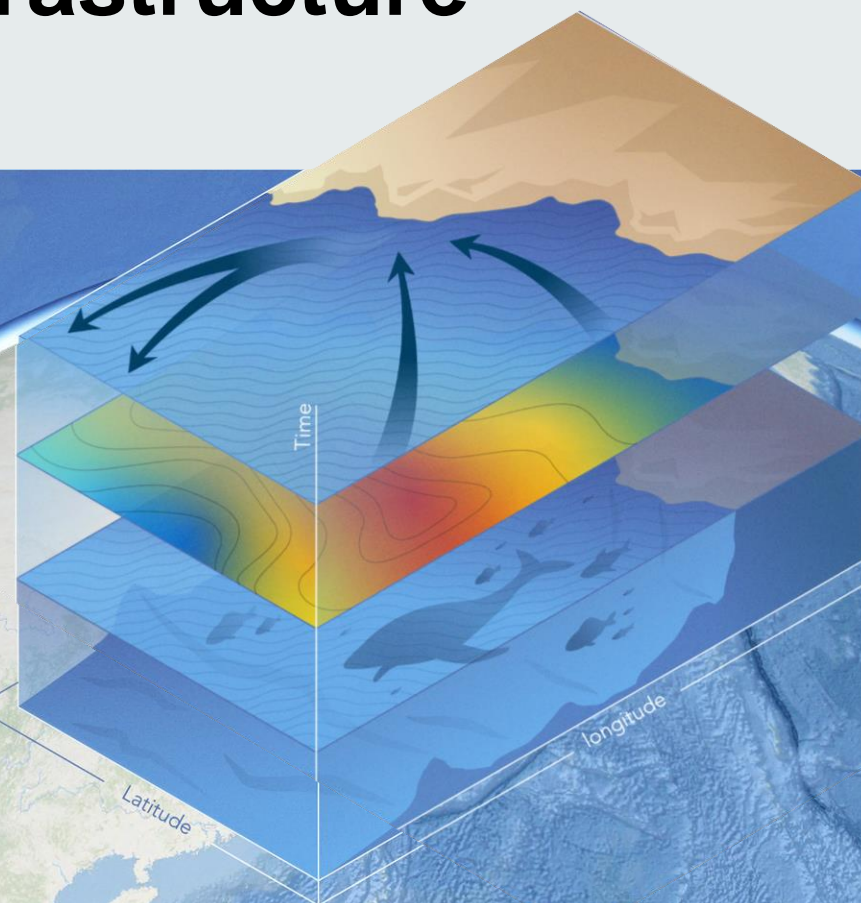


Transforming an MSDI into a Modern *Hydrospatial* Infrastructure



Rafael Ponce

Esri Sr. Maritime
Executive Consultant



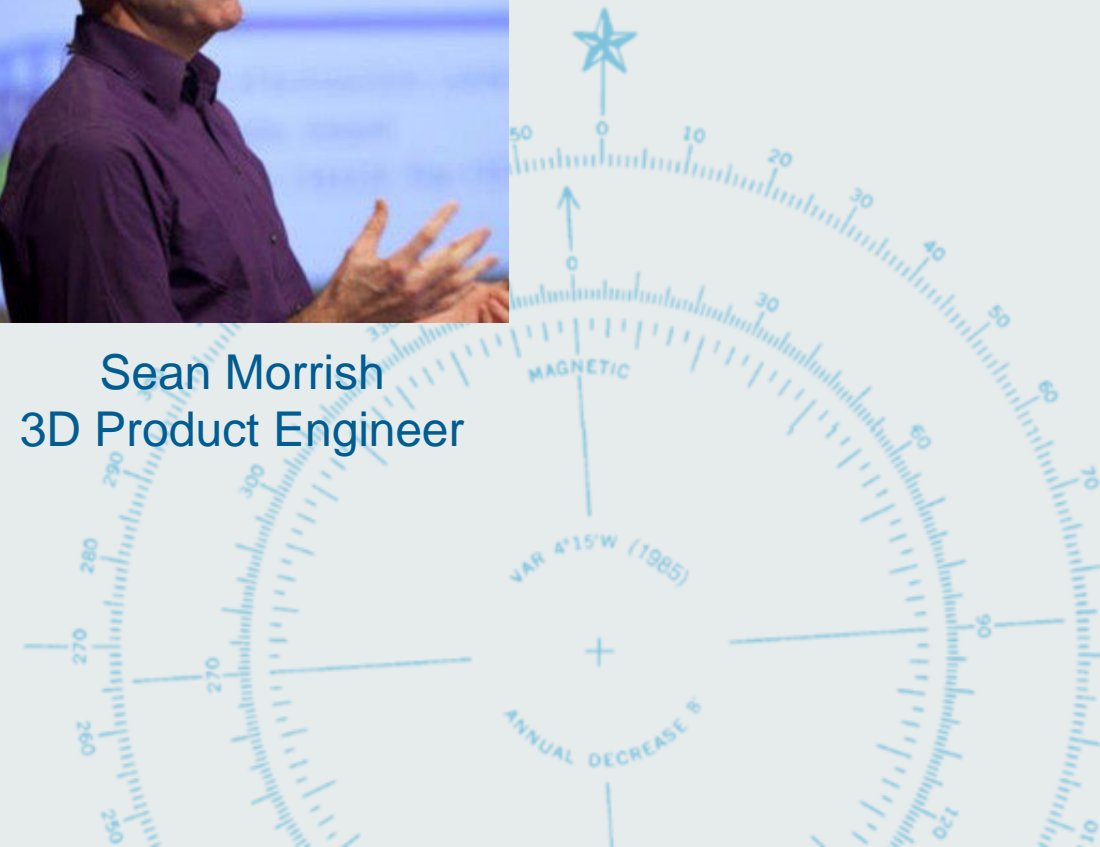
Presenters



Rafael Ponce
Global Maritime Consultant



Sean Morrish
3D Product Engineer





Content/Agenda

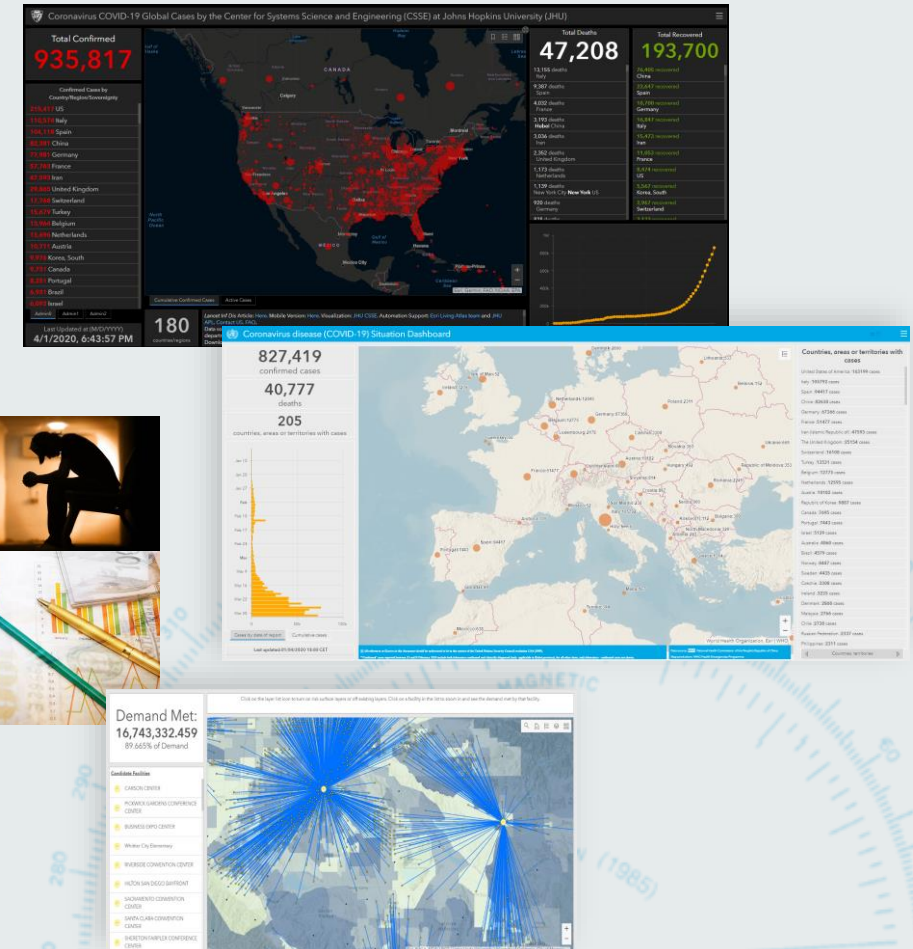
- I. The World today
- II. Marine Spatial Data Infrastructure
- III. Hydrospatial
- IV. The Enablers
- V. Transforming into a Hydrospatial agency
- VI. MSDIs around the World (some examples)
- VII. New Technologies, New Opportunities





Challenges and Opportunities

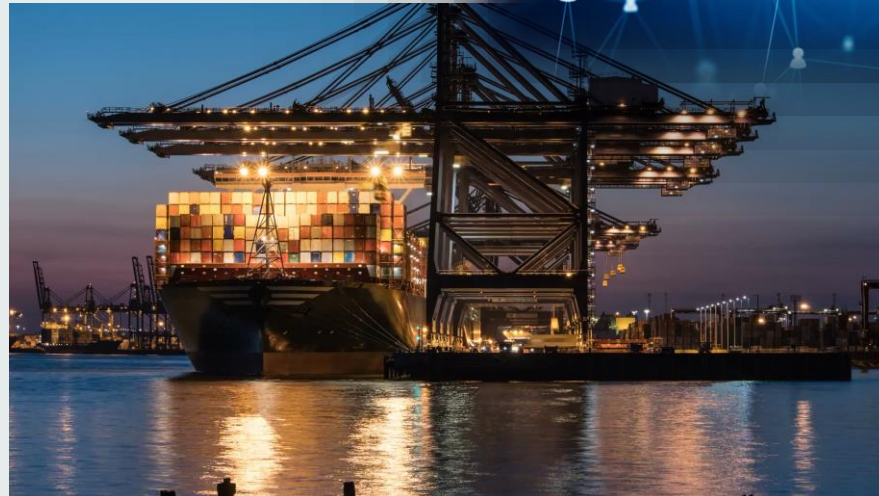
- Uncertain times
 - Pandemic
 - Economic impacts
 - Continuity of operations
- Technology and Connectivity
 - The 4th Industrial Revolution
- New demands for products and services
- New standards
- Data accessibility



Drivers

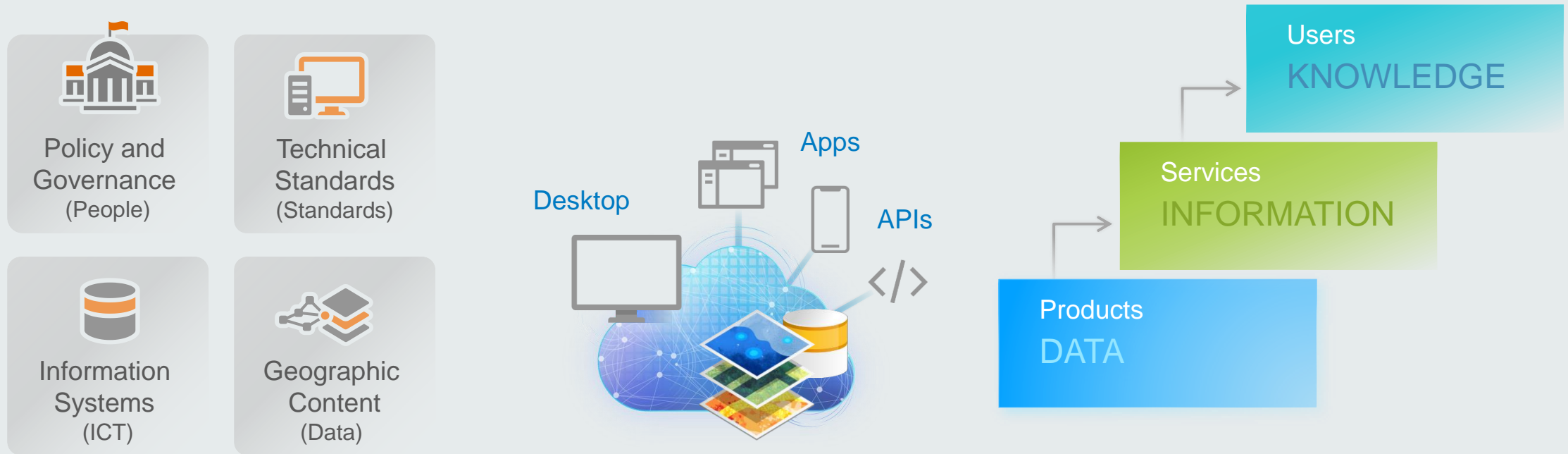
- Climate change
- Sea level rise
- Autonomous ships
- E-Navigation
- Maritime ports growth
- Sustainable Development (the Blue Economy)
- UN Decade of Ocean Science
- Seabed 2030

First Poll:
What's the main mission of your
organization?





