KONGSBERG

Evolution of Hydroacoustic Hydrographic Survey, from the vessel to the office.

05/12/2018

MSc Leonardo Figueroa

Time since KONGSBERG was established

204 years 8 months 5 days

21:05:19

KONGSBERG

+200 YEARS OF TECHNOLOGY INNOVATION








From deep sea to outer space

KONGSBERG

TRANSPORT

CLIMATE CHANGE

TECHNOLOGY IS THE
MAIN DRIVER FOR SOLVING OUR
SUSTAINABILITY ISSUES

THE OCEANS PLAY
A KEY ROLE

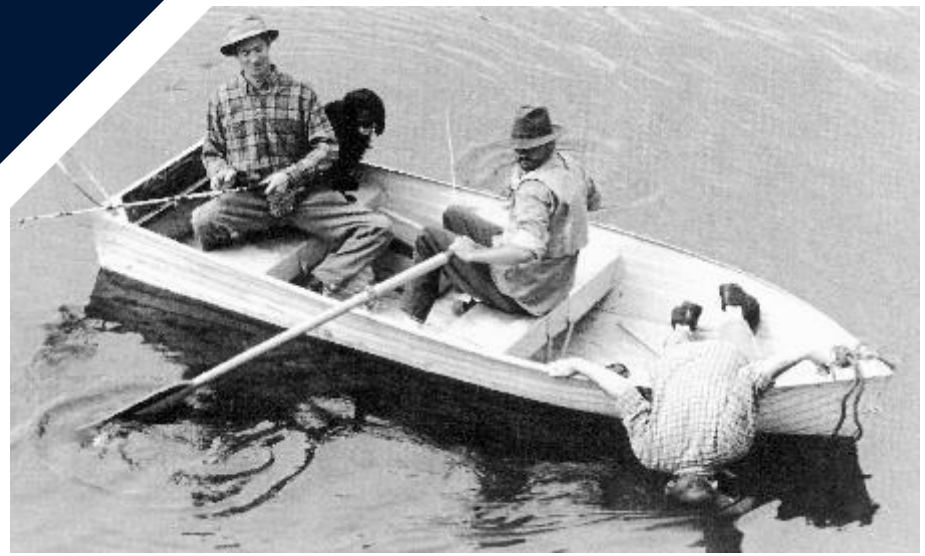
ENERGY

FOOD

DEFENCE AND SECURITY

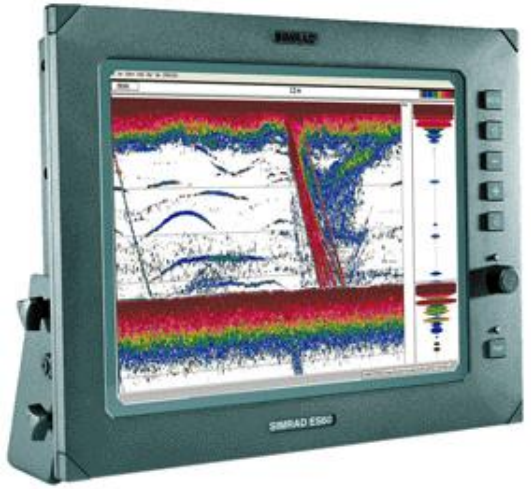
Hidrografía

Historia



First Echsounder in NOAA around 1930

Kongsberg (SIMRAD) diseña su primera ecosonda a mediados de 1950s



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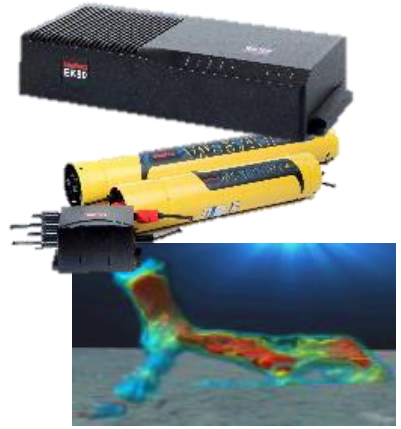
KONGSBERG
SIMRAD



1996
SIMRAD is acquired by Kongsberg

1947
SIMRAD foundation

1951
First SIMRAD Echosounder

1958
First fishery research sonar and echo sounder, Simrad SBO-10

1968
First generation EK scientific echo sounders with calibrated output at 12,18, 38 and 120 kHz

1970
Rack version of EK sounder, EK-S and the first analogue Echo integrator Simrad QM

1980
EK400 and digital echo integrator Simrad QD

1984
Simrad ES400 First split beam echo sounder

1989
SIMRAD EK500. First echosounder with high instantaneous dynamic range

2002
First composite transducer

2003
EK60 introduced with BI60 post processing software, computer style, with frequencies 12 to 400 kHz

2005
Simrad ME70, first scientific multibeam echosounder

2006
Simrad MS70, first scientific multibeam sonar

2013
RAW data output on omni directional sonars

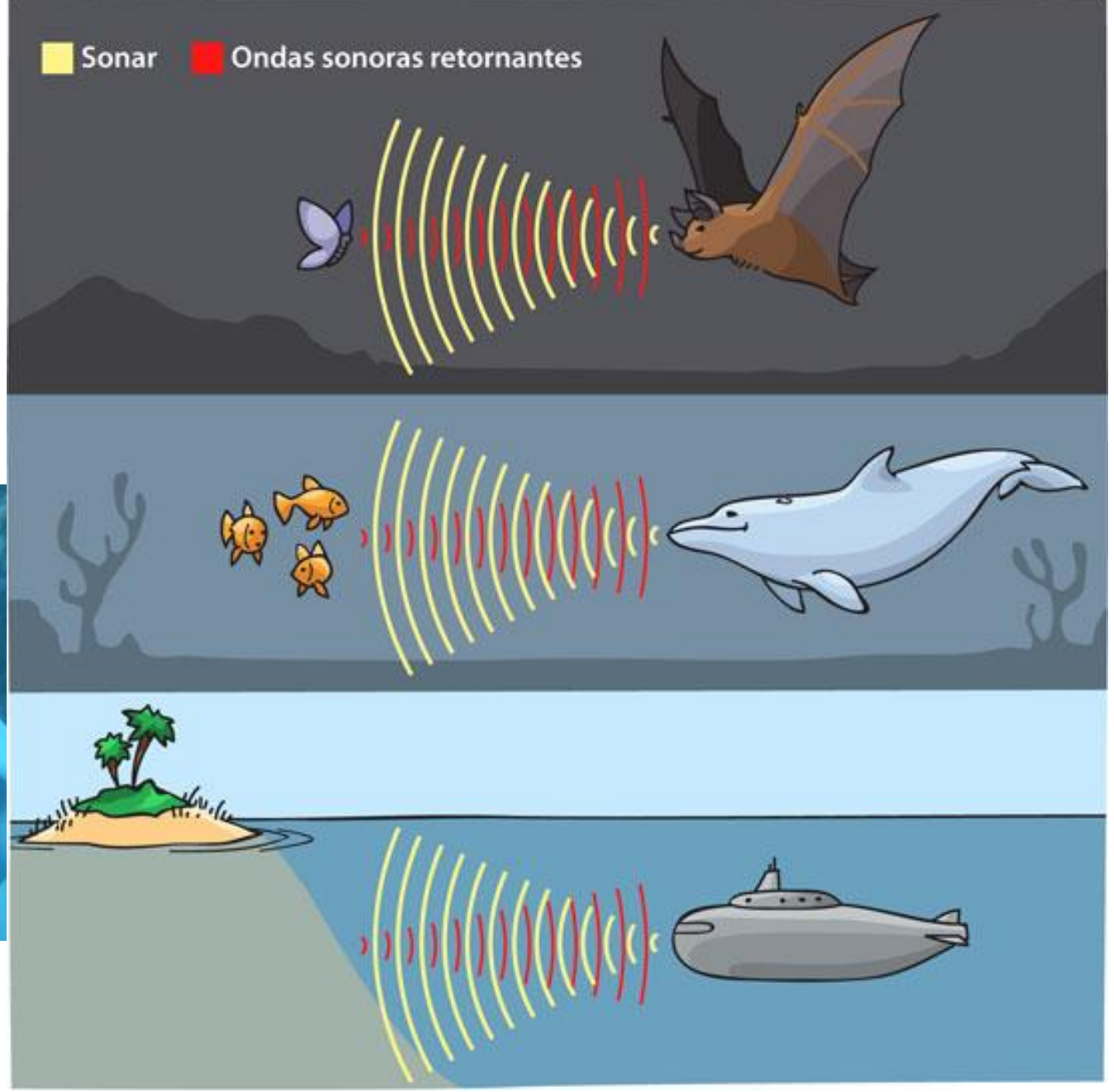
2015
Simrad EK80, first scientific wideband echo sounder

2016
WBAT, first wideband autonomous echo sounder

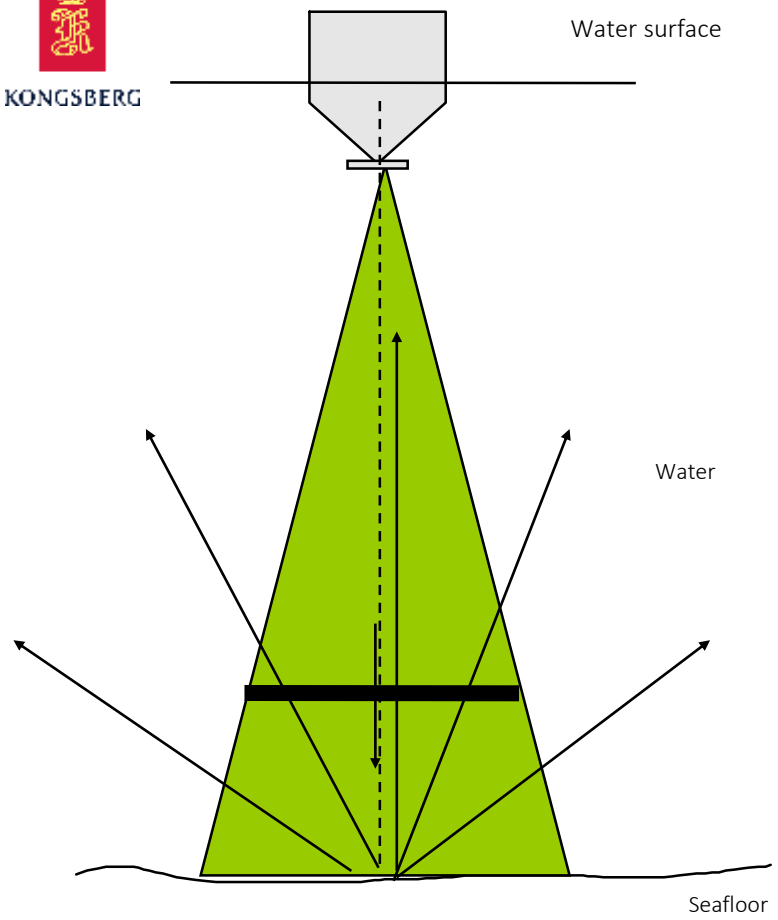
2017
TD50, first real time 3D visualization software

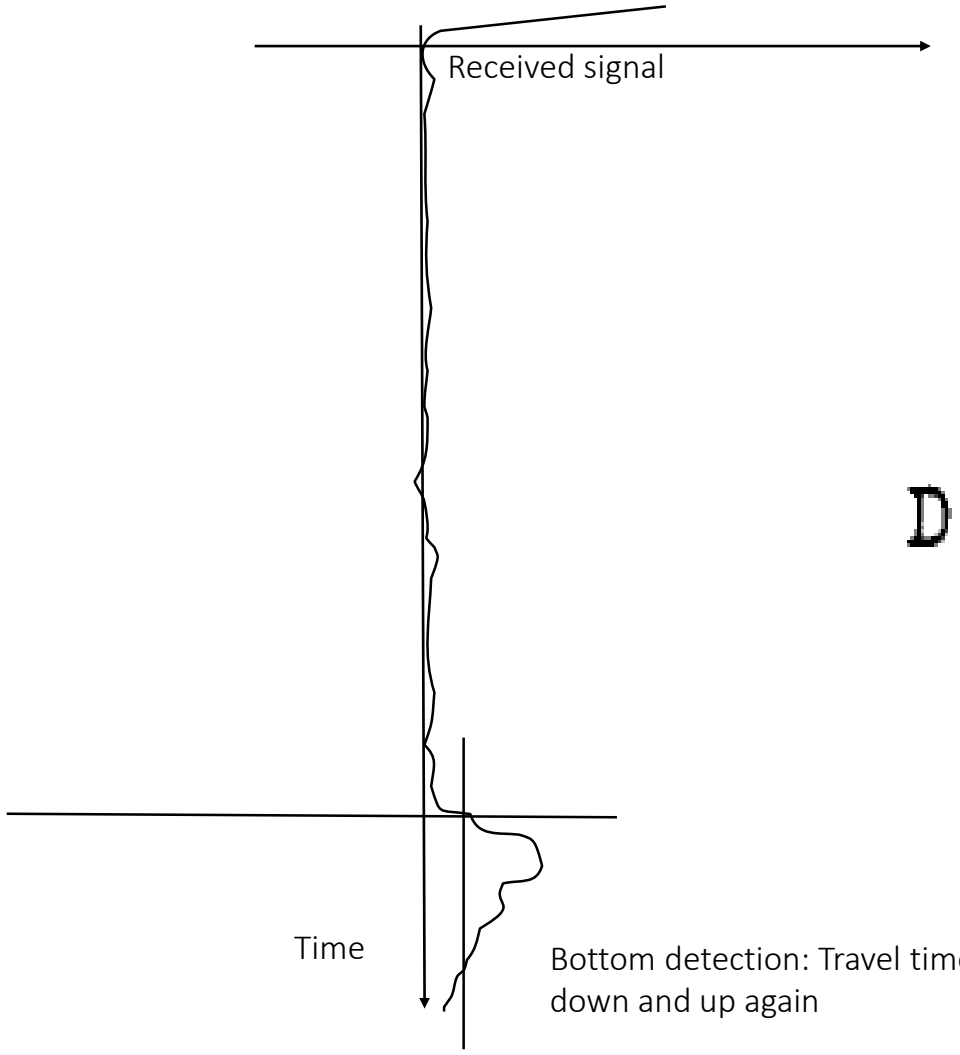
KONGSBERG

Eco-Detección



Reflexión de Fondo





$$D = \frac{1}{2} c \Delta t$$

Bottom detection: Travel time T down and up again

FORMACIÓN DEL ECO

KONGSBERG

Dirección de emisión del Pulso de Sonido

Ángulo de Incidencia

Plano Vertical

Reflexión

Dispersión

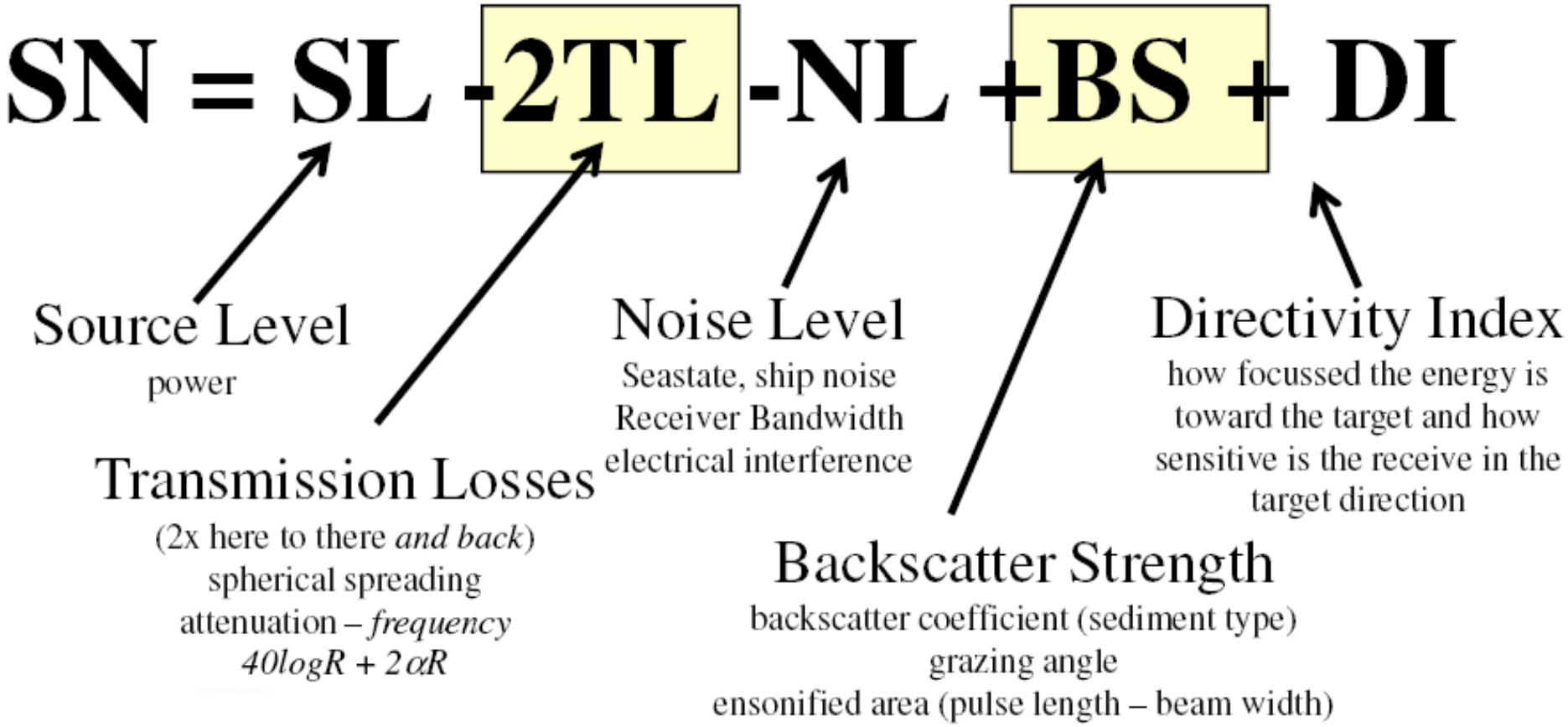
Transmisión

Piso Oceánico

Aplicación de la Ley de Snell, en principios acústicos

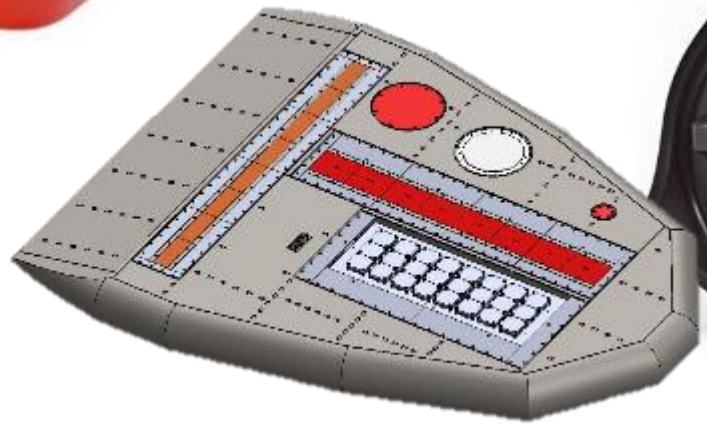
Rendimiento en alcance: La Ecuación del Sonar

Para trabajar eficazmente el eco proveniente de un objetivo distante debe ser lo suficientemente **MÁS** fuerte que el nivel de ruido en el ambiente: **La Proporción Entre la Señal y el Ruido** *(The Signal-to-Noise ratio – S/N)*



Ocean Mapping Group
University of New Brunswick
CANADA

Transducers



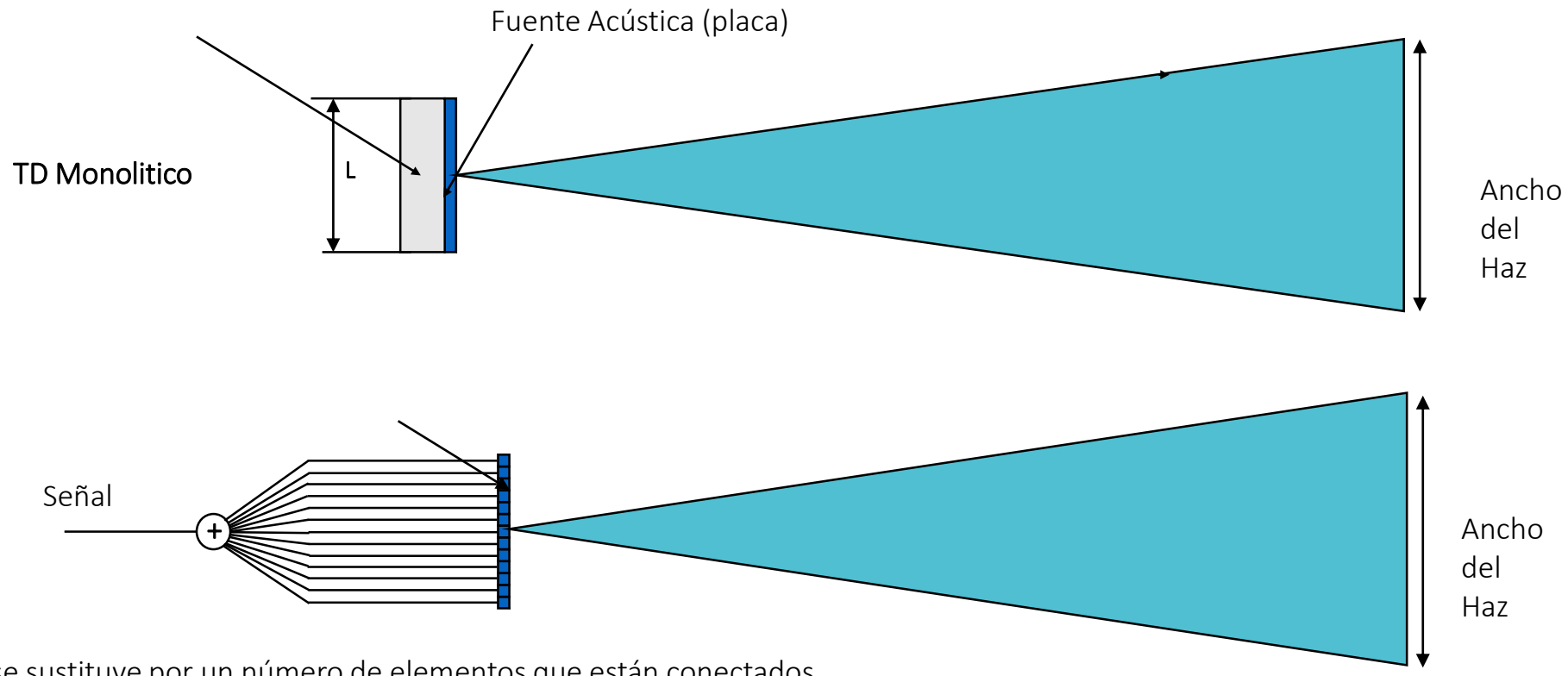
Tanque de pruebas de las ecosondas

Se realizan pruebas de:
- Impedancia
- Directividad de los haces y lóbulos laterales
- Sensibilidad del Receptor
- Eficiencia

Cada transductor hecho por KONGSBERG se prueba individualmente en tanque de pruebas

El Haz del Transductor

Direccionamiento de los Haces *(Beam Steering)*

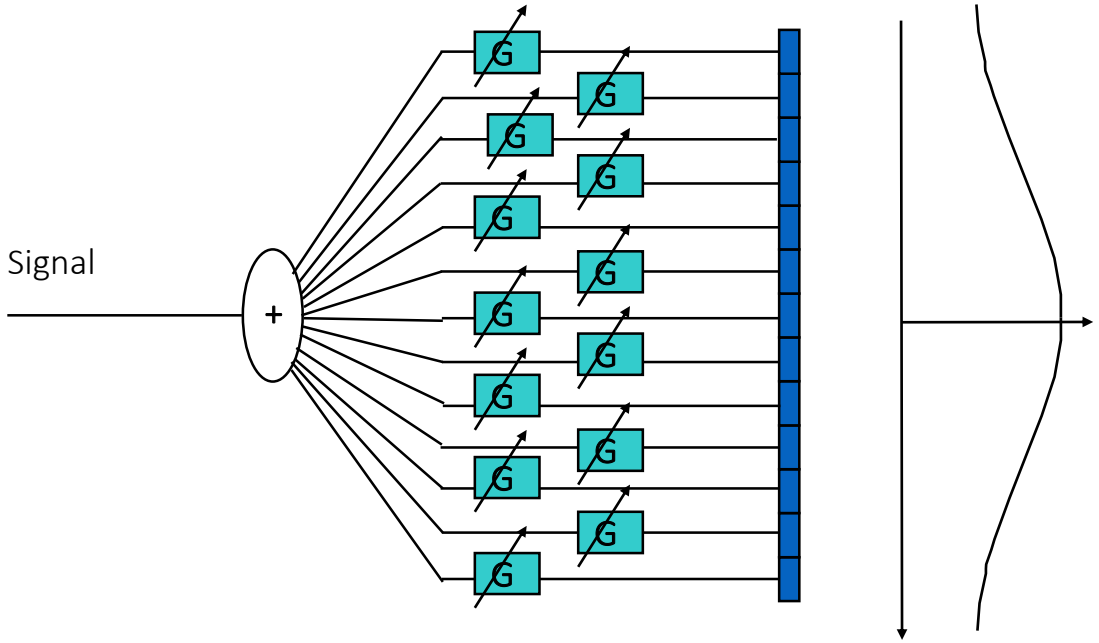


La placa se sustituye por un número de elementos que están conectados.
Esto es necesario para poder hacer el 'Direccionamiento de los Haces'.

