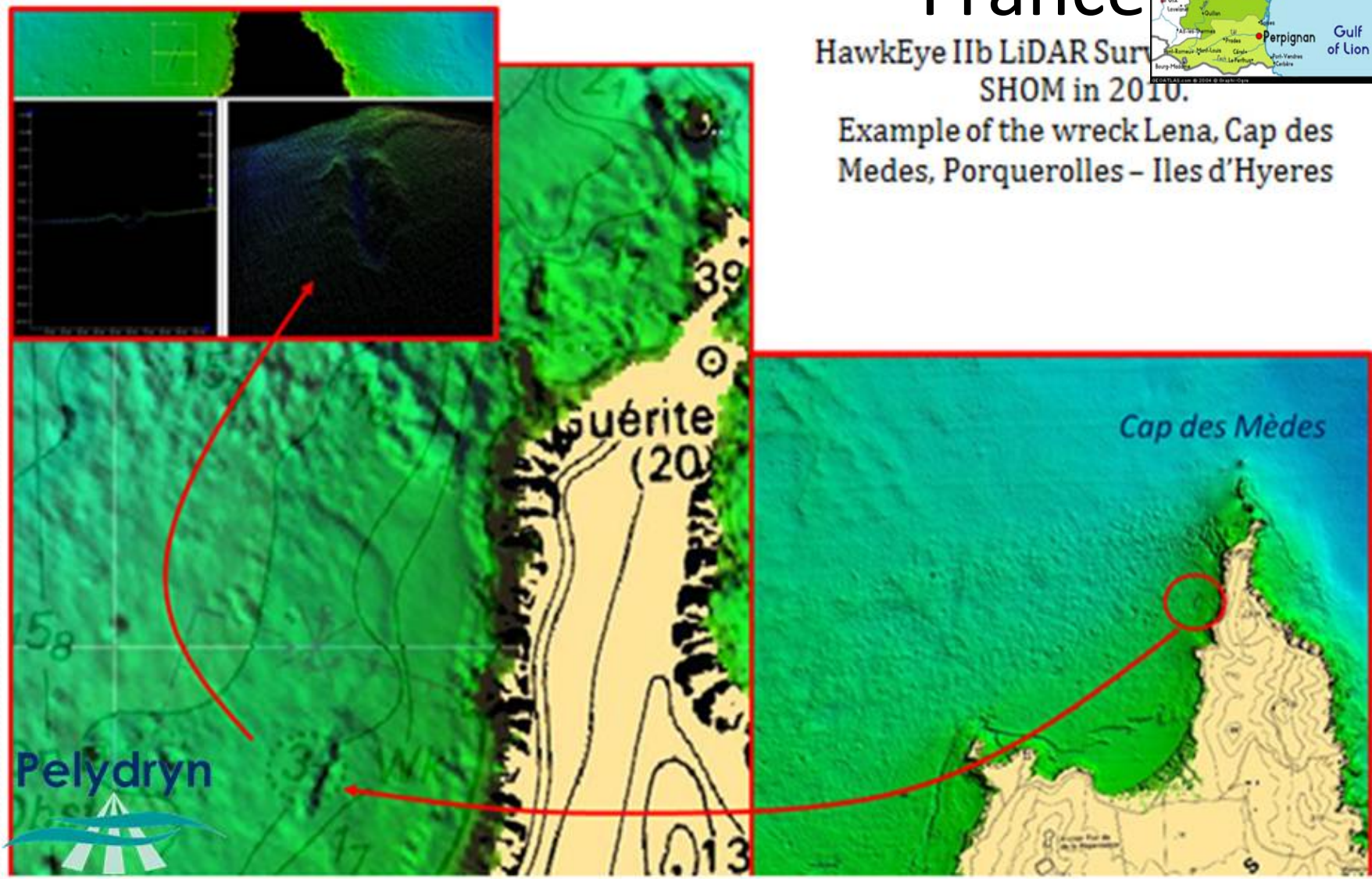
France

HawkEye IIb LiDAR Surv
SHOM in 2010.
Example of the wreck Lena, Cap des Medes, Porquerolles – Iles d'Hyeres



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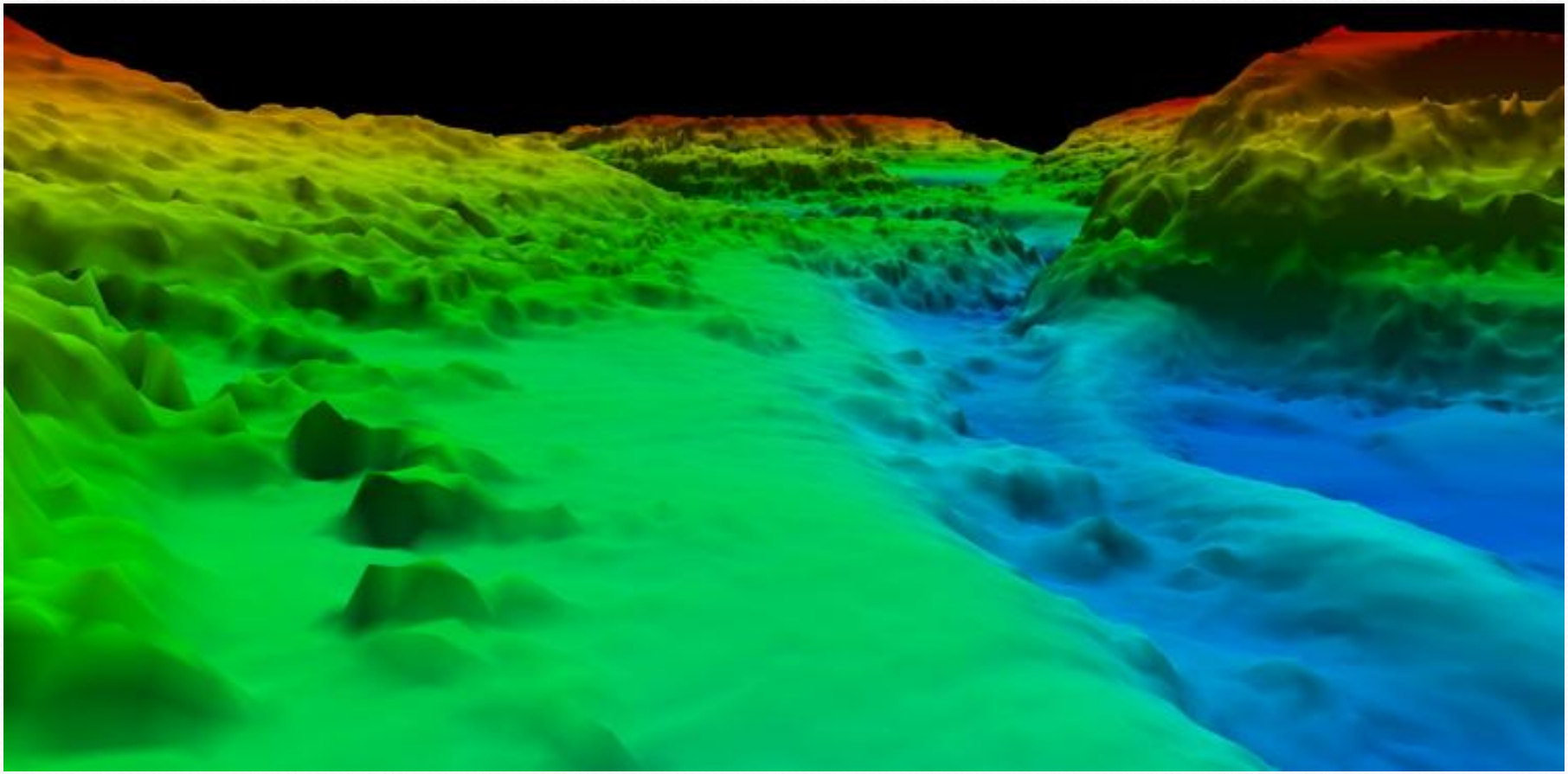
New England