A Marine Spatial Data Infrastructure (MSDI)



SDI is "the relevant base collection of technologies, policies and institutional arrangements that facilitate the availability of and access to spatial data".

Ref: Global Spatial Data Infrastructure (GSDI) Cookbook



What is “Hydrospatial”?

...“is the branch of applied sciences which deals with the analysis, understanding and access to static and dynamic **marine geospatial** digital and analog **data and information**, digital signals, measurement and description of the **physical, biological and chemical features** of oceans, seas, coastal areas, lakes and rivers from all possible available data sources in near-real time, real-time, including history and the prediction of their change over time. For the purpose of providing timely access to a standard, quality and the most up-to-date **marine spatial data infrastructure**, including the safety and efficiency of navigation; aquatic and marine activities for a sustainable Blue environment & economic development, security and defense, and scientific research.”

Reference:

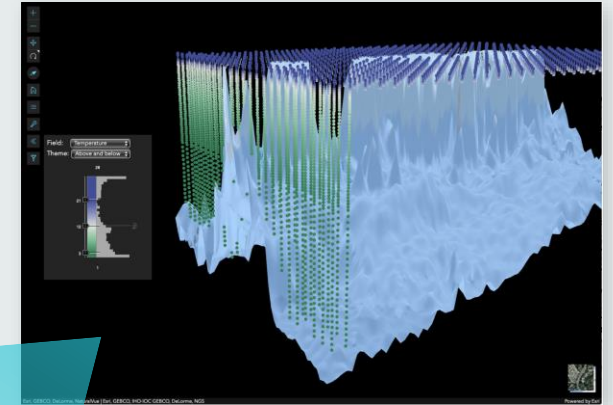
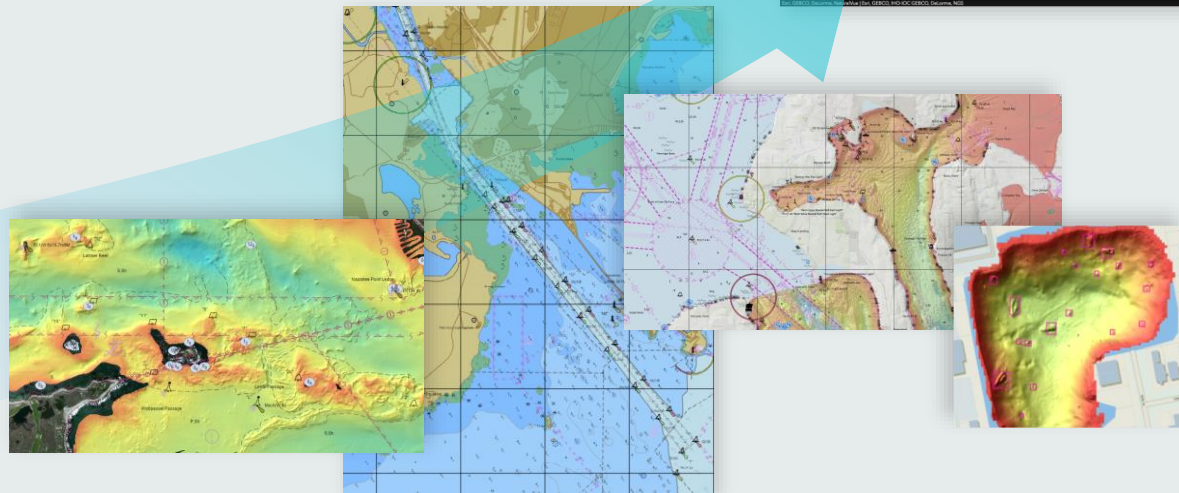
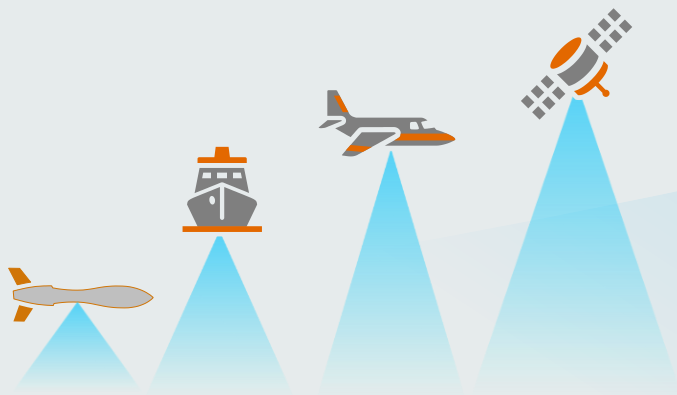
Canadian Hydrographic Conference 2020 – What’s HYDROSPATIAL? – Presentation by Denis Hains, 2020/02/25, Quebec City, Canada – www.chc2020.org

https://hydrography.ca/wp-content/uploads/2020/04/10_Hains_-Whats-HYDROS-CHC_Feb2020.pdf

From a traditional Hydrographic to a modern *Hydrospatial* Agency



- HOs embracing the MSDI concept
- Bathymetry as a main asset
- Temperature, Pressure, Density, Turbidity
- Tides
- HOs becoming *Hydrospatial* – Geospatial at Sea





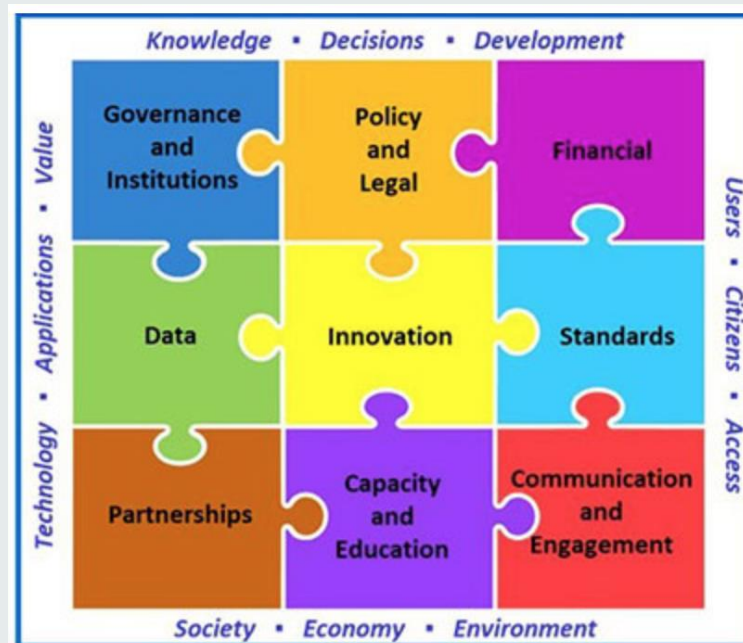
The Hydrospatial enablers

Policy and Governance

- The UN Integrated Geospatial Information Framework (IGIF) initiative
 - Basis and guide for geospatial information management
 - Development
 - Integration
 - Strengthening



9 Strategic Paths





The Hydrospatial enablers

Policy and Governance

- The UN Sustainable Development Goals



<http://unstats-undesa.opendata.arcgis.com/>



The Hydrosatial enablers

Policy and Governance

- IHO C-17 Spatial Data Infrastructures “The Marine Dimension”
 - The IHO MSDI WG
 - Guidance for Hydrographic Offices
 - Key drivers:
 - Blue Economy and “Blue Growth”
 - Open Data
 - Smart monitoring of the oceans
 - INSPIRE
 - e-Navigation
 - Emergency planning and response
 - Sea level rise
 - Population growth



SPATIAL DATA INFRASTRUCTURES "THE MARINE DIMENSION"

Guidance for Hydrographic Offices

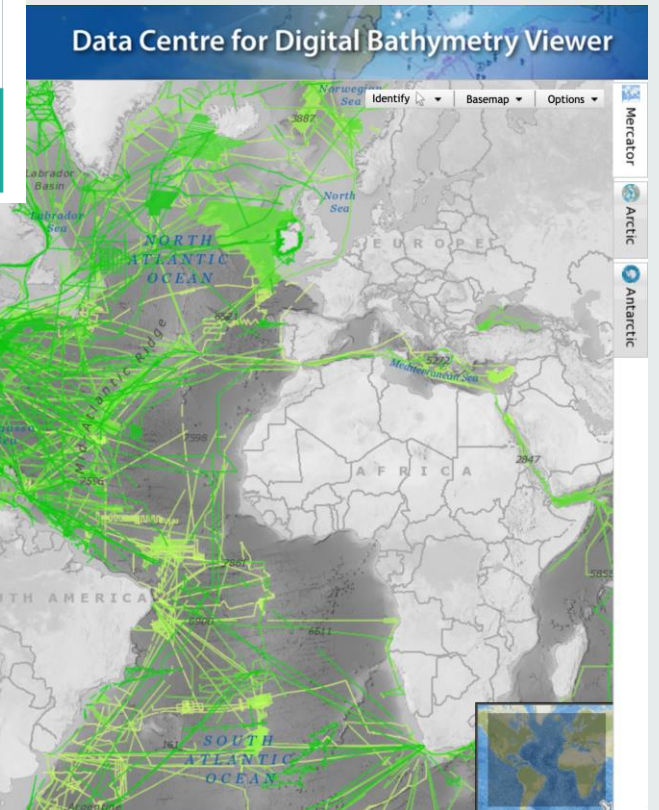
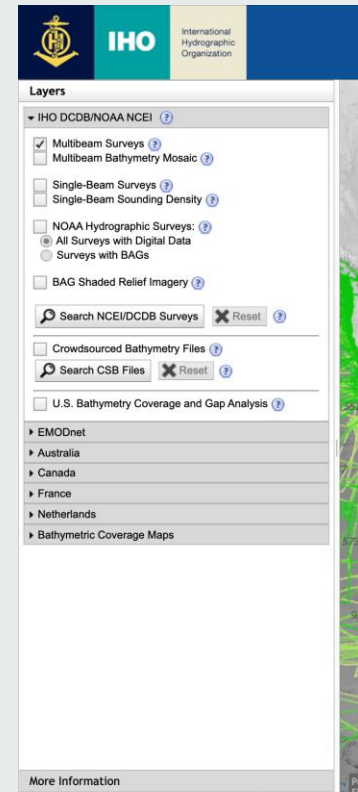
Publication C-17
Second Edition
Version 2.0.0 - January 2017

Published by the
International Hydrographic Organization
4b, quai Antoine 1er
B.P. 445
Monaco, MC 98011 Cedex
MONACO
info@iho.int
www.iho.int

The Hydrospatial enablers

Data

- Bathymetry
- Authoritative data
 - Official from a responsible agency
- Crowdsourc (Bathymetry)
 - Something is better than nothing
 - IHO B-12
- Metadata
 - How and when I can use data



https://maps.ngdc.noaa.gov/viewers/iho_dcdb/

Second Poll:
What's the main type of data that you manage/work with in your organization?