El Haz del Transductor

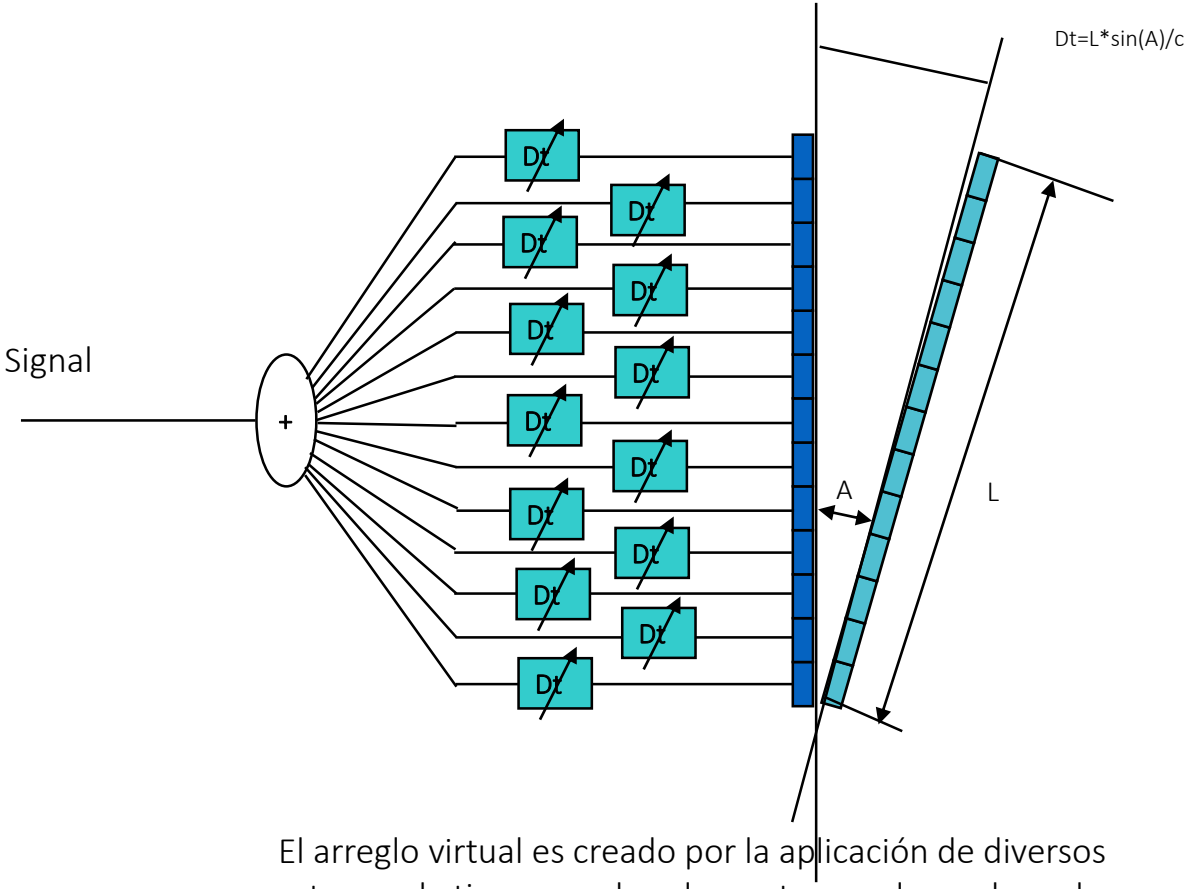
Direccionamiento de los Haces *(Beam Steering)*

Supresión de Lóbulos



Los lóbulos laterales son controlados mediante la aplicación de patrones de ponderación en la sumatoria

Orientación de Haces



El arreglo virtual es creado por la aplicación de diversos retrasos de tiempo en los elementos en el arreglo real

Levantamiento Multihaz vs. Monohaz

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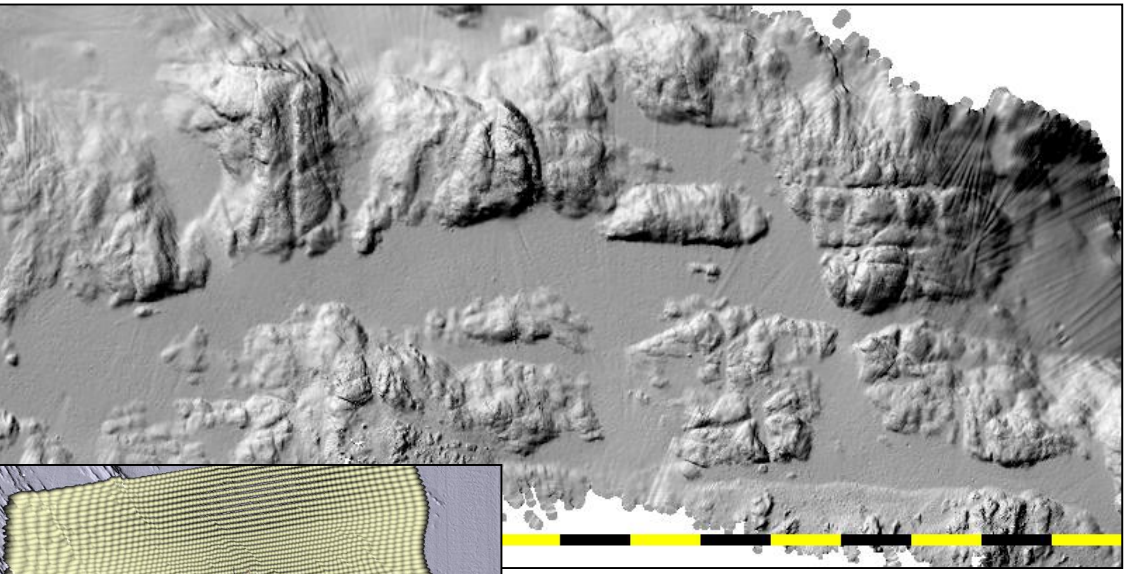
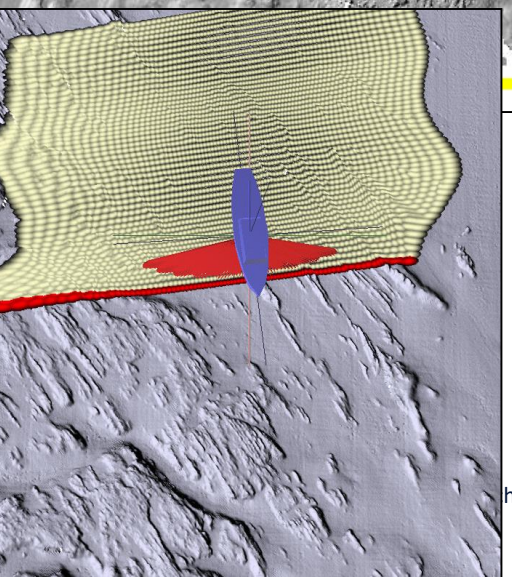
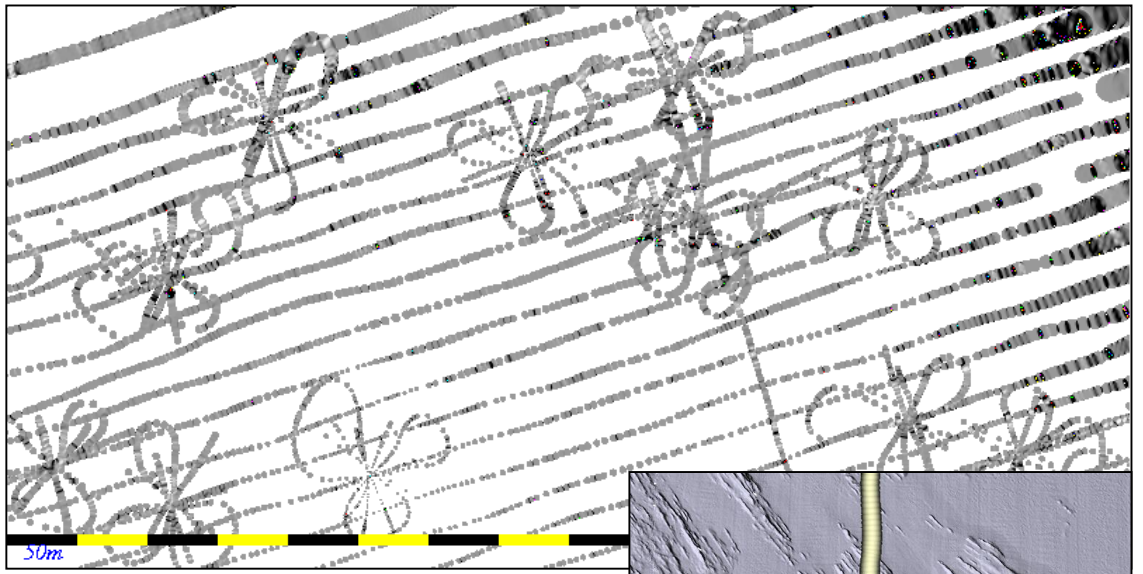
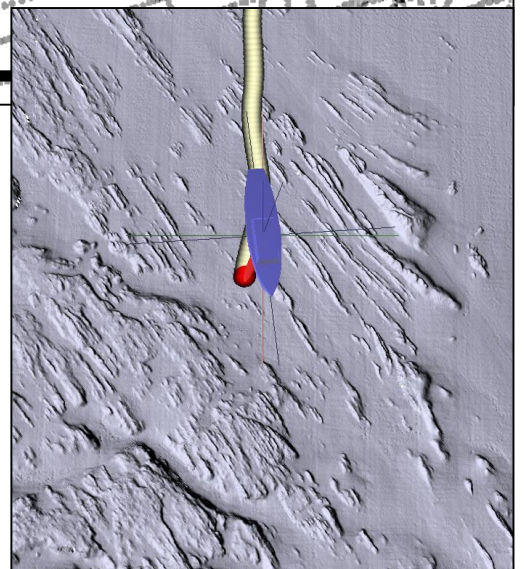
Datos EM3000
200% de cobertura





Monohaz - 10grados
(50m espaciamiento entre líneas)

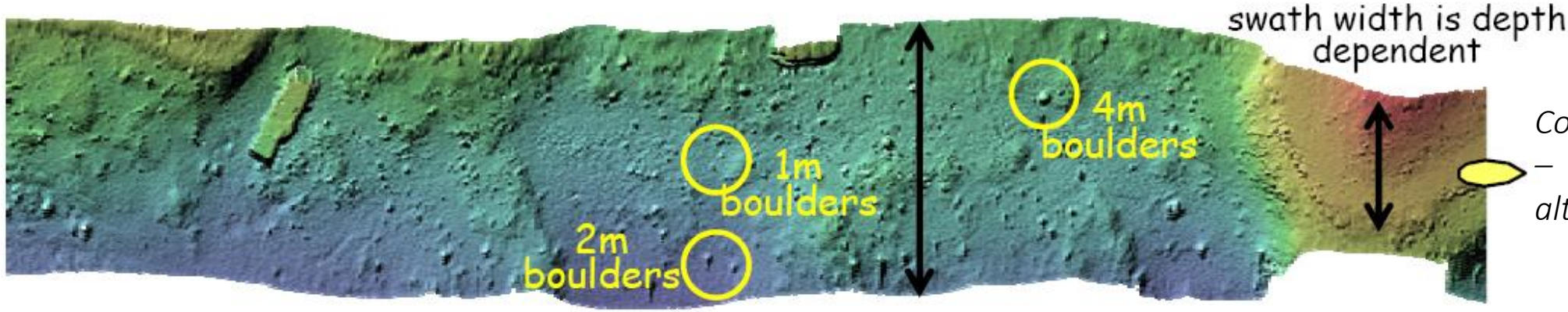




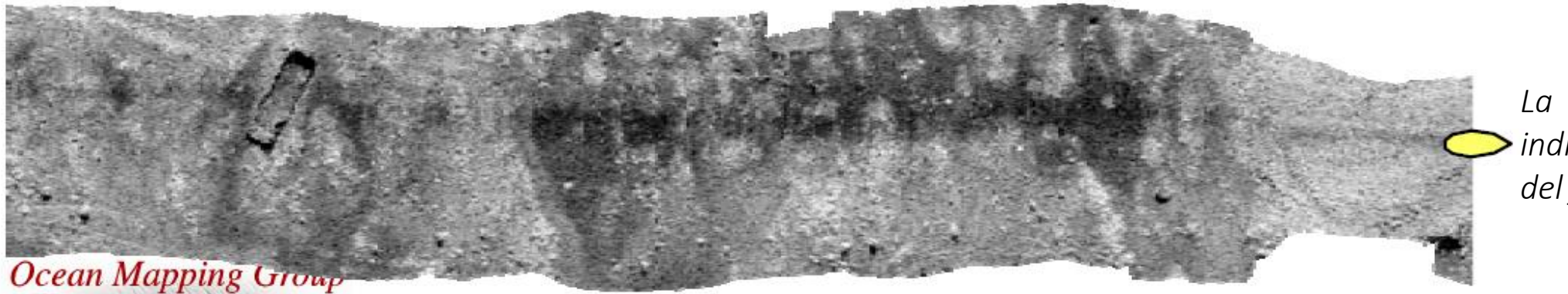
DTM de 0.5m (efecto ilum-solar)
Creado con: Filtro ponderado variable
Considera: - Tamaño del 'footprint' - Confidencia de las sondas

¿Qué productos genera un sonar multihaz?

1. 100% de cobertura batimétrica
2. La detección de objetivos
3. Distribución de sedimentos
4. Datos de la columna de agua

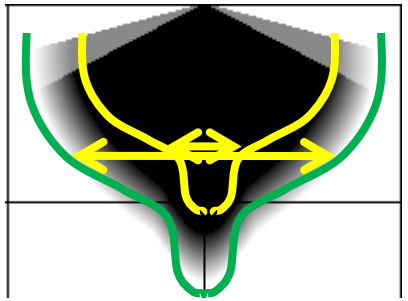


Corredor de profundidad – datos batimétricos de alta resolución



La intensidad del eco - indica el tipo de sedimento del fondo marino

Relación en Tipo de Pulsos



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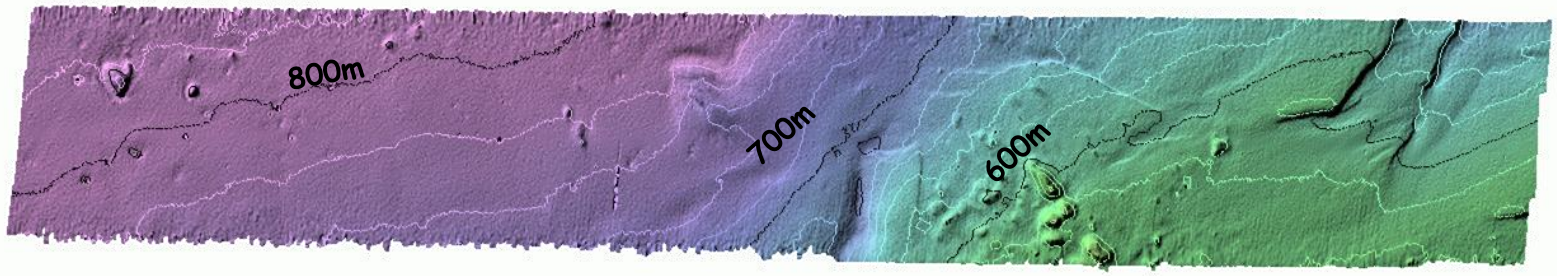
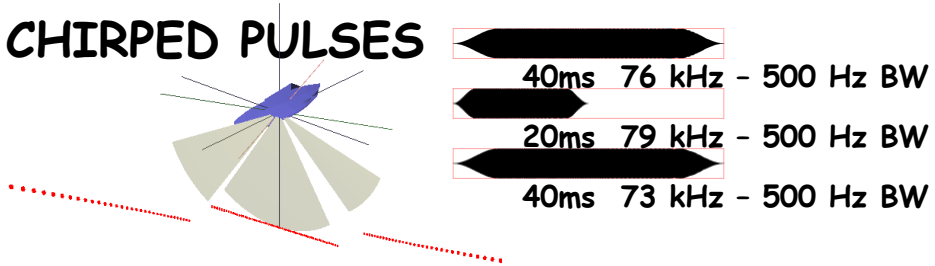
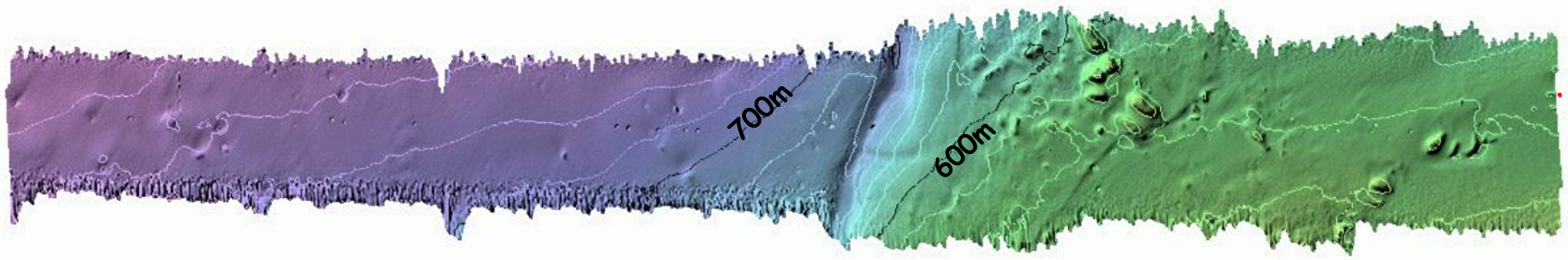
DUTY CYCLE LIMITATION:
CW – dual swath
Chirp – single swath

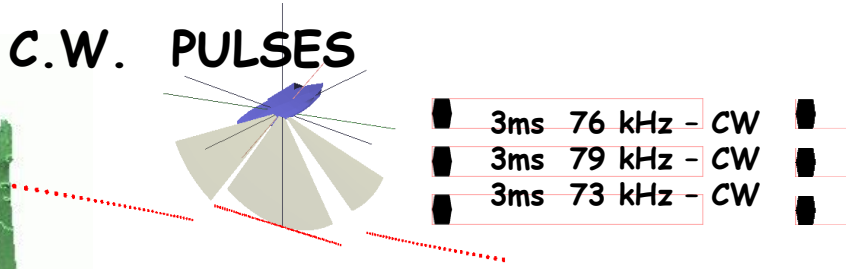


CHIRPED PULSES





C.W. PULSES



EM710: CW v. Chirp, 600-800m depth

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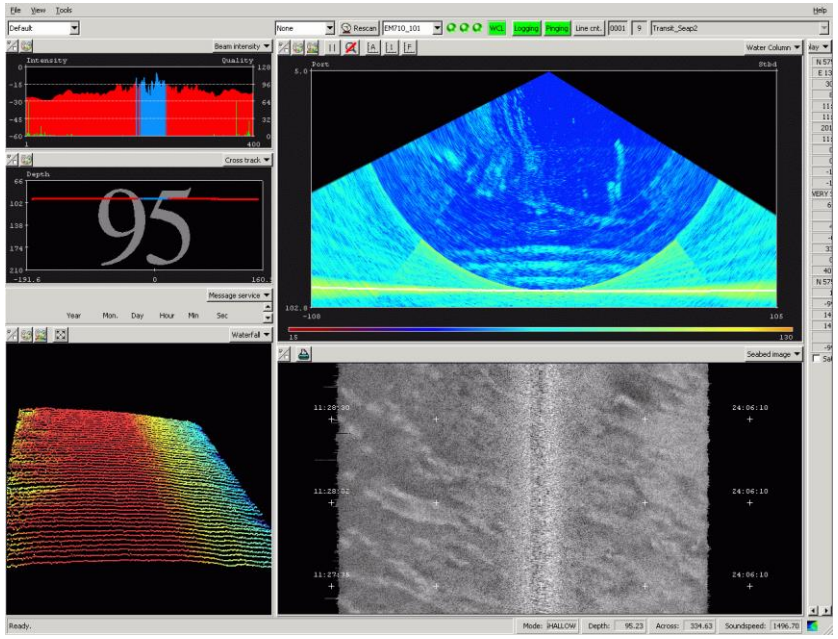
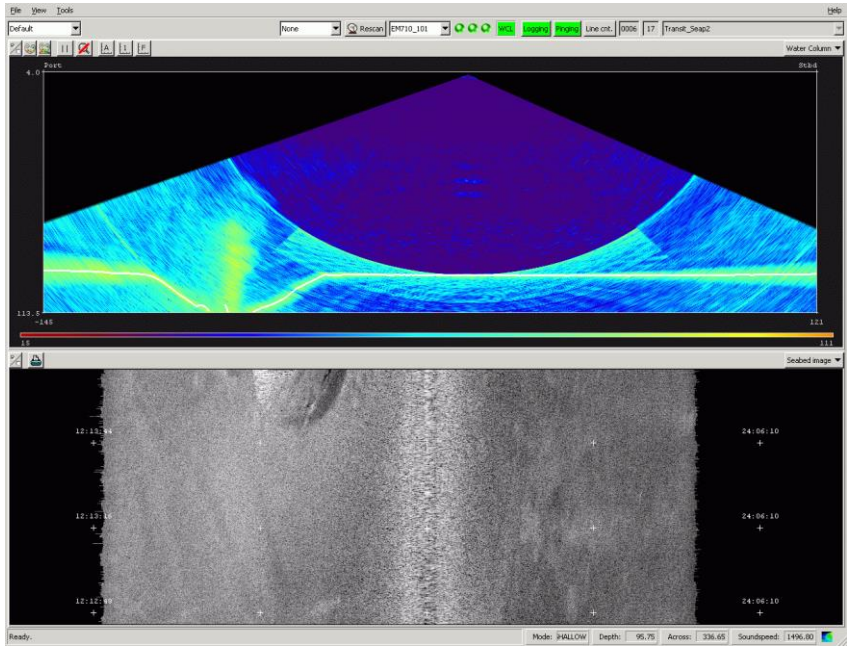
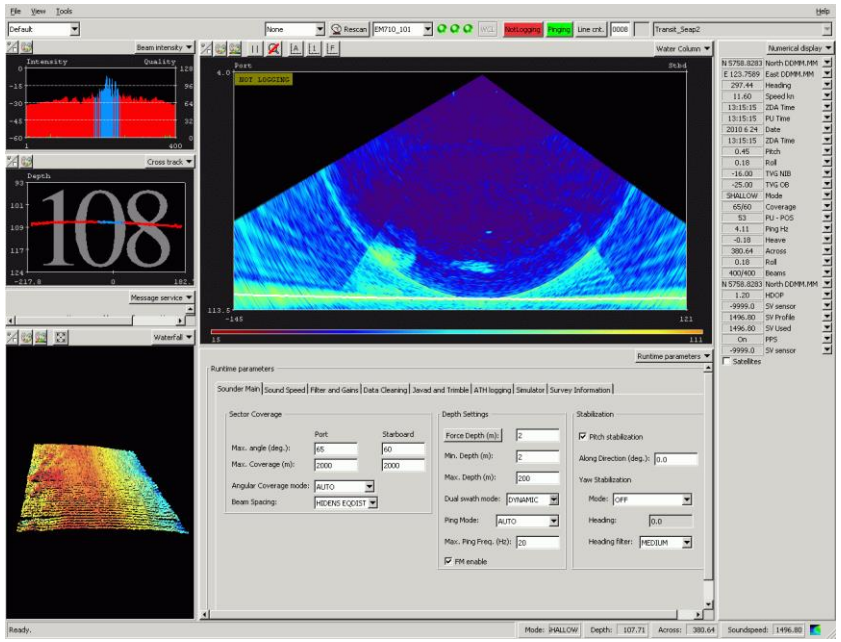
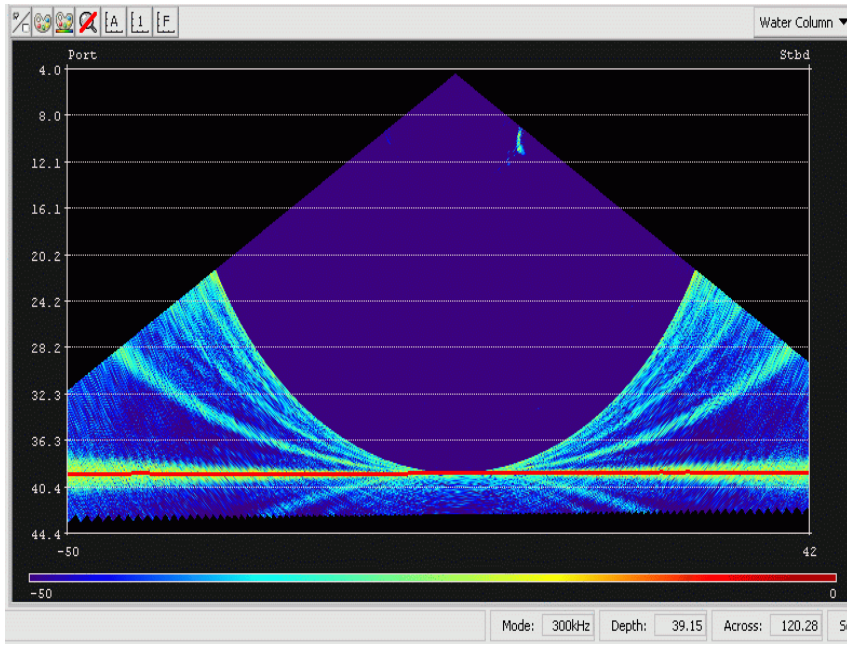
Adquisición de Datos Multihaz

