



Ministerio de Defensa Nacional

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**Dirección General Marítima**  
Autoridad Marítima Colombiana

*“Consolidemos nuestro país marítimo”*



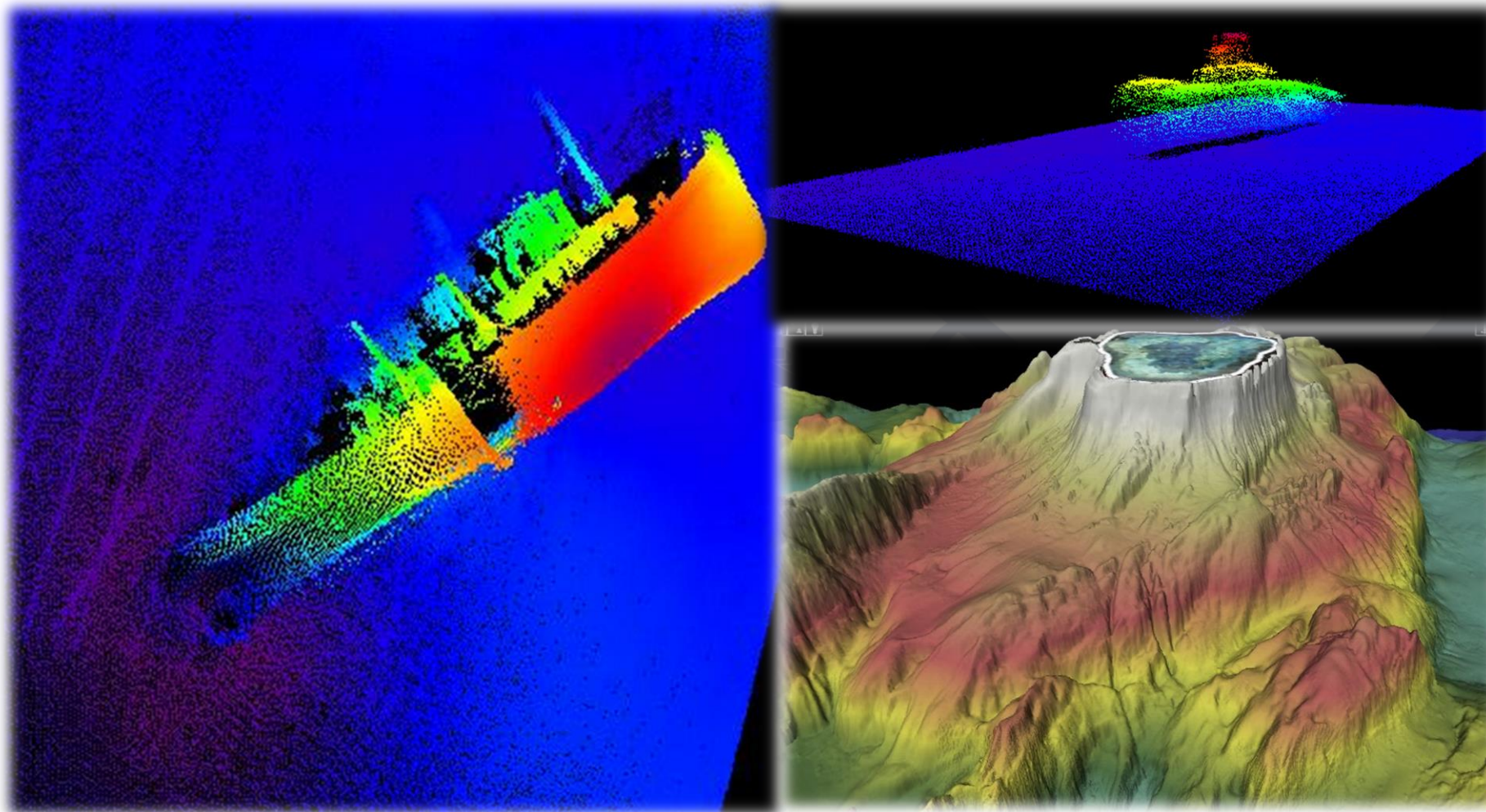
*"Contribution of the General Maritime Authority  
to the Offshore Exploration program of the  
National Hydrocarbons Agency"*