The Hydrospatial enablers

Standards

- Open Geospatial Consortium (OGC)
- The IHO Universal Hydrographic Data model S-100
 - Registry and Registers (S-99)
 - Domains
 - Series
- New Products
 - S-101 ENC
 - S-102 Bathymetric Surface
 - S-104 Tides
 - S-111 Currents
 - S-129 UKCM





The Hydrospatial enablers

Technology

- Hardware and Software
- Big Data
 - Volume, Velocity and Variety
- Internet of Things (IoT)
- Artificial Intelligence (AI)
 - Deep Learning
- Digital Twin
- Virtual and Augmented Reality

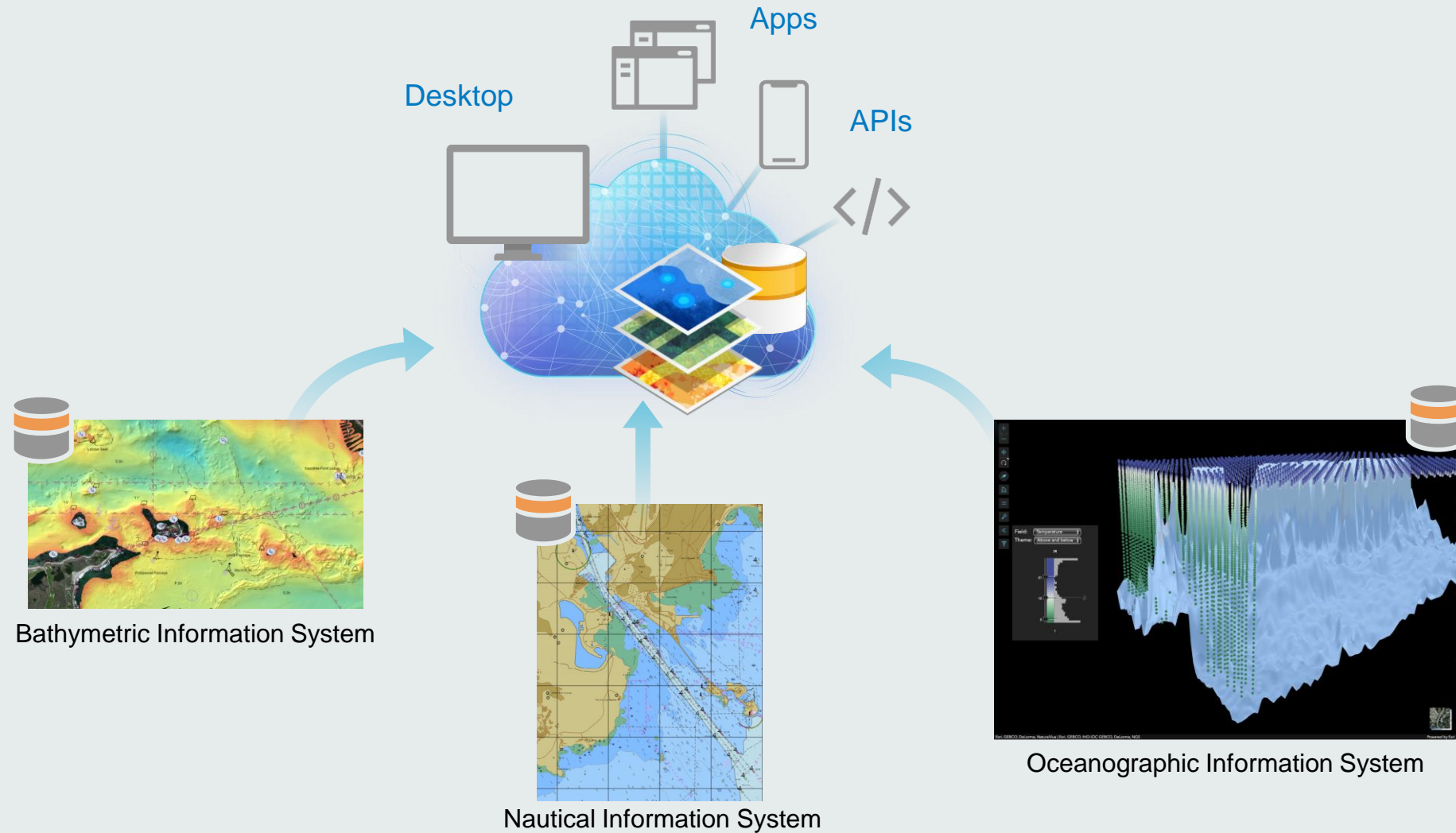


Third Poll:
What technical problem keeps you
awake at night?



Transforming into a Hydrospatial agency

Building an MSDI

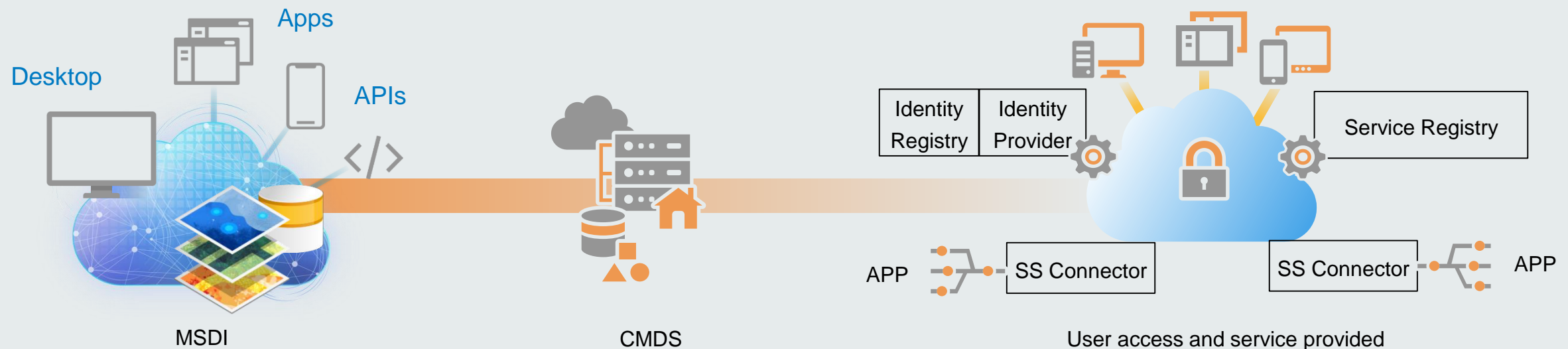




Transforming into a Hydrospatial agency

Supporting a Common Maritime Data Structure

- Taking advantage of the IHO S-100 for new products and services
 - e-Navigation → CMDS
 - Maritime Services Portfolios
 - MSP 5 – Maritime Safety Information Service
 - MSP 6 – Pilotage Service
 - MSP 12 – Nautical Chart Service
 - MSP 13 – Nautical Publications Service
 - MSP 16 – Real-time Hydrographic and Environmental Information Service

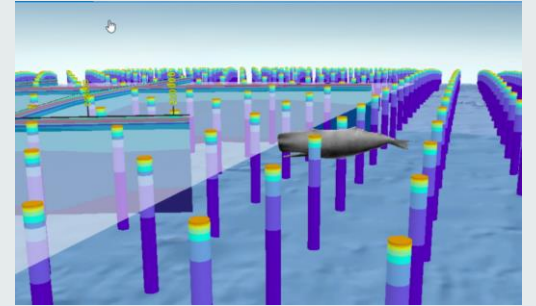




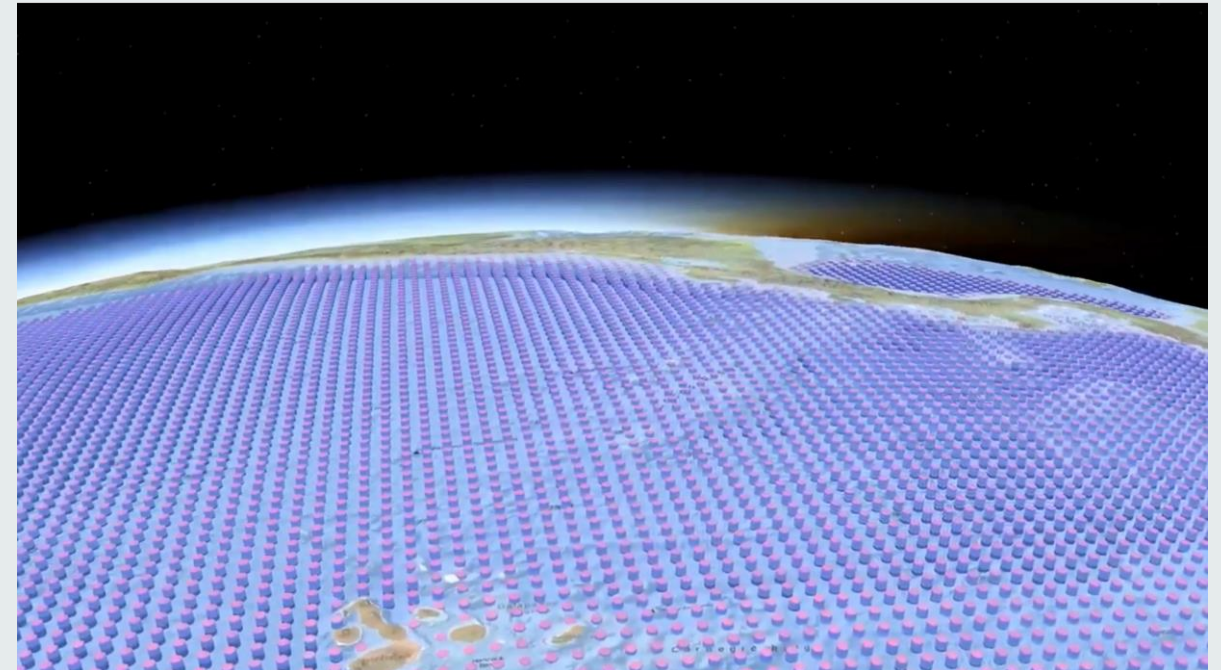
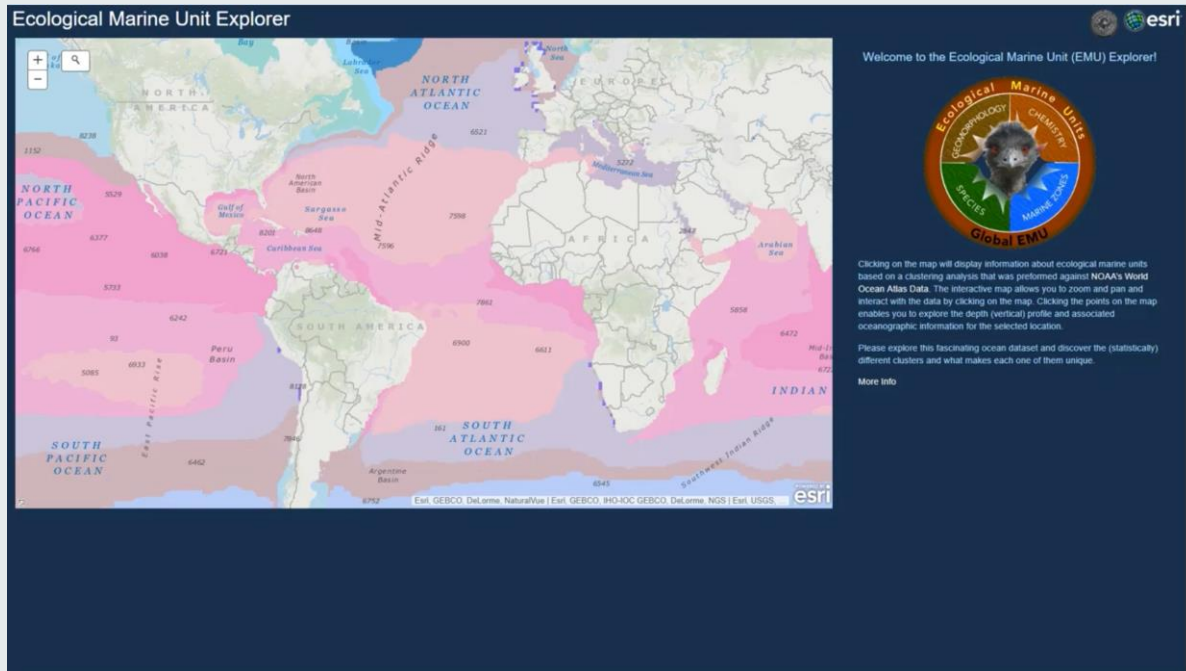
Transforming into a Hydrospatial agency