Datos de Columna de Agua



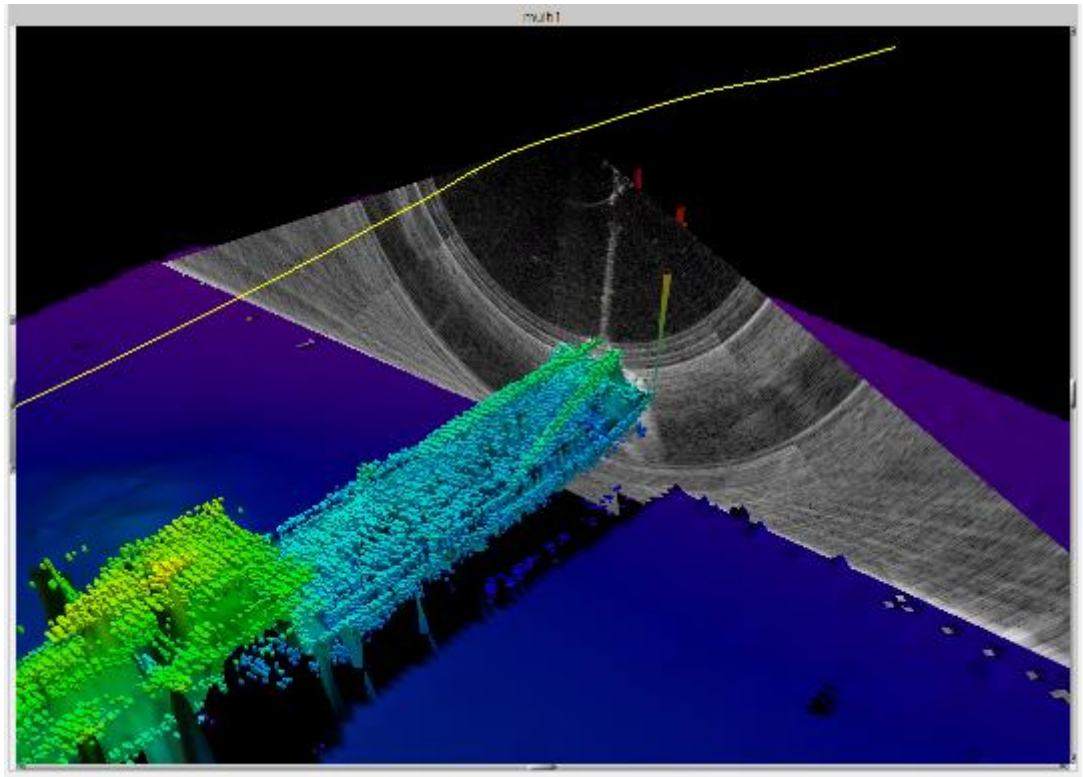




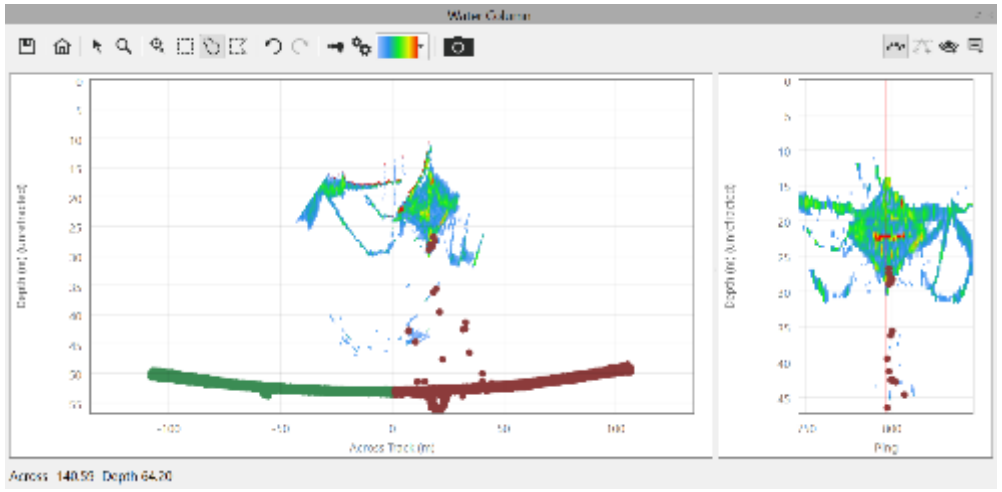


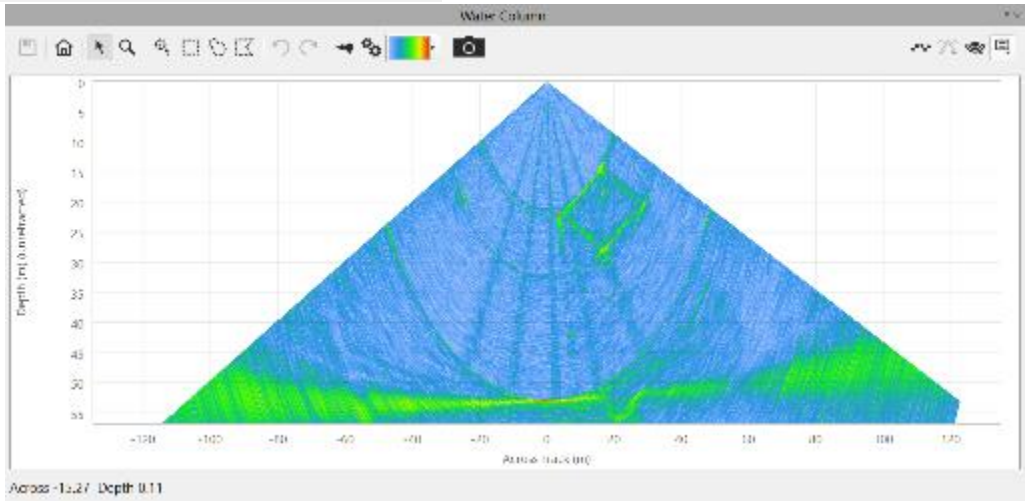
Búsqueda de Objetos en Columna de Agua

Pecios



Quimera





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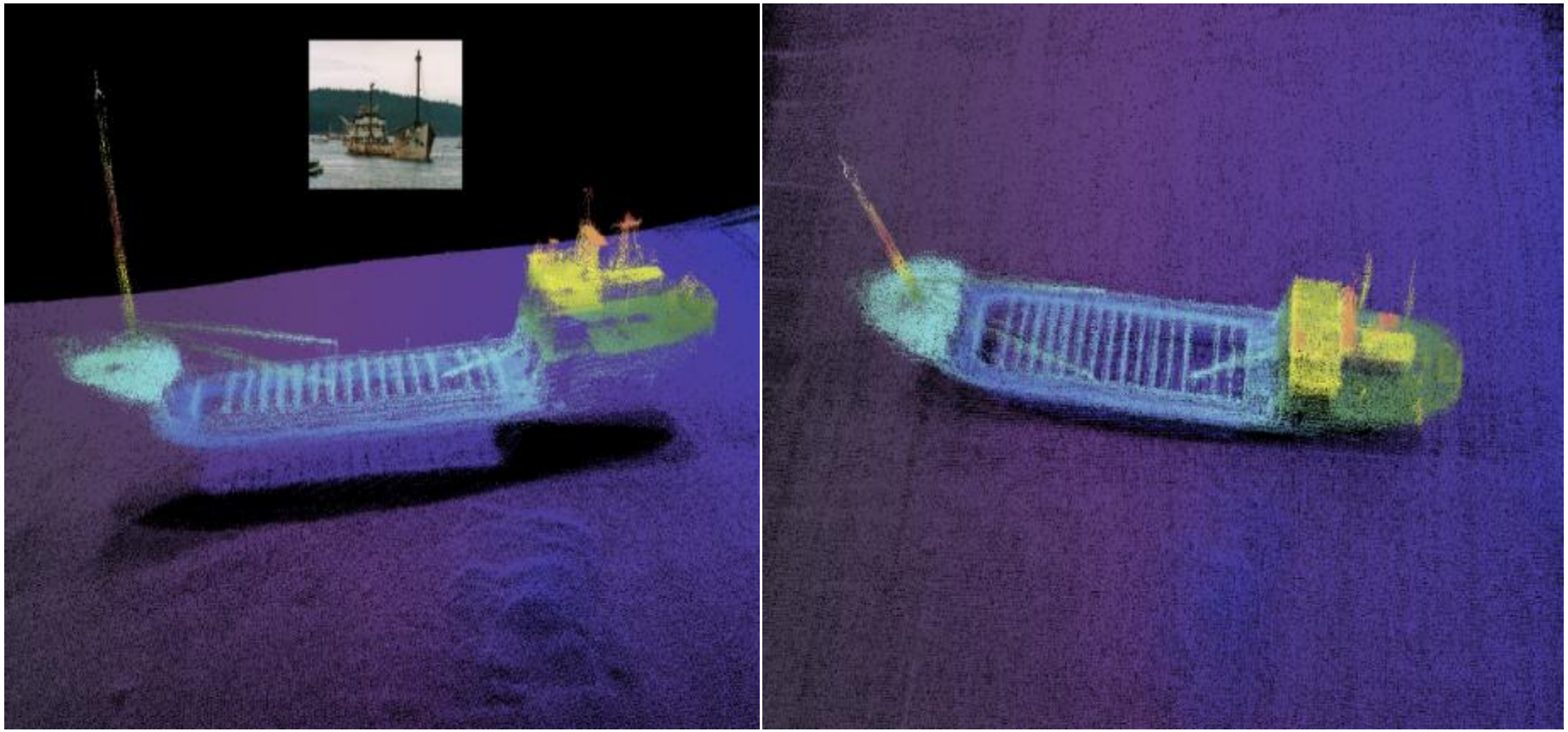
Sunken Ship, EM2040

Búsqueda de Objetos en Columna de Agua

Pecios



QPS

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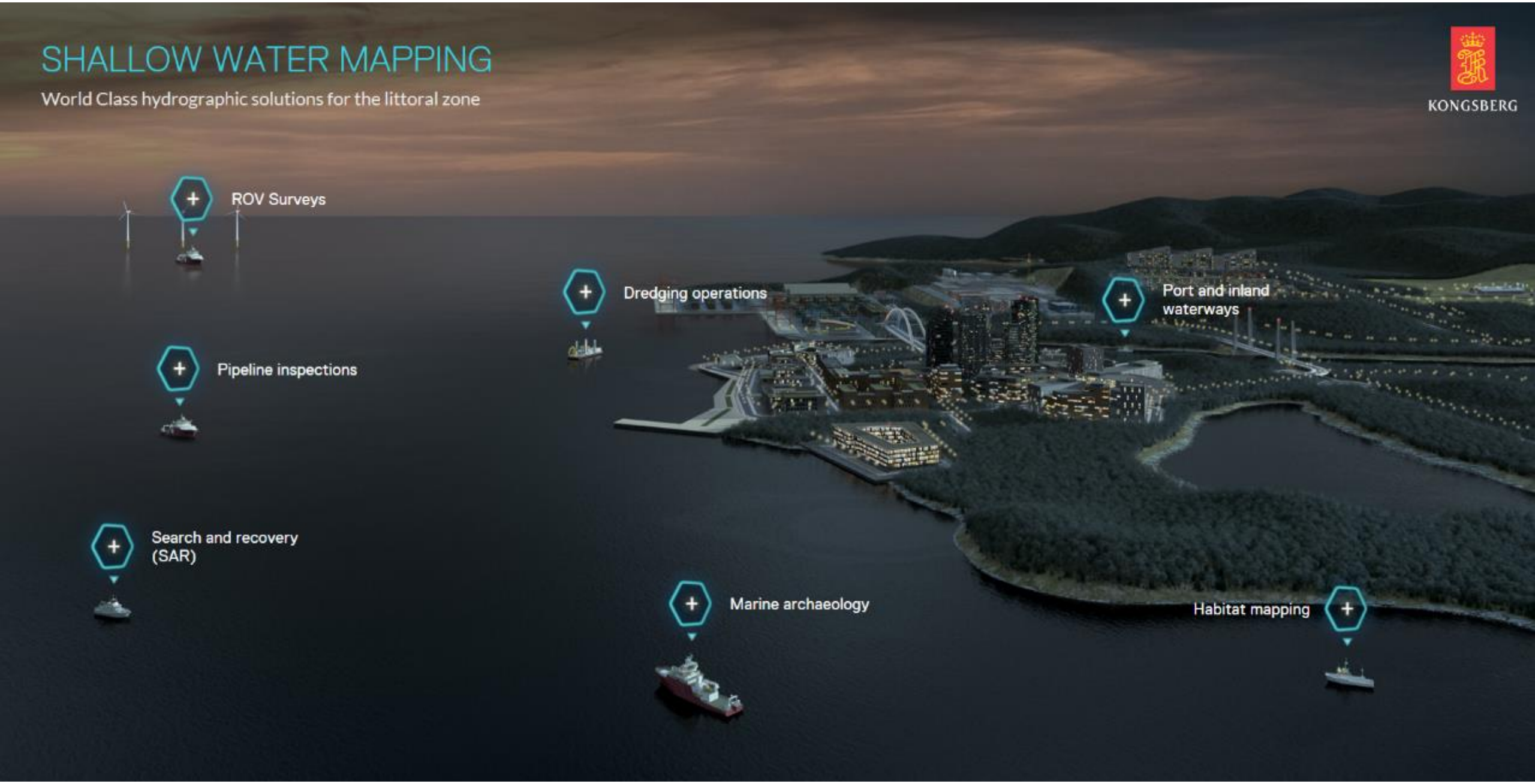
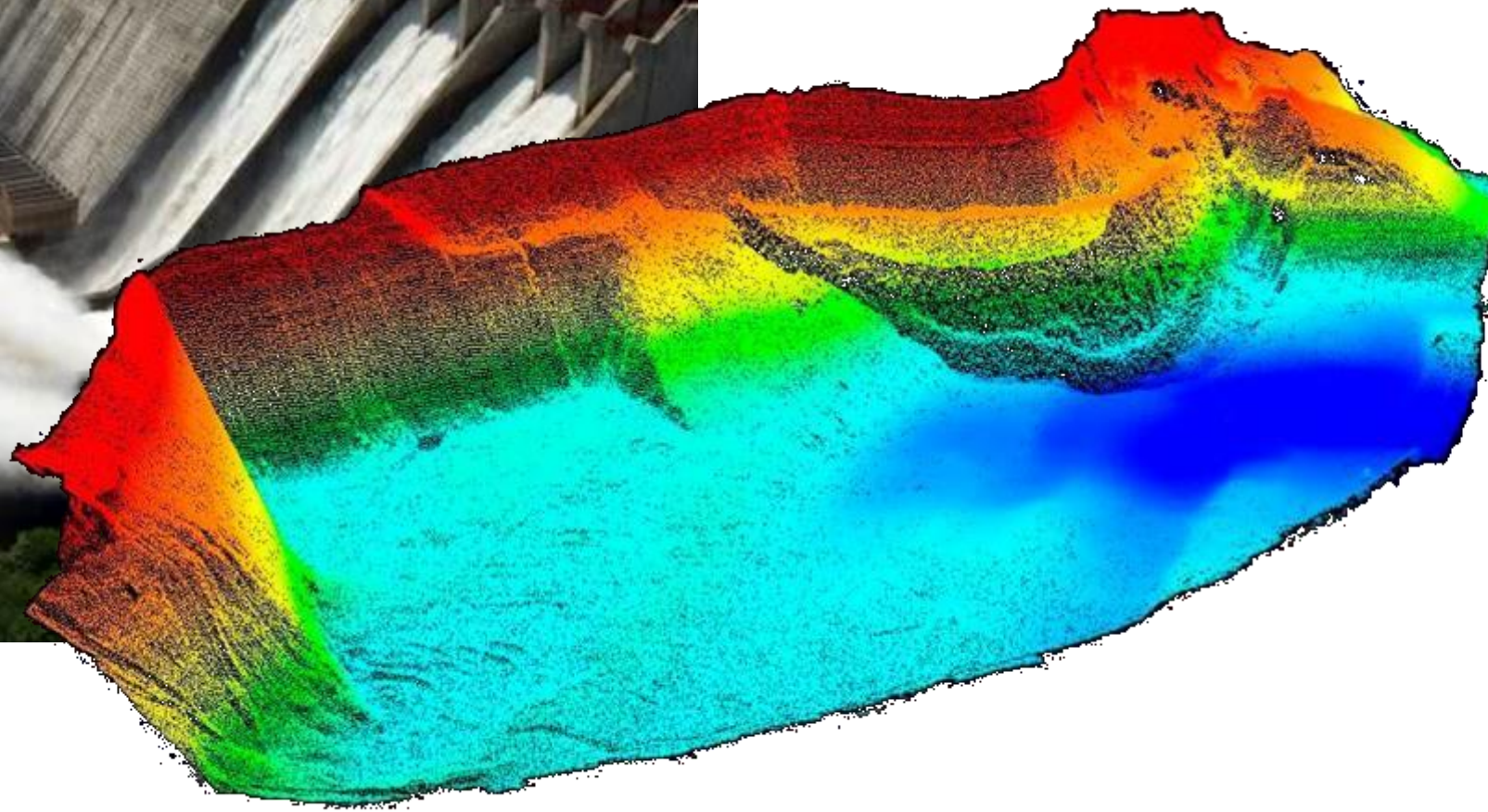
Una Herramienta para cada necesidad

SHALLOW WATER MAPPING

World Class hydrographic solutions for the littoral zone



Lagos, Embalses y Centrales Hidroeléctrica



Recreativo

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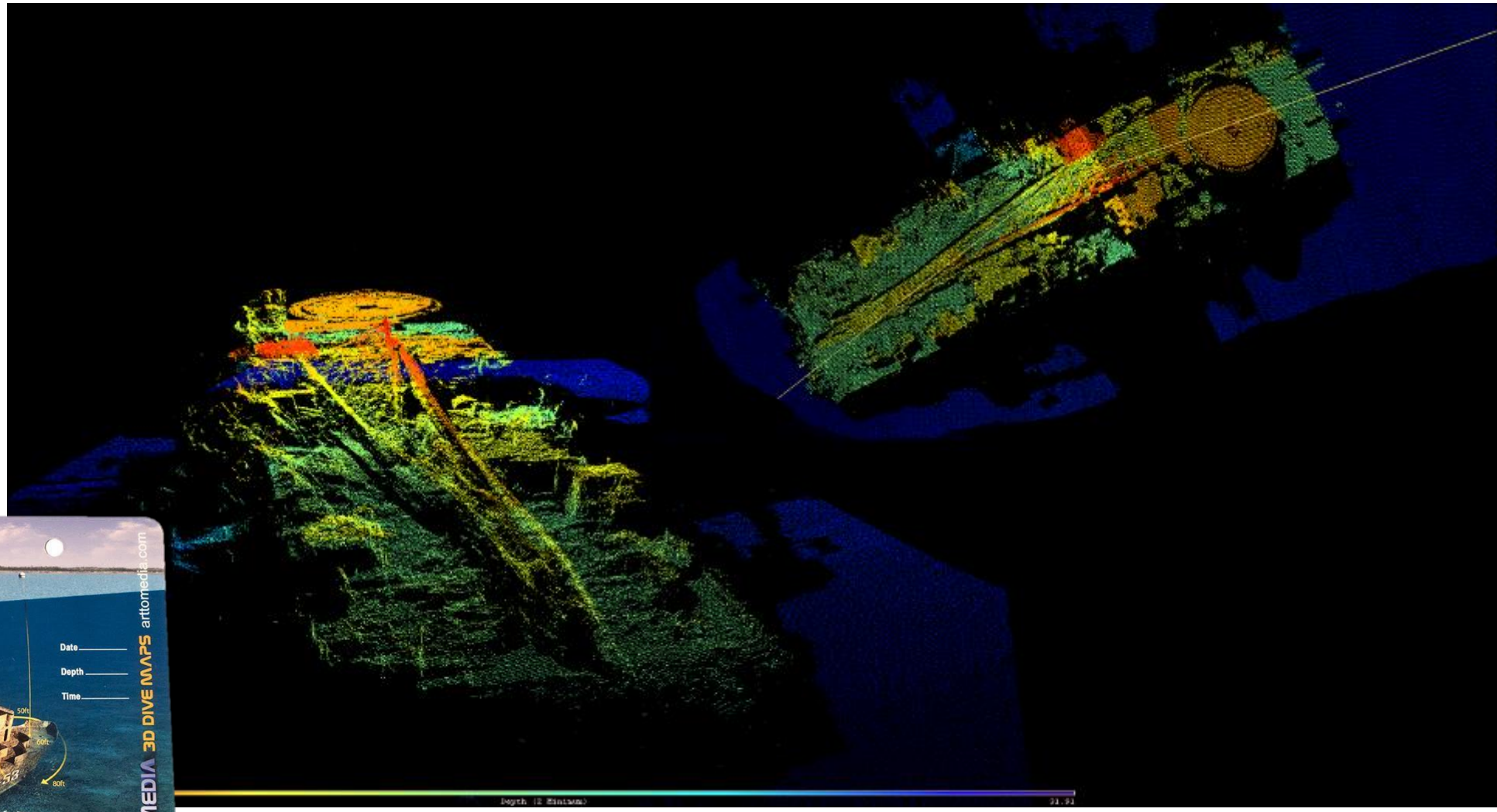
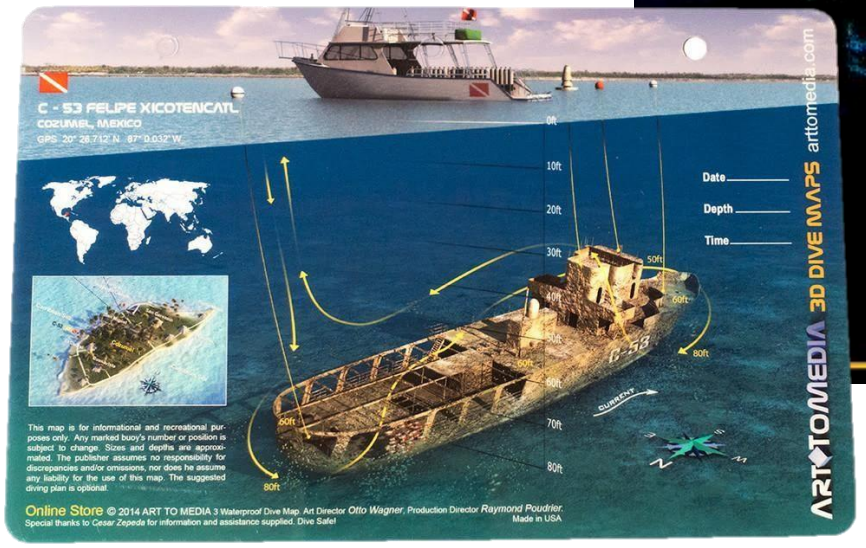
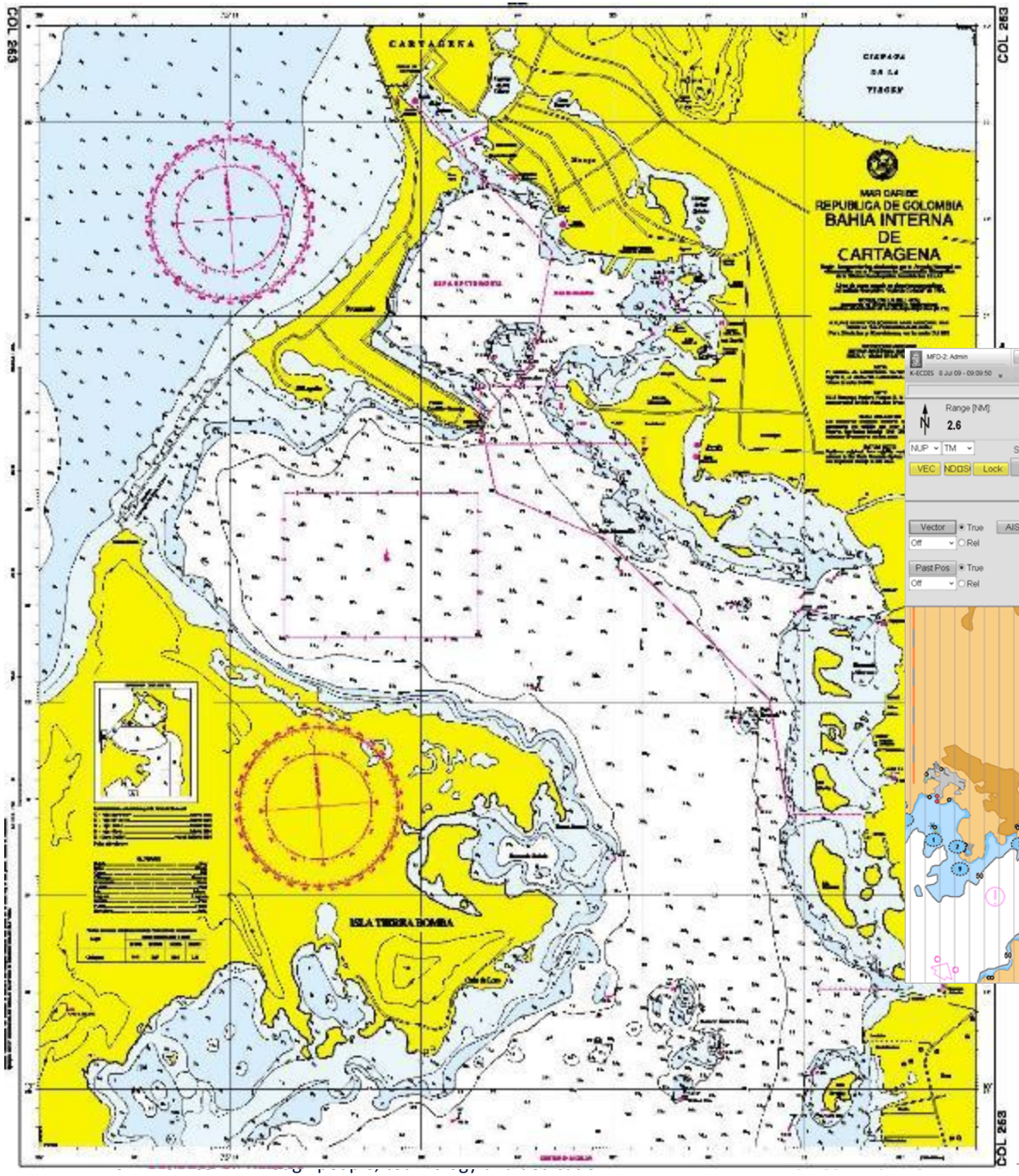
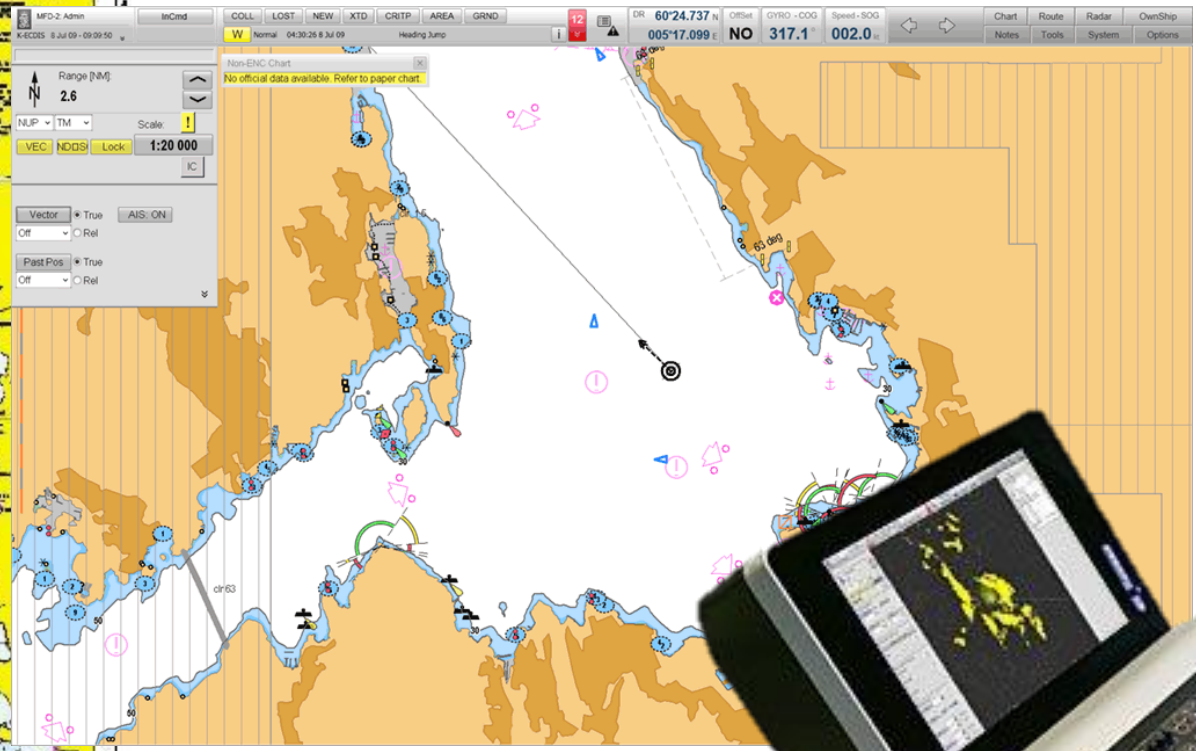