*Nelson Iván Benito Barrera  
Defense Advisor 04  
General Maritime Directorate*



# Multibeam System

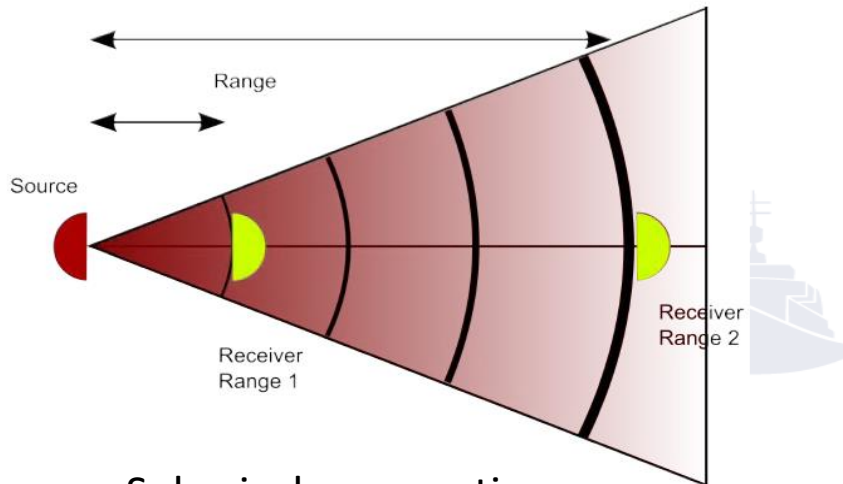


*“Consolidemos nuestro país marítimo”*

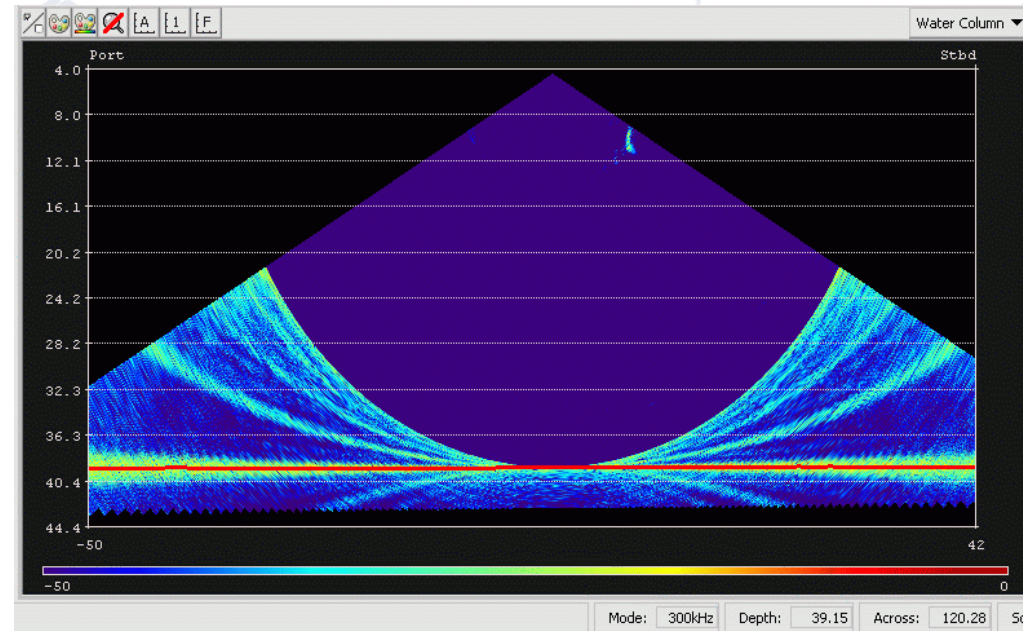


# Multibeam System

## The Sound In The Water Basic Principles of Hydroacoustics

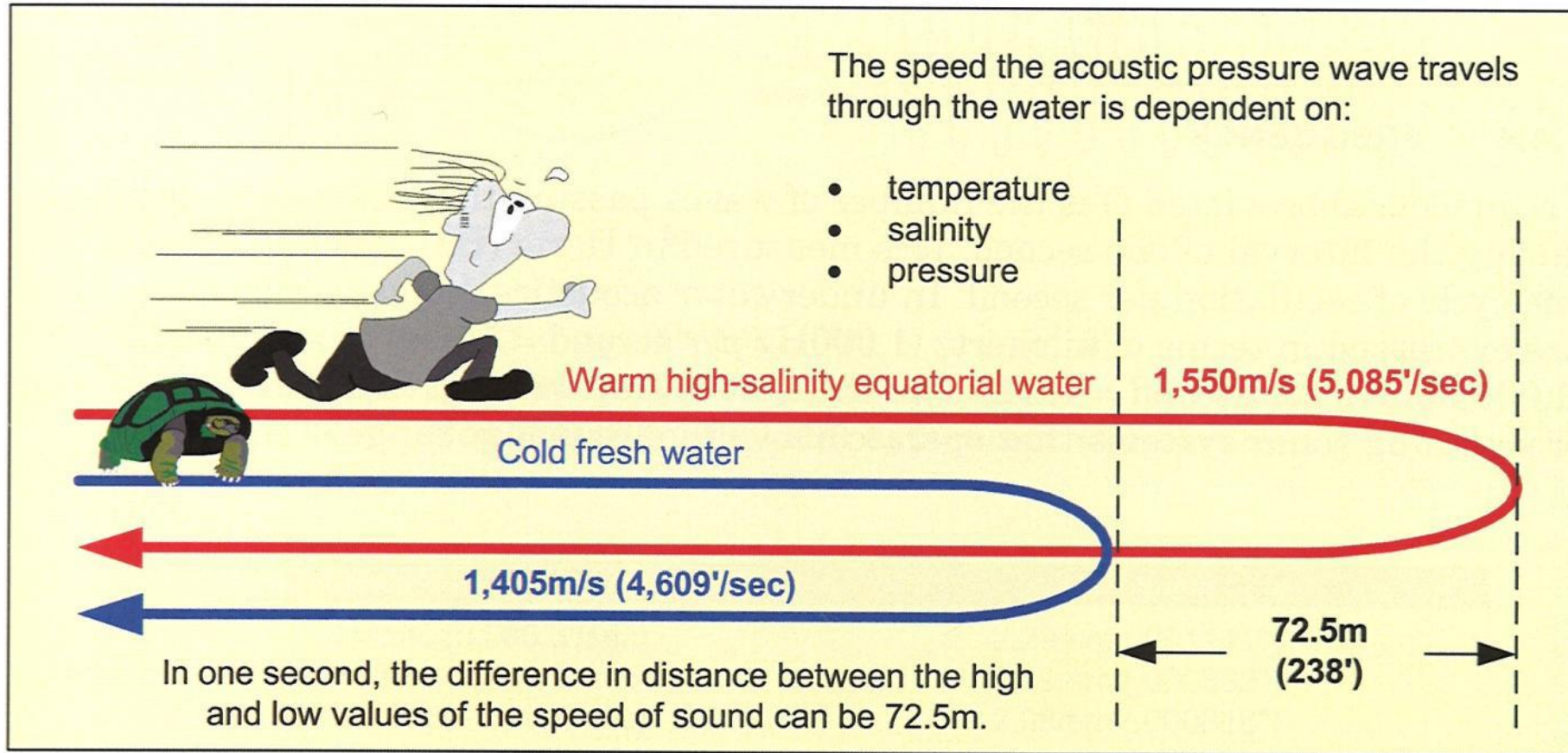


- Spherical propagation of the acoustic wave



# ► Multibeam System

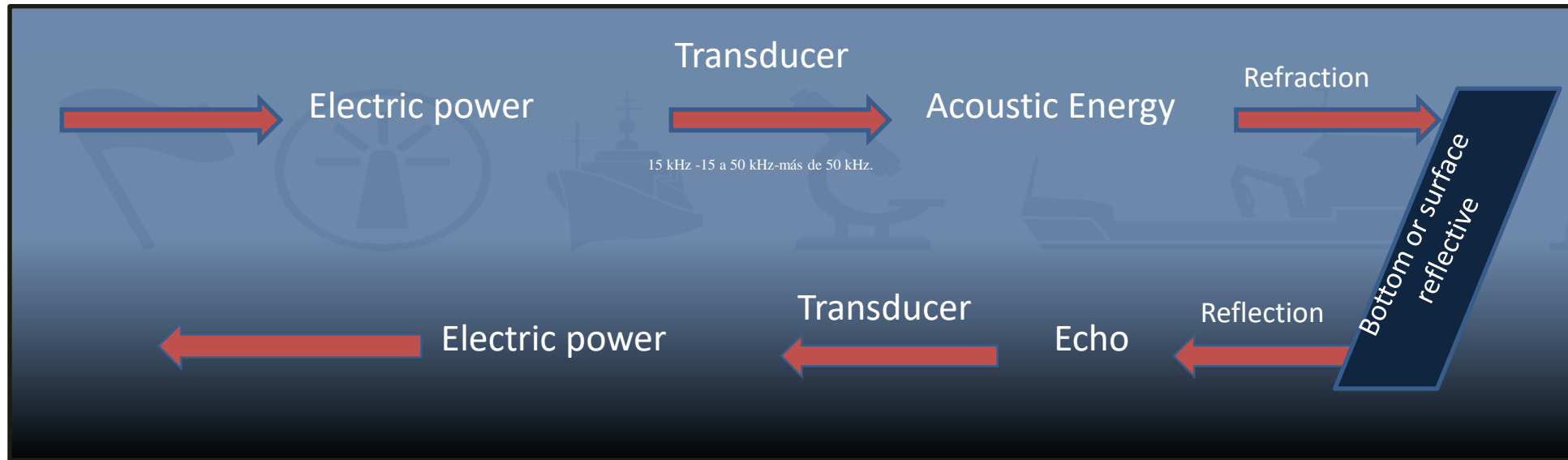
## The Sound In The Water Basic Principles of Hydroacoustics





# Multibeam System

## Sound in Water Theory of Sonars





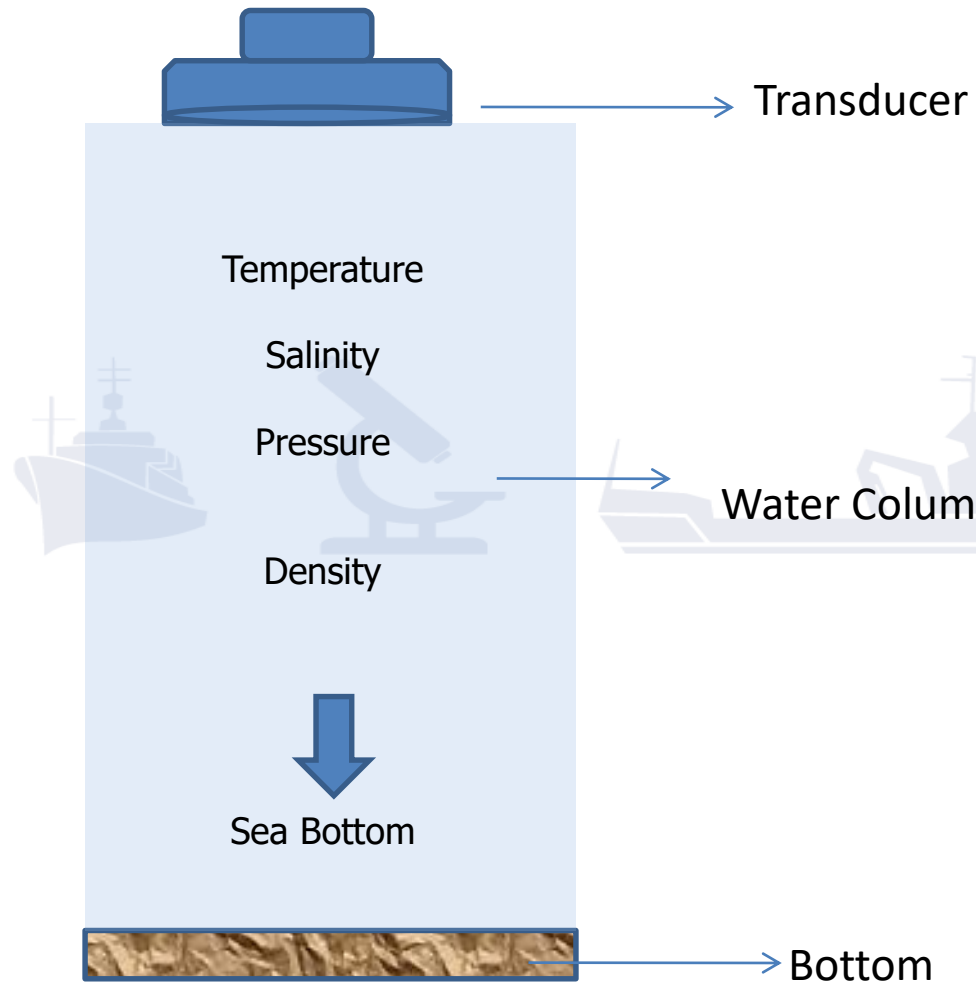
# Multibeam System

## ALL ECHO SOUNDER MEASURE TIME

$$D = \frac{VT}{2}$$



D = Depth  
 V = Speed of Sound  
 T = Time



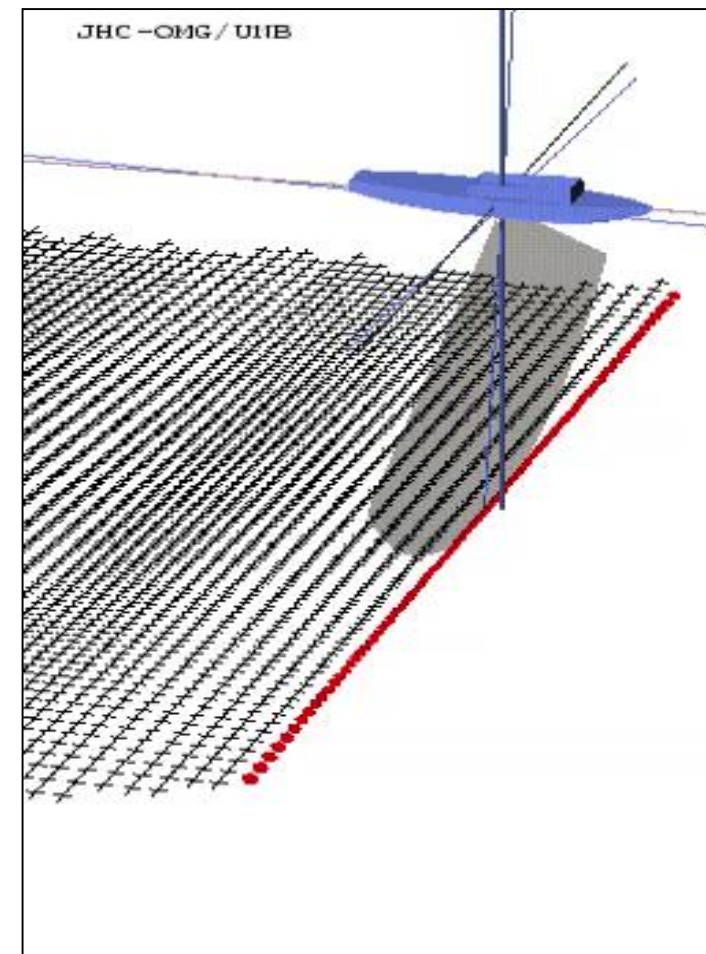
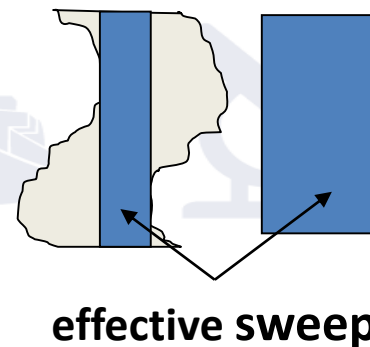
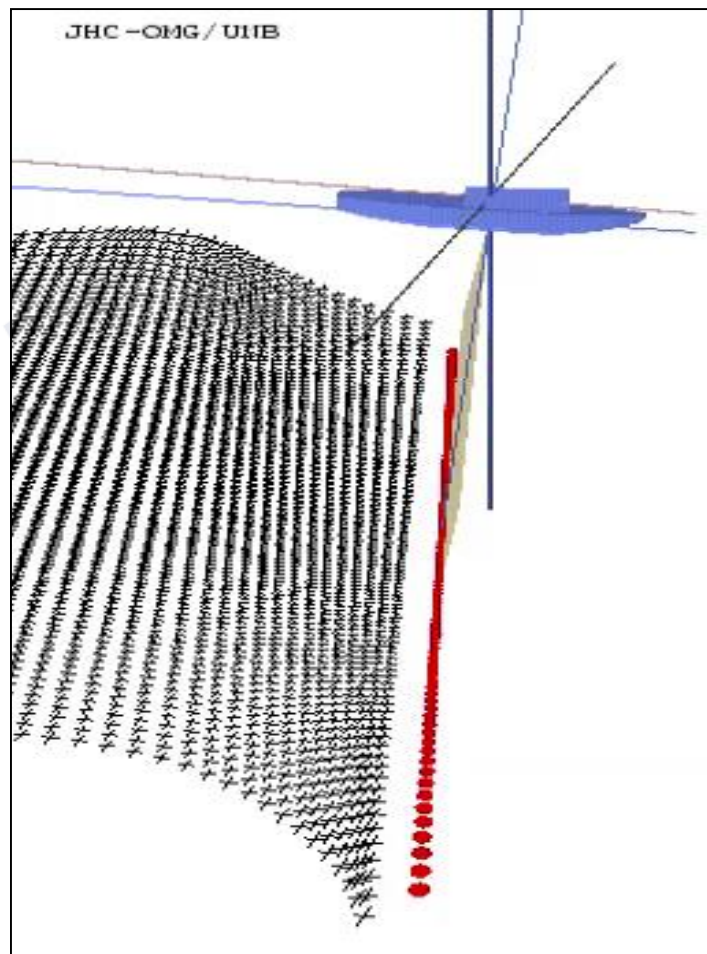
**Sound in Water  
 Theory of Sonars**



# ► Multibeam System

## Real Time Stabilization Techniques

All beams are stabilized according to the Pitch and Roll of the boat.