Enabling Marine Spatial Planning

- Marine Spatial Planning – Coastal Zone Management (EMUs and CMUs)
- Becoming the gatekeeper, custodian and curator of Hydrospatial data
 - Authoritative and crowdsource
- Becoming the complement to the land Geospatial data



<https://livingatlas.arcgis.com/emu>

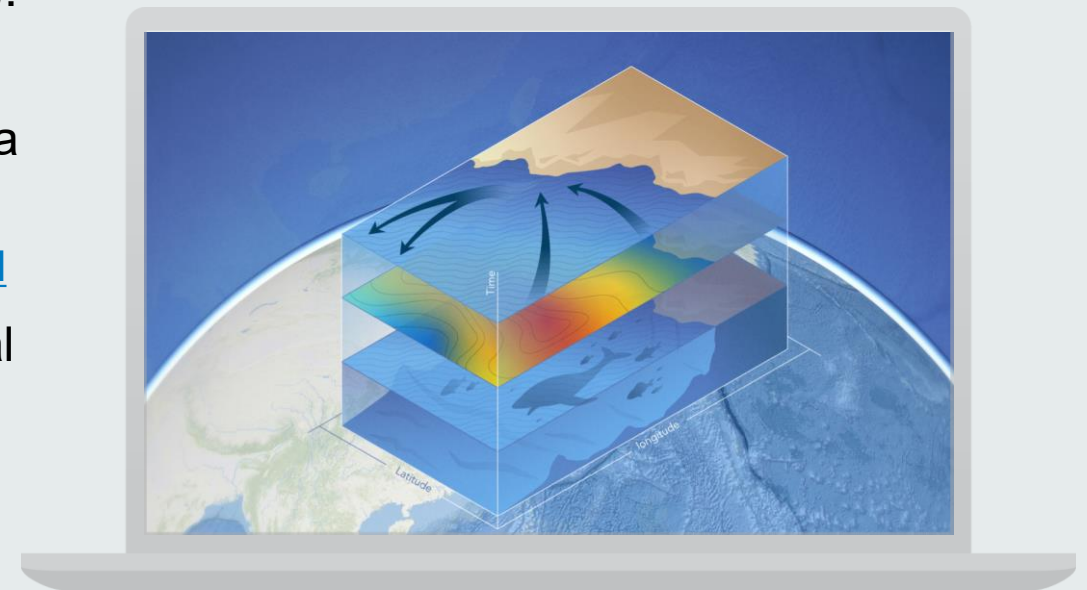




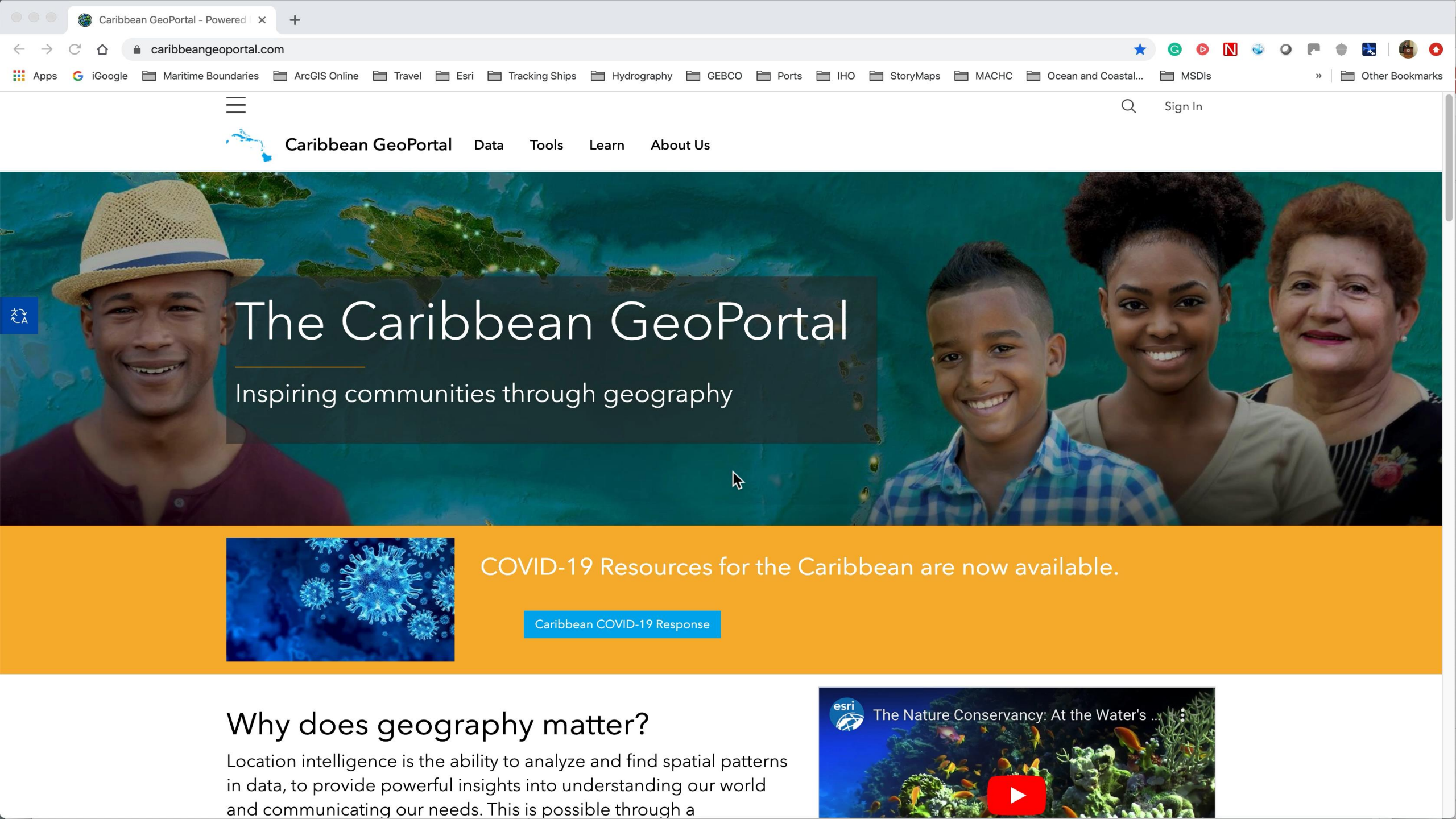
How a (M)SDI result looks like in the real world?

Some examples

- The Caribbean GeoPortal:
 - <https://www.caribbeangeoportal.com/>
- Direccion General Maritime (DIMAR Open Data – Colombia):
 - <https://geohub-dimar.opendata.arcgis.com/>
- United Kingdom Hydrographic Office's Admiralty Marine Data Portal:
 - <https://data.admiralty.co.uk/portal/apps/sites/#/marine-data-portal>
- GeoAdriatic, Croatian Hydrographic Institute's Marine Spatial Data Portal:
 - <https://www.hhi.hr/geoadriatic/>



Not static, but in constant evolution



The Caribbean GeoPortal

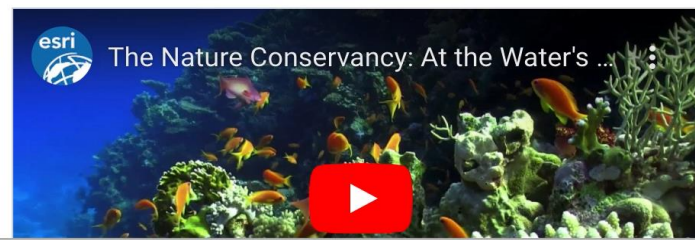
Inspiring communities through geography

COVID-19 Resources for the Caribbean are now available.

[Caribbean COVID-19 Response](#)

Why does geography matter?

Location intelligence is the ability to analyze and find spatial patterns in data, to provide powerful insights into understanding our world and communicating our needs. This is possible through a



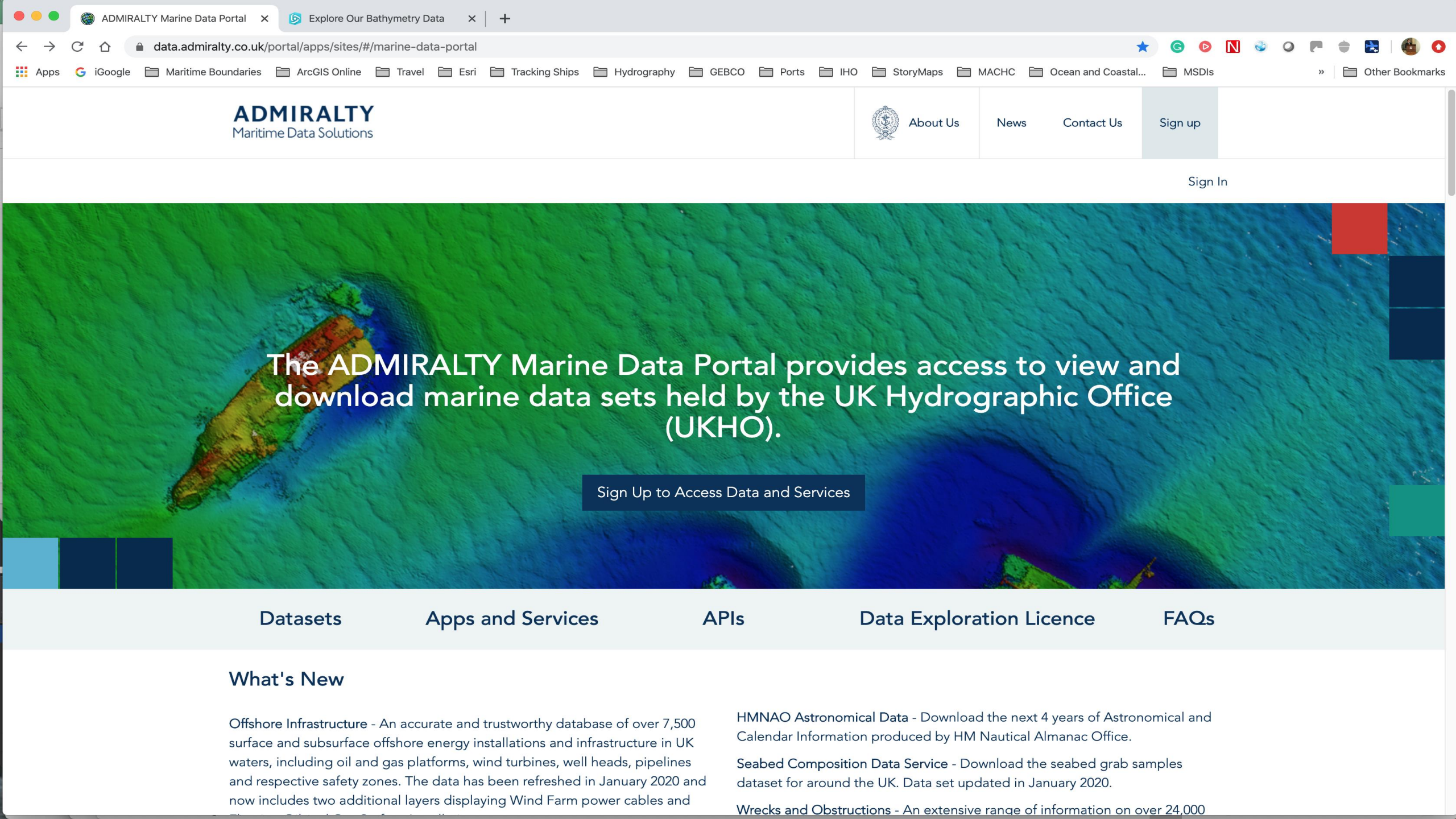


INFRAESTRUCTURA DE DATOS ESPACIALES MARÍTIMA, FLUVIAL Y COSTERA DE COLOMBIA

¿Quieres conocer nuestro país marítimo?