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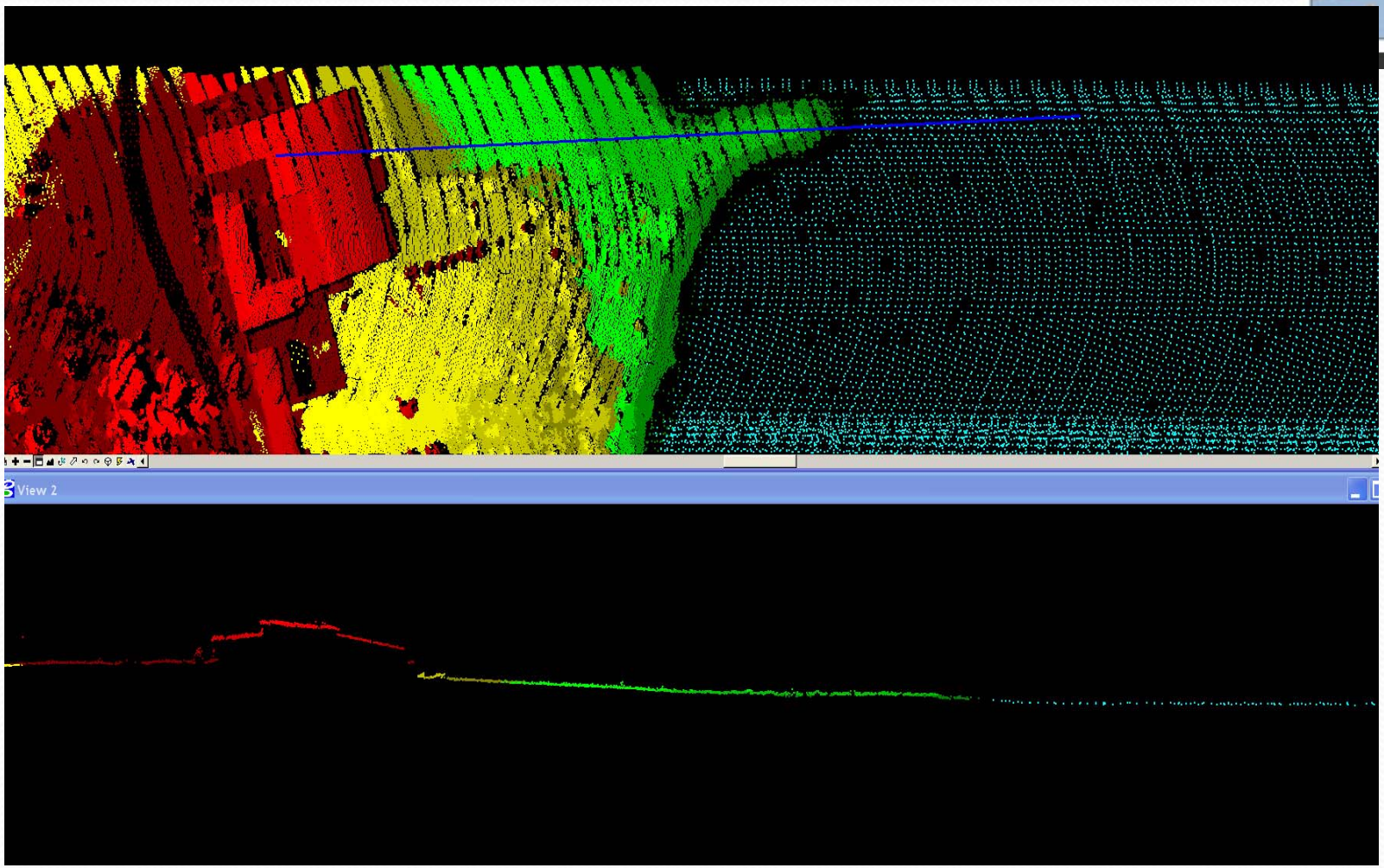