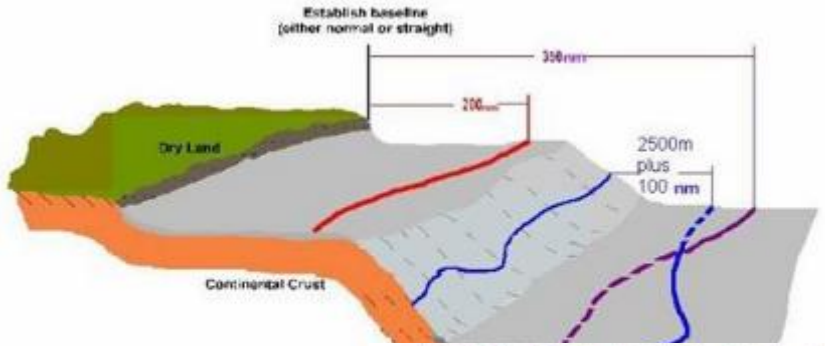
Cartas Náuticas
Hidrografía

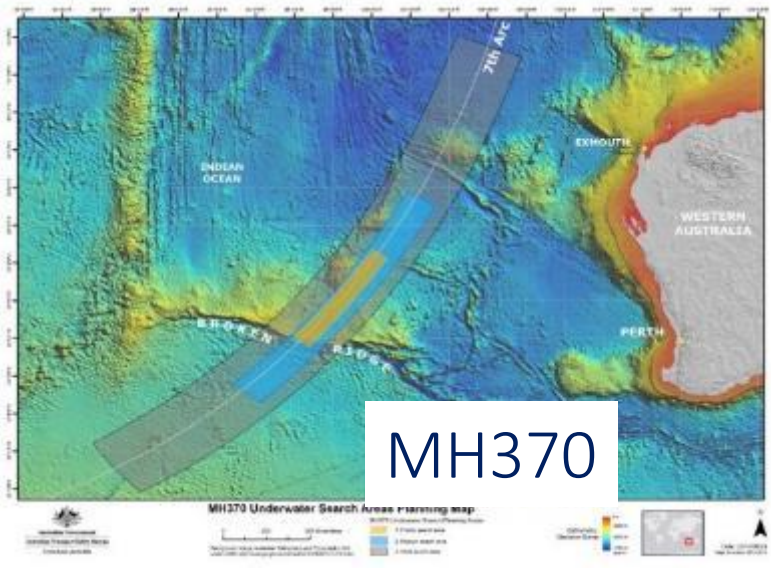




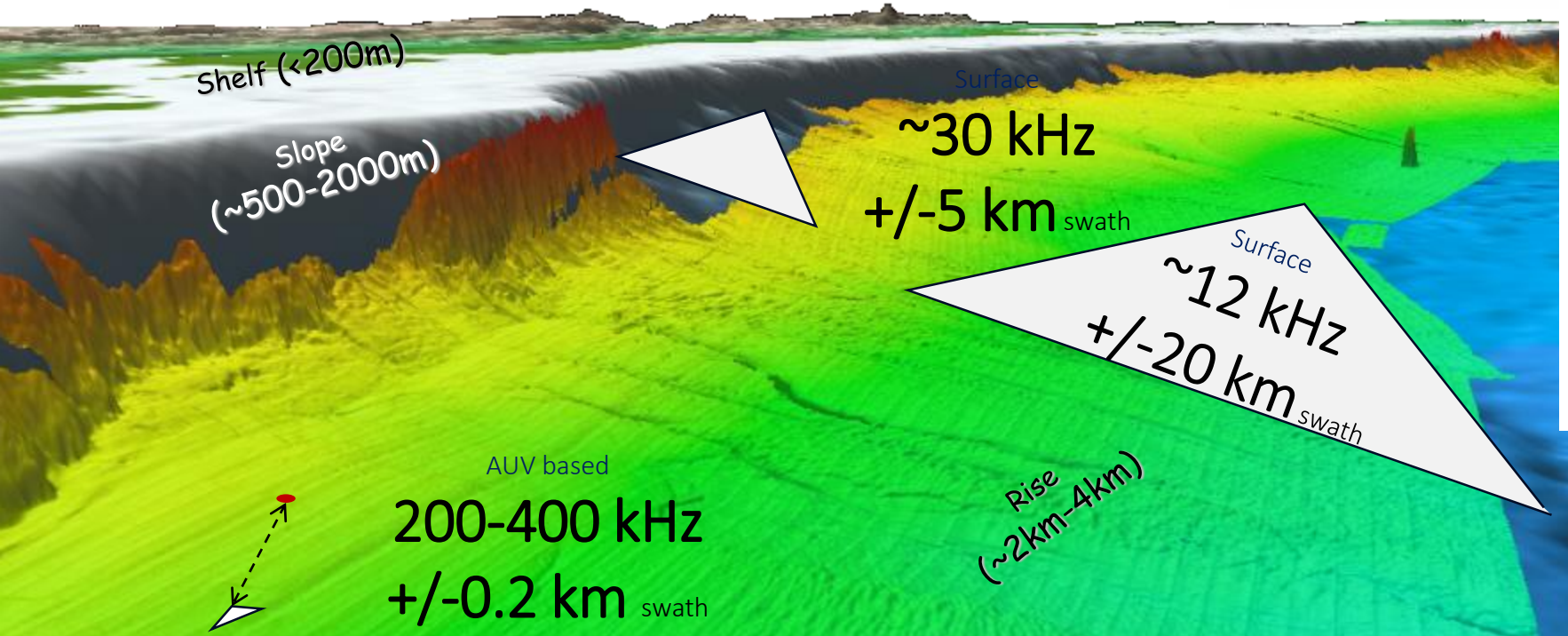
Aplicaciones Aguas Profundas

- Ley de Mar
- Búsqueda de Hidrocarburos
- Emanaciones de gas
- Investigaciones académicas de tectónica
- Rutas para cables y tuberías
- Búsqueda y rescate





MH370



Abyssal Plains (4km+)

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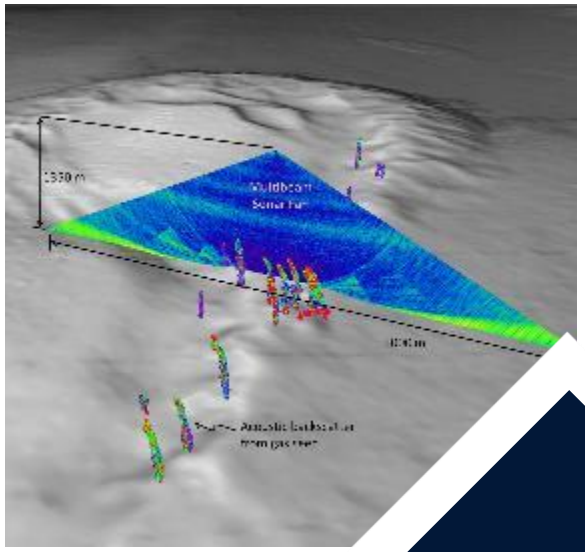
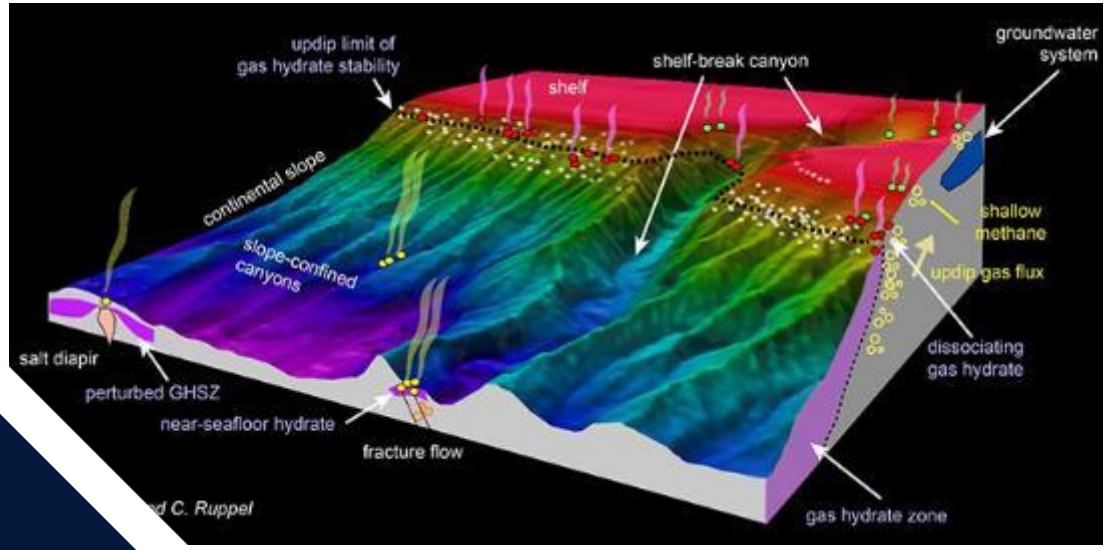
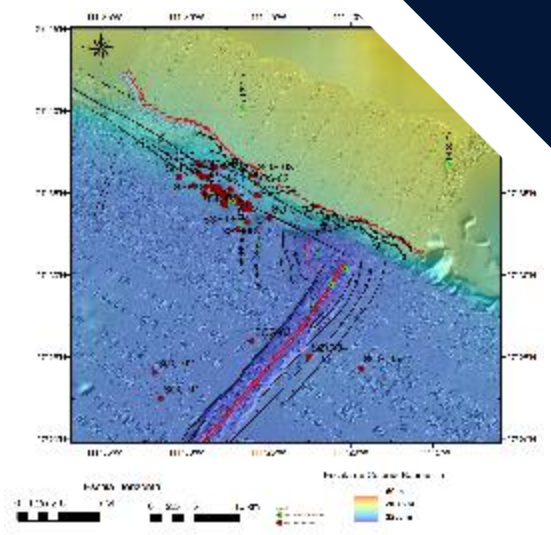
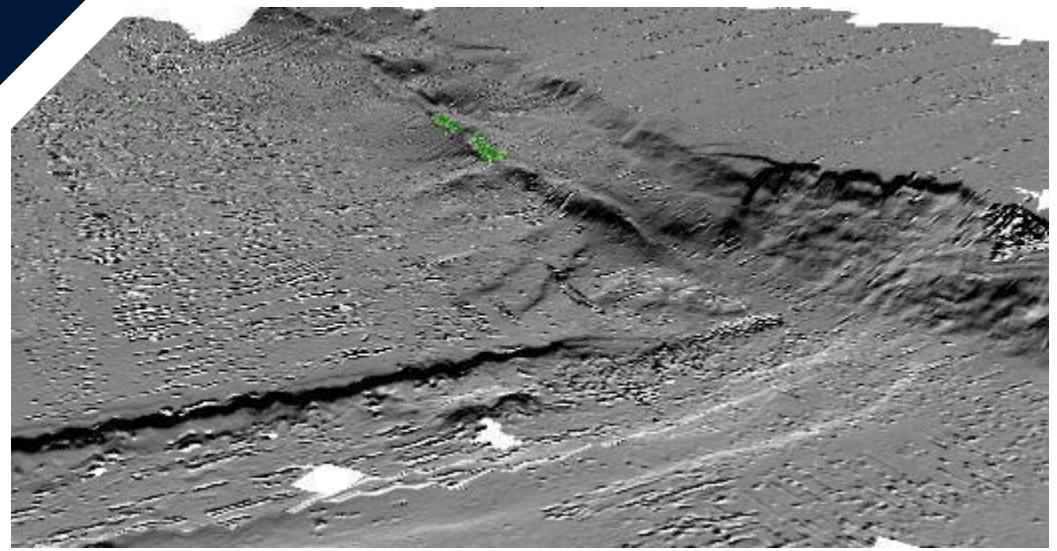
Investigaciones Multidisciplinarias

Hidratos de Metano y Emanación de Fluidos

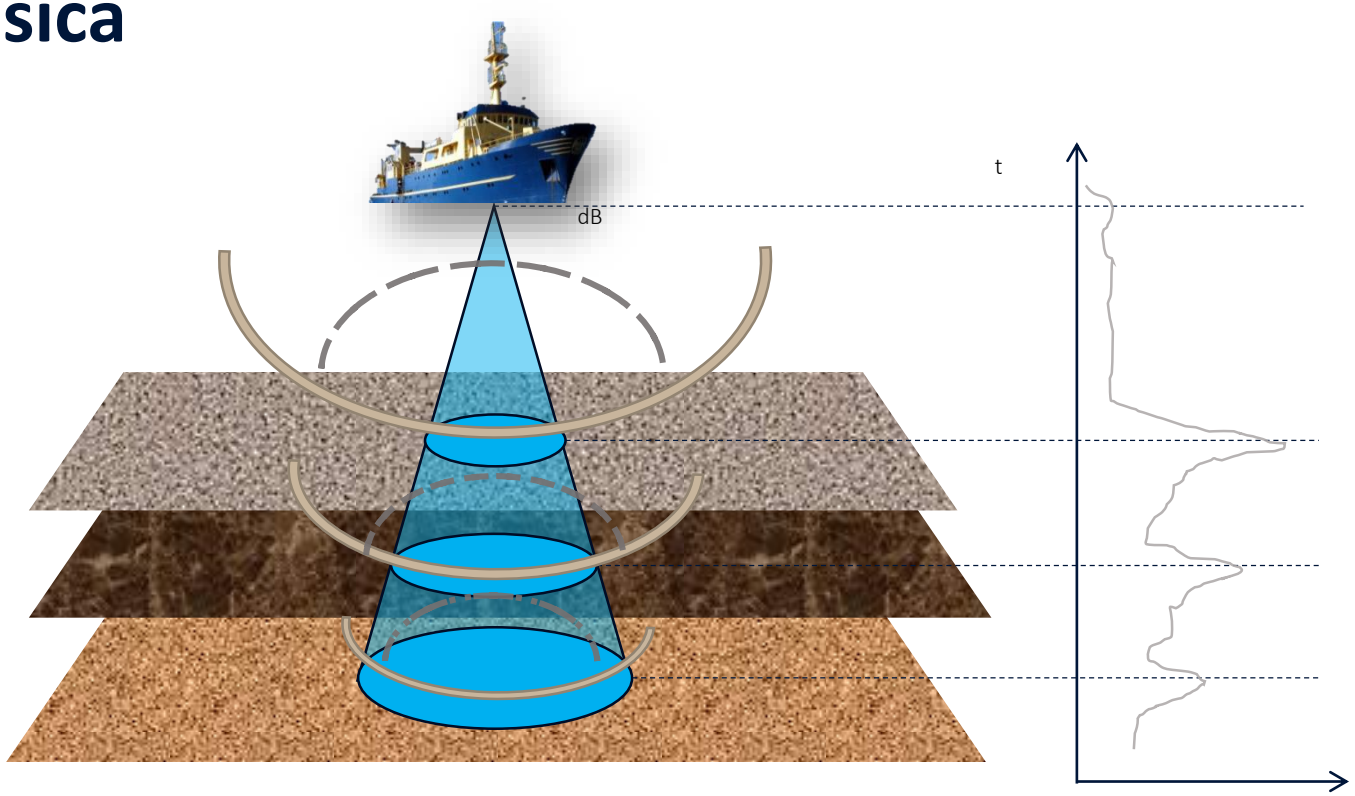


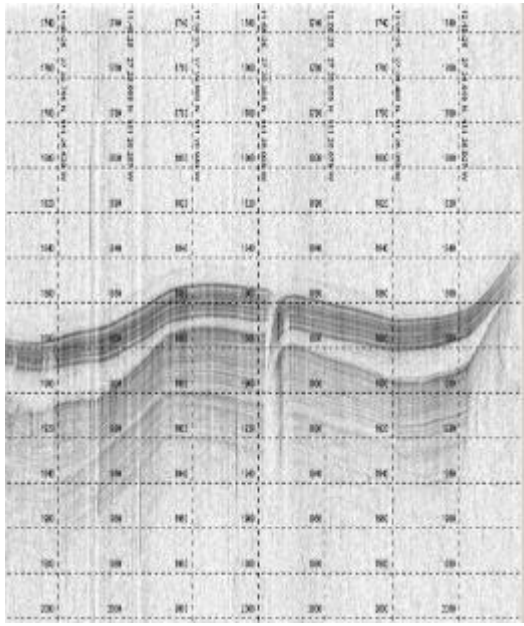






Aplicaciones Geofísica





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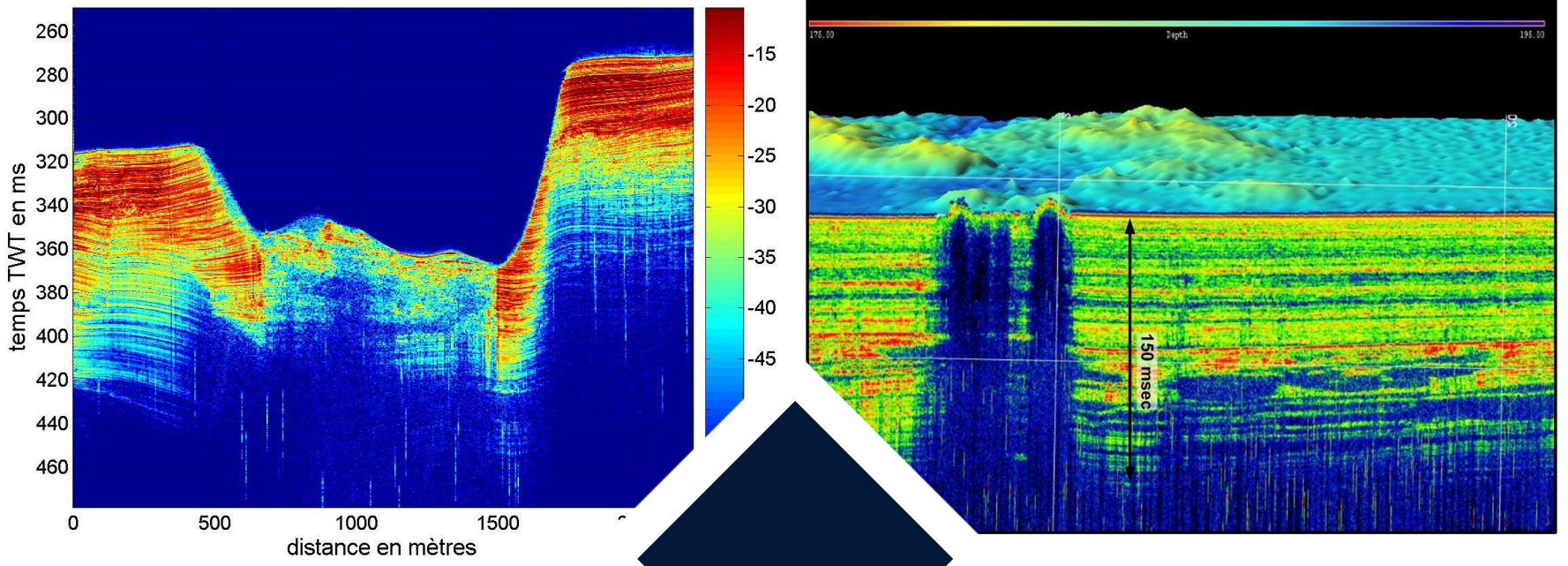
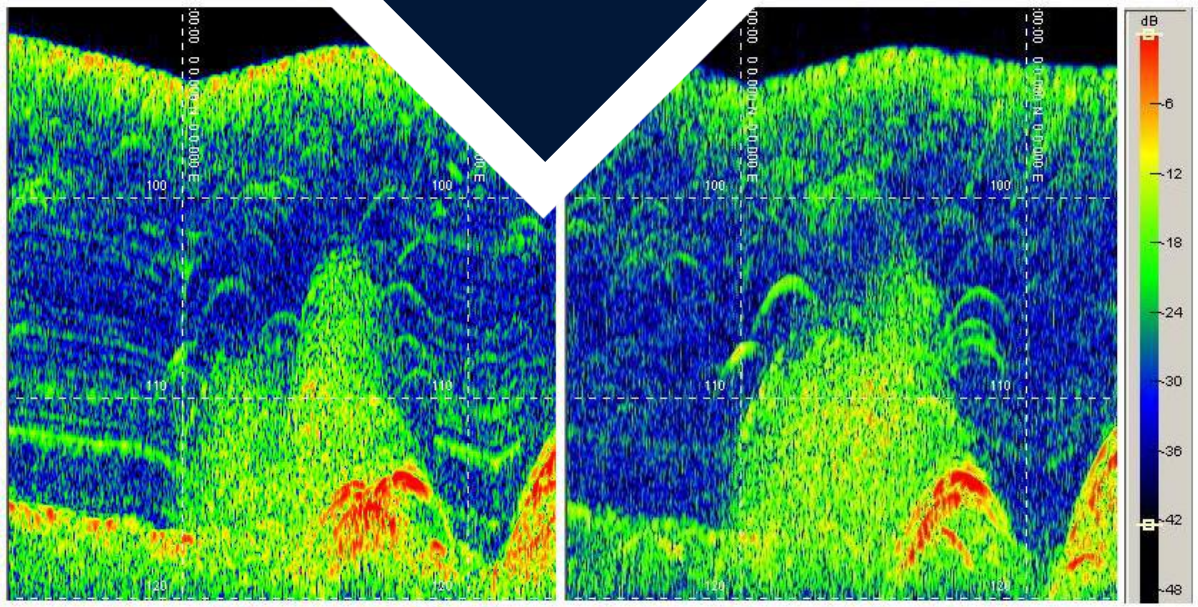
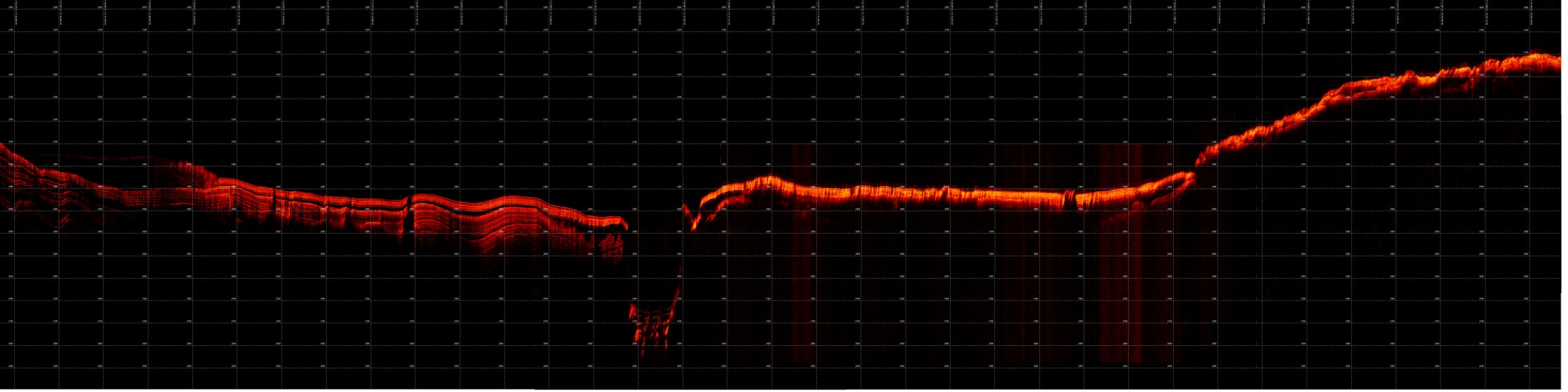
Aplicaciones Geofísica

