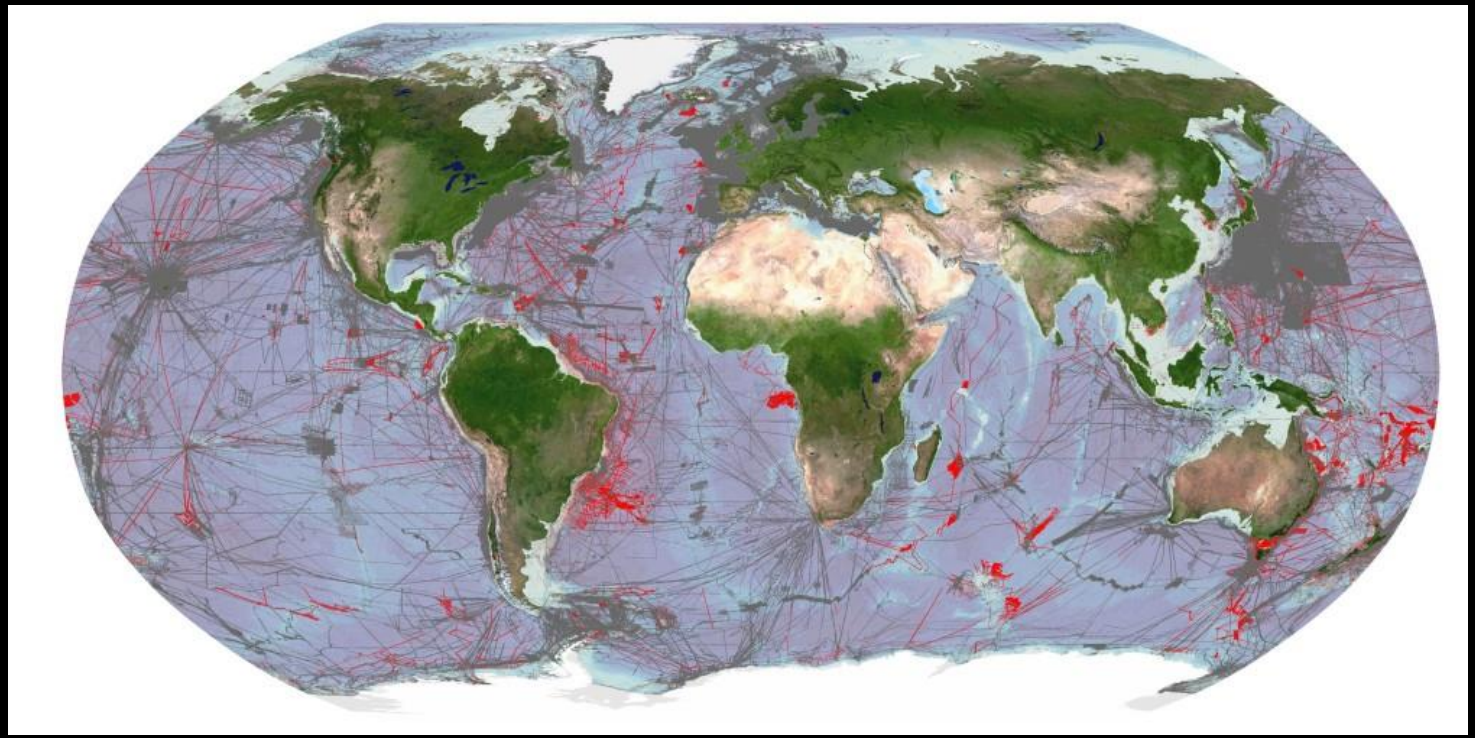
Lakebed/Seabed 2030

Advancements in technology and mapping capabilities

Hans Van Sumeren
Great Lakes Water Studies Institute
Northwestern Michigan College