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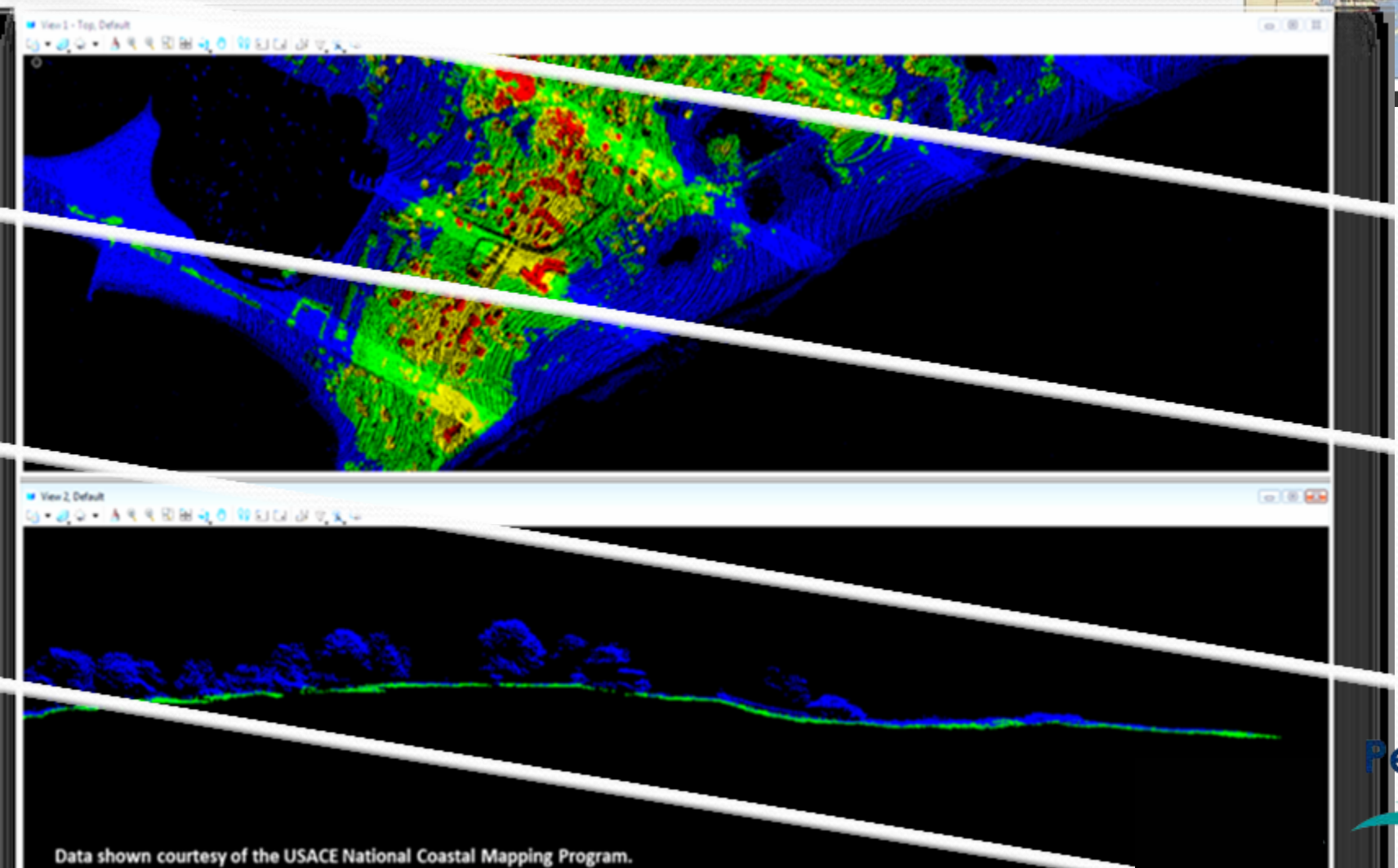

Data shown courtesy of the USACE National Coastal Mapping Program.

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Reflectance processing

New England

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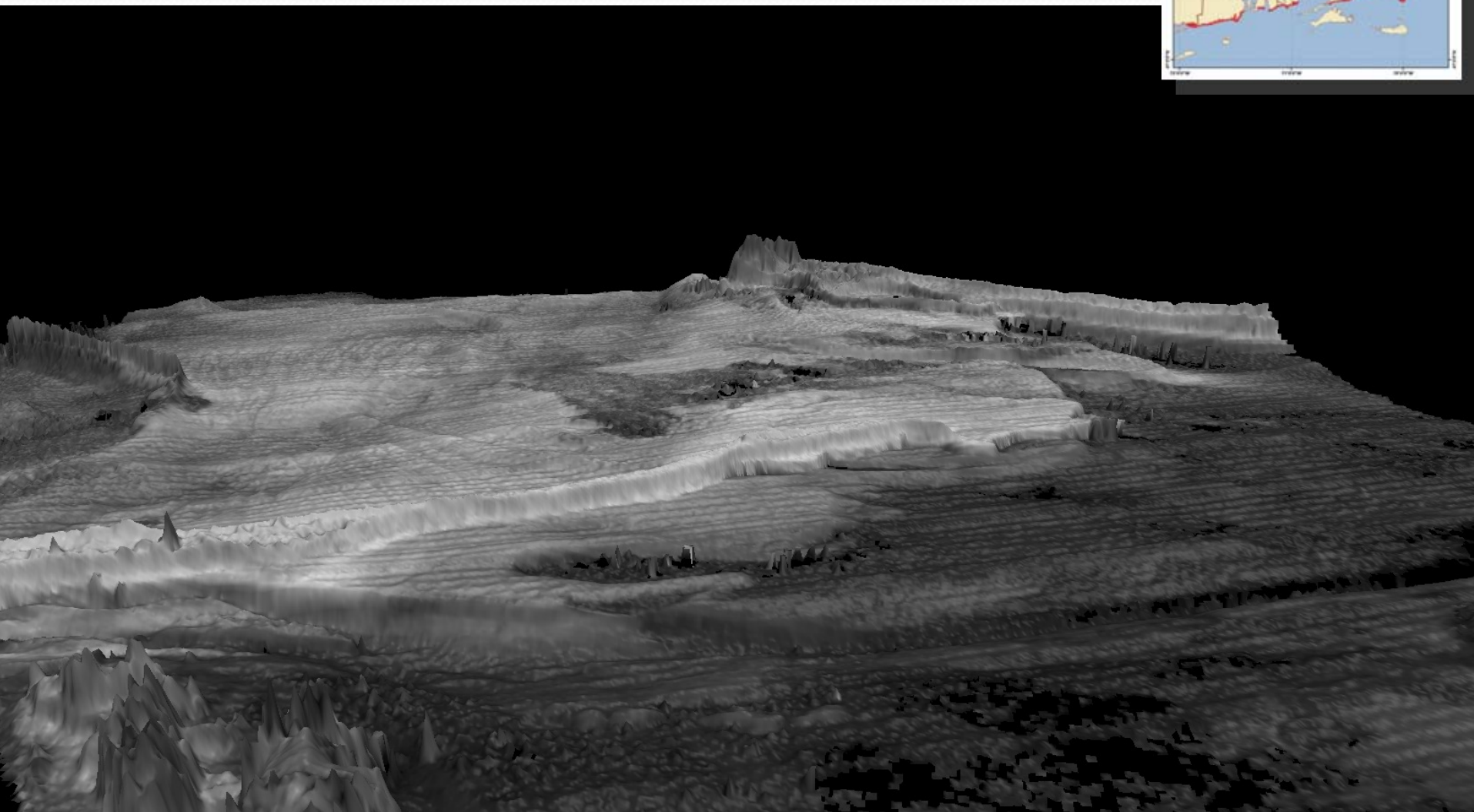
New England