En este portal podrás explorar y visualizar información geográfica de nuestros mares y costas

Descubre el poder de la comunidad marítima



The ADMIRALTY Marine Data Portal provides access to view and download marine data sets held by the UK Hydrographic Office (UKHO).

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Datasets

Apps and Services

APIs

Data Exploration Licence

FAQs

What's New

Offshore Infrastructure - An accurate and trustworthy database of over 7,500 surface and subsurface offshore energy installations and infrastructure in UK waters, including oil and gas platforms, wind turbines, well heads, pipelines and respective safety zones. The data has been refreshed in January 2020 and now includes two additional layers displaying Wind Farm power cables and

HMNAO Astronomical Data - Download the next 4 years of Astronomical and Calendar Information produced by HM Nautical Almanac Office.

Seabed Composition Data Service - Download the seabed grab samples dataset for around the UK. Data set updated in January 2020.


Wrecks and Obstructions - An extensive range of information on over 24,000

ADMIRALTY Marine Data Portal

data.admiralty.co.uk/portal/apps/sites/#datasets

AppsiGoogleMaritime BoundariesArcGIS OnlineTravelEsriTracking ShipsHvdrographvGEBCOPortsIHOStoryMapsMACHCOcean and Coastal...MSDIsOther Bookmarks

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Home > Digital Services > Digital Charts > ADMIRALTY Vector Chart Service

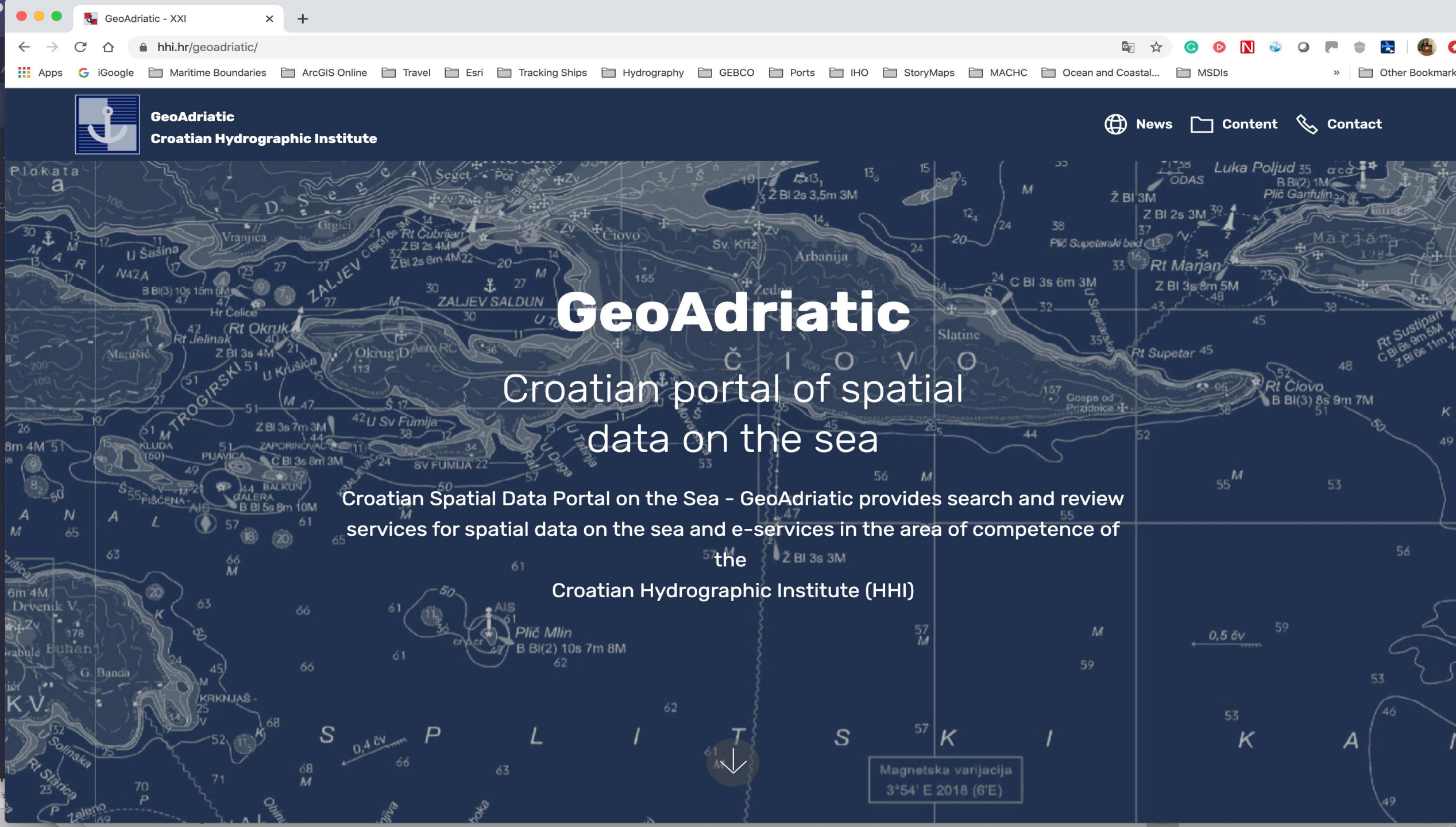
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Vector Chart Service

The world's most chosen ENC
service for ECDIS – now
available online

OverviewFeaturesSpecificationsUpdatesSupportHow to buyAVCS Online

The ADMIRALTY Vector Chart Service (AVCS) is the world's leading official digital maritime chart service, with over 15,800 official Electronic Navigational Charts (ENCs) to help bridge crews navigate safely and efficiently whilst meeting flag and port State requirements.

AVCSADMIRALTY
Vector Chart Service...



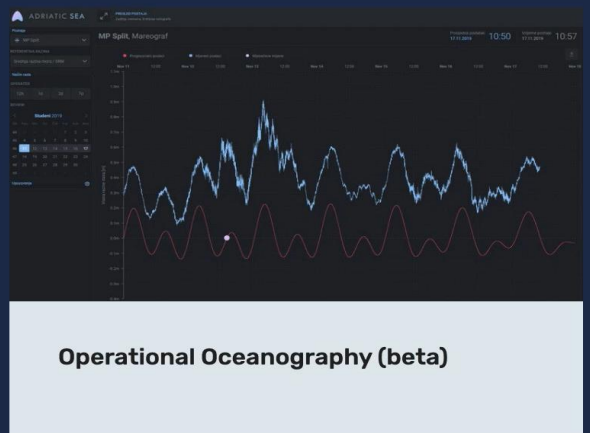
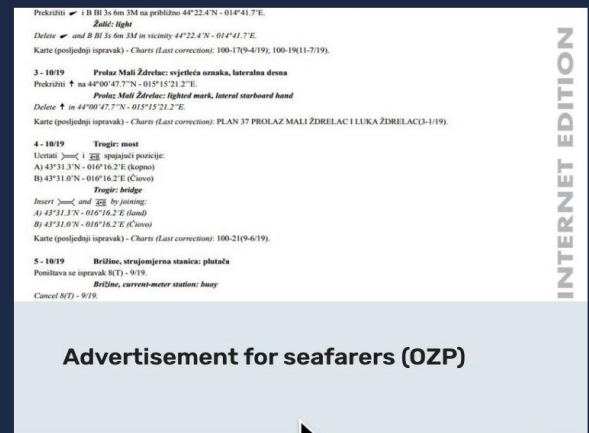
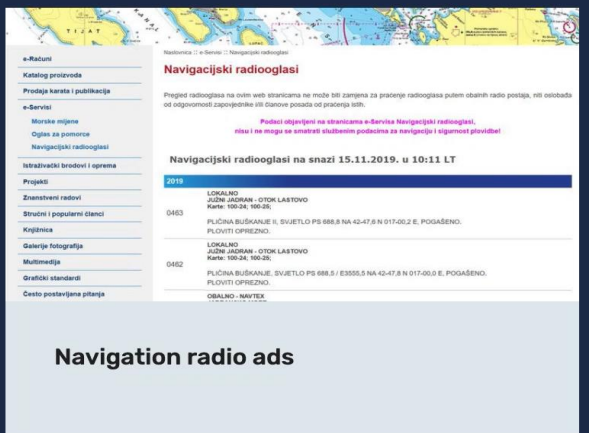
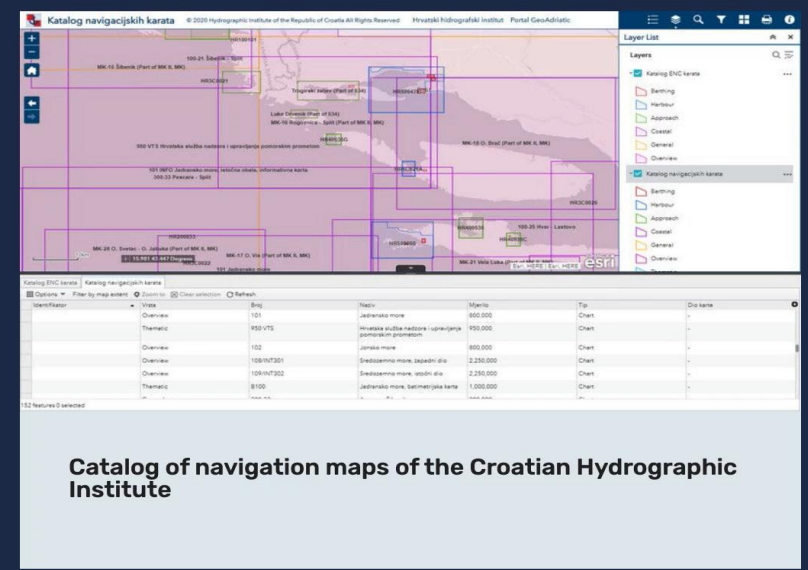
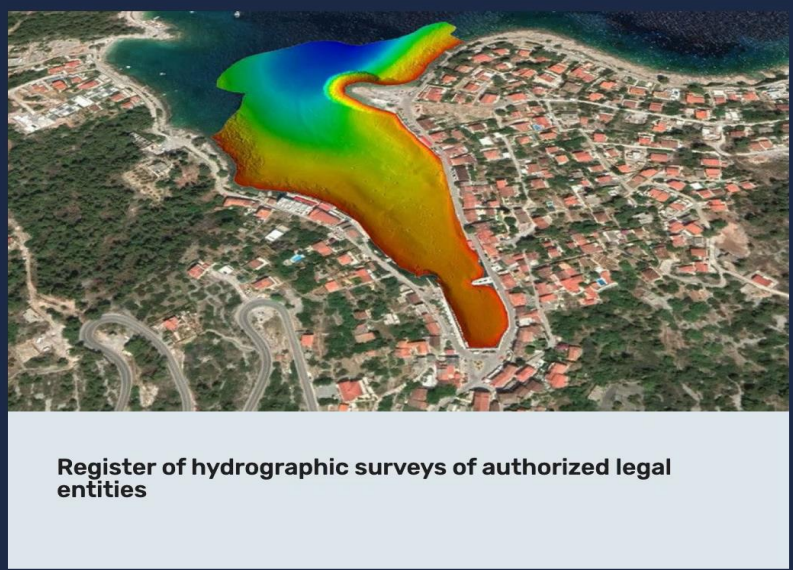
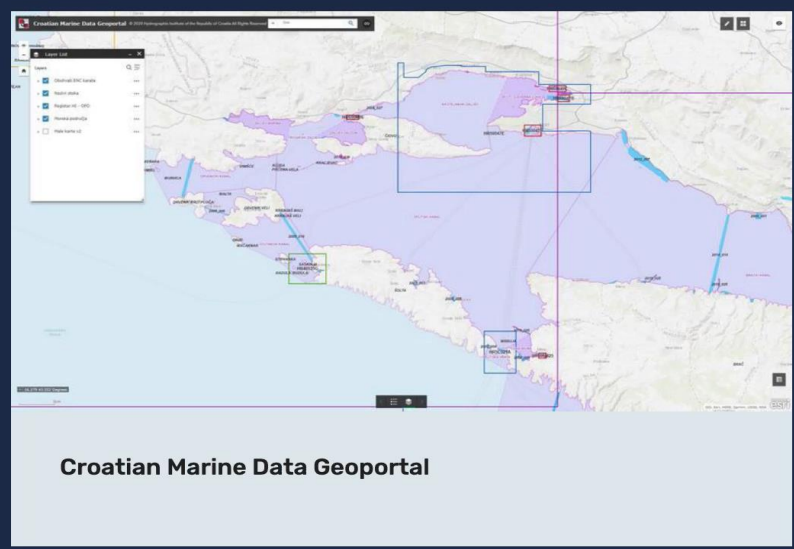
GeoAdriatic
Croatian Hydrographic Institute