TOPAS / SBP / GeoPulse

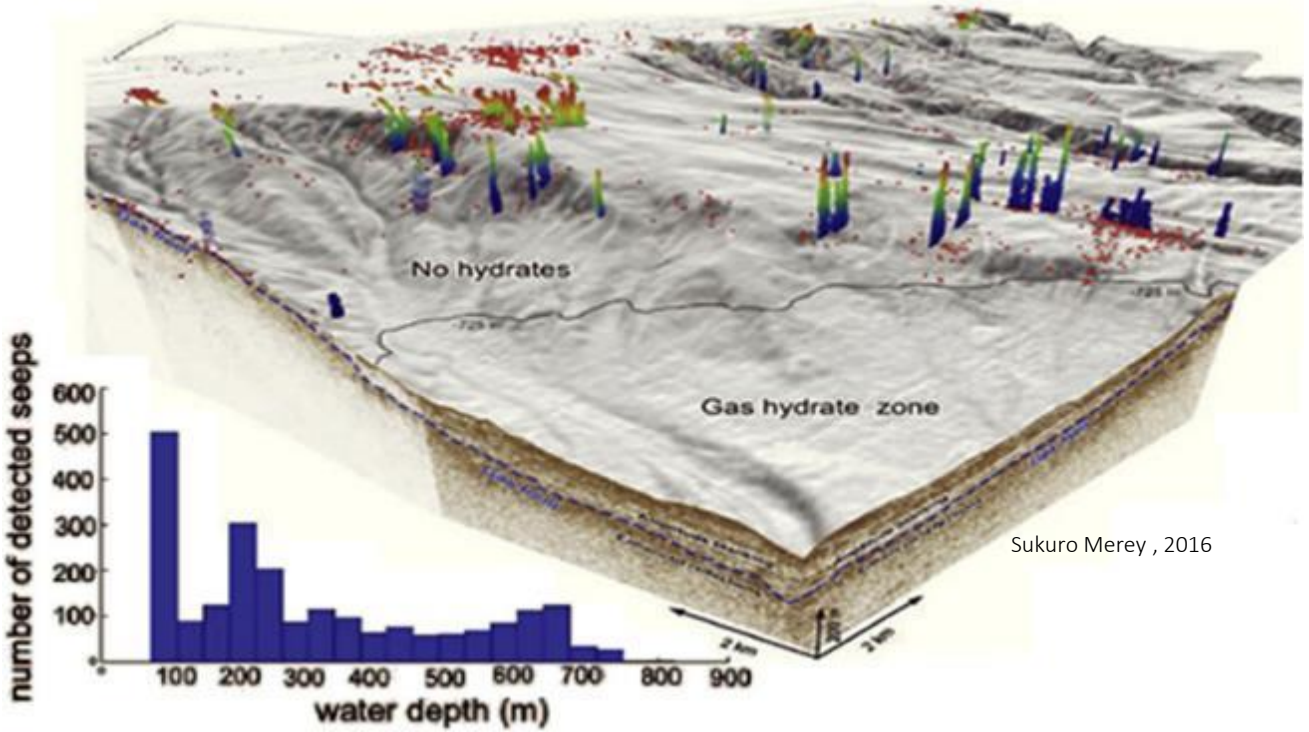






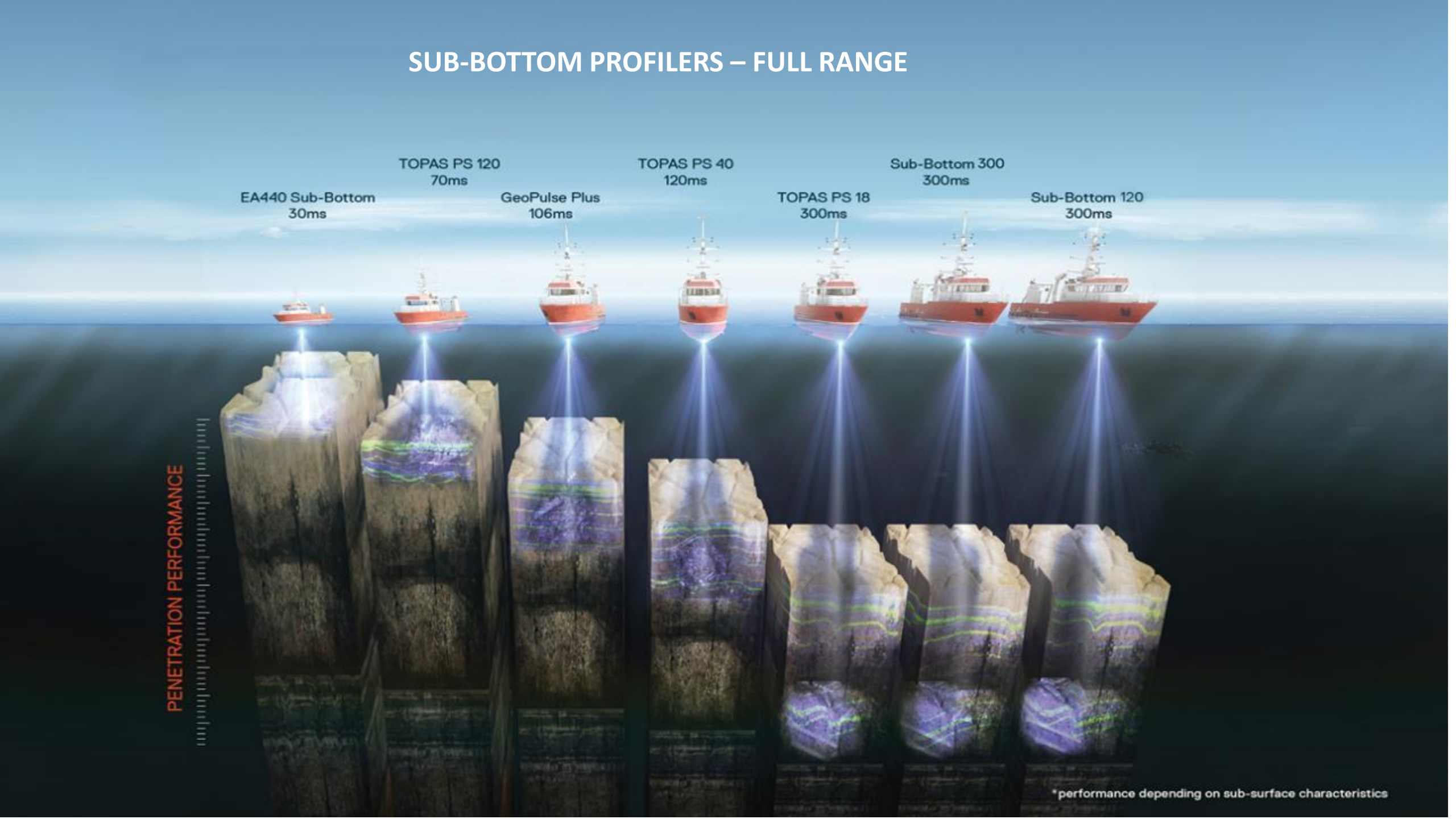
Aplicaciones Geofísica

TOPAS / SBP / GeoPulse



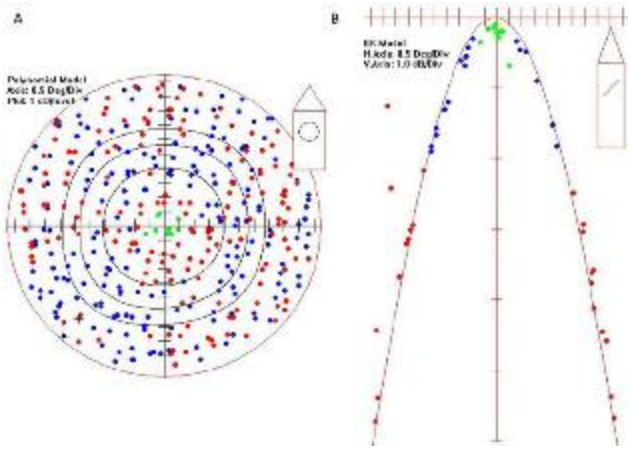
Sukuro Merey , 2016

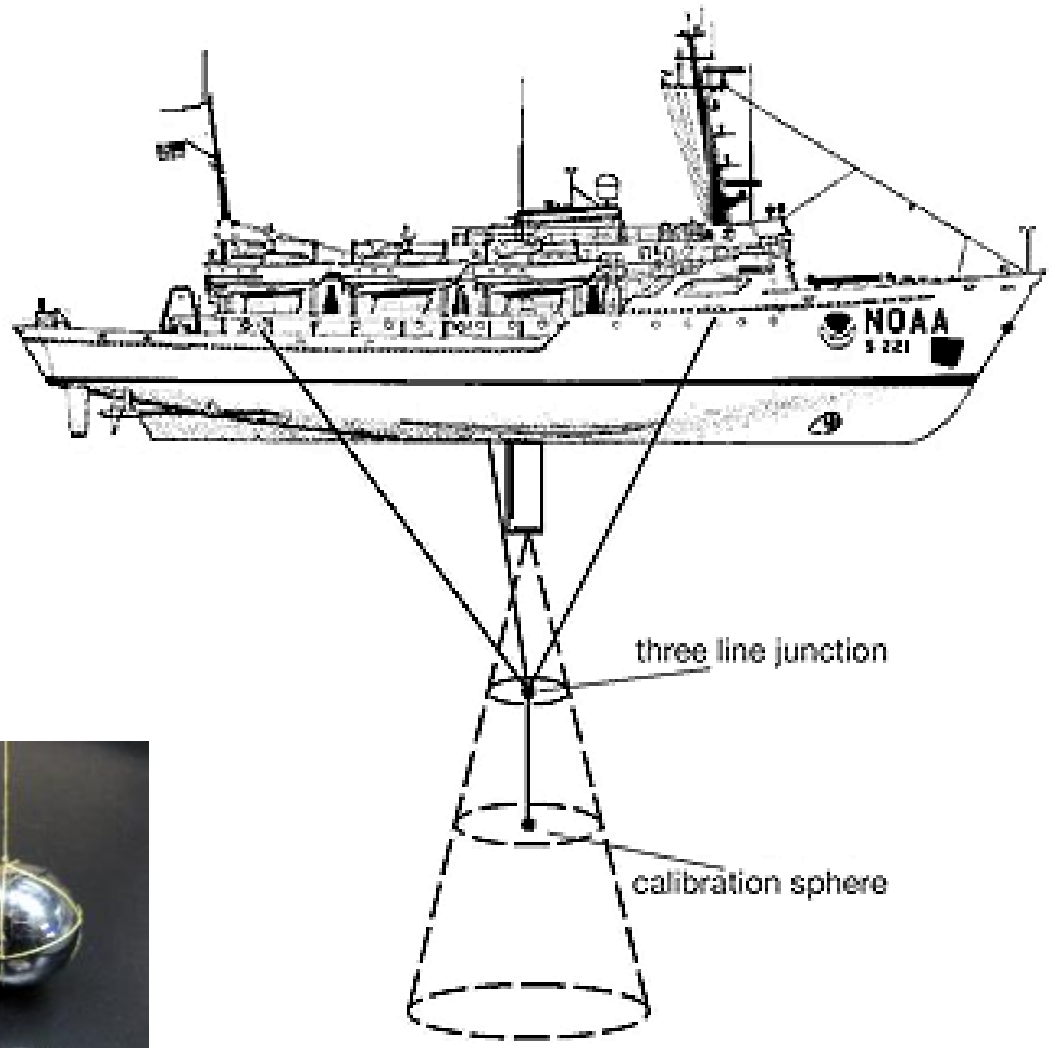
SUB-BOTTOM PROFILERS – FULL RANGE



Calibración de Datos

Sistema EK80 y EK60





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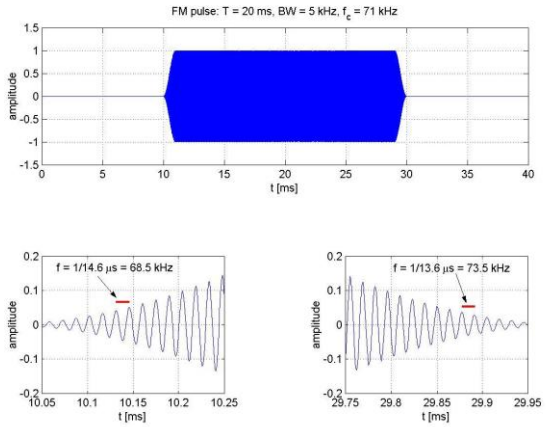
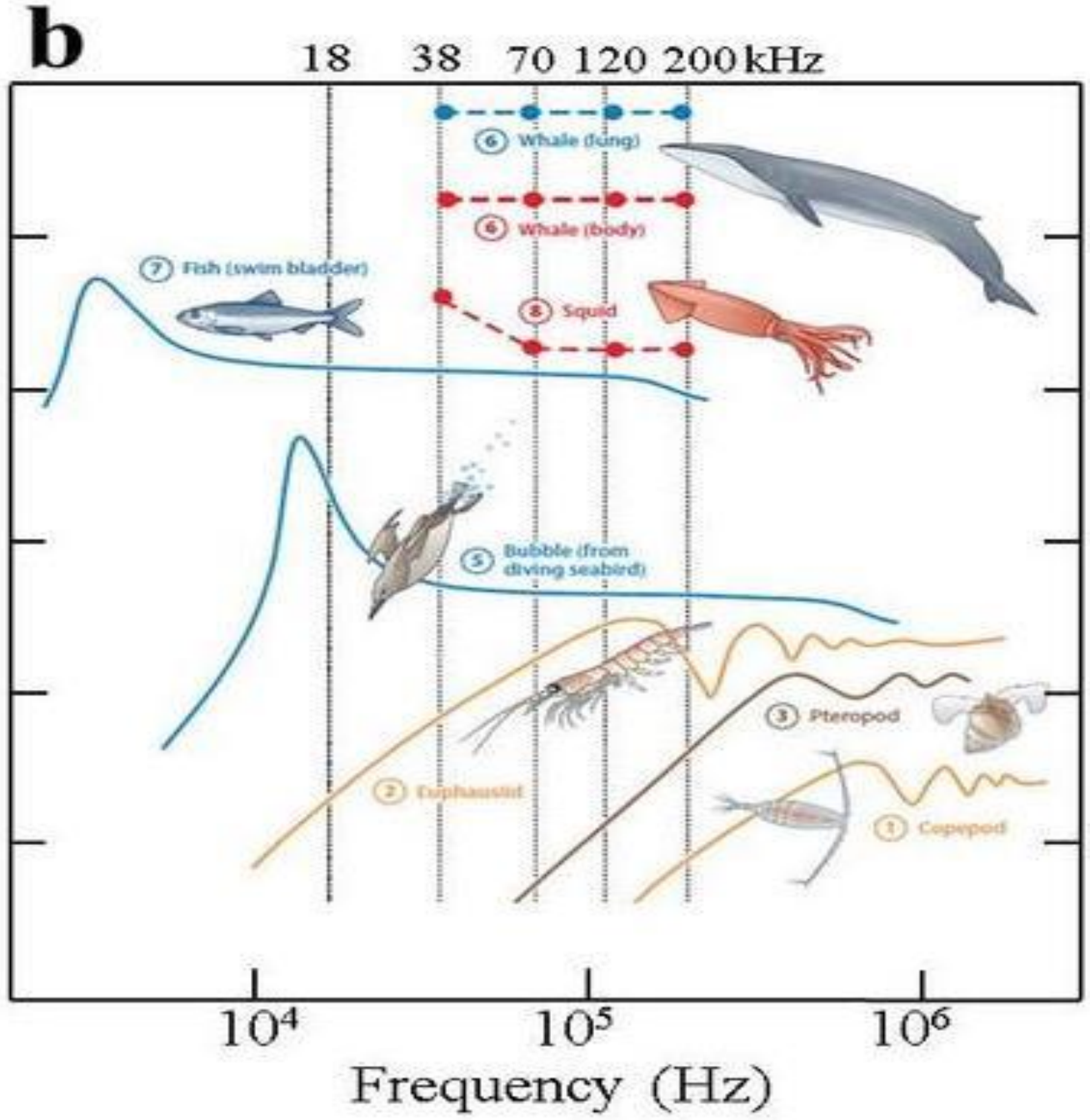
Respuesta de Ts vs Fq

Respuesta de frecuencia para varios objetivos





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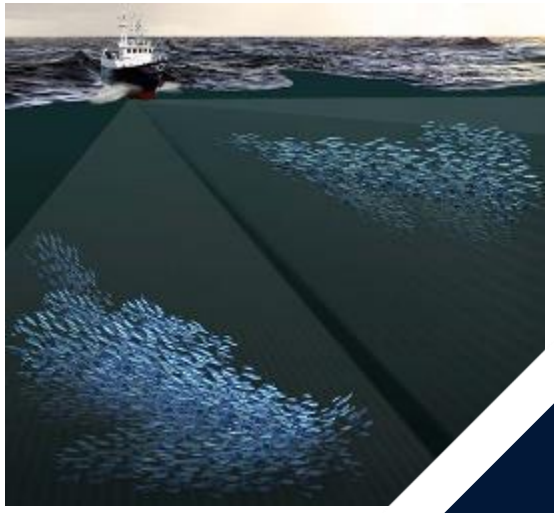
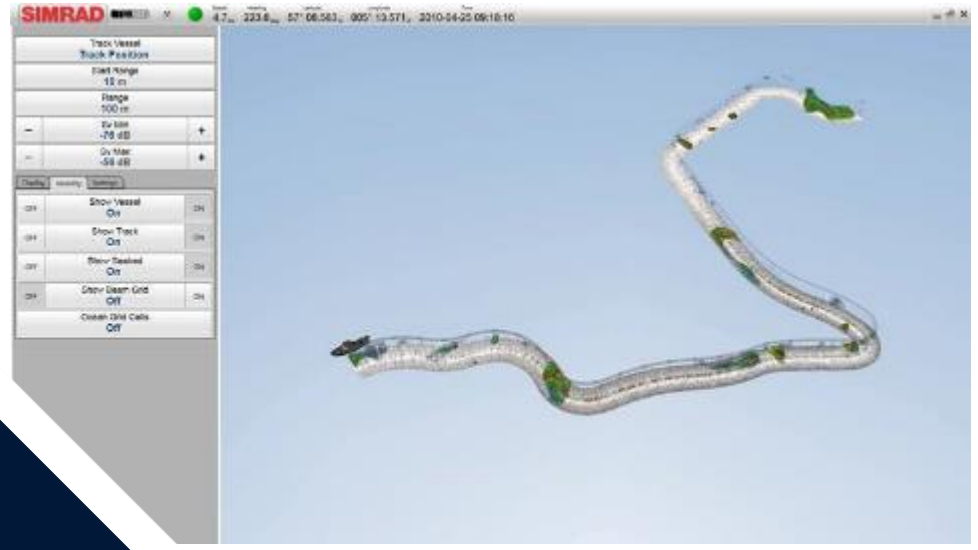
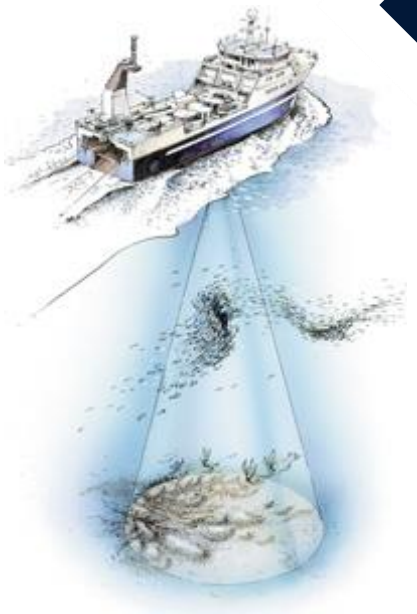
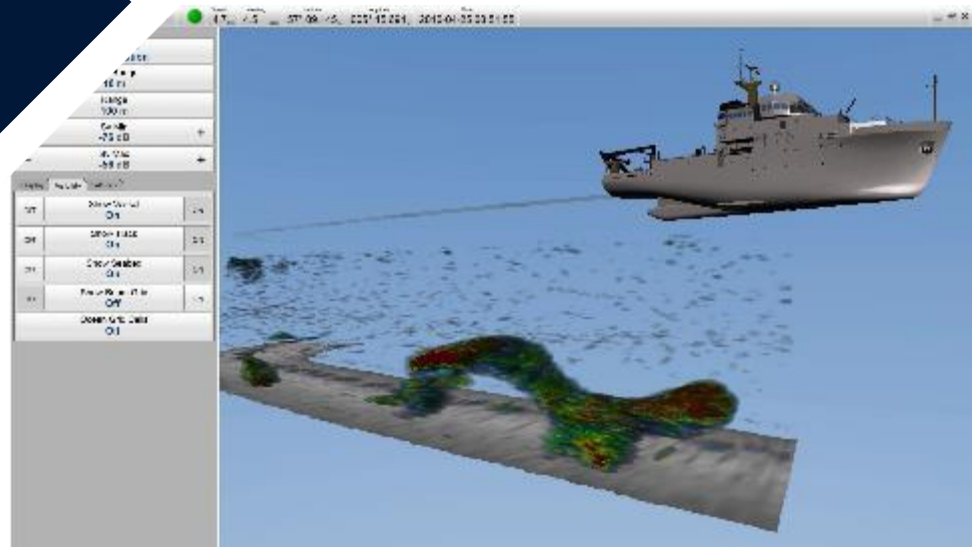
Estudios Pesqueros