Reflectance processing



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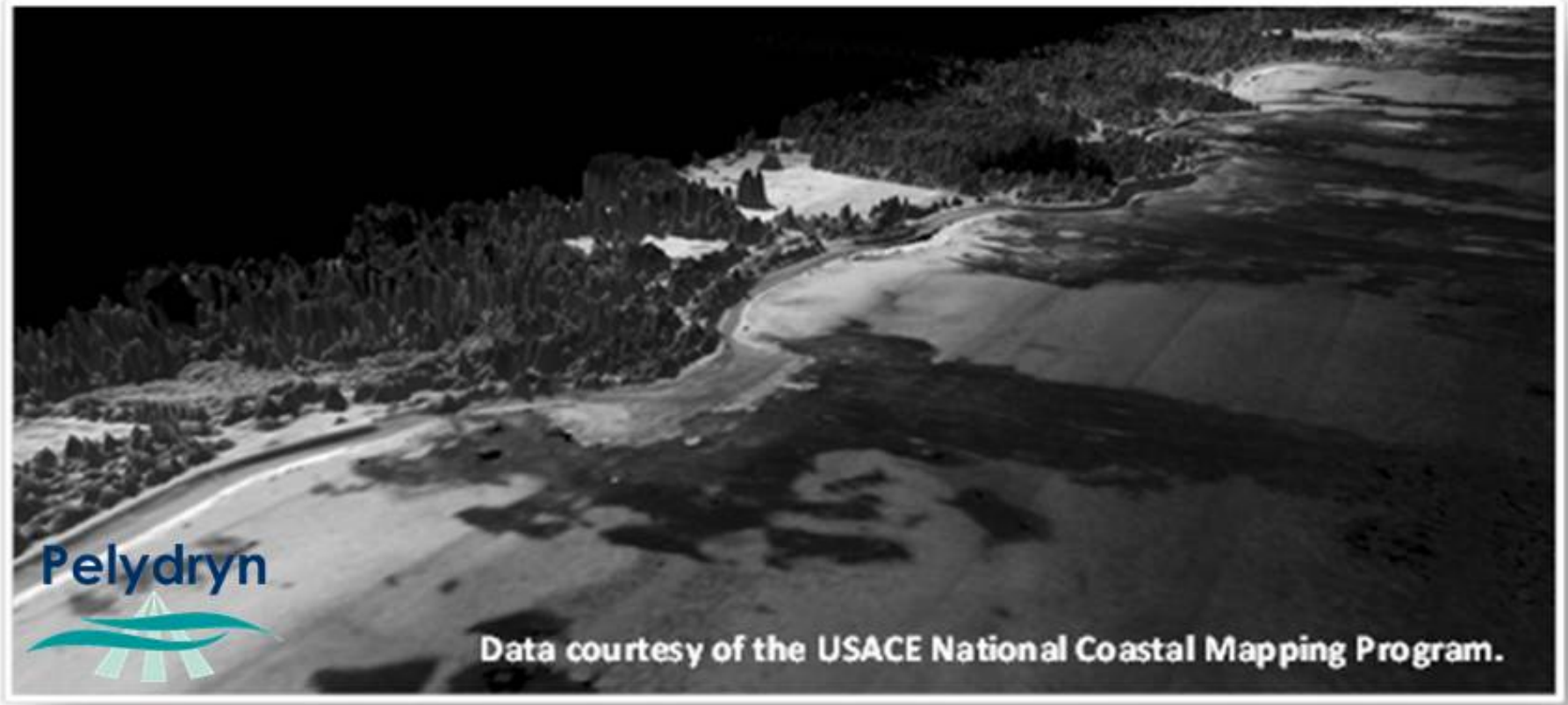
Reflectance processing