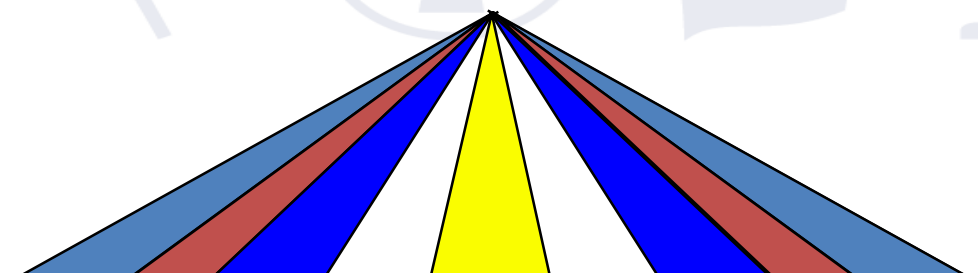


## Multibeam System

The system is fully stabilized according to Azimuth (Yaw) through the use of transmission sectors.

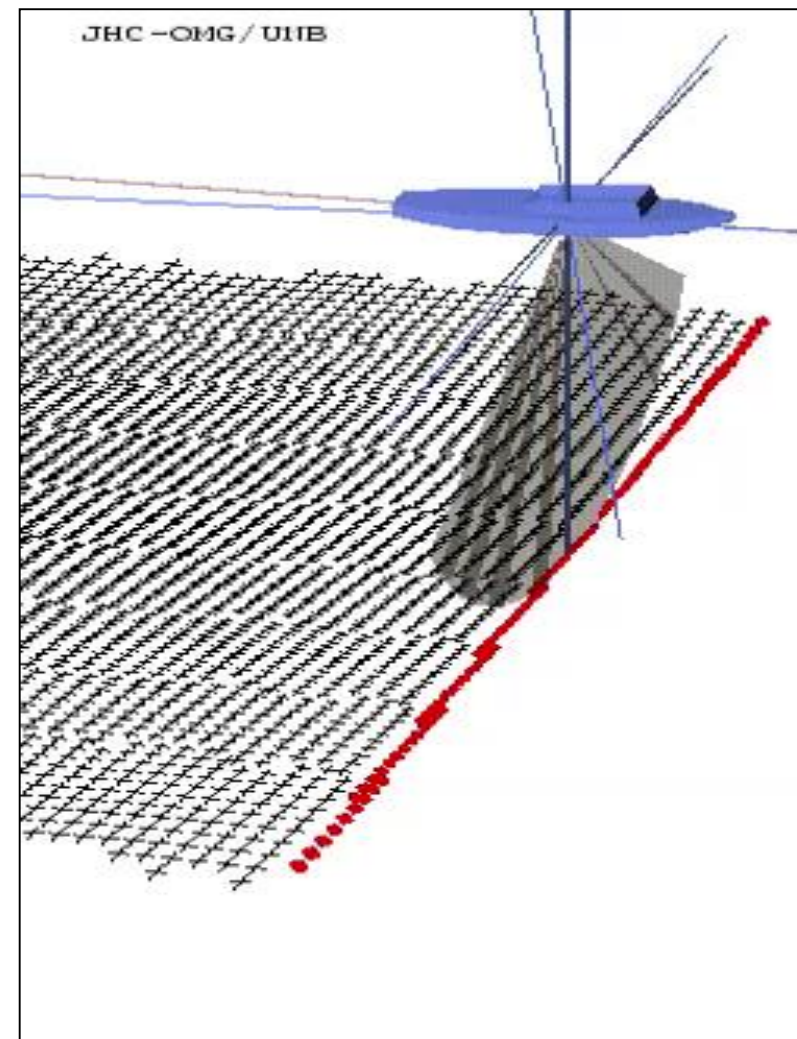
Sector transmission with frequency coding and individual tilt control.

Simultaneous transmission in all sectors.

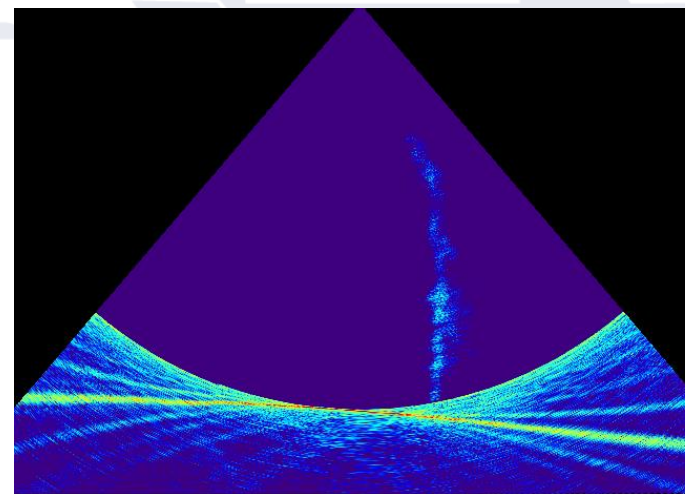
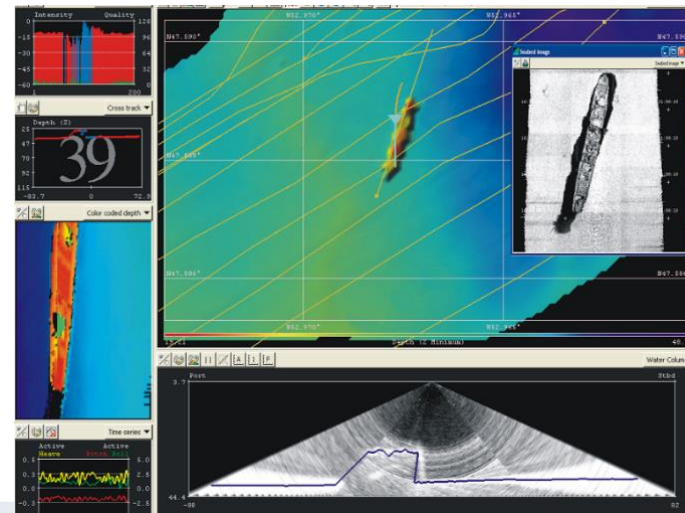
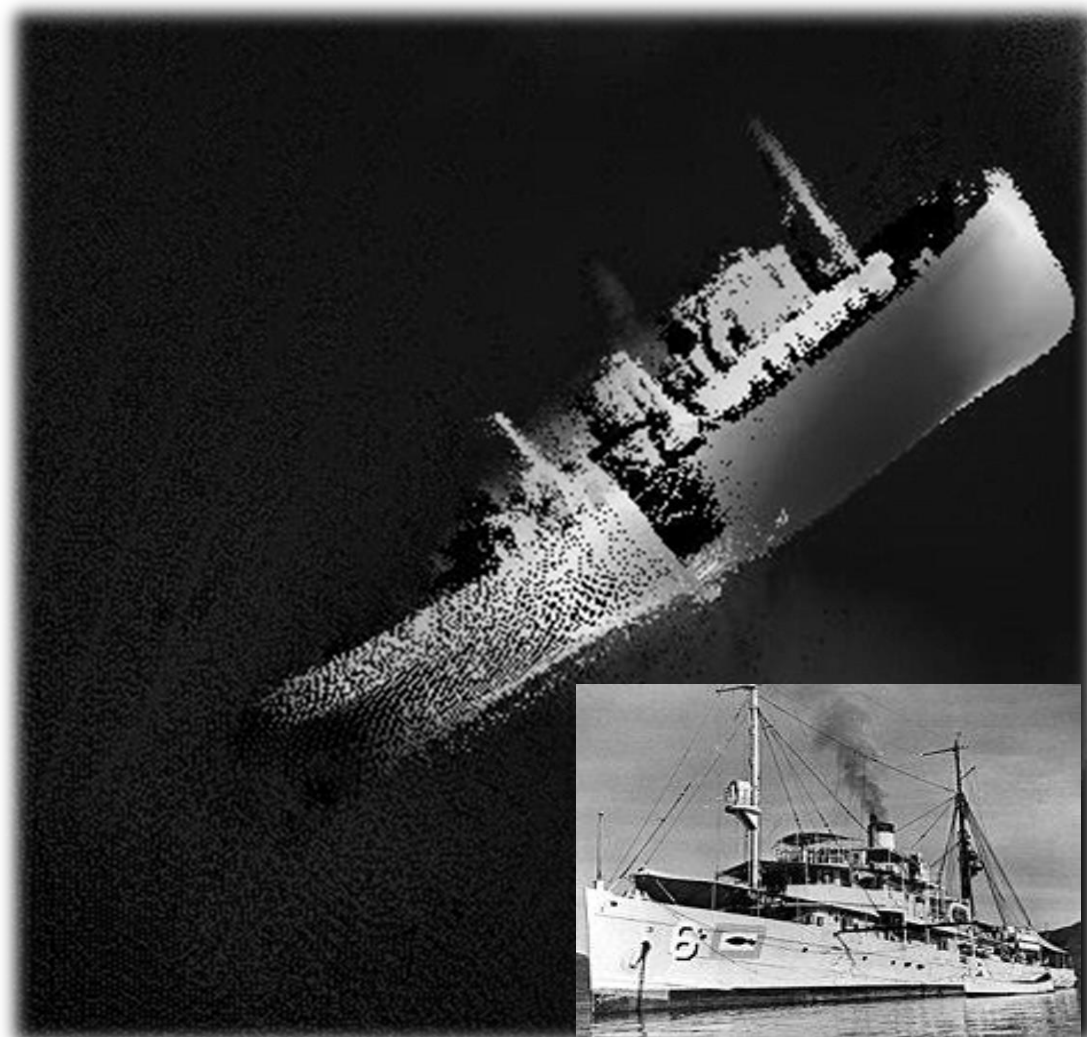