Biomass analysis









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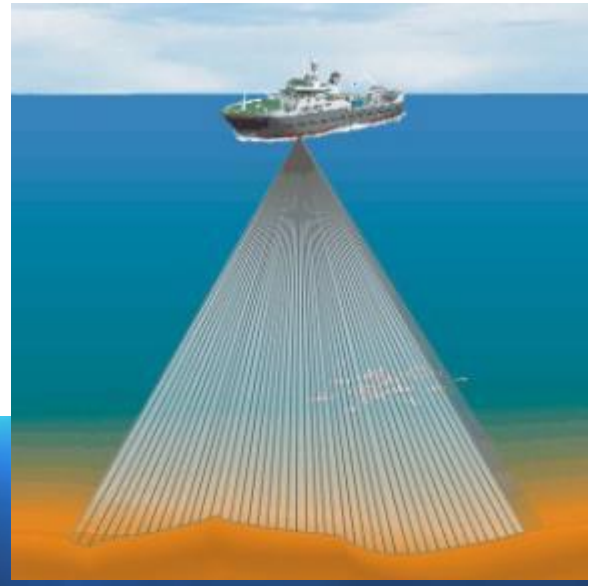
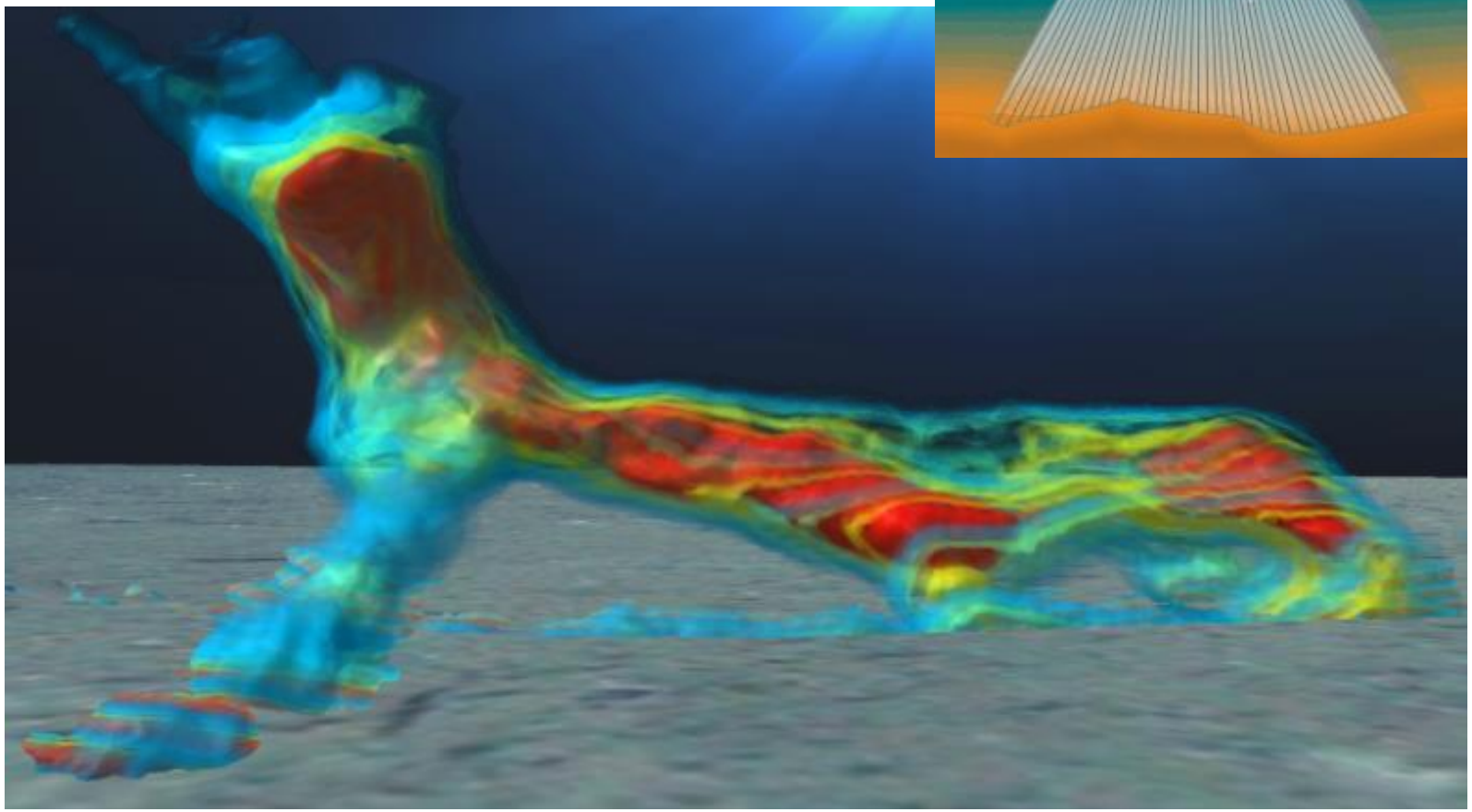
Multihaz de Pesquería

Sistema ME70



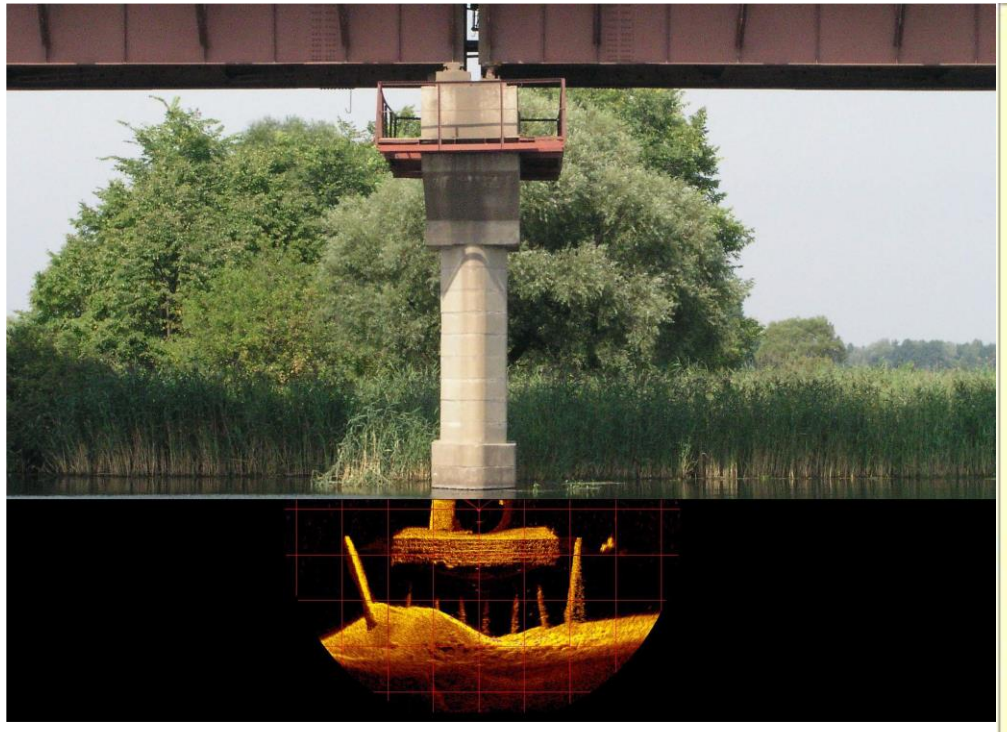


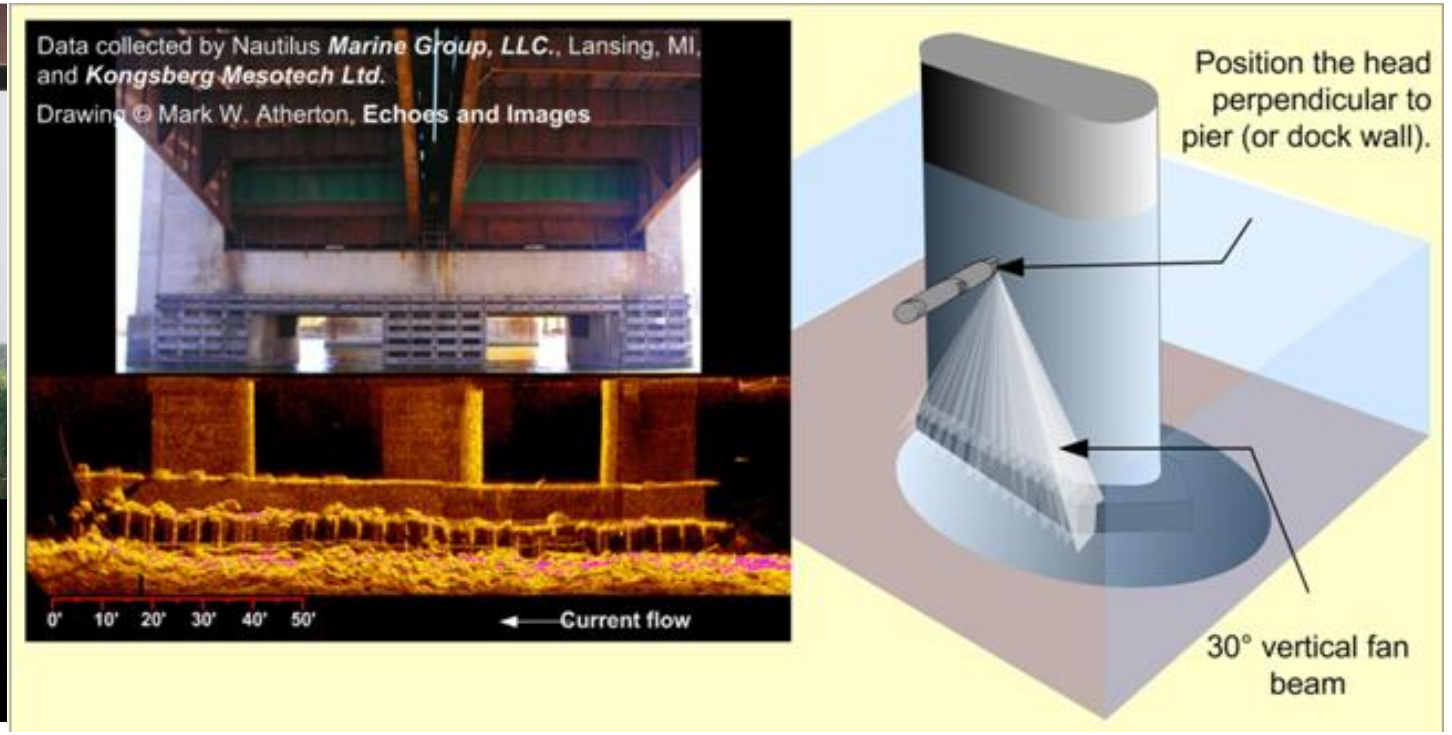
La estimación de abundancias de recursos pesqueros es la mas importante aplicación de estos sistemas

Controlar la cantidad de captura en relación a la cantidad de población del recurso a explotar

Aplicaciones Ingenieriles

MS1000





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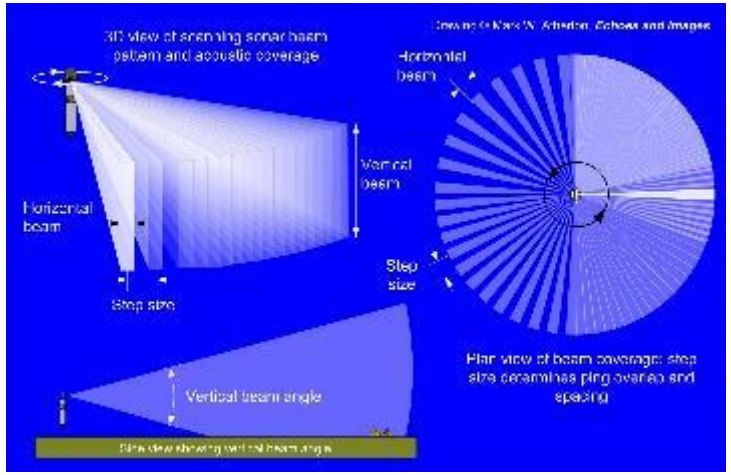
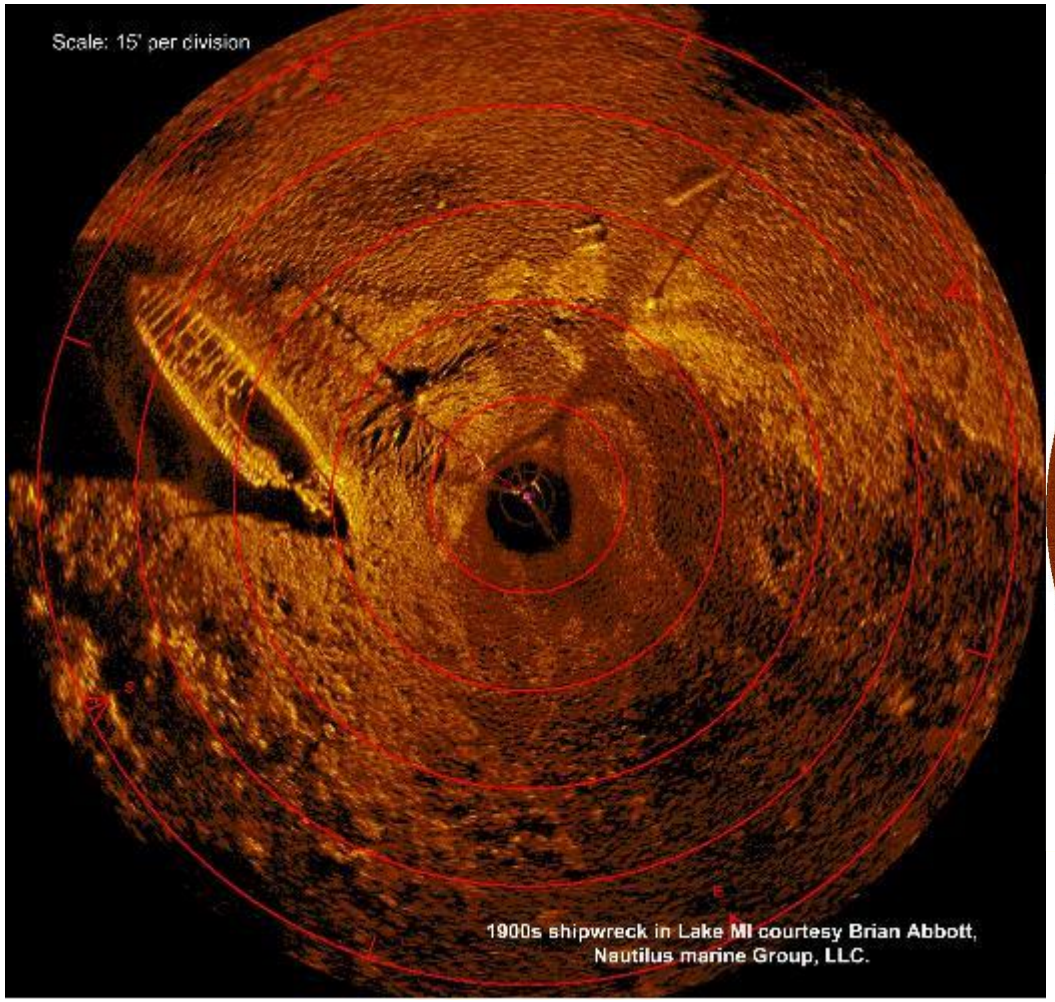
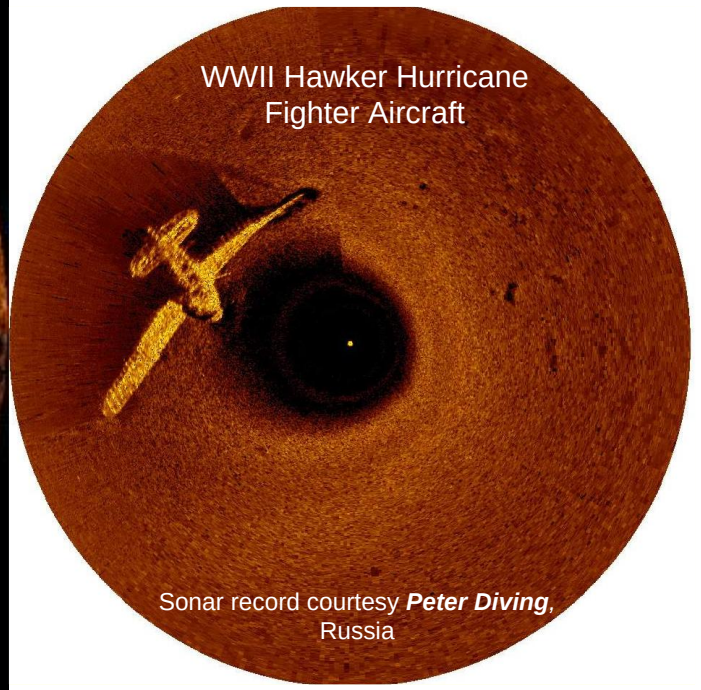
Aplicaciones Ingenieriles

MS1000







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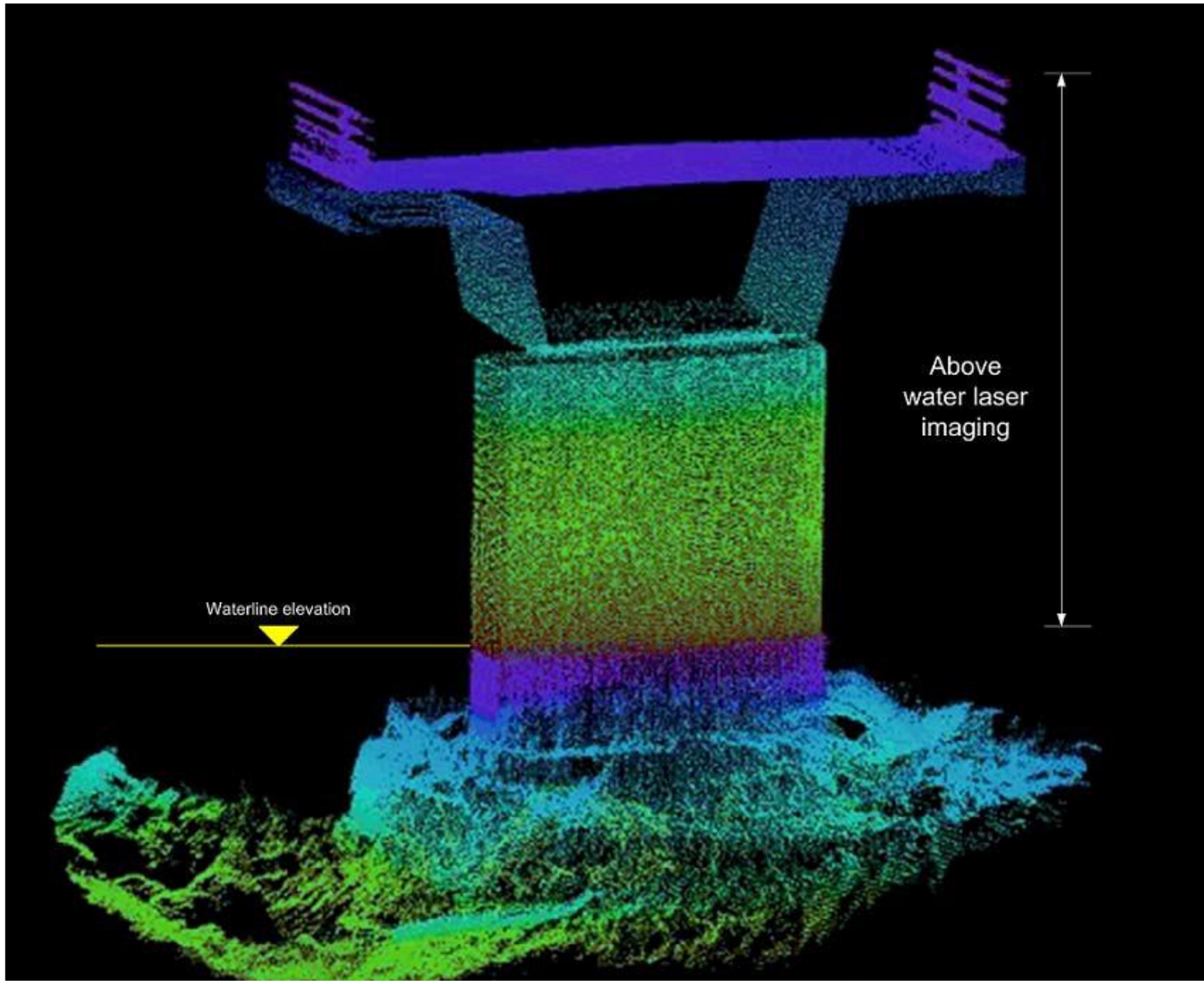
Construcción de Nubes de punto 3D



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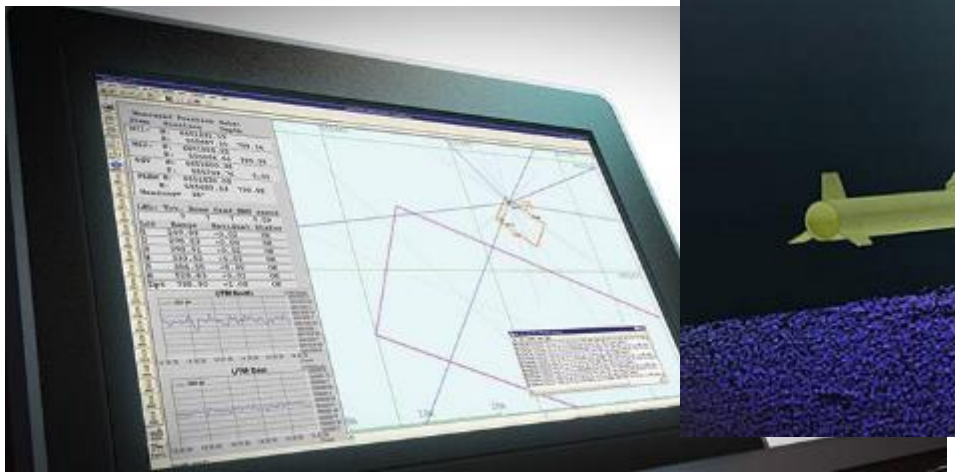
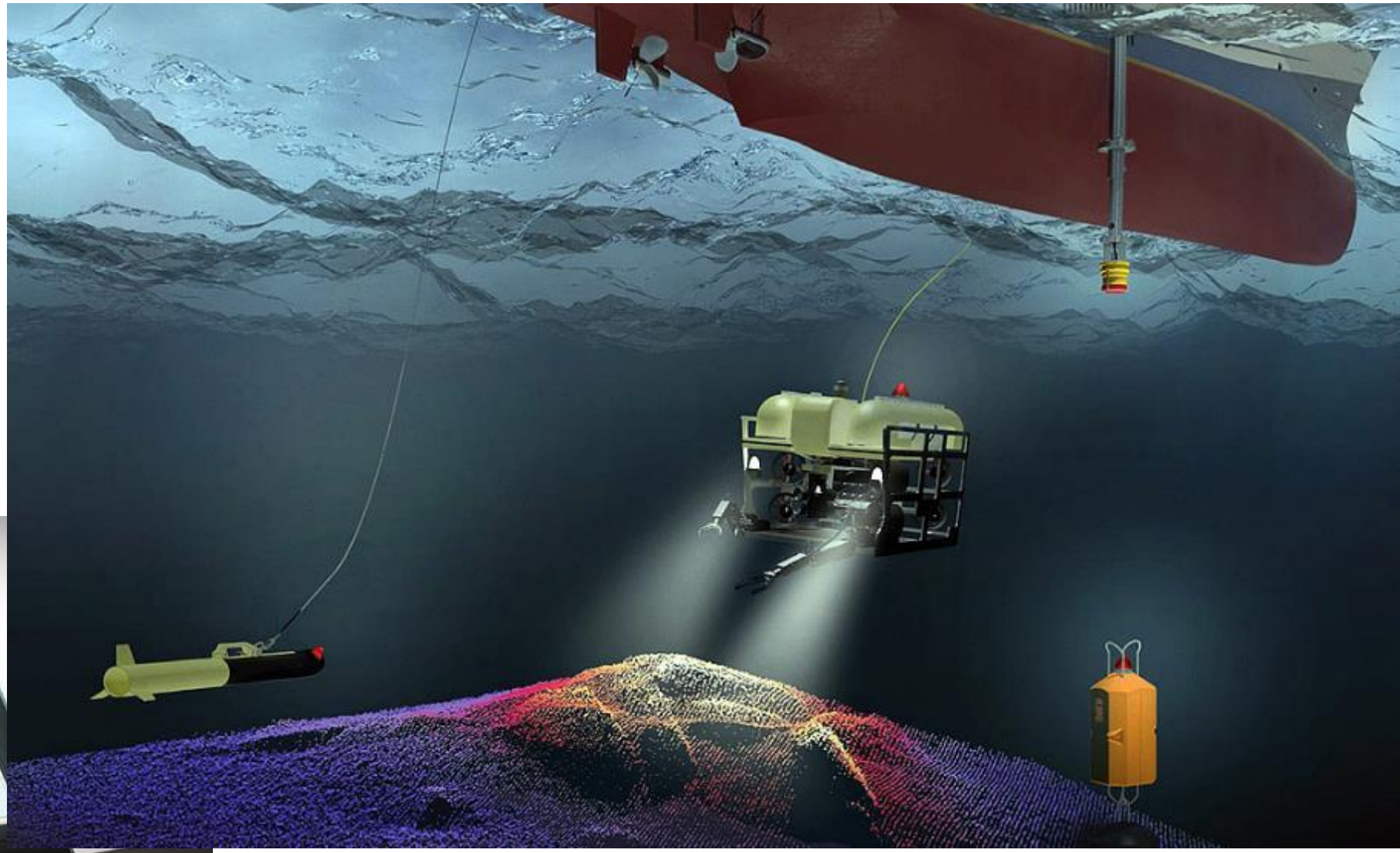
Sistemas de Navegación Acústica Sub-Acuática