New England



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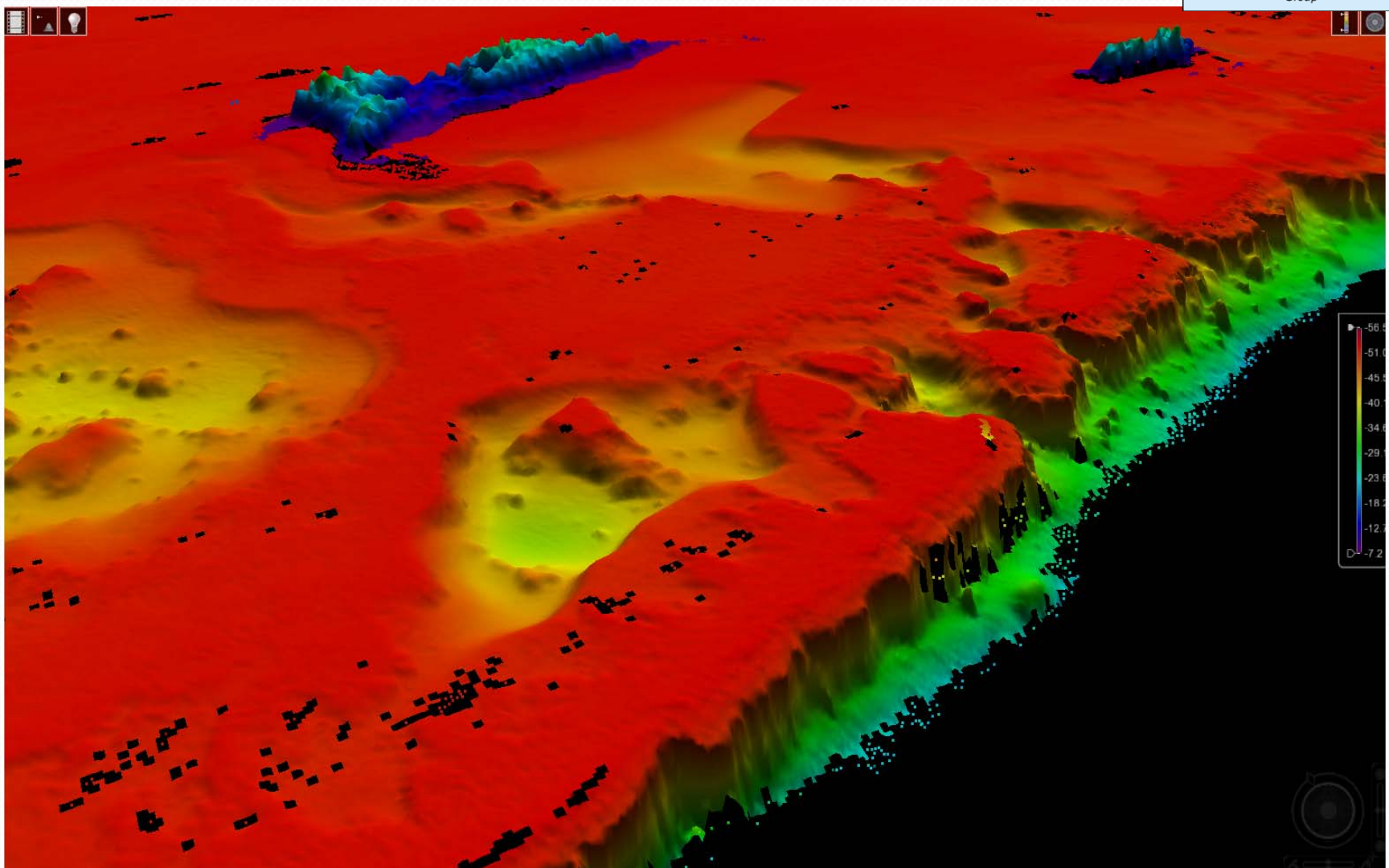

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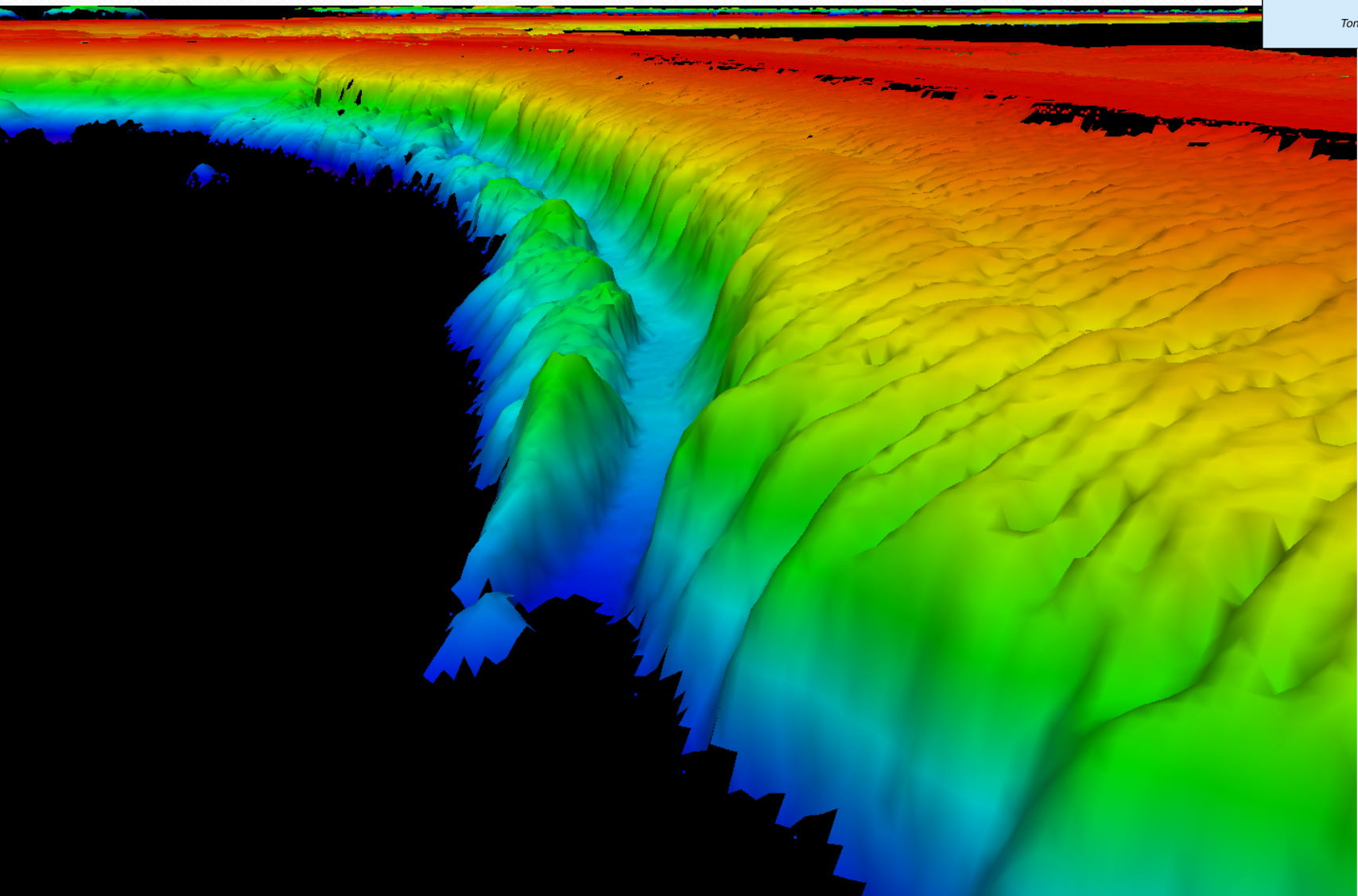
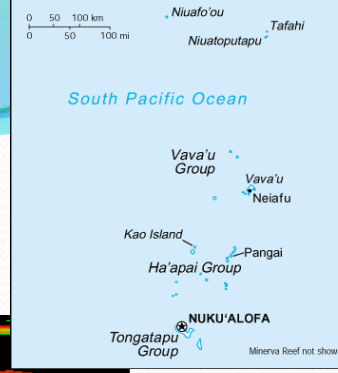
Tonga