Frequency coding of transmitted beams

9 sectors in deep waters



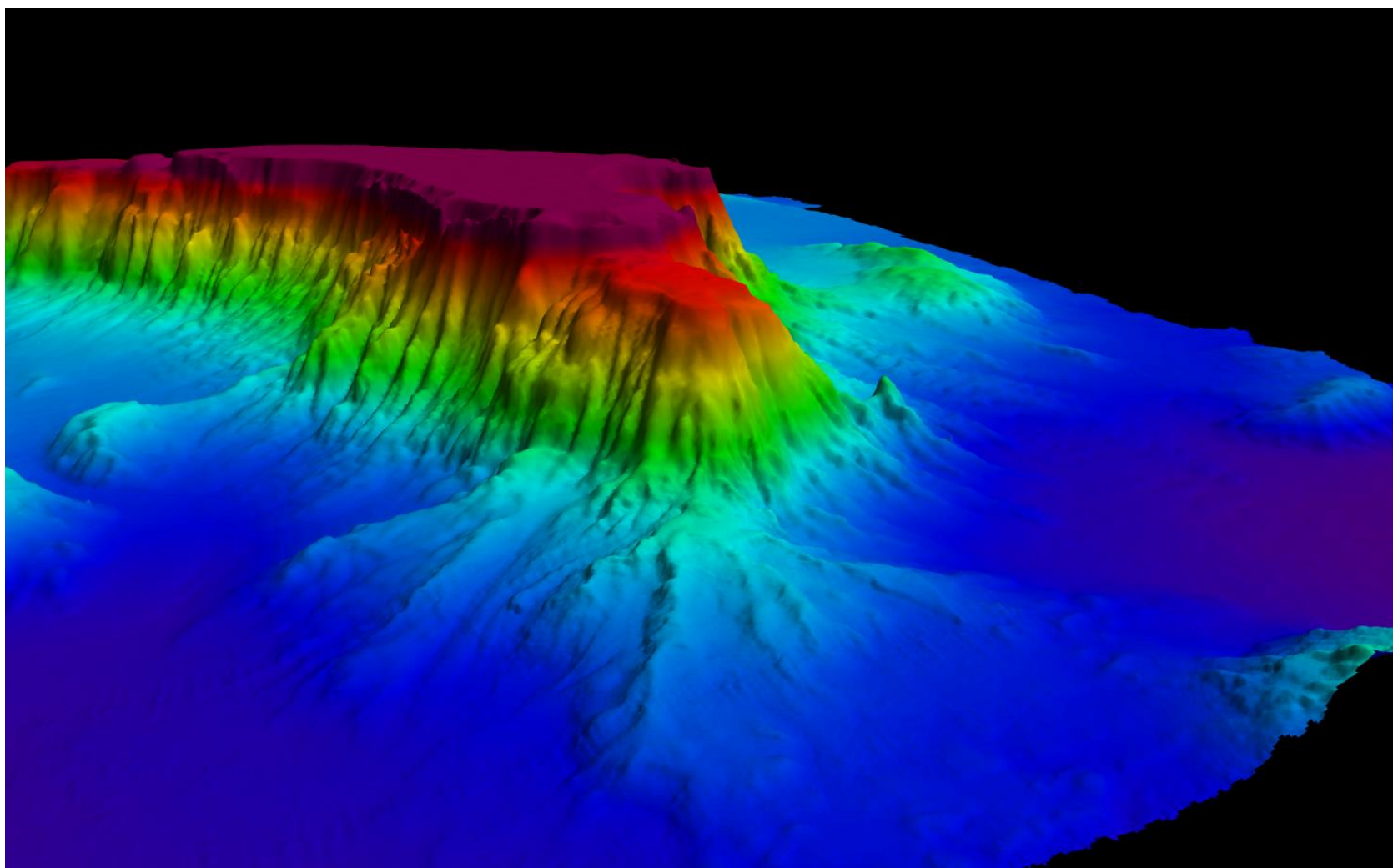
# Multibeam System



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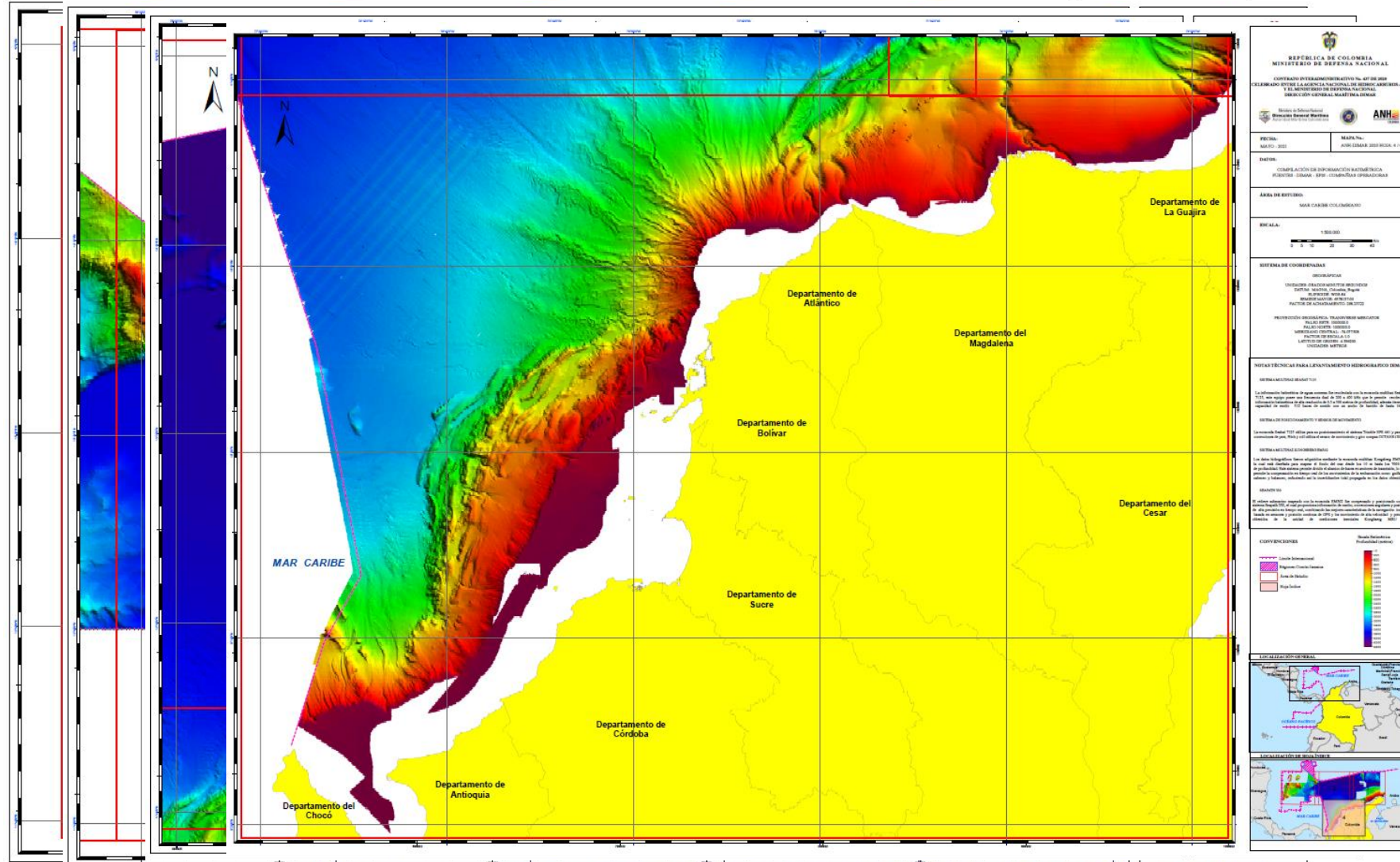
## Generated Products



Surface \* .Csar format,  
with bathymetry point  
cloud in XYZ format



# Generated Products



Integration of the bathymetric data of this project with the high resolution bathymetry of the Colombian Caribbean available in the DIMAR databases and EPIS.



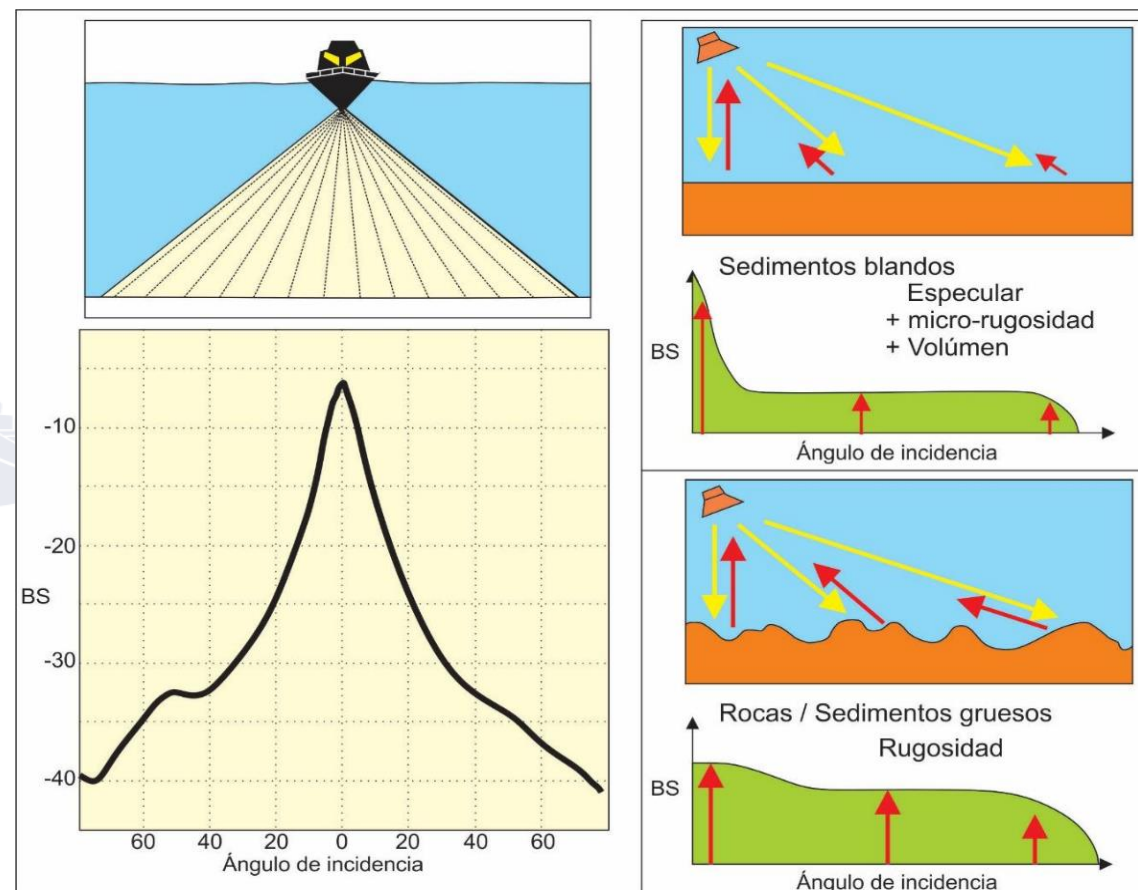
# Backscatter

## Acoustic Response of the Backscatter Seabed

Is defined as Backscatter to energy returned from an acoustic pulse that has been transmitted through a column of water, to a certain distance and at a certain angle, in a specific area of the seabed.