HiPAP

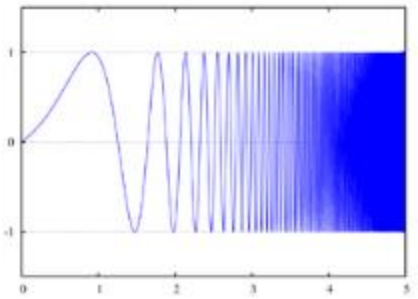


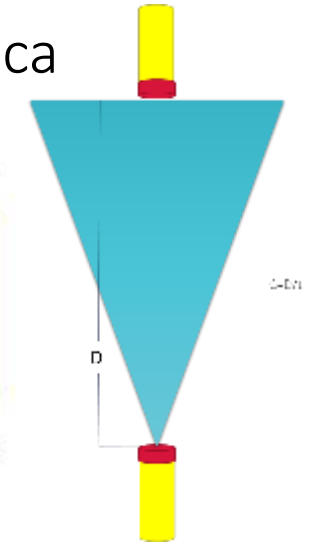


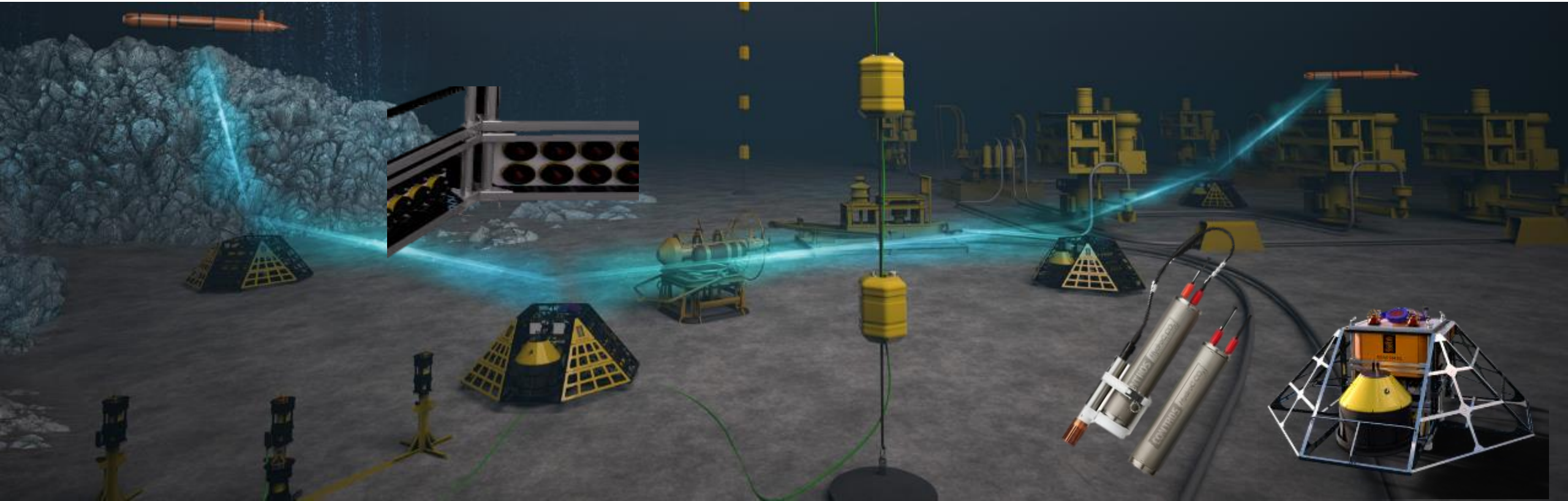
Plataformas Autónomas

Monitoreo Ambiental

Telemetría acústica





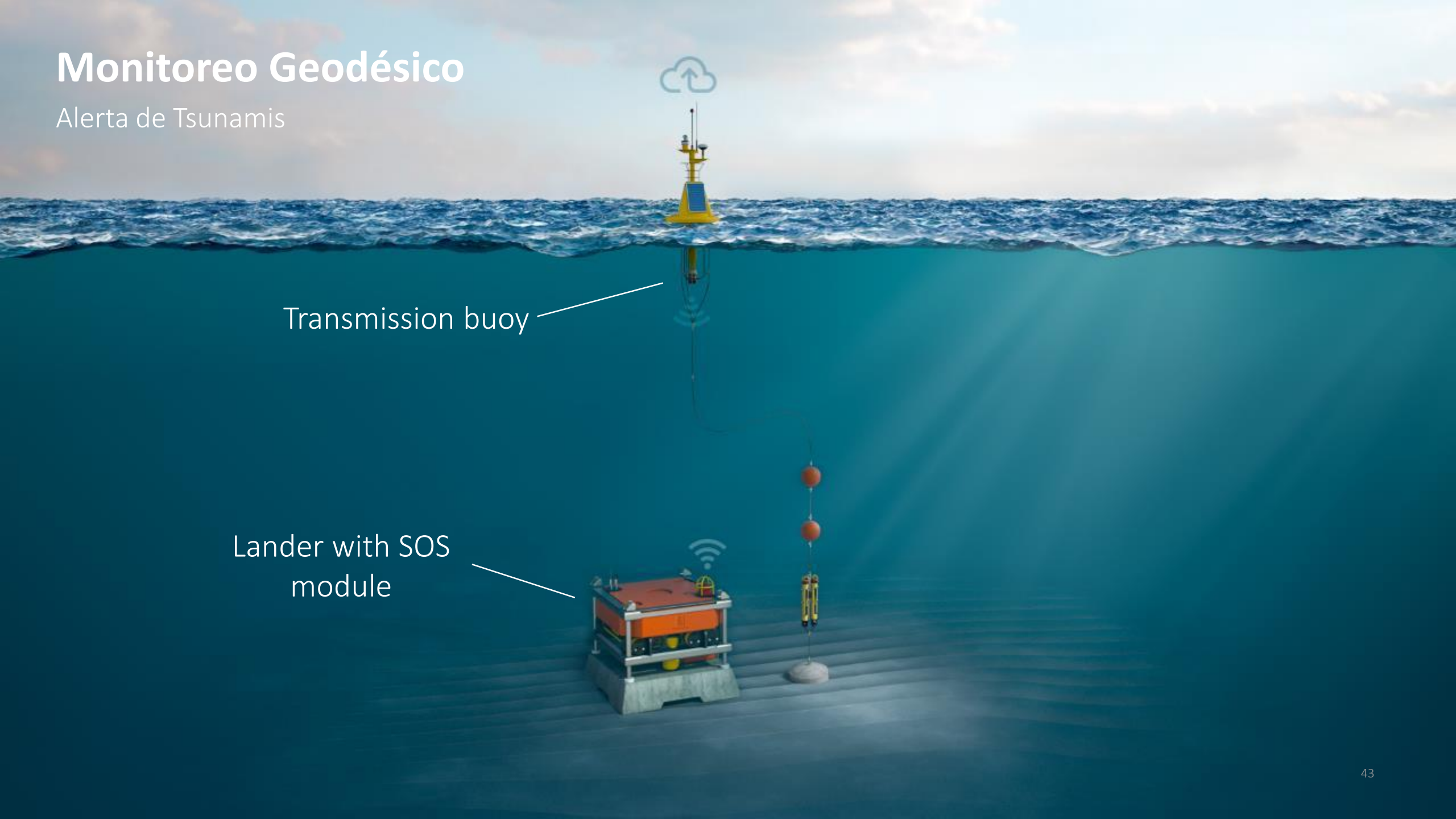


Monitoreo Geodésico

Monitoreo de movimientos del fondo oceánico (deslizamientos, slumps, tectónica, etc)

Monitoreo Geodésico

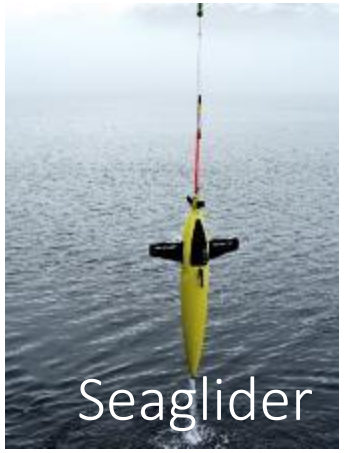
Alerta de Tsunamis



25+ years of experience developing unmanned solutions for marine applications

Plataformas Autónomas para Monitoreo

USV



CSV

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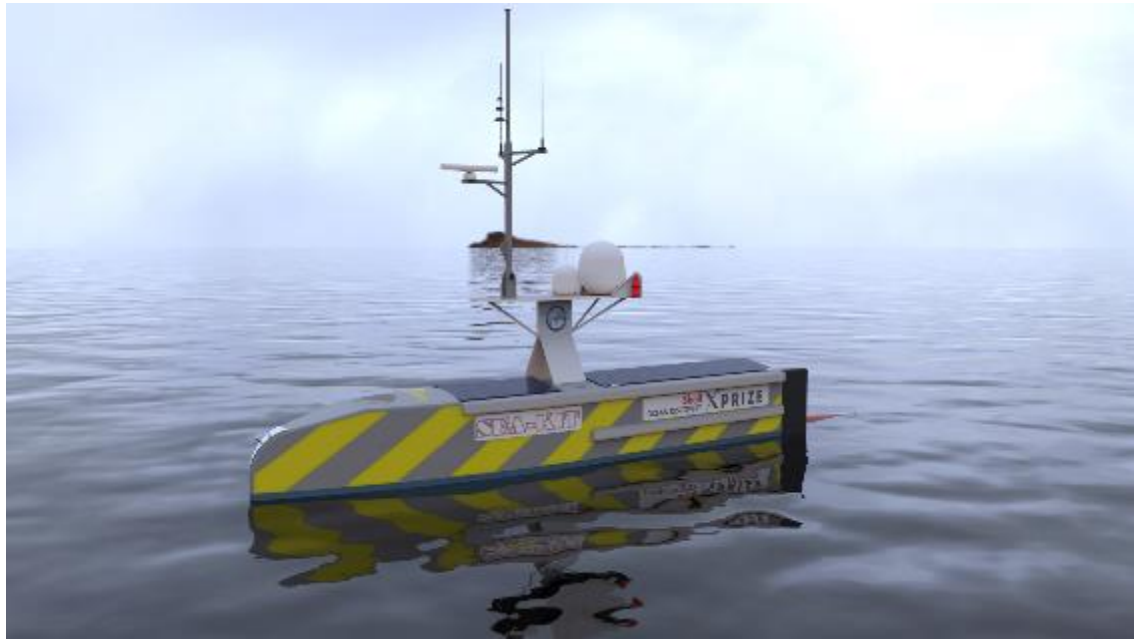
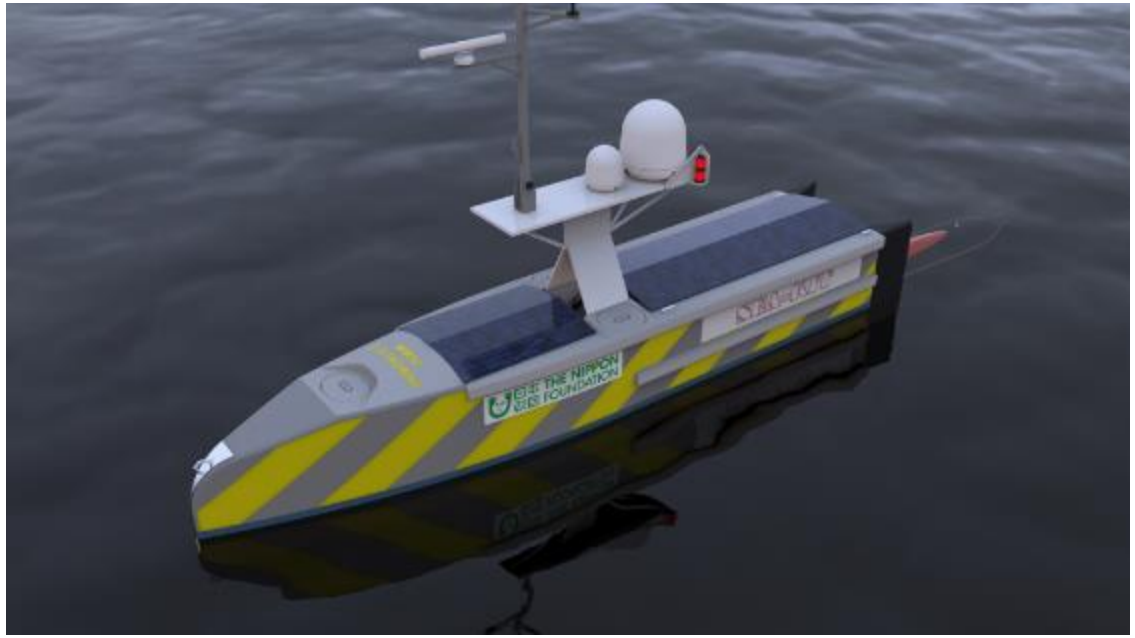
El desarrollo de la tecnología autónoma en el futuro inmediato





Buque de investigaciones autónomo SEA-KIT

- Buque de levantamiento completamente autónomo. Basado en un concepto mixto de tecnología AUV-USV
- El buque SEA-KIT proporciona una capacidad oceánica de próxima generación, de largo alcance y de larga duración que no existe hoy en día. Es capaz de operar sin asistencia durante meses a la vez y es el primero de una nueva generación de embarcaciones que realmente puede operar de forma independiente.
- Puede llevar hasta 2.5 toneladas. Habilitado con sistemas automatizados y acústicos (multihaz, monohaz etc.)
- Usa 'K-MATE', que es un sistema de control de vehículos autónomos de superficie. Diseñado para seguir misiones planificadas, además de proporcionar operaciones supervisadas globales o incluso el control directo del operador para tareas complejas.
- Lanzamiento en Septiembre de 2017

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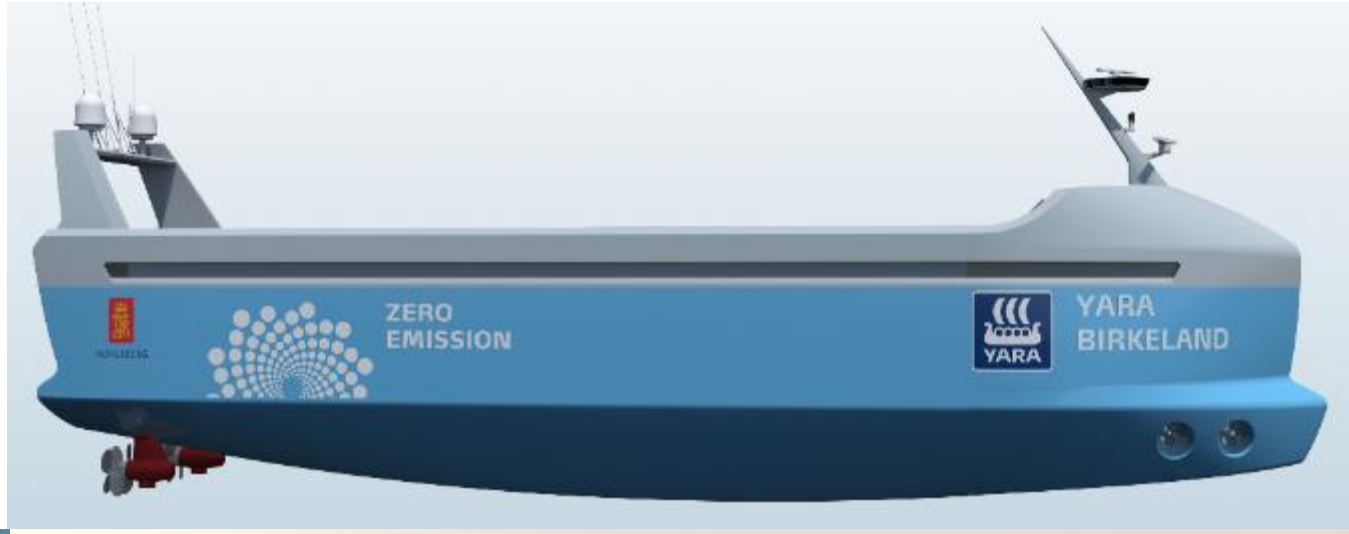
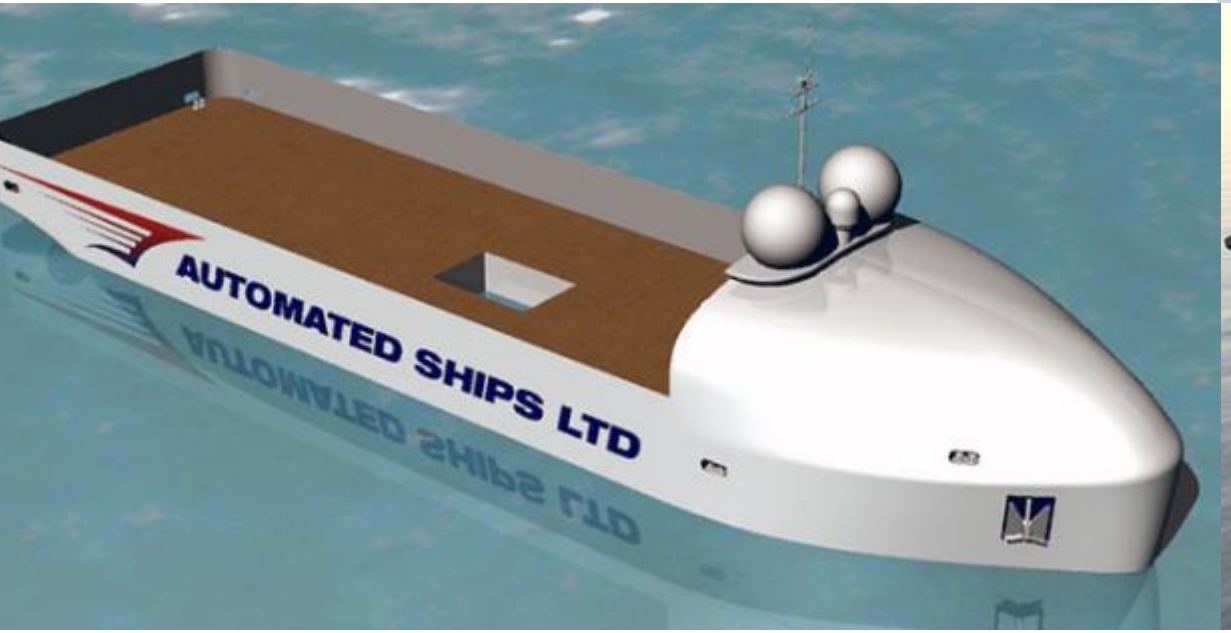
Embarcaciones Autónomas

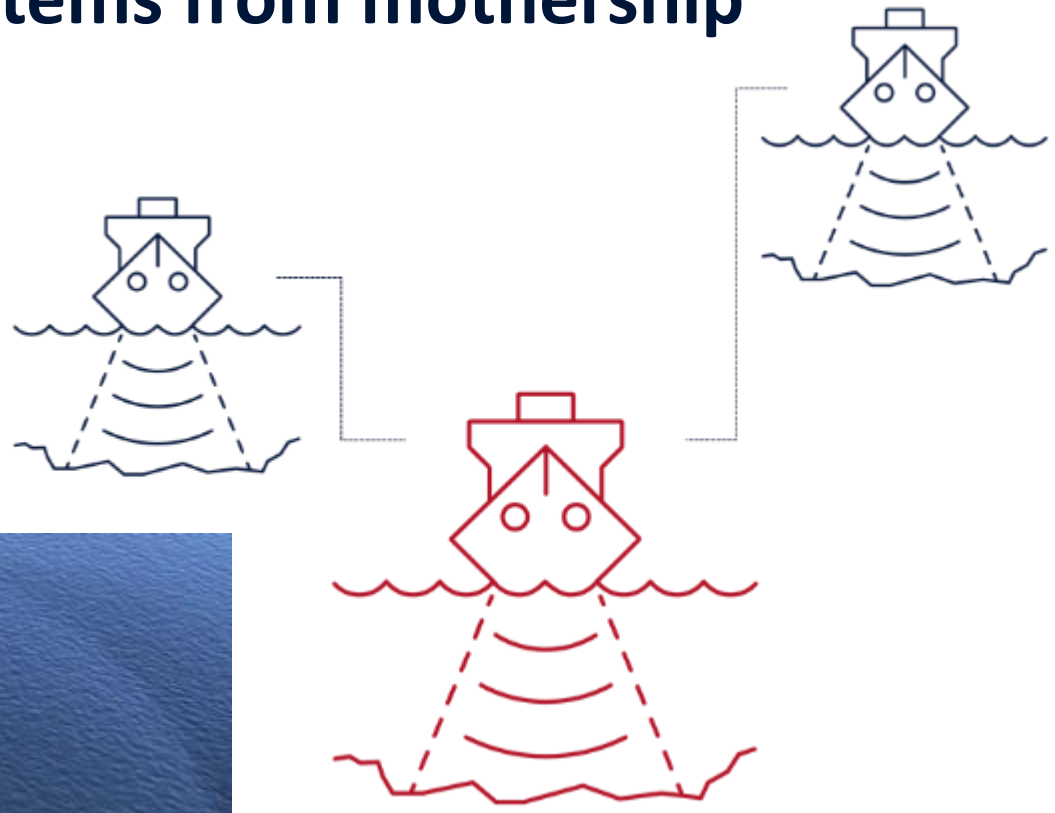




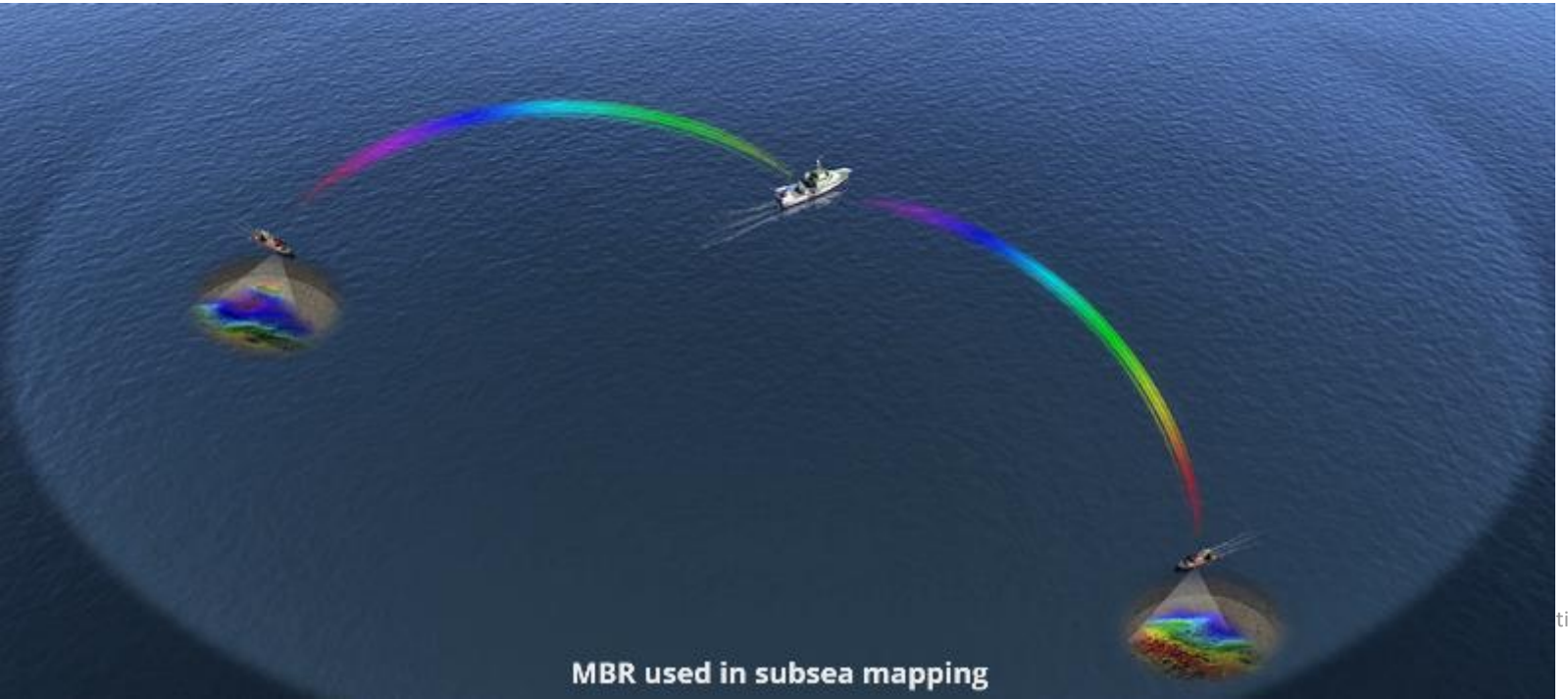
Kongsberg Maritime Today

Connecting the Ocean Through Data

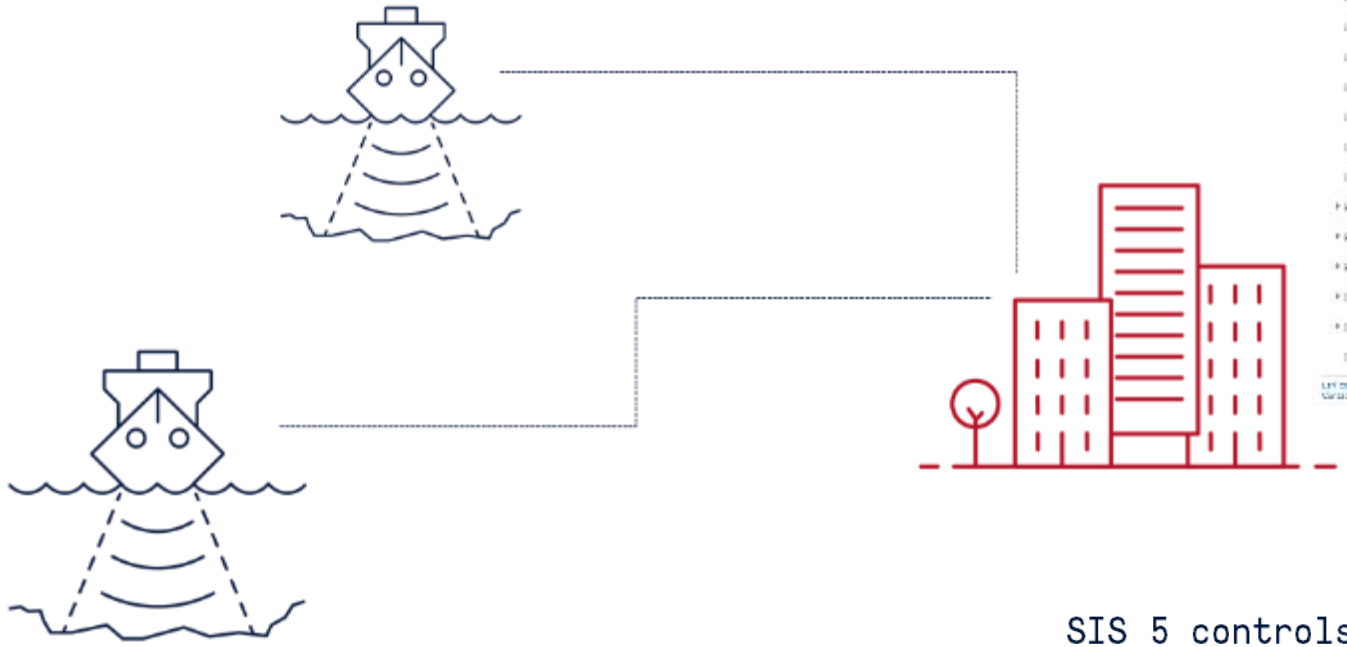
SIS 5 controls three EM-Systems from mothership

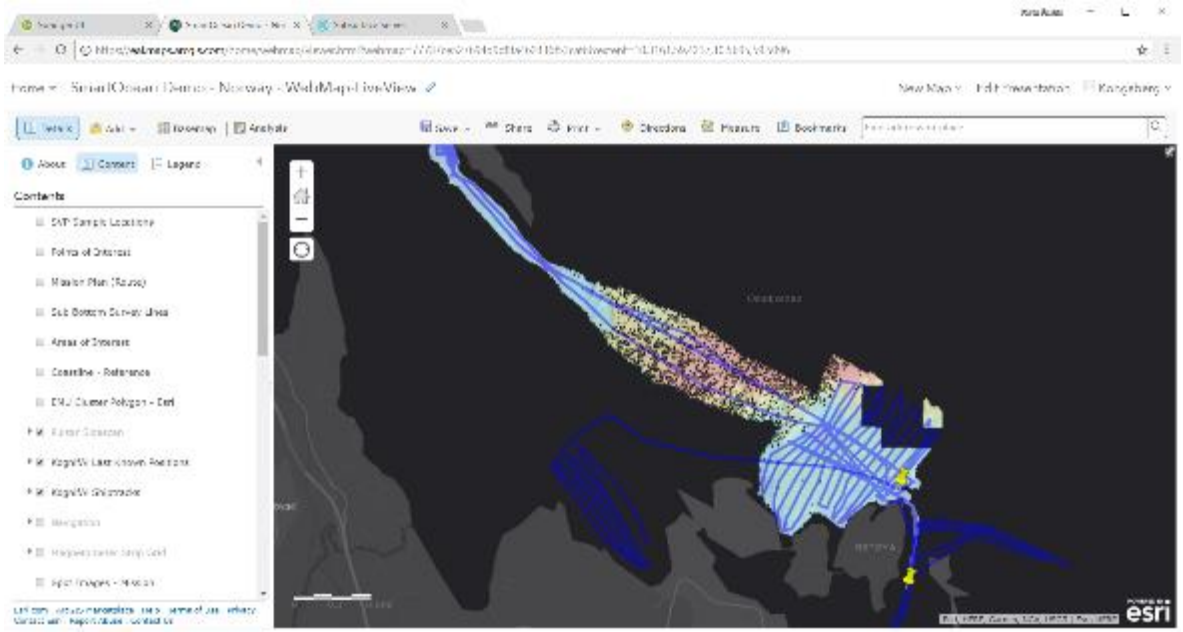


SIS 5 controls three
EM-systems from mothership.