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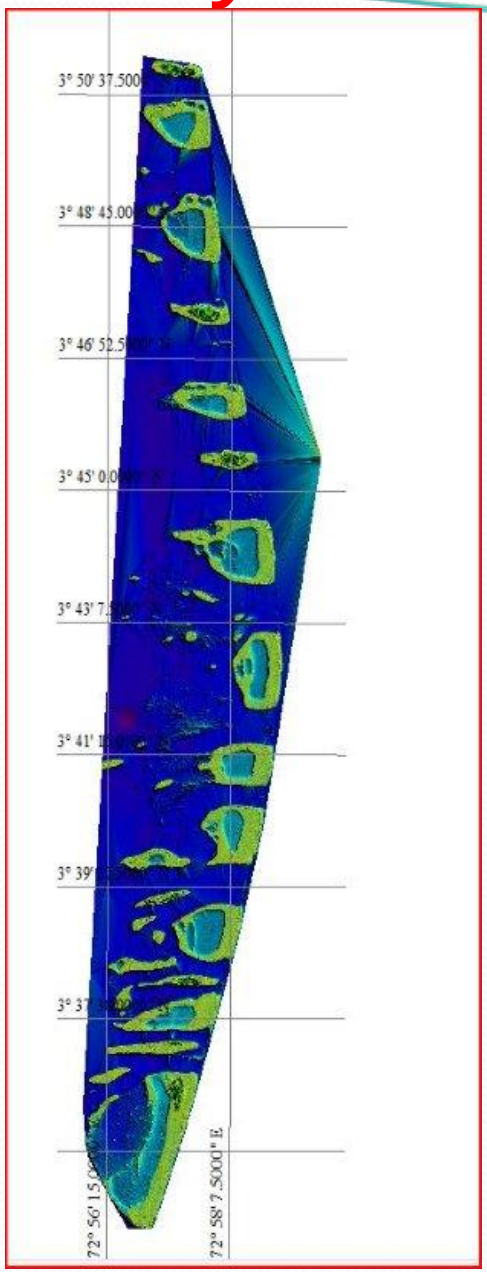

Maldives

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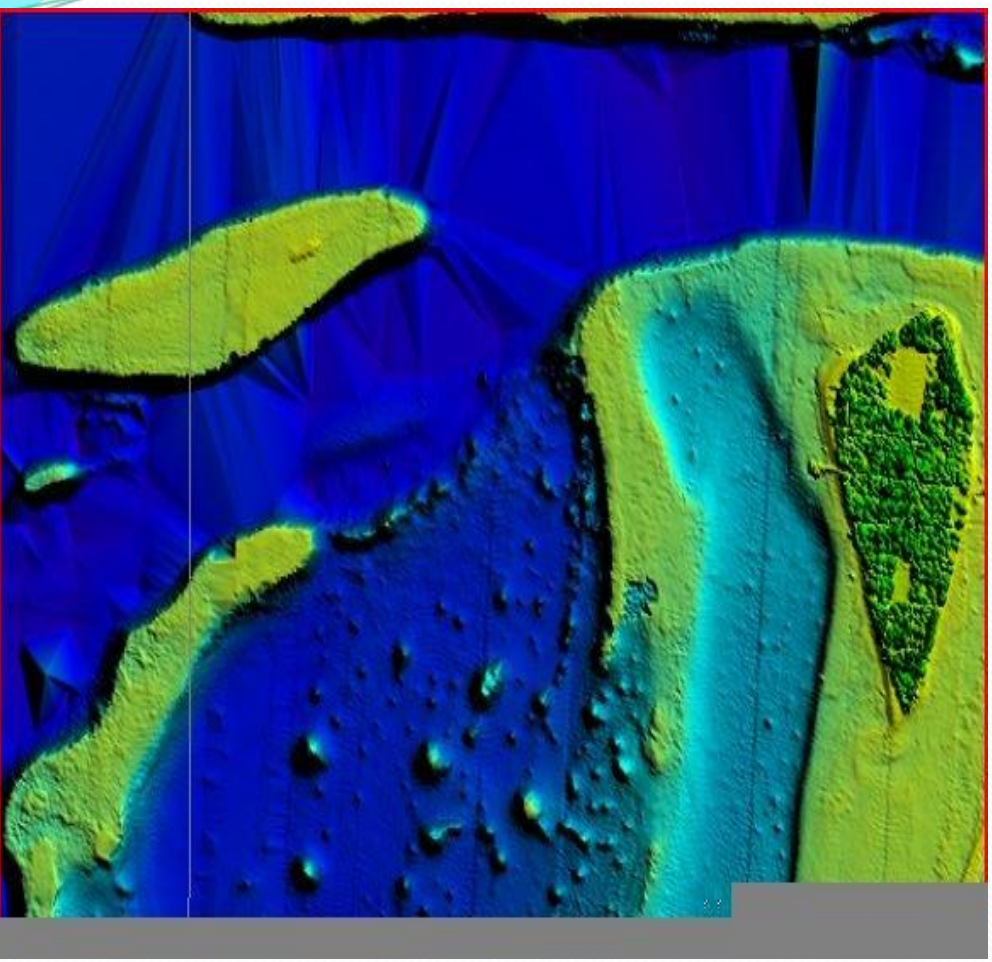