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GeoAdriatic

Croatian portal of spatial data on the sea

Croatian Spatial Data Portal on the Sea - GeoAdriatic provides search and review services for spatial data on the sea and e-services in the area of competence of the Croatian Hydrographic Institute (HHI)




Caribbean GeoPortal - Powered by ArcGIS Online

caribbeangeoportal.com

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Caribbean GeoPortal Data Tools Learn About Us



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Datos Abiertos Dirección General Marítima

geohub-dimar.opendata.arcgis.com

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Inicio Escuela IDE Acerca de IDE ¿Dónde Encontrarnos?



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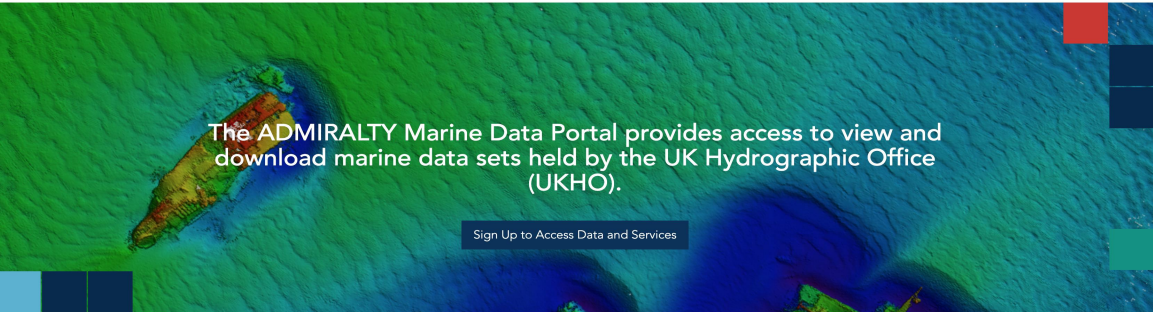
data.admiralty.co.uk/portal/apps/sites/it/marine-data-portal

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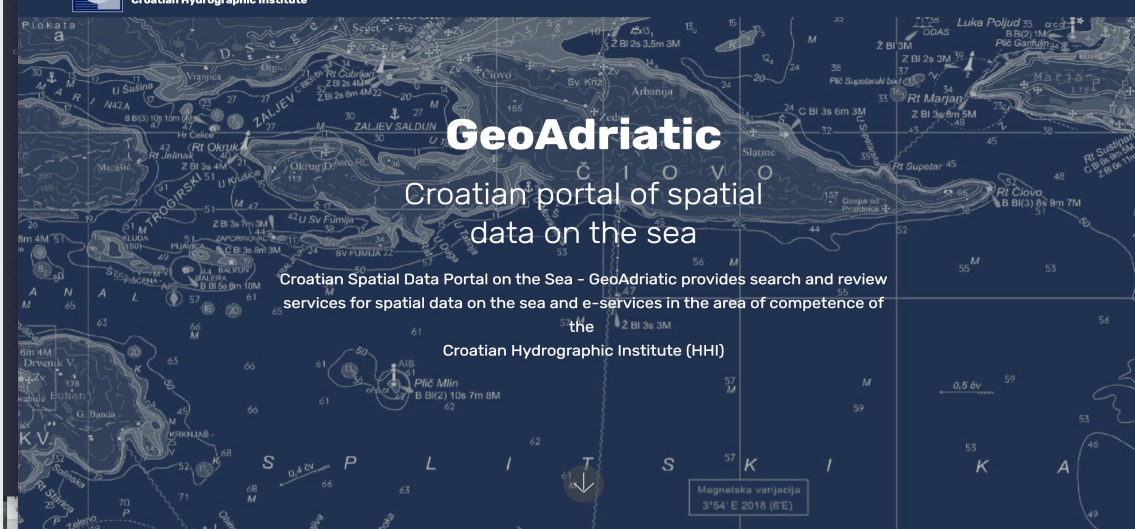
GeoAdriatic - XXI

hhi.hr/geoadriatic/

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Croatian portal of spatial data on the sea

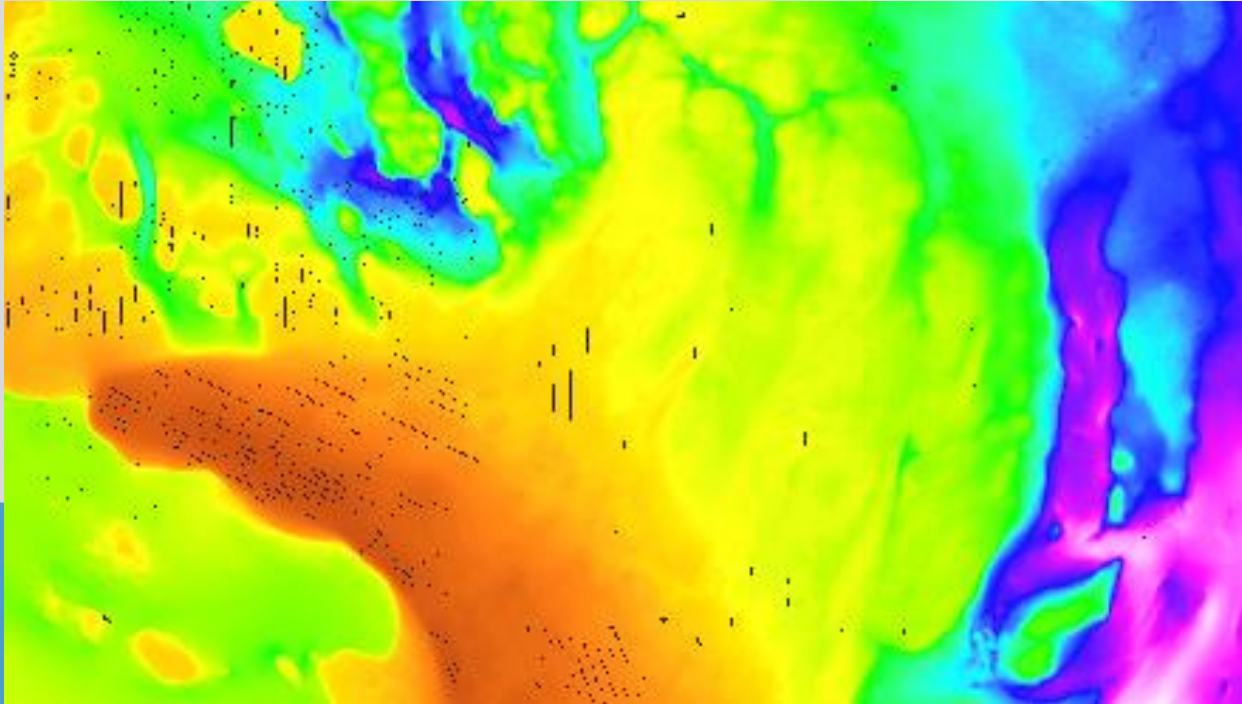
Croatian Spatial Data Portal on the Sea - GeoAdriatic provides search and review services for spatial data on the sea and e-services in the area of competence of the Croatian Hydrographic Institute (HHI)