February 22, 2023

AREAS OF THE GLOBAL SEAFLOOR CONSIDERED MAPPED



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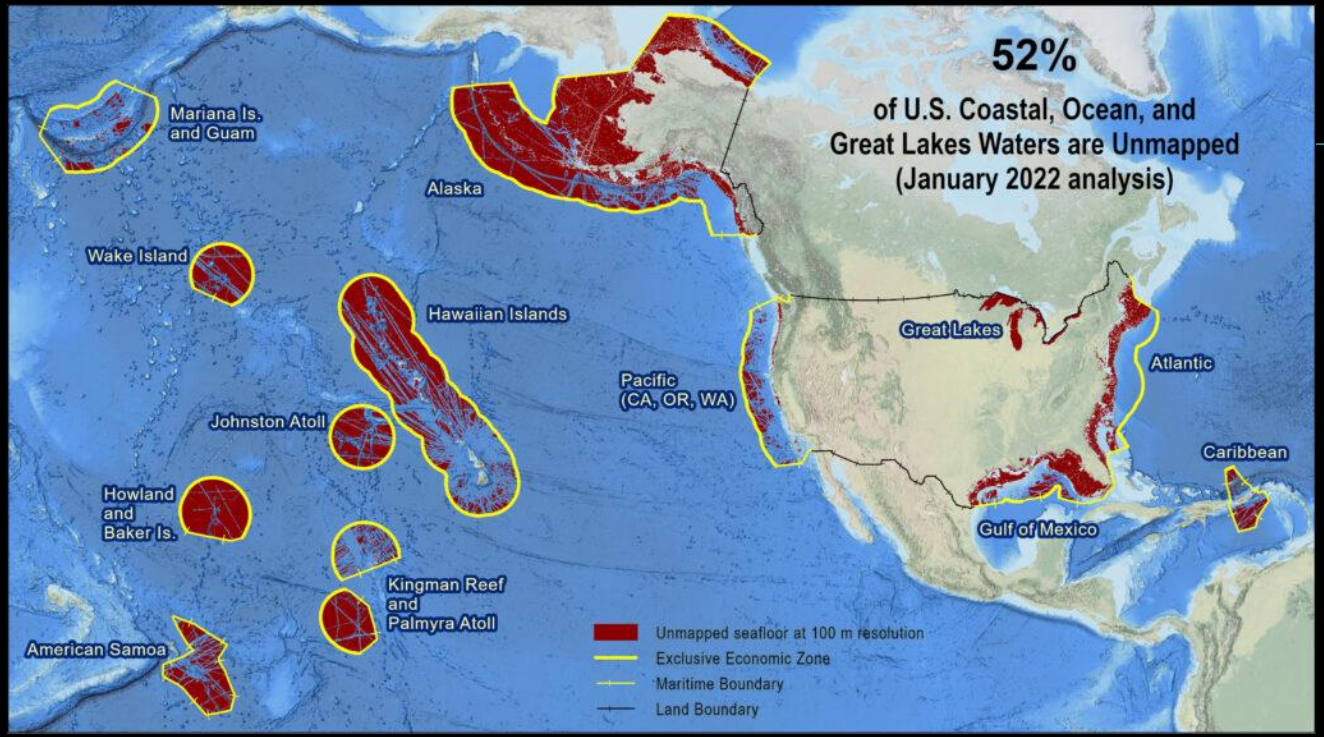