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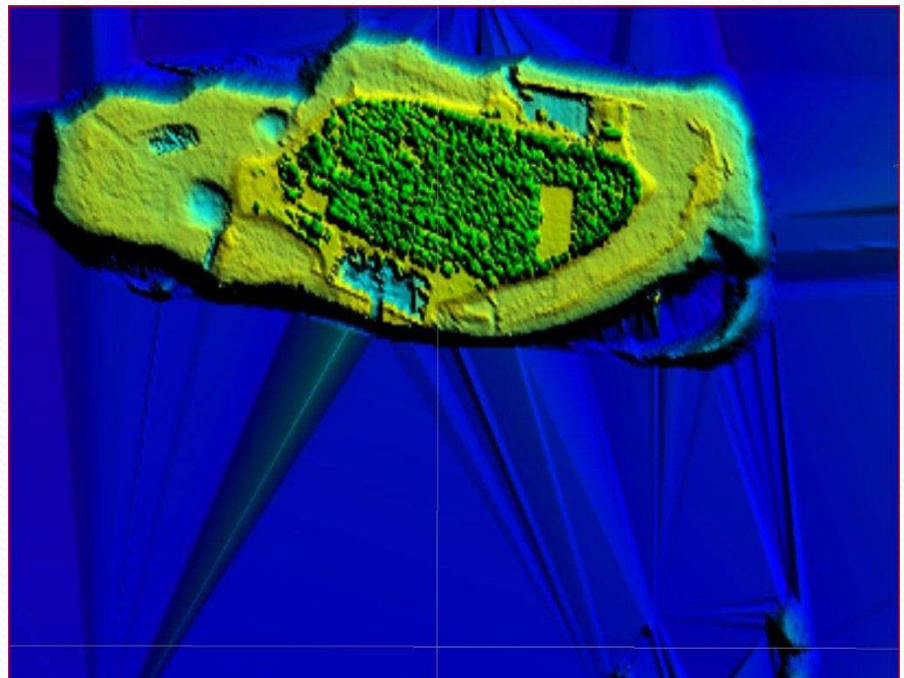

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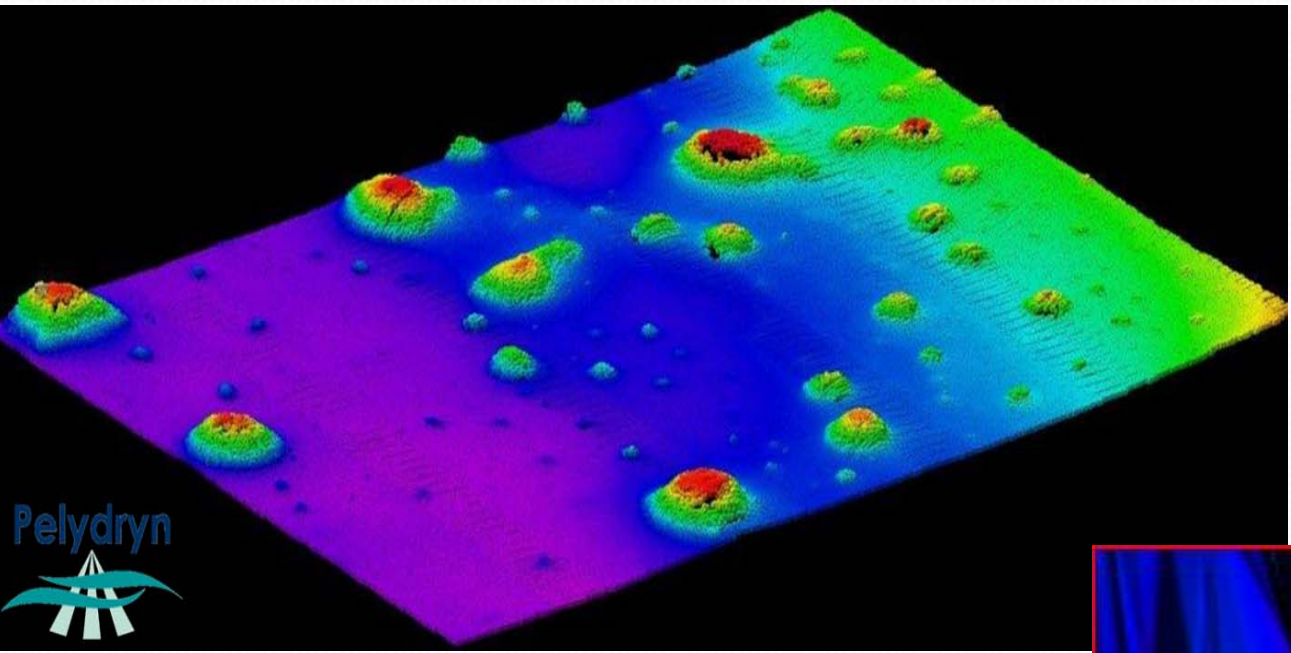