SIS 5 controls two survey vessels from shore





SIS 5 controls two survey vessels from shore.

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Kognifai

Kongsberg's Open Digital Environment

Partners

Boost Productivity: Kongsberg Maritime assists in configuring the connection between storage and partners for seamless integration.

ESRI

The global leader in spatial analytics

EARTH ANALYTIC

Specialists in science-based geospatial analysis and systems architecture design

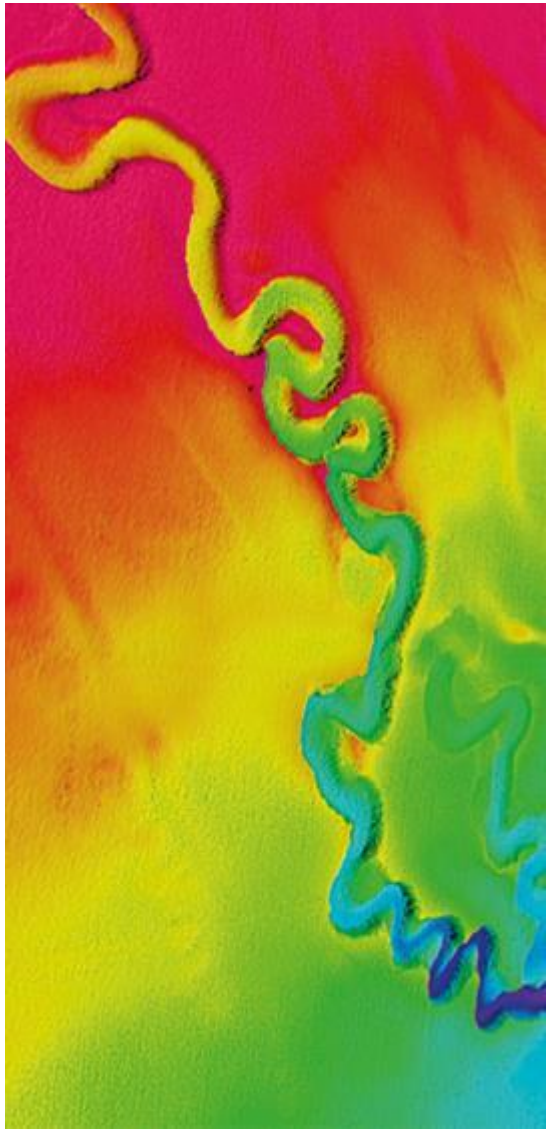
GEOCAP

Specialists in geographical information and visualization.

KONGSBERG

Deliverables

- Storage
- Virtual Machine
- Connection to Partners



Processing VM

- Choose preconfigured VMs
- VM is connected to Storage, ready to process data
- Install your own processing software on VM just as a regular PC

Storage

- Download Windows Desktop Application to help copy files from Local Storage to Mapping Cloud
- Storage App to manage Hot/Cold storage
- File management

Partners

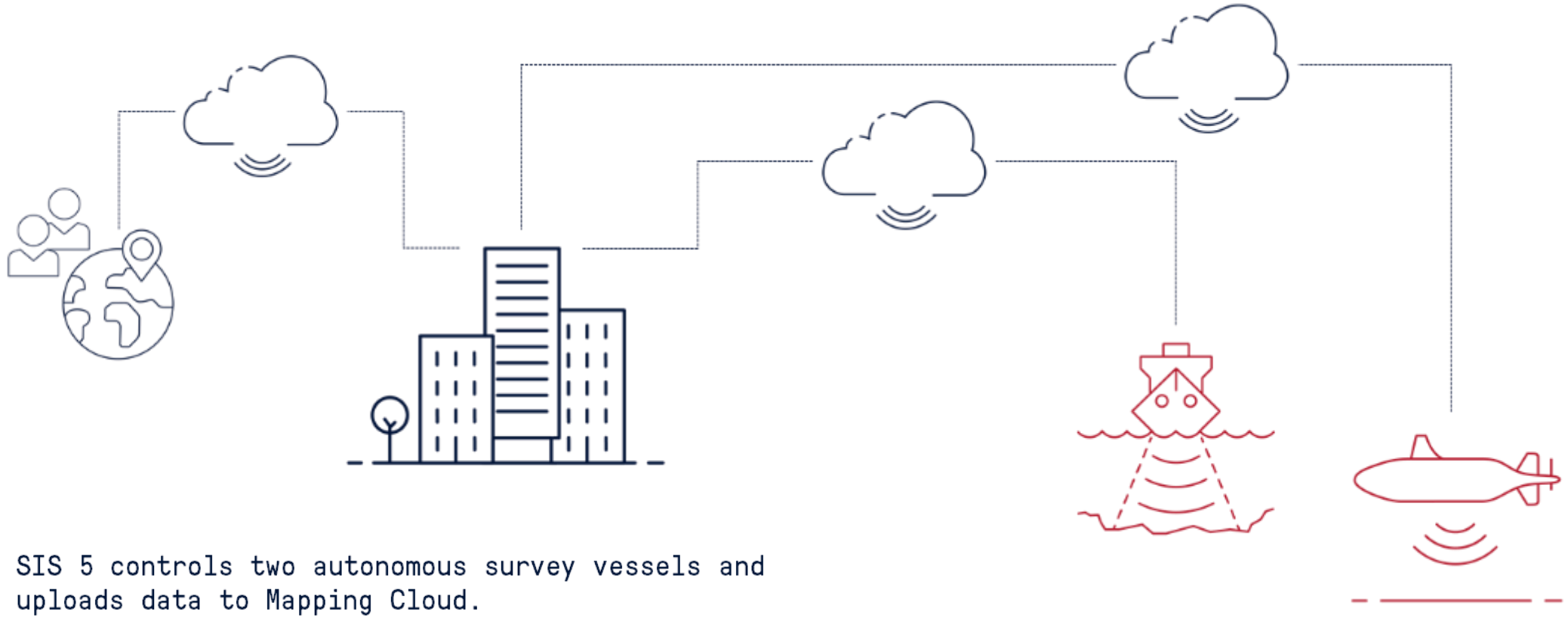
- ESRI
- Earth Analytic
- Geocap

SIS 5 on the mothership connects to Mapping Cloud and uploads data

Data is made available to onshore personnel and partners

SIS 5 on the mothership connects to Mapping Cloud and uploads data. The data is then made available to onshore personnel and partners.

SIS 5 controls two autonomous survey vessels and uploads data to Mapping Cloud



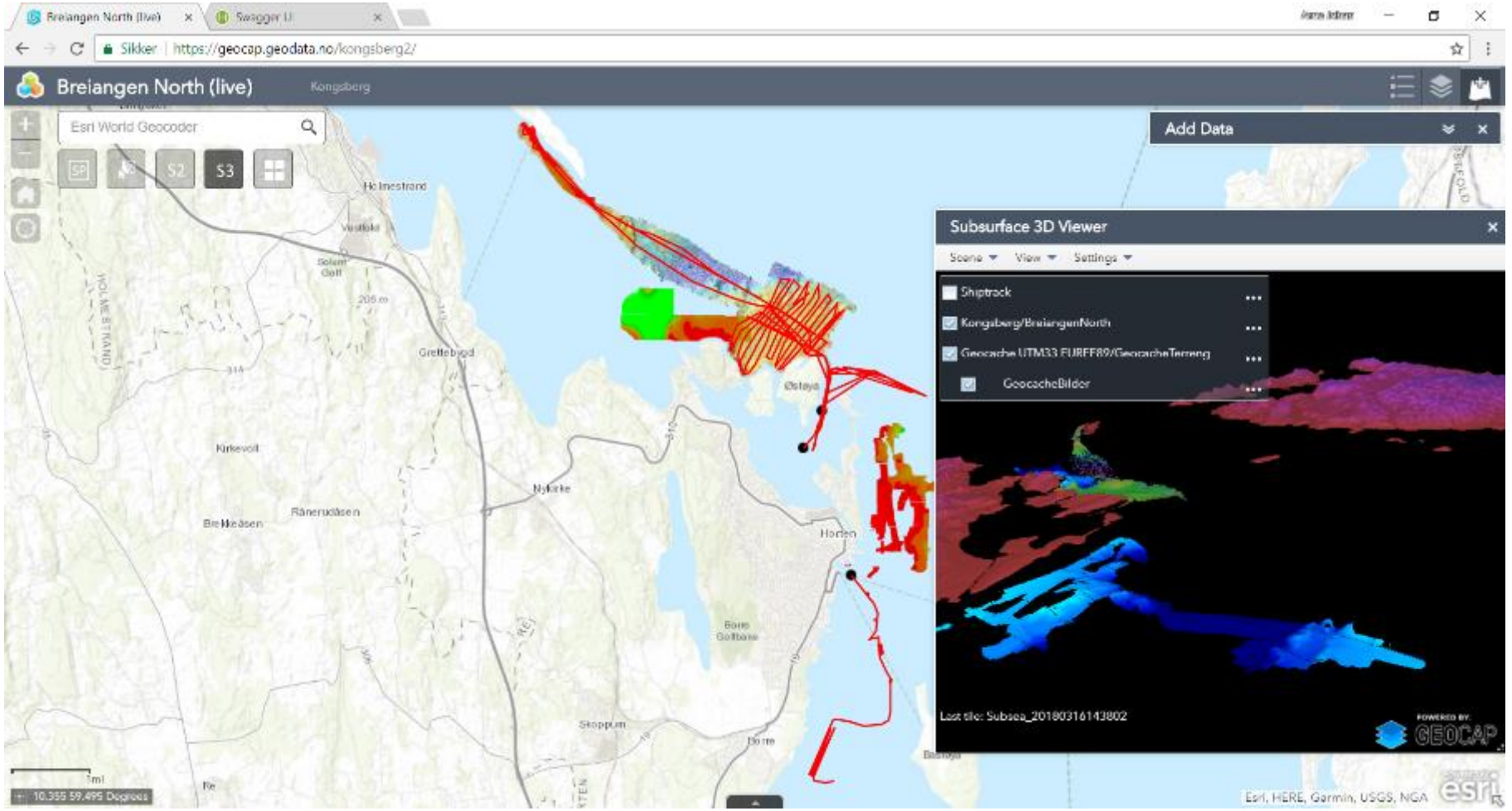
SIS 5 controls two autonomous survey vessels and uploads data to Mapping Cloud.

Mapping Cloud

Visualize, analyze and share multibeam data in real time

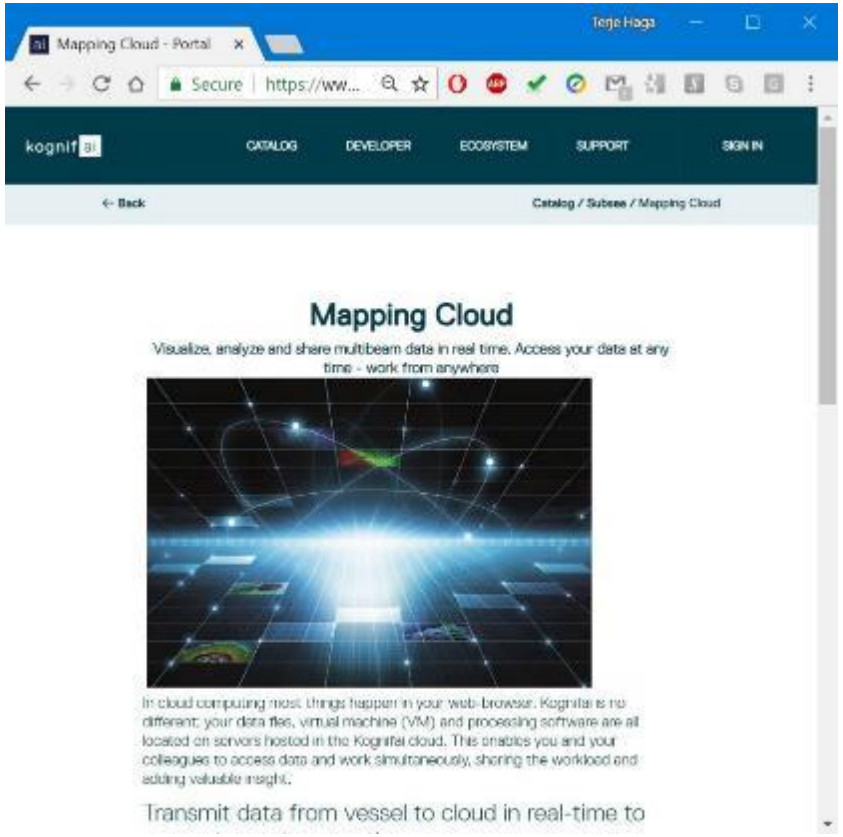
Mapping Cloud

Based on Kognifai



Mapping Cloud

https://kongsberg.com/mappingcloud



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AT A GLANCE:

Data storage
Processing
ESRI interfaces

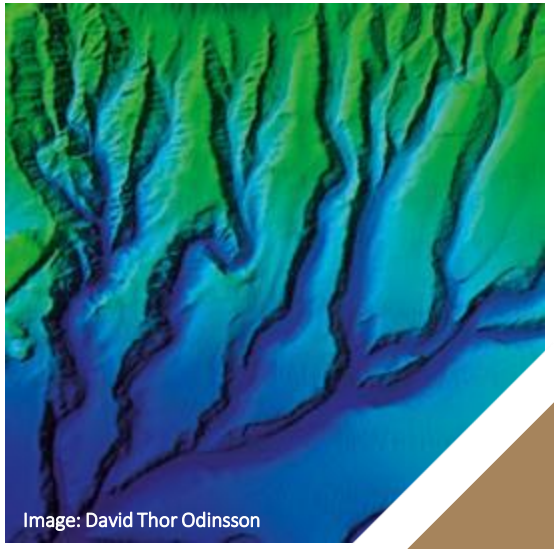
Image: David Thor Odinsson

- Easy storage of different types of data in the Cloud
- Upload and distribute real-time data
- Use the Cloud to manage sharing, processing and archiving
- Run your existing applications in a virtual machine environment
- Share results with partners and customers through web browsers

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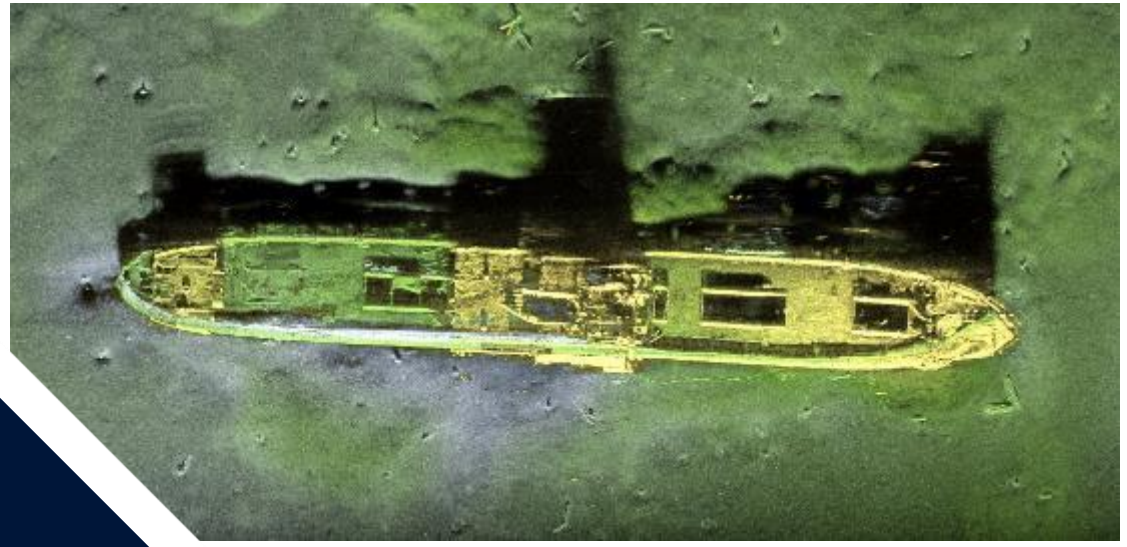
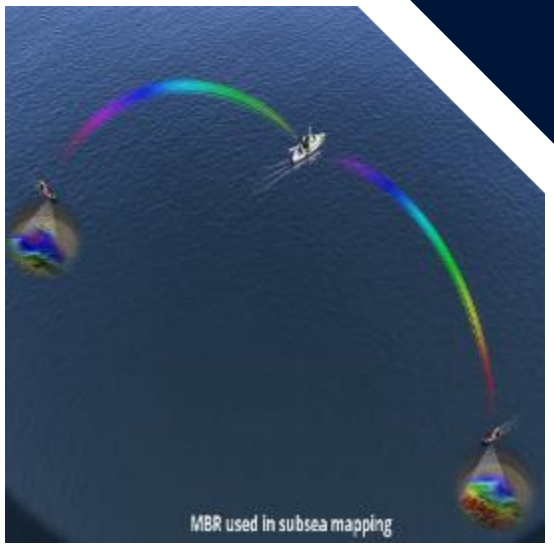
Working with partners

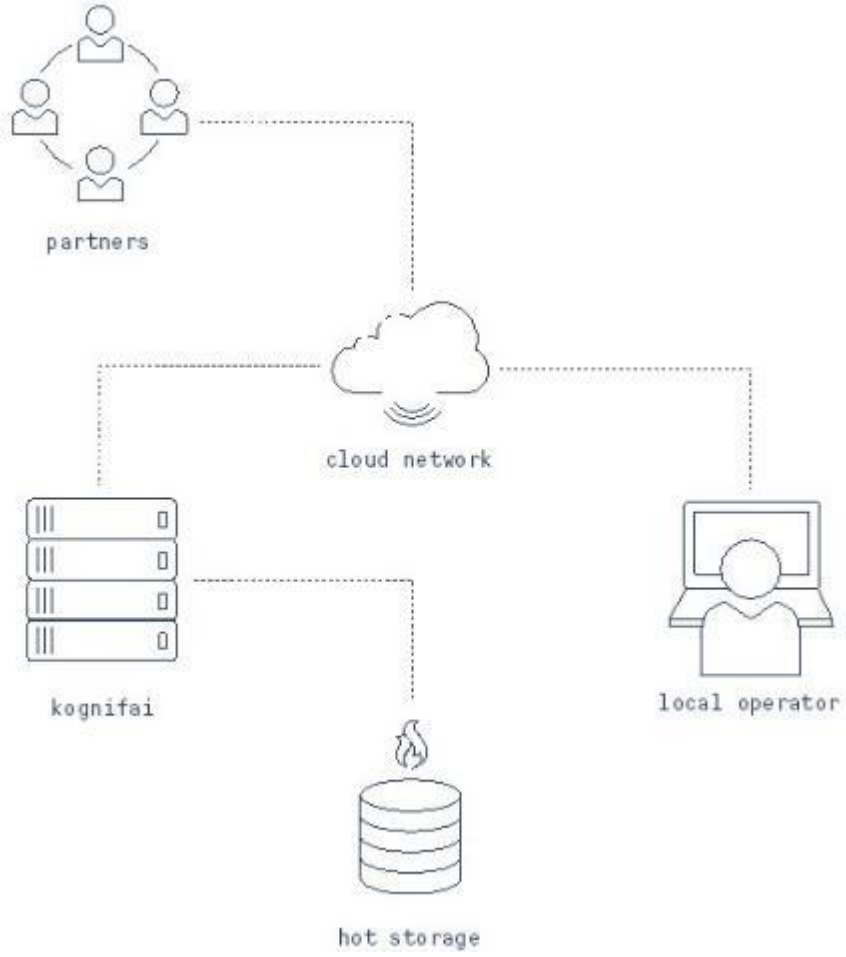
Skills and experiences can be shared to build a complete picture.

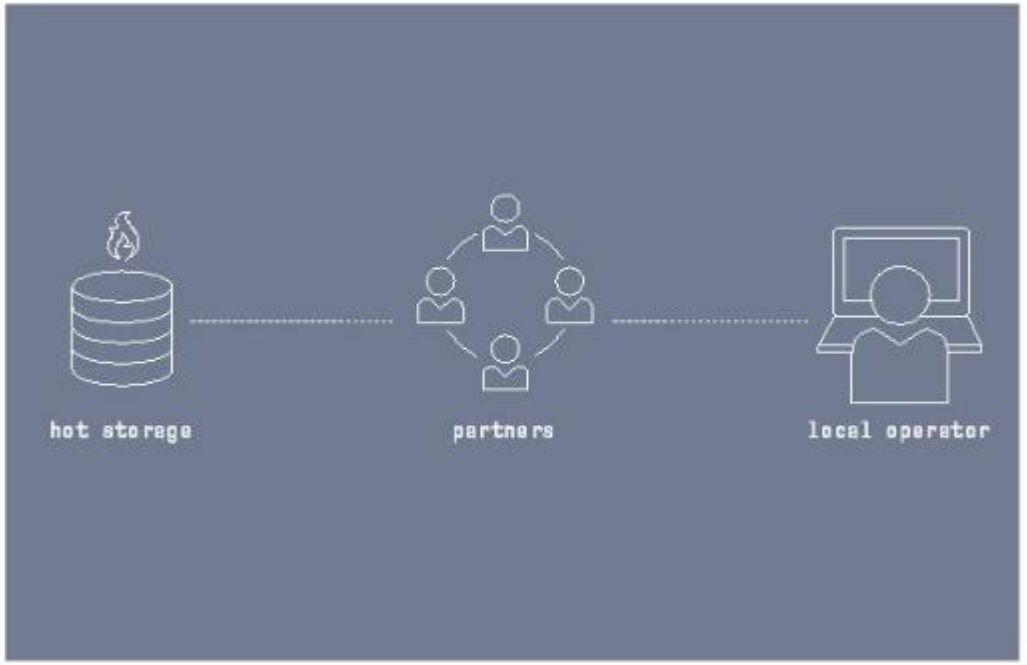




Partners

Every cloud can talk to each other in the virtual atmosphere





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Connecting the Ocean Through Data

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THANKS

Gracias