New Technologies, New Opportunities

Demonstrations

The Maritime Chart Service





Bathymetric Elevation Service

Esri Hydrographic Office

BIS Filter

chartondemand.esri.com/Bathy/

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Filter

▼

🔍

Explore Bathymetry

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Properties

Name

BIS Dataset Type

Cell Size

0

and

Data Percentage

0

and

100

Vertical Units

Direction

Extended Metadata

Ext IHO Survey Order

Ext Sensor

+

Profile

⌂

🔄

⬅️

➡️

Concord

Dover

Portsmouth

Manchester

Hampton

Amesbury

Newburyport

Nashua

Haverhill

Ipswich

Lowell

Gloucester

Peabody

Salem

Cambridge

Boston

Leominster

Worcester

Massachusetts

Atlantic Ocean

0 20km

-69.910 42.368 Degrees

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Options

▼

Filter by map extent

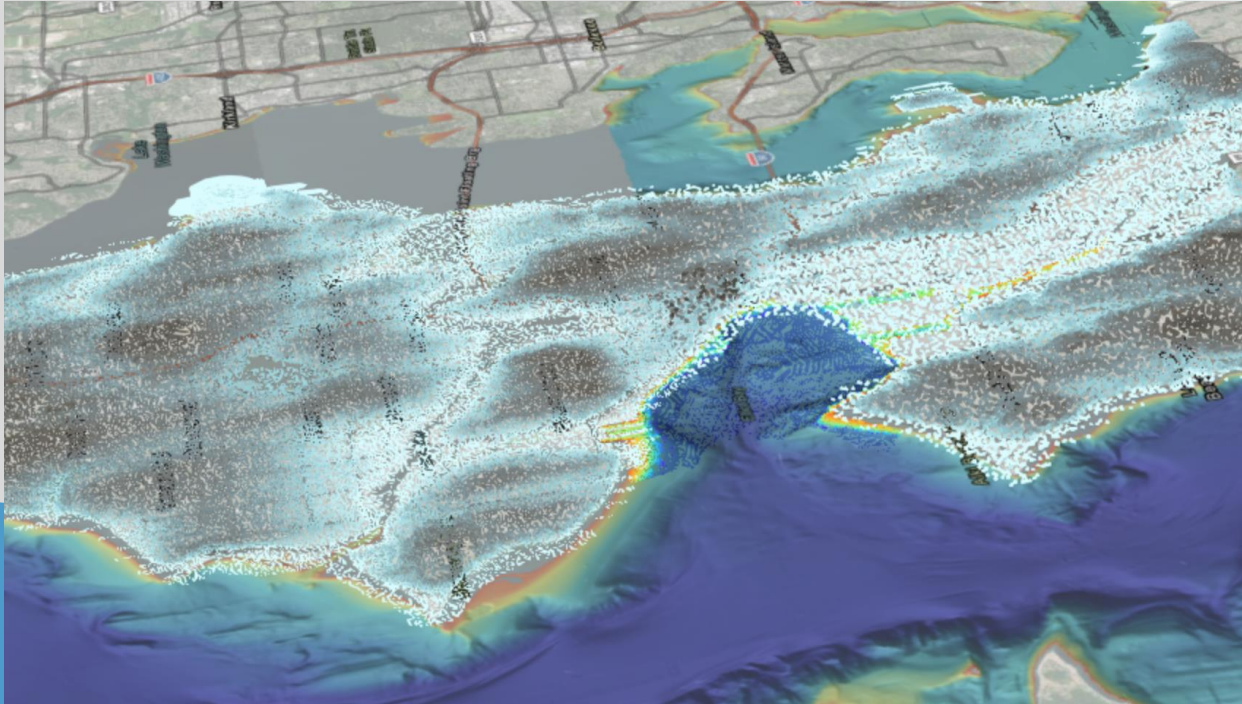
📍 Zoom to

☑ Clear selection

🔄 Refresh

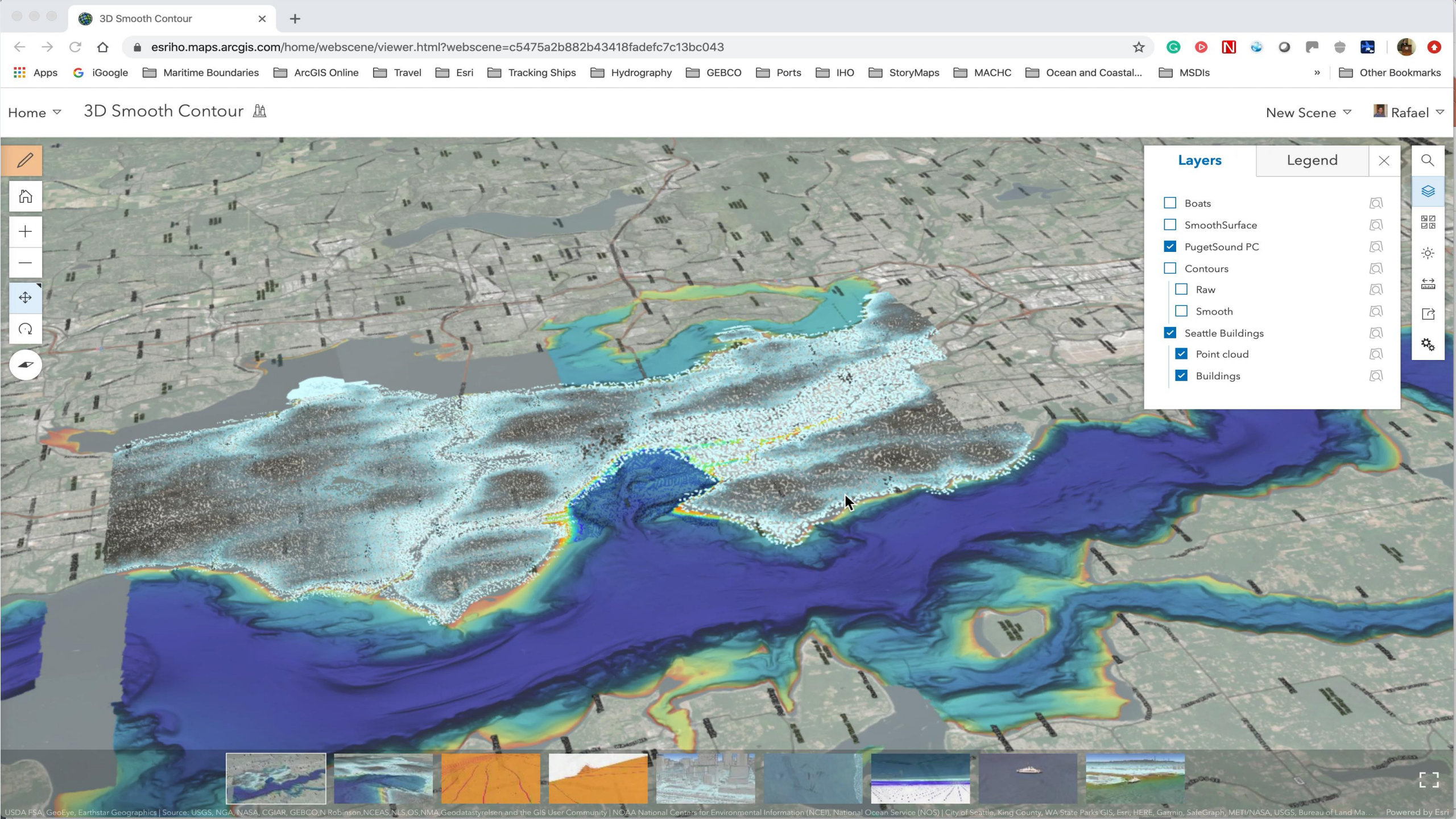
OBJECTID	Name	BisDatasetId	BIS Dataset Type	Cell Size	Data Percentage	Vertical Units	Direction	BIS Models	Ext IHO Survey Order	Ext Sensor	Ext Vessel	
1	H11421_4m_MLLW_1of2	{75283AD9-A54F-46CD-917D-D0AC1AE7C018}	Gridded BAG	4	3	Meters	Positive Up		Special Order	Sensor 1	Vessel 1	Mt
2	H11421_6m_MLLW_2of2	{B4FED879-E427-43EB-AAC3-14ACD5540432}	Gridded BAG	6	73	Meters	Positive Up		Special Order	Sensor 1	Vessel 1	Mt

24 features 0 selected



Point Cloud Service

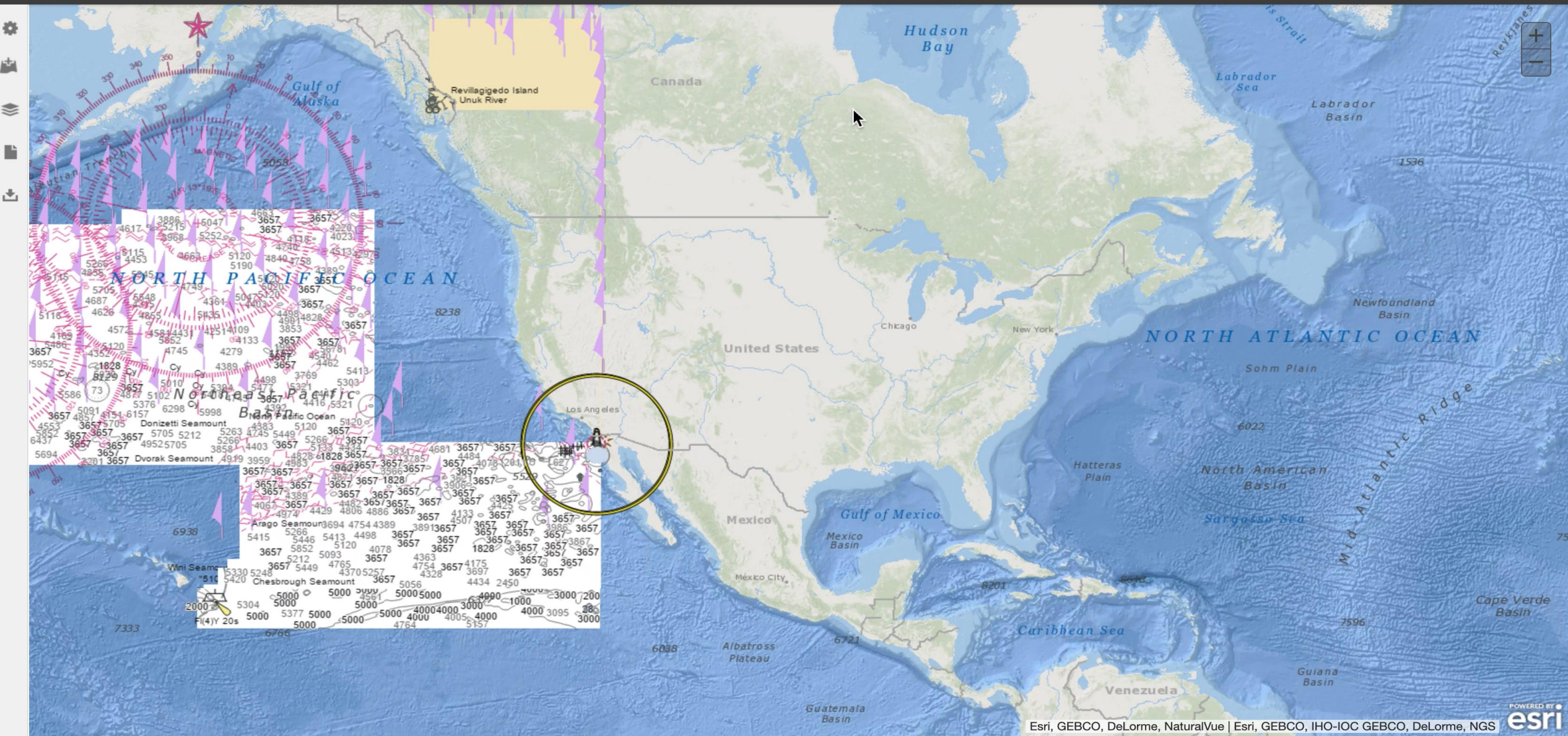
<https://www.ogc.org/standards/i3s>
[ArcGIS Blog](#)

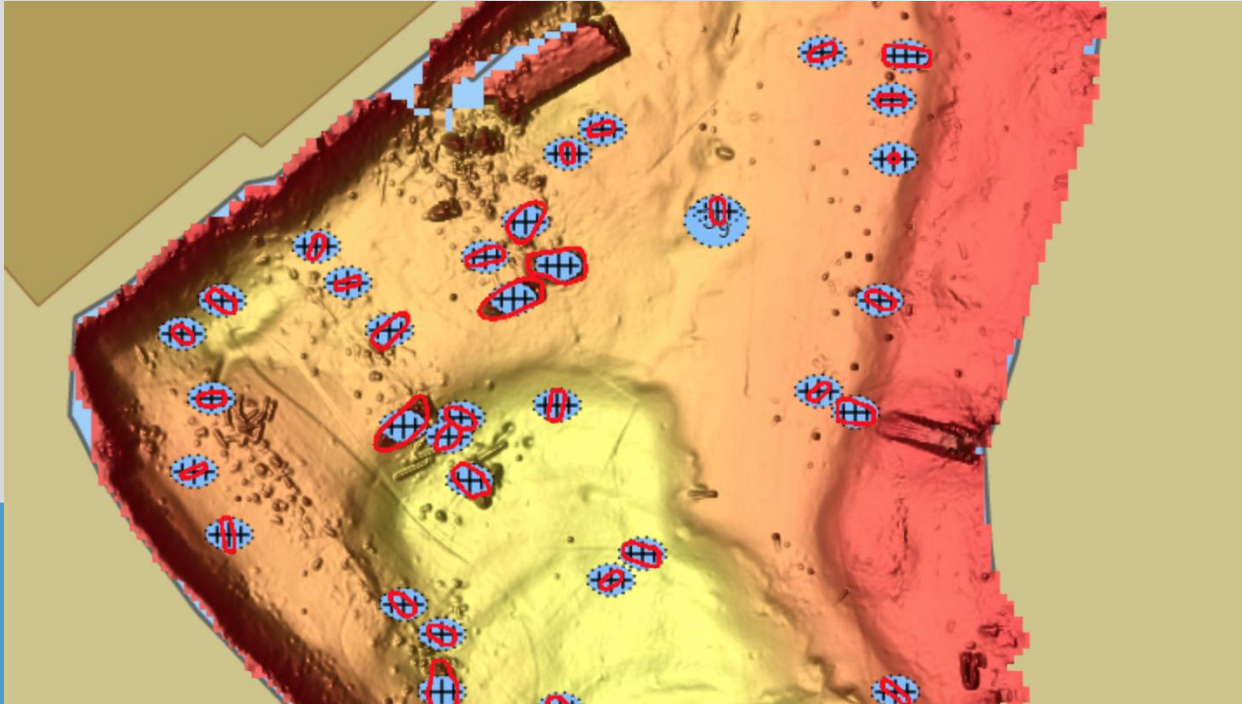




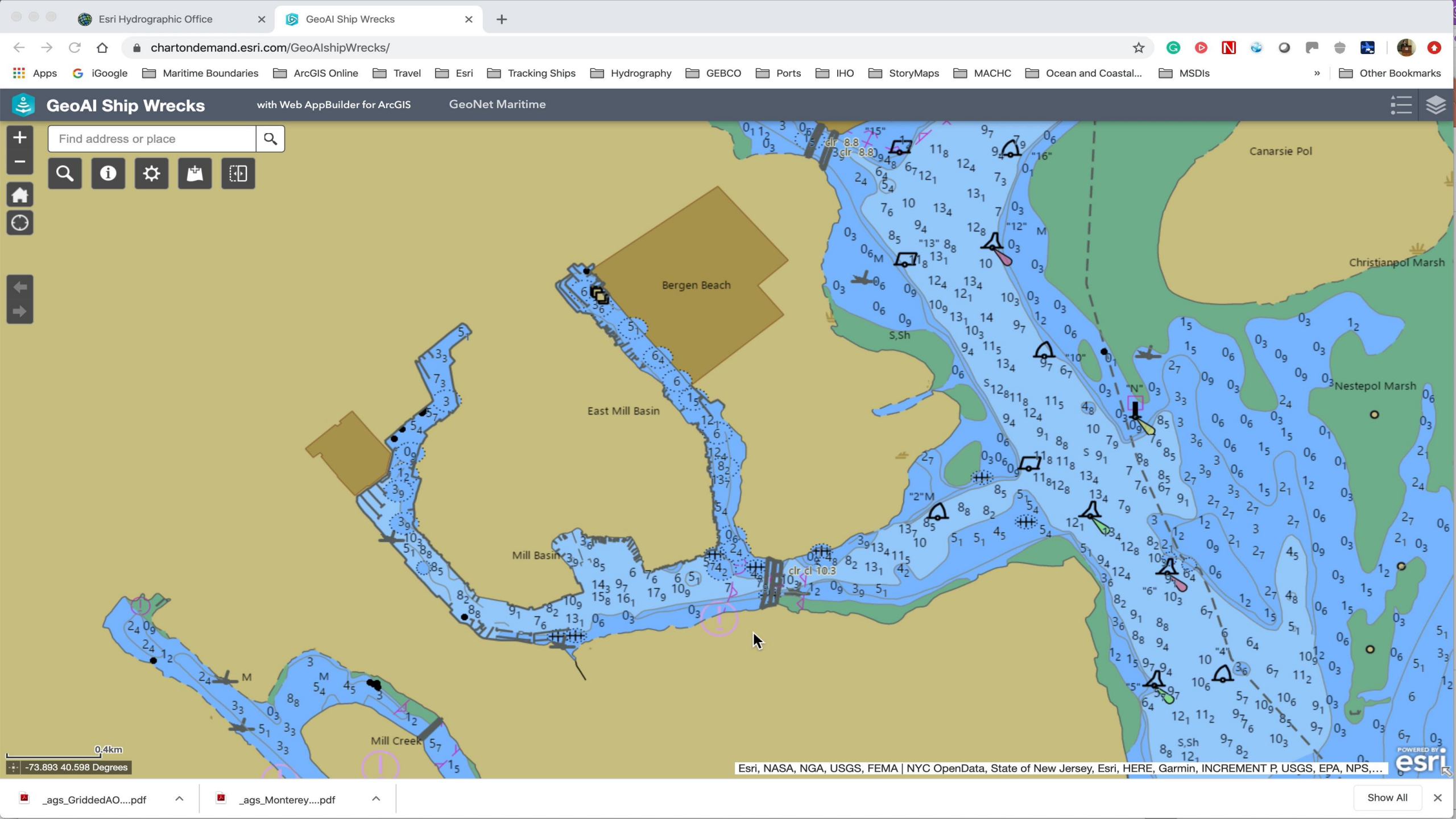
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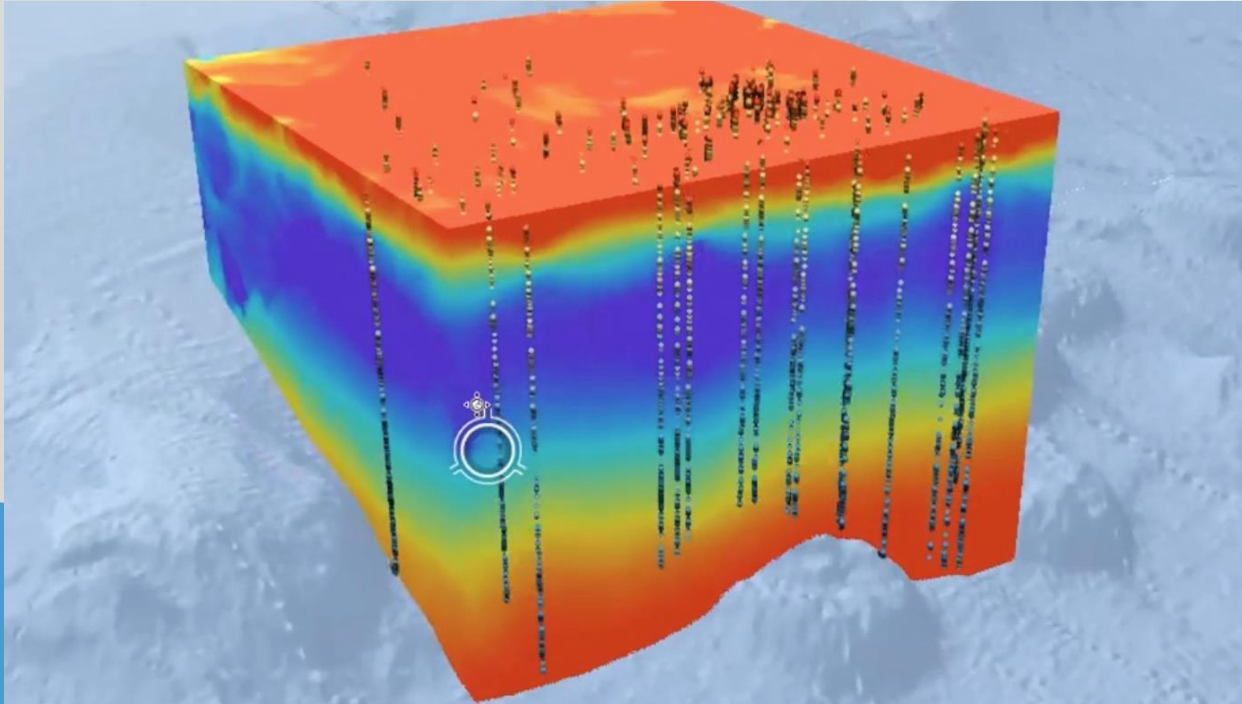
rponce_EsriHO





GeoAI Ship Wrecks Analysis





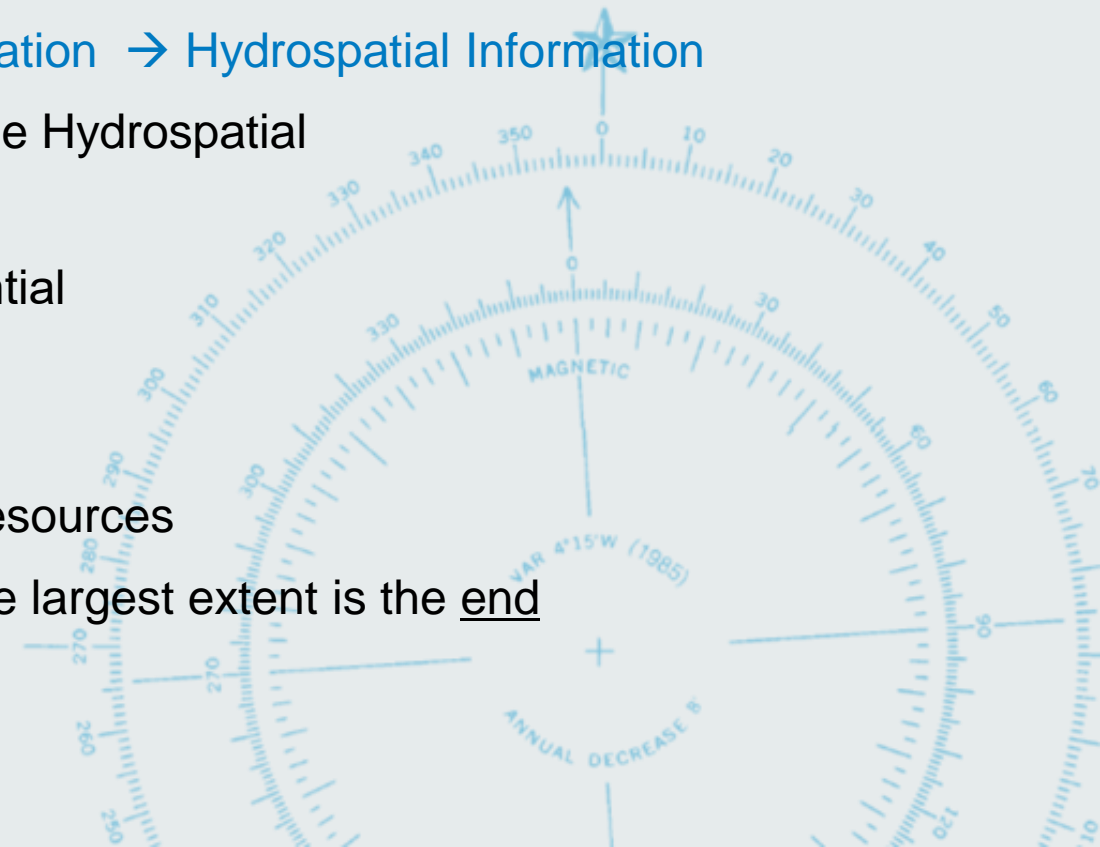
Voxels and NetCDF for Multi-dimensional analysis

Sean Morrish



Take Home Message

- Nature and technological changes bring new challenges and opportunities
- Hydrographic agencies are evolving from their traditional roles
 - Getting more responsibilities
 - Custodians and producers of Marine Geospatial Information → Hydrospatial Information
- A Marine Spatial Data Infrastructure is the mean to become Hydrospatial
 - Four pillars
- Innovation and listening to customers' demands are essential
 - Be agile
 - Be open minded
- Technology allows for the change without needing more resources
- Enabling Hydrospatial data and information products to the largest extent is the end





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Thank you!