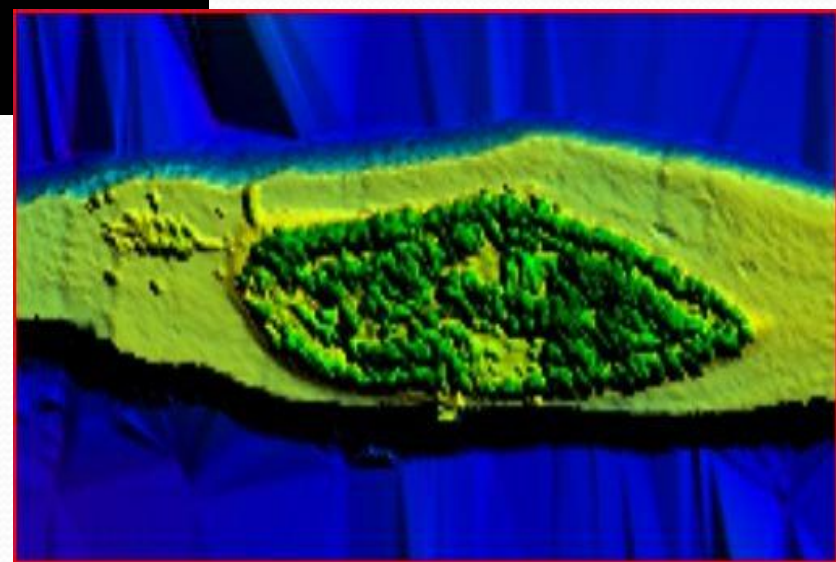

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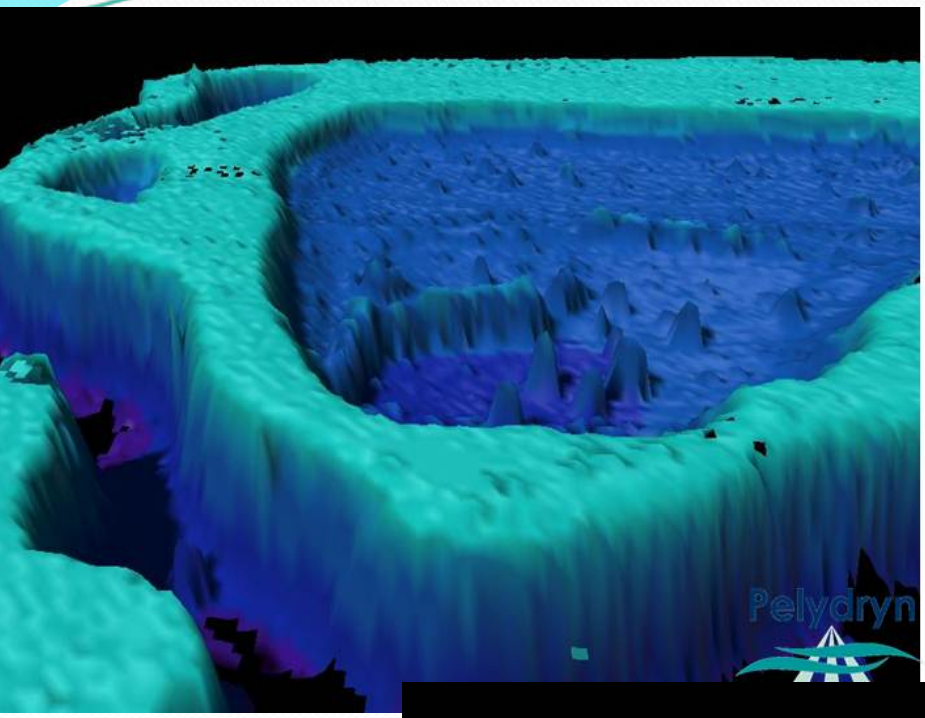
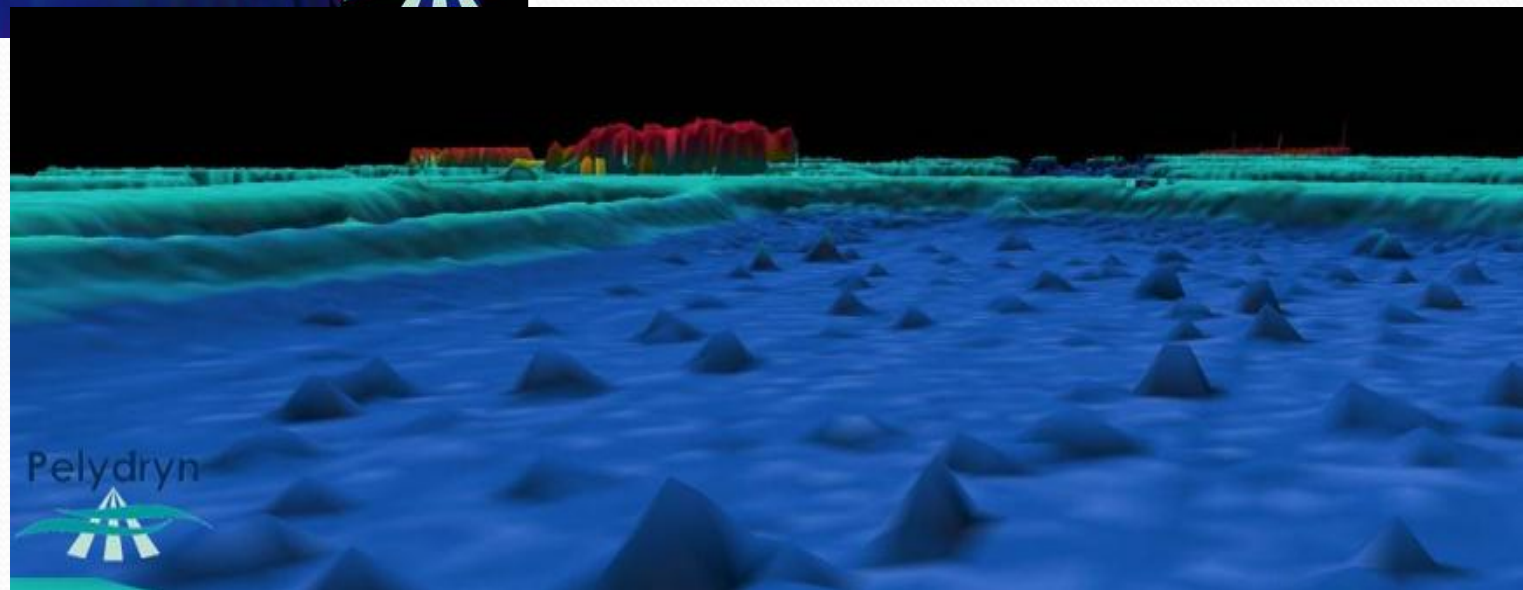


Maldives



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North America
Central America
South America
Europe

Middle East
Indian Ocean
Africa

Far East
Australasia
China
Russia

Improved technology: HE3
MBES

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Survey Planning

Survey Management

Data Collection → Ship-borne sonar
Data Collection → Air-borne lidar

Data Processing

Product delivery

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Pelydryn Ltd

provides a complete survey service
using world-leading airborne lidar and ship-borne sonar equipment
to meet the growing global demand for coastal & shallow-water
hydrographic & topographic data