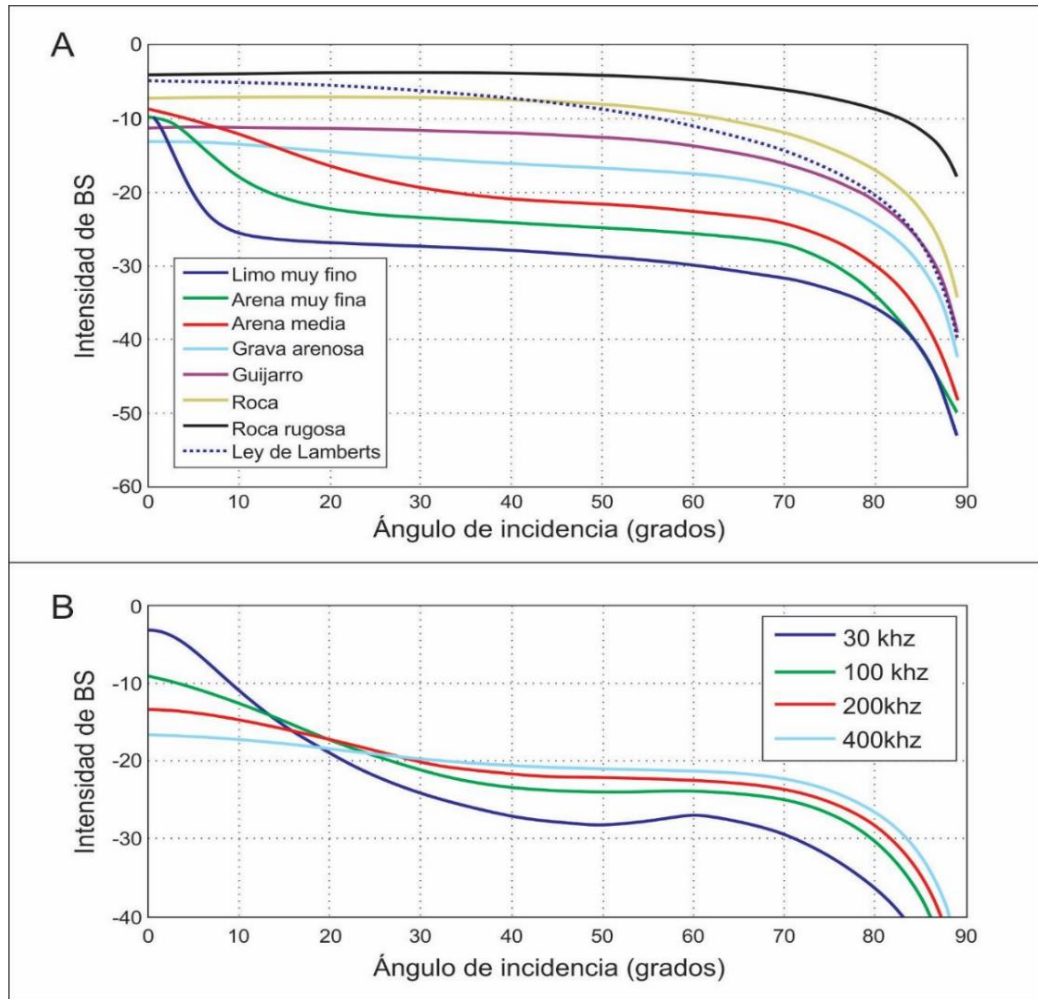
Backscatter depends on:

- The reflection coefficient, due to the difference in impedance acoustics between water and seabed materials.
- The volume of Reverb, expressed in terms of the length of wave.
- The roughness of the bottom surface





# Backscatter



Angular dependence of the backscatter intensity (BS). Taken and modified from (Lurton & Lamarche, 2015).

Is defined as Backscatter to energy returned from an acoustic pulse that has been transmitted through a column of water, to a certain distance and at a certain angle, in a specific area of the seabed.

Backscatter depends on:

- The reflection coefficient.
- The volume of Reverb, expressed in terms of the length of wave.
- The roughness of the bottom surface

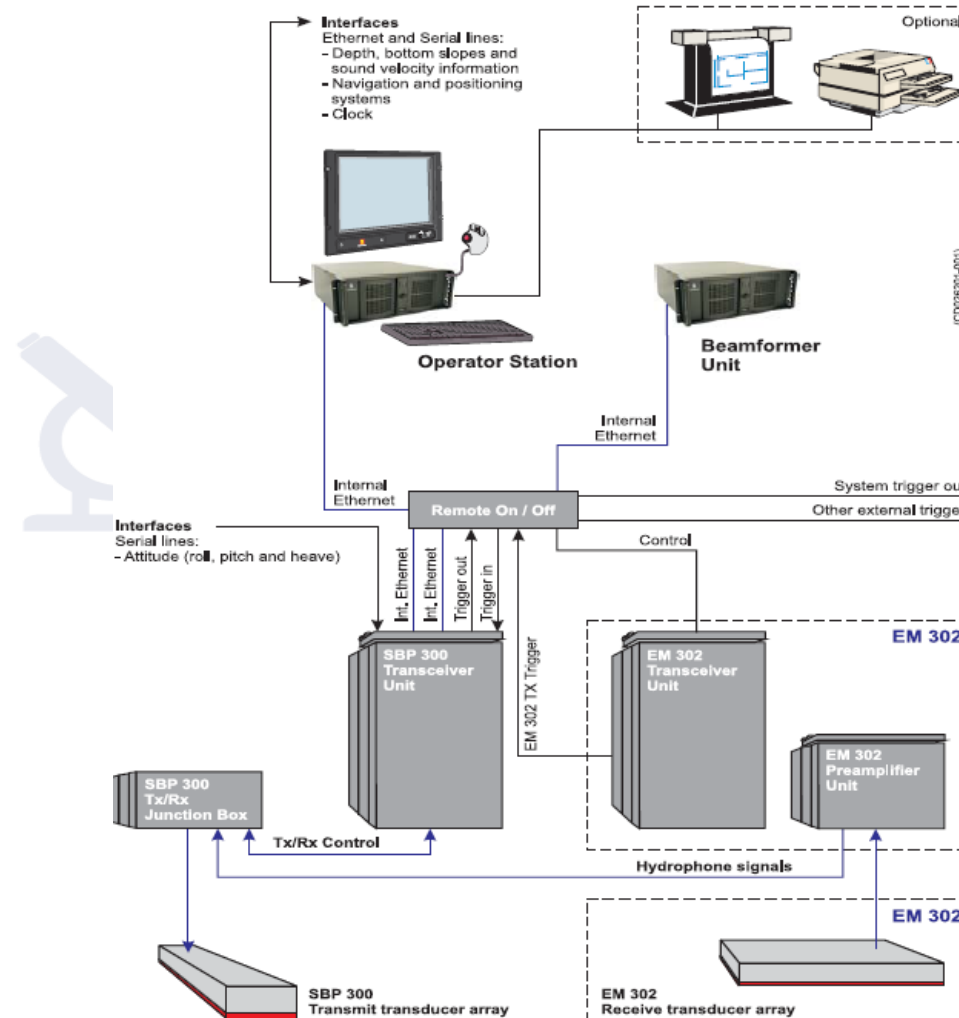
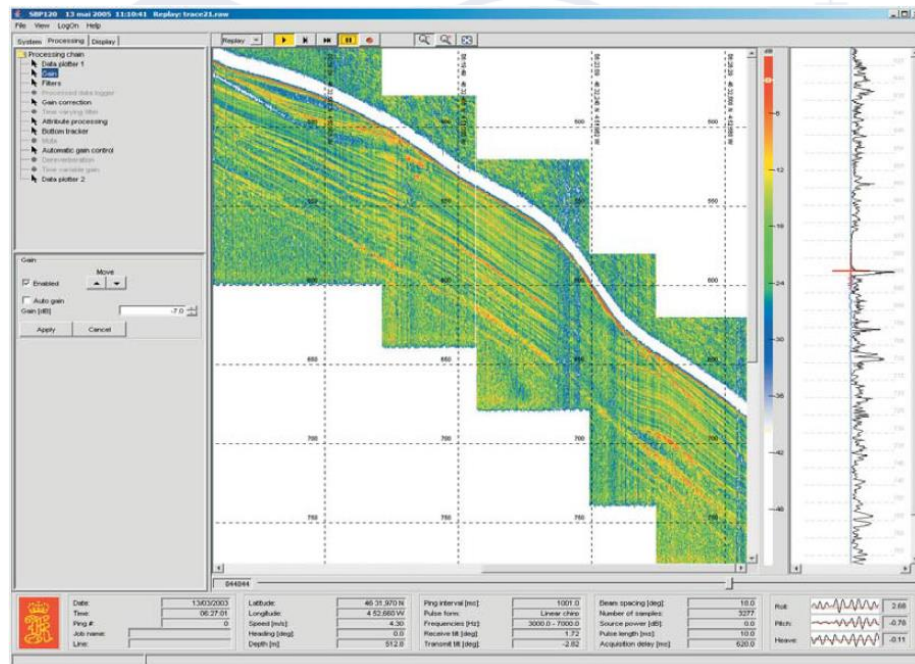






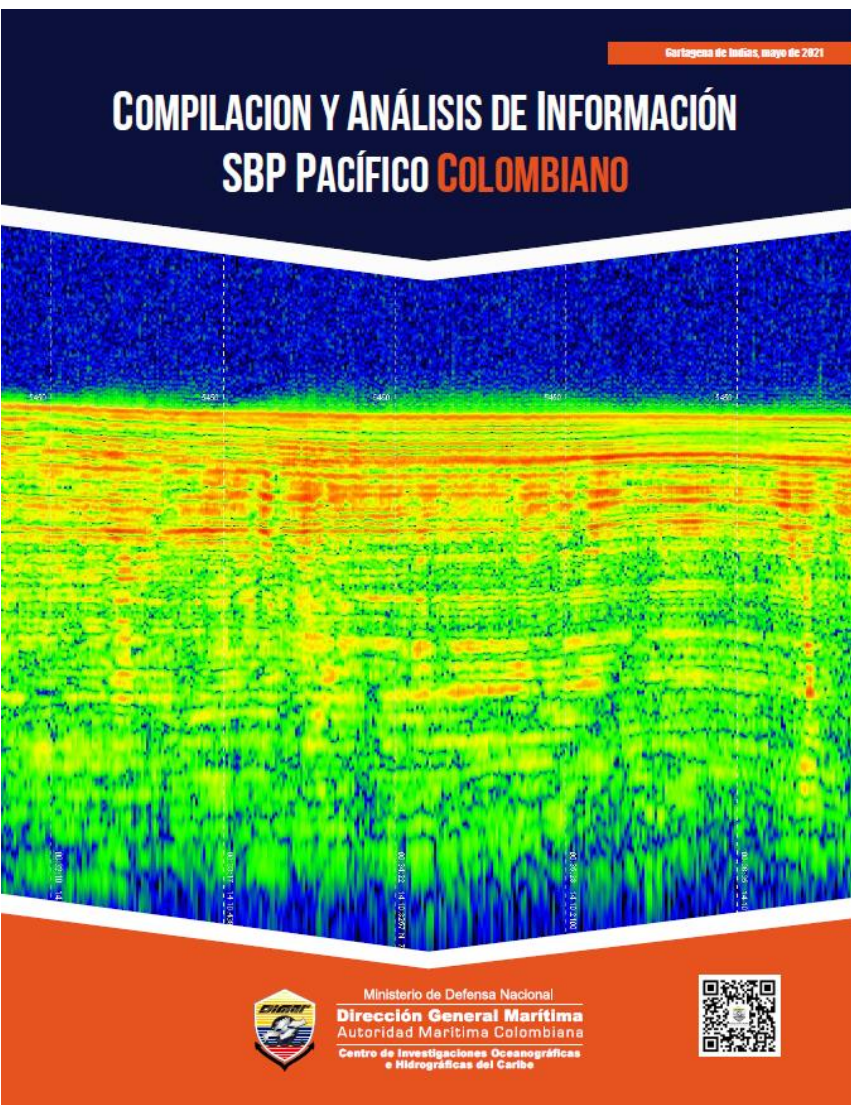
# Sub Bottom Profiler SBP

The main application of SBP is to make images of sediment layers and buried objects. It uses low frequencies (between 3.5 kHz and 6.5 kHz) that are capable of traveling through the water column and penetrating the first layers of the seabed (100 meters on average, depending on the hardness of the seabed).