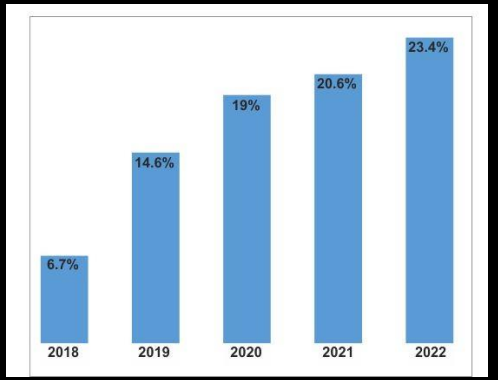

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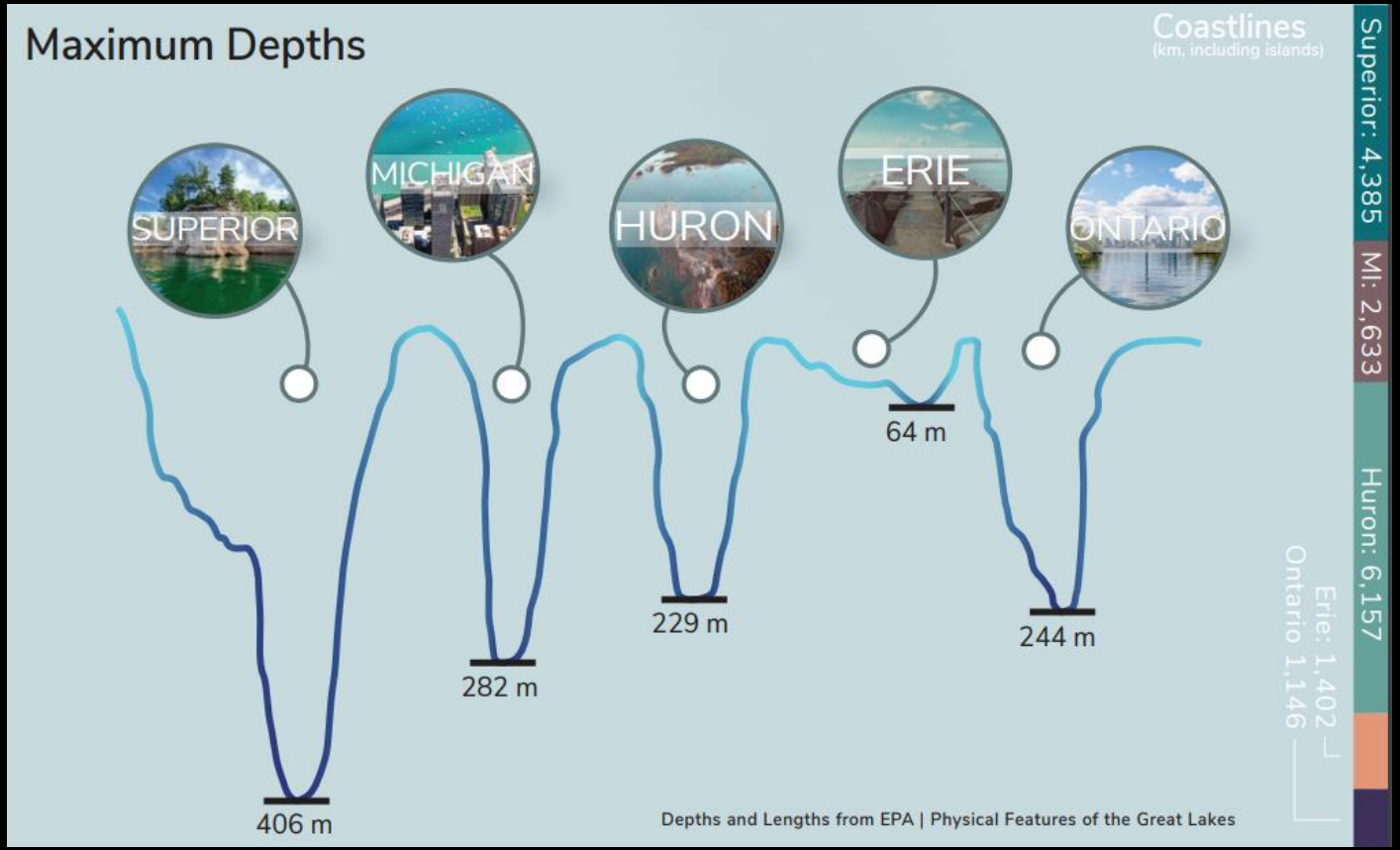
Significant Gaps in all Great Lakes