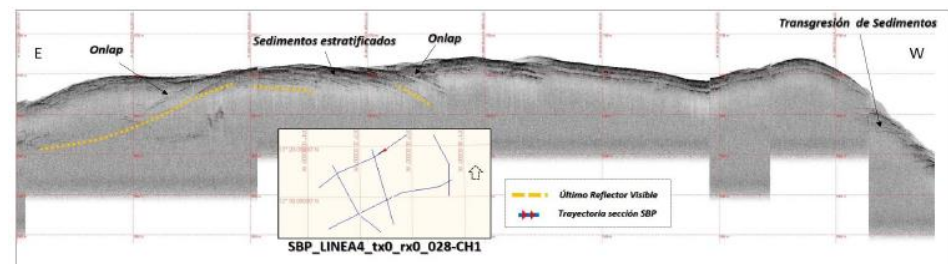
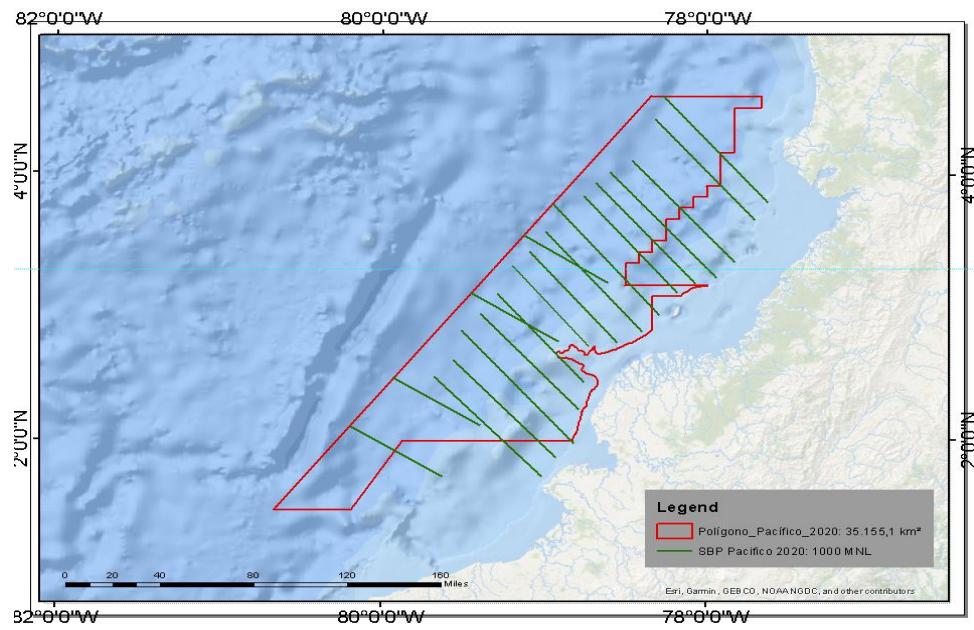




# Generated Products



Report on the collection and analysis of information on the identification of sedimentary strata of the seabed





# ANH Contracts Background

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## ANH-DIMAR CONTRACTS BACKGROUND



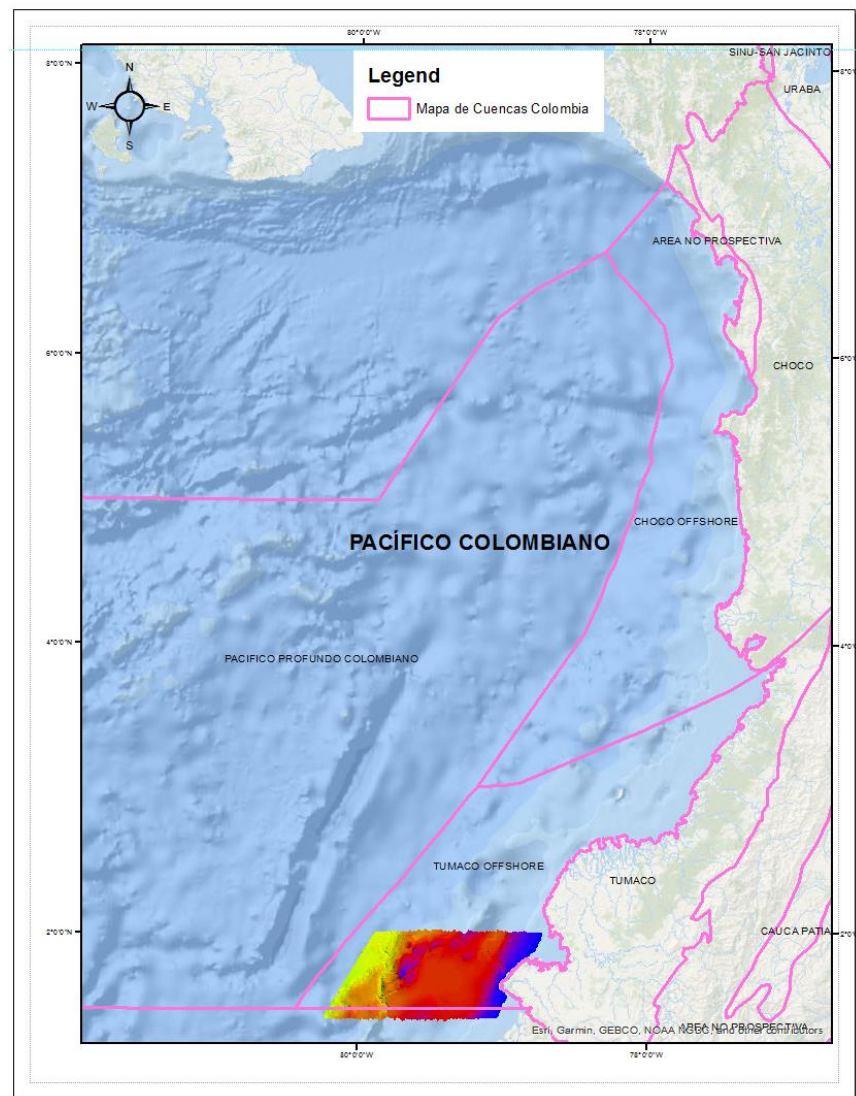
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# Agreement No. 018 DIMAR – ANH Year 2007



**Contract Value:**

\$ 12.000.164.460 M/CTE

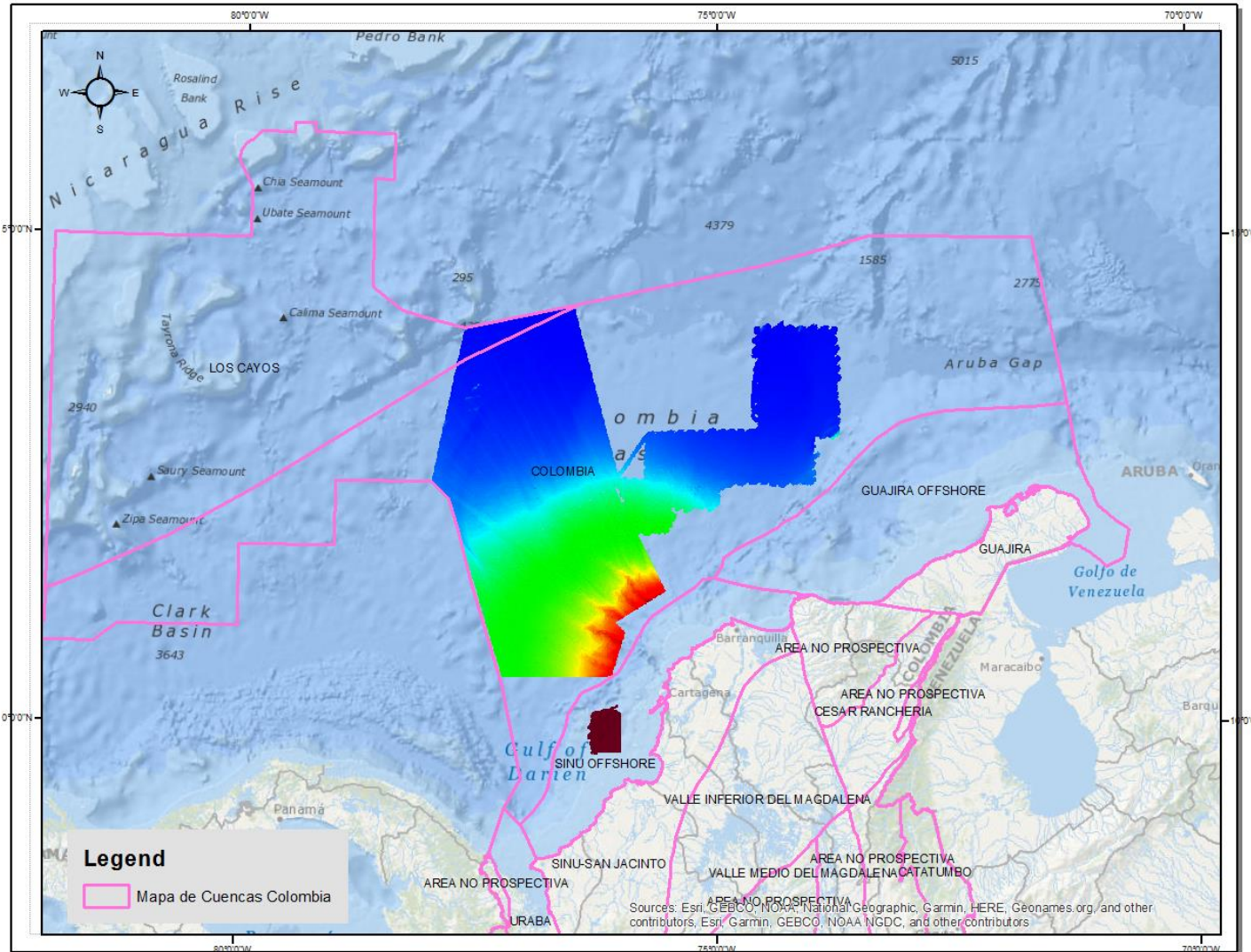
**Acquired area: 8.595,78 km<sup>2</sup> MB.**

**Deliverables:**

Surfaces in format Csar, Data Hidrographic XYZ, Maps GeoTIFF.

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# Contract No. 169 DIMAR – ANH Year 2014



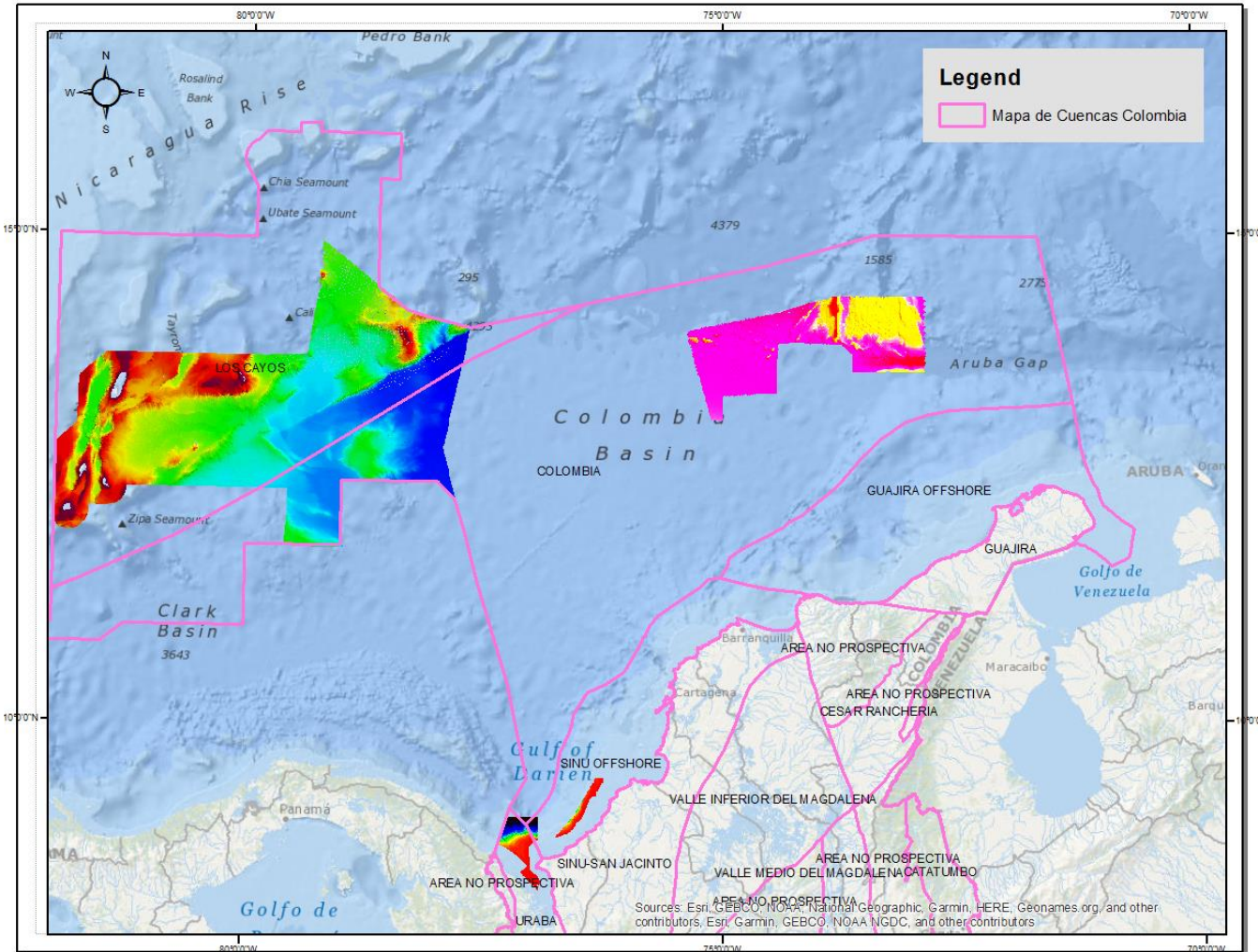
**Contract Value:**  
\$ 17.939.570.880 M/CTE.

**Acquired Area:** 92.028 km<sup>2</sup>.

**Deriverables:**  
Surfaces in format Csar, Data Hydrographic Data XYZ, Maps GeoTIFF, Backscatter y Geodata Base of the information.

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# Contract No. 245 DIMAR – ANH Year 2018



## Contract Value:

\$ 29.746.470.000 M/CTE /

\$14.431.843.538 = \$ **44.178.313.538**

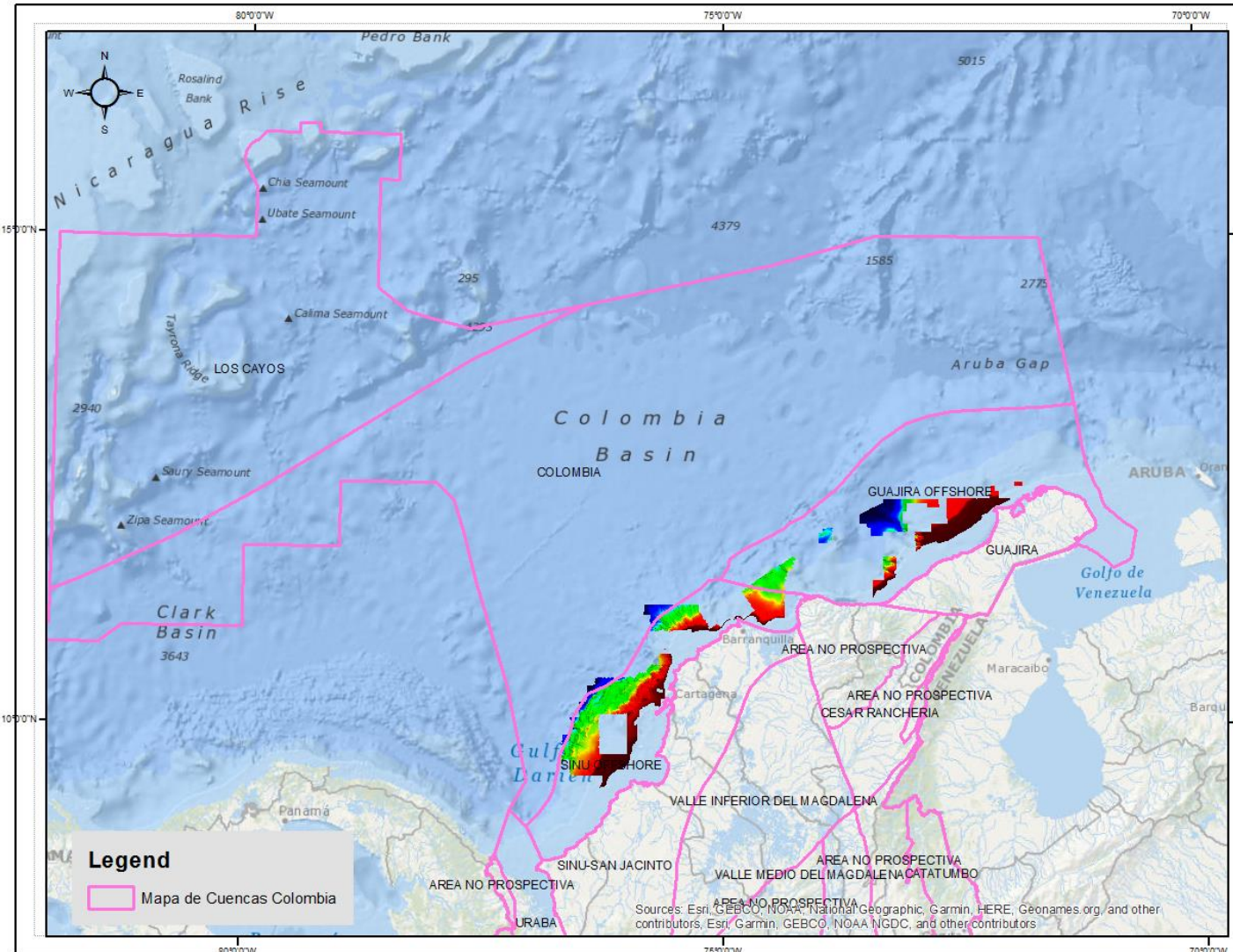
**Acquired Area: 160.531,7 km<sup>2</sup> MB.**

## Deriverables:

Surfaces in format Csar, Point Cloud XYZ, SBP Data, Reports: Characterization of Underwater Geofoms, Identification of Sedimentary Strata, Backscatter, Oceanographic Characterization. Maps ANH DIMAR database integration.

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# Contract No. 407 DIMAR – ANH Year 2019



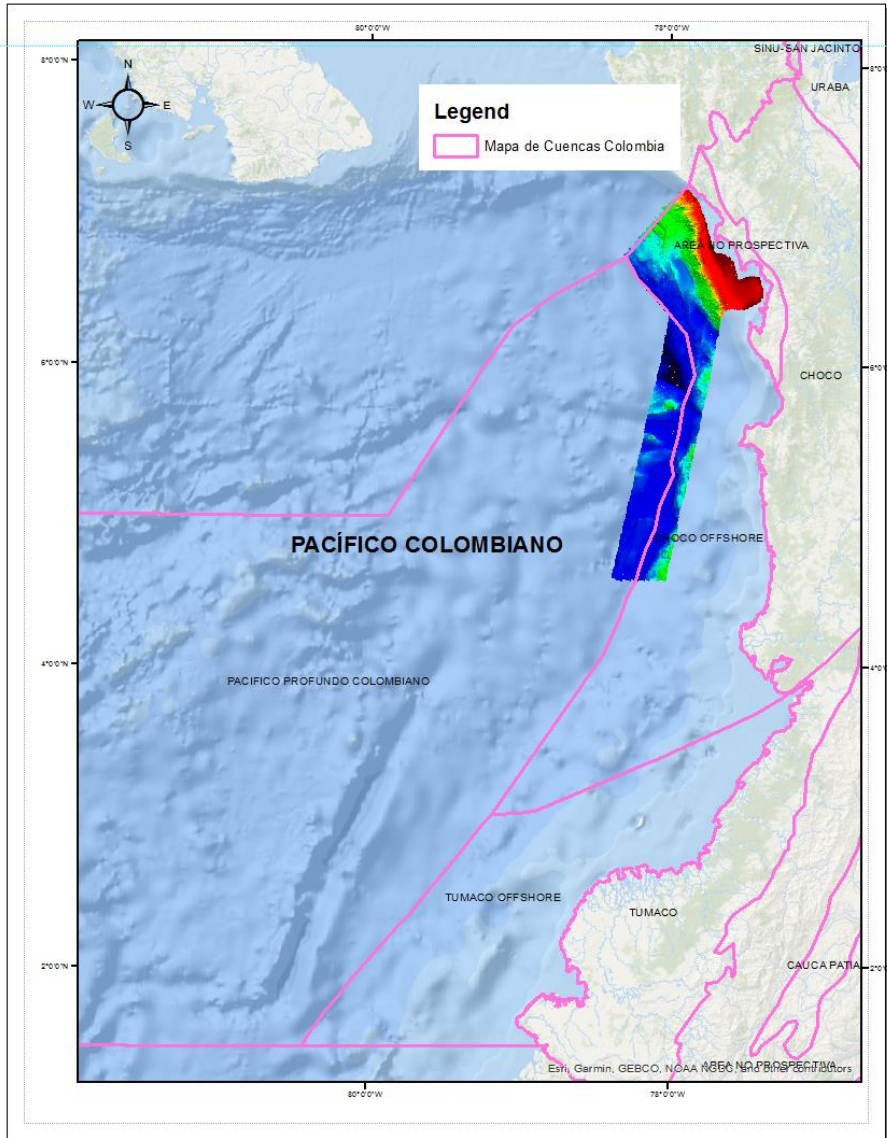
**Contract Value:**  
\$ 20.000.000.000 M/CTE

**Acquired Area:** 16.531,45 km<sup>2</sup> (3.508,45 km<sup>2</sup> shallows/ 13.023,0 km<sup>2</sup> deep water) MB.

**Deriverables:**  
Surfaces in format Csar, Point Cloud XYZ, SBP Data, Reports: Characterization of Underwater Geofoms, Identification of Sedimentary Strata, Backscatter. Maps ANH DIMAR database integration and Operating Companies.