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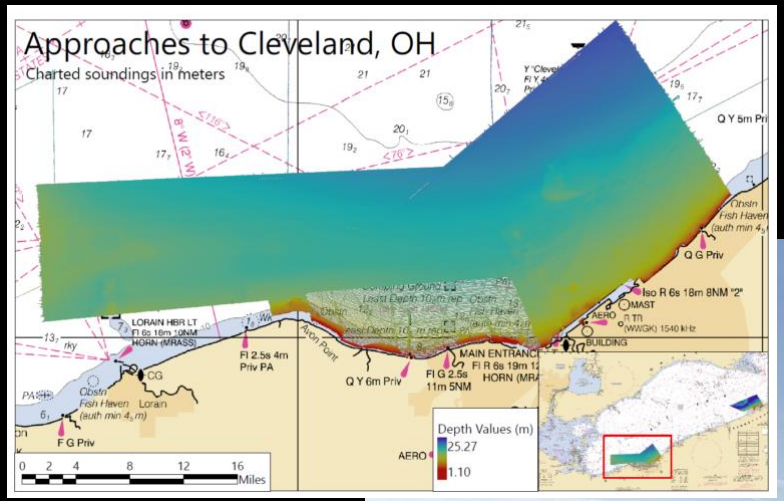
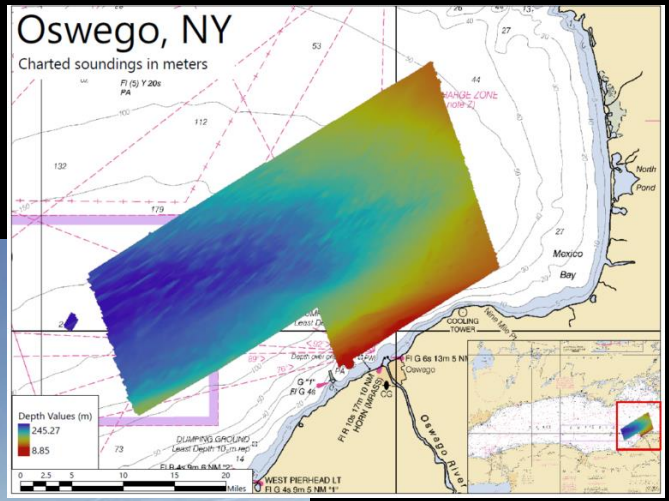
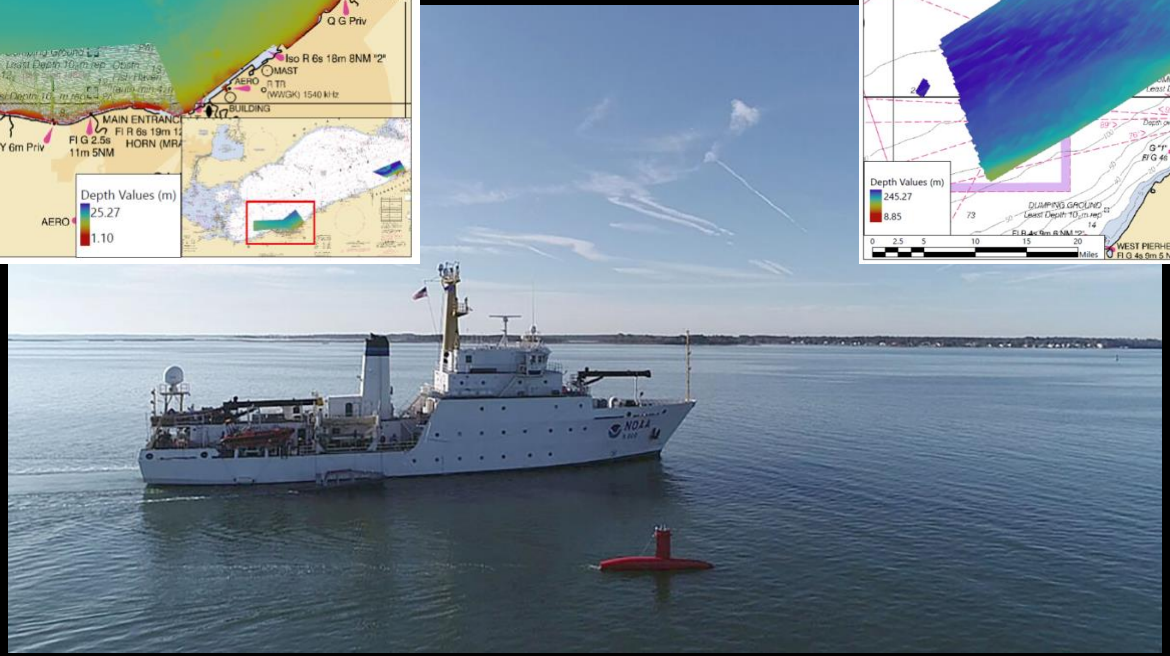
NOAA return to the Great Lakes







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The ocean covers ~71+ % of our planet

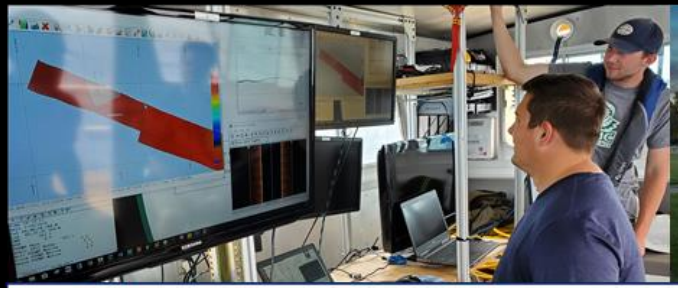
~~10-15% (2018)~~ 23.4% of the world ocean has been mapped at High Resolution (2022)

~ 48% of all US waters have been mapped (2022)

The Great Lakes only ~~~ 5-7% (2019)~~ ~12-15% mapped (US and Canada, 2022)

~~*Less*~~ *More has been explored*
But mysteries remain…
~5% (2022)

How Does GLWSI Contribute?



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GREAT LAKES WATER STUDIES INSTITUTE

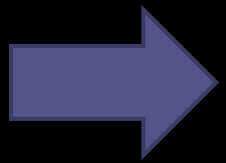
Academic Programs – Professional Development – Applied Research & Technical Services – International Programs

ACADEMIC PROGRAMS	PROFESSIONAL DEVELOPMENT (MARINE CENTER)	RESEARACH, TECHNICAL SERVICES, and GRANTS	INTERNATIONAL PROGRAMS
- Bachelor of Science: Marine Technology - Associates (AAS): Marine Technology - Associates (AAS): Water Quality / Environmental Technology - Associates (ASA): Freshwater Studies	- Technical training - Conferences & webinars - Accelerated programs delivery - Micro-credentials - Custom training - Professional CEUs	- NOAA - National Park Service - Corp. of Engineers - Office of Naval Intelligence - Professional societies - University systems	- Costa Rica - Colombia - Canada - Indonesia (Manado State Polytecknic) - China (Yellow River Technical Institute)

Future Focused in Distinctive Markets

- Competency based
- Networked delivery
- High demand / high growth
- Public/private partnerships and collaborative approaches
- Agile and adaptive
- Multiple learner markets

All Connected to Surveying



- 2008 – Freshwater Studies ASA
- 2012 – Marine Technology AAS
- 2015 – Marine Technology BSMT
- 2017 – YRCTI Marine Technology
- 2018 – Surveying
- 2018 – Marine Center
- 2022 – Infrastructure Inspection credential
- 2023 – Water Quality Environmental Tech (WET Tech)

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Higher Resolution → Better Understanding

Detroit Water Intake

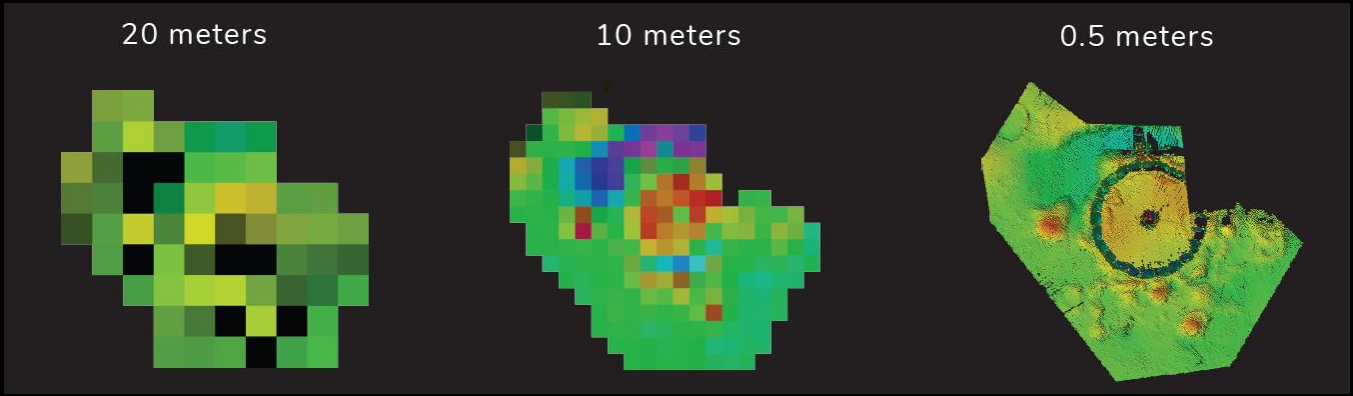

Image courtesy of GLOS

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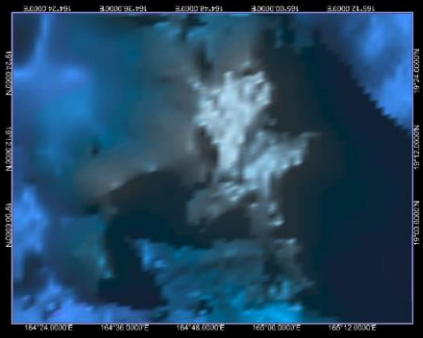
Predicted vs Capable – How much better can we get?
McDonnell Seamount, Wake Atoll, Western Pacific Ocean



Predicted