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# Contract No. 692 DIMAR – ANH Year 2019



**Contract Value:**

**\$ 5.167.999.400 M/CTE**

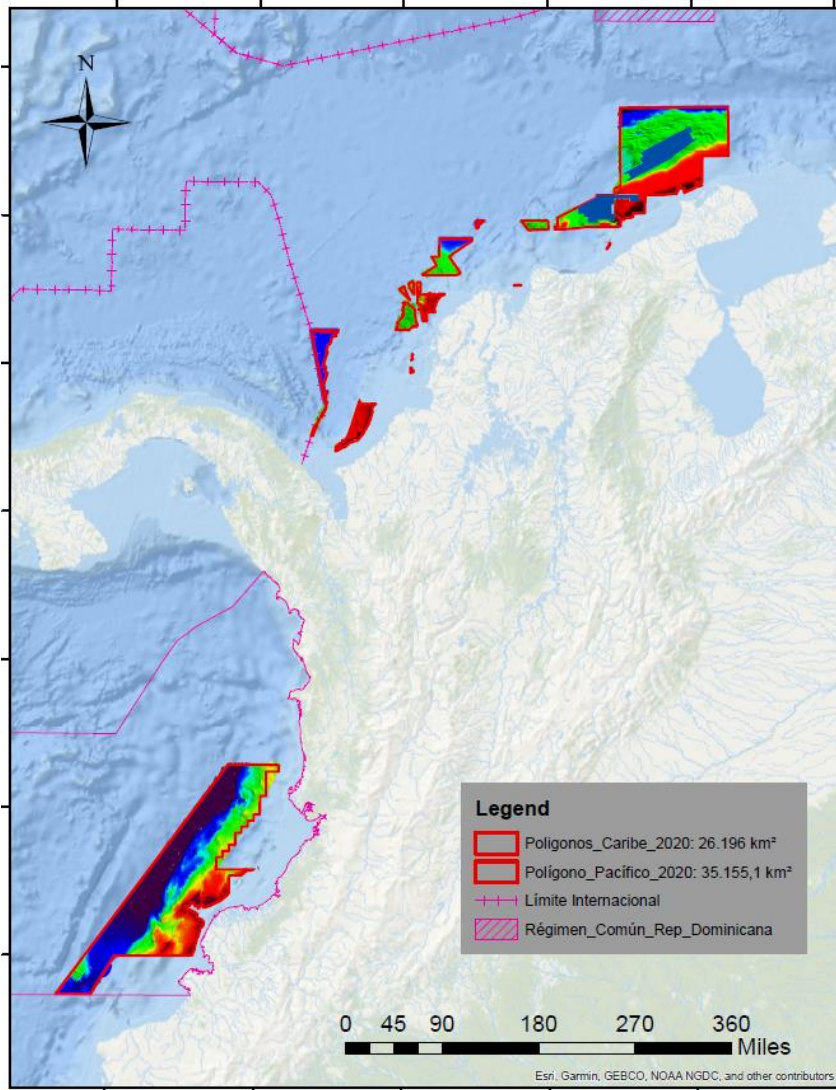
**Acquired Area: 12.011 km<sup>2</sup> MB.**

**Deriverables:**

Surfaces in format Csar, Point Cloud XYZ , SBP Data, Reports: Characterization of Underwater Geofoms, Identification of Sedimentary Strata, Backscatter



# Contract No. 437 DIMAR – ANH Year 2020



**Contract Value:**  
\$ 19.020.093.000 M/CTE

**Acquired Area:** 61.346,1 km<sup>2</sup> MB.  
(26.191 km<sup>2</sup> Caribe / 35.151,1 km<sup>2</sup> Pacífico)  
1.406 MNL SBP

**Deriverables:**  
Surfaces in format Csar, Point Cloud XYZ , SBP Data, Reports:  
Characterization of Underwater Geofoms, Identification of Sedimentary Strata, Backscatter.

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# ANH-DIMAR inter-administrative contracts



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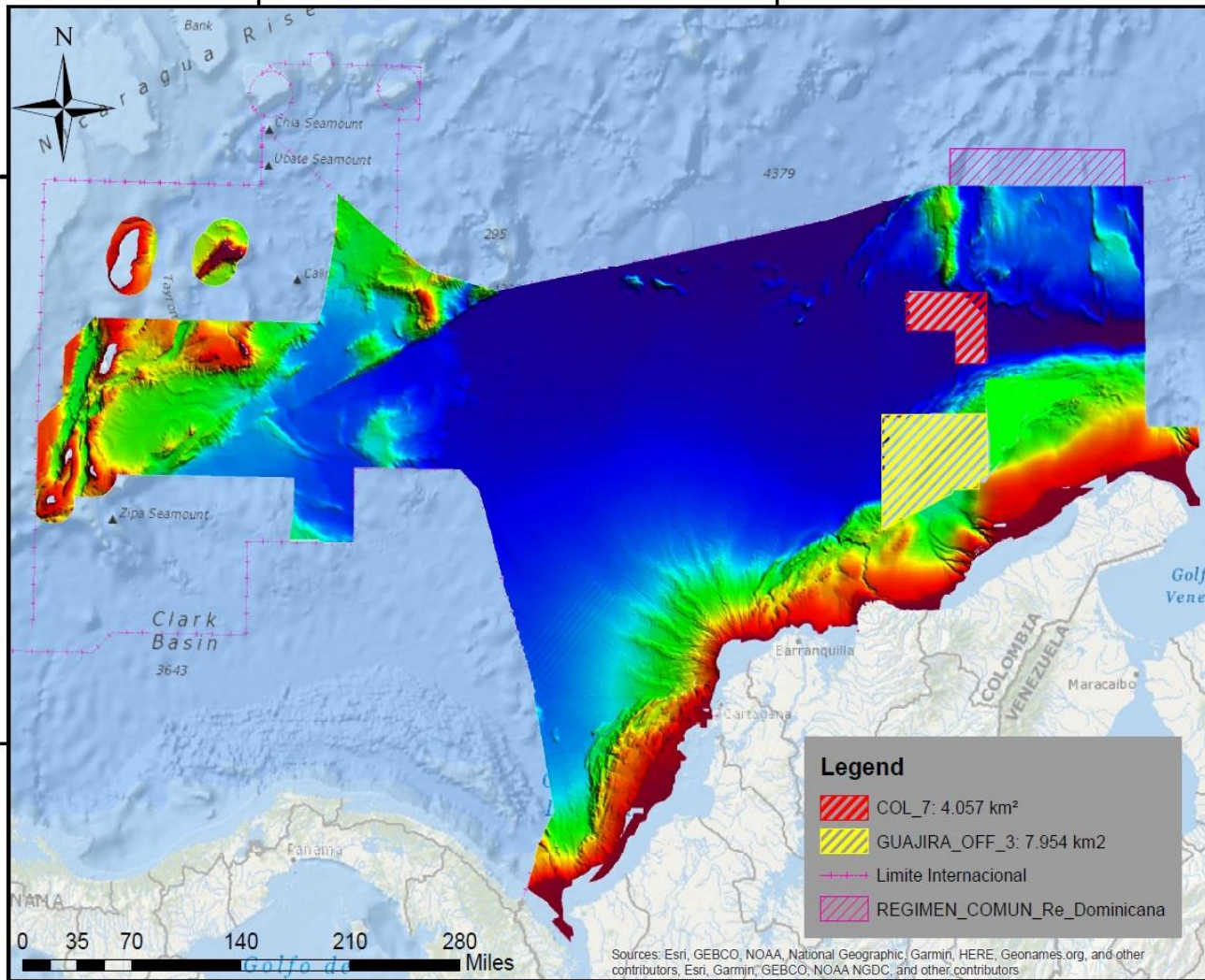
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Contract / Agreement	Object	Study Area	Value
Agreement 018 de 2007	<i>Acquisition and processing of high resolution bathymetric information in the offshore basin of the Colombian Pacific.</i>	8.595 km <sup>2</sup>	\$12.000.164.460,00
Contract 169 de 2014	<i>Acquisition and processing of high resolution bathymetric information in deep and shallow waters of the Colombian Caribbean.</i>	92.028 km <sup>2</sup>	\$17.939.570.880,00
Contract 245 de 2018	<i>Acquisition and processing of multibeam meteoceanographic and bathymetric base information in the Colombian Caribbean.</i>	160.531,45 km <sup>2</sup>	\$44.178.313.538,00
Contract 407 de 2019	<i>Acquisition and processing of multibeam bathymetric information, backscatter and integration of the information available in the EPIS and DIMAR databases, in the Colombian Caribbean Sea.</i>	16.531,6 km <sup>2</sup>	\$20.000.000.000,00
Contract 692 de 2019	<i>Acquisition and processing of multibeam bathymetric information, backscatter and SBP in waters of the Colombian Pacific.</i>	12.215 km <sup>2</sup>	\$5.167.999.400,00
Contract 429 2019	<i>Prospectivity evaluation based on the geochemical characterization of bottom samples Piston Core, Heat Flow and modeling of oil systems in the Colombian Caribbean.</i>	45 puntos	\$15.700.000.000,00
Contract 437 de 2020	<i>Acquisition and processing of multibeam bathymetric information, backscatter and SBP, in the Colombian Caribbean and Pacific.</i>	61.351,1 km <sup>2</sup>	\$19.020.093.000,00
		<b>351.216 km<sup>2</sup></b>	<b>\$102.997.903.002</b>



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# Future Projects Year 2021



Área: 12.011 km<sup>2</sup> de MB.

## Deriverables:

Surfaces in format Csar, Point Cloud XYZ, SBP Data, Reports: Characterization of Underwater Geoforms, Identification of Sedimentary Strata, Backscatter



Thank you !



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Caribbean Oceanographic and Hydrographic Research Center

# *Science and Sovereignty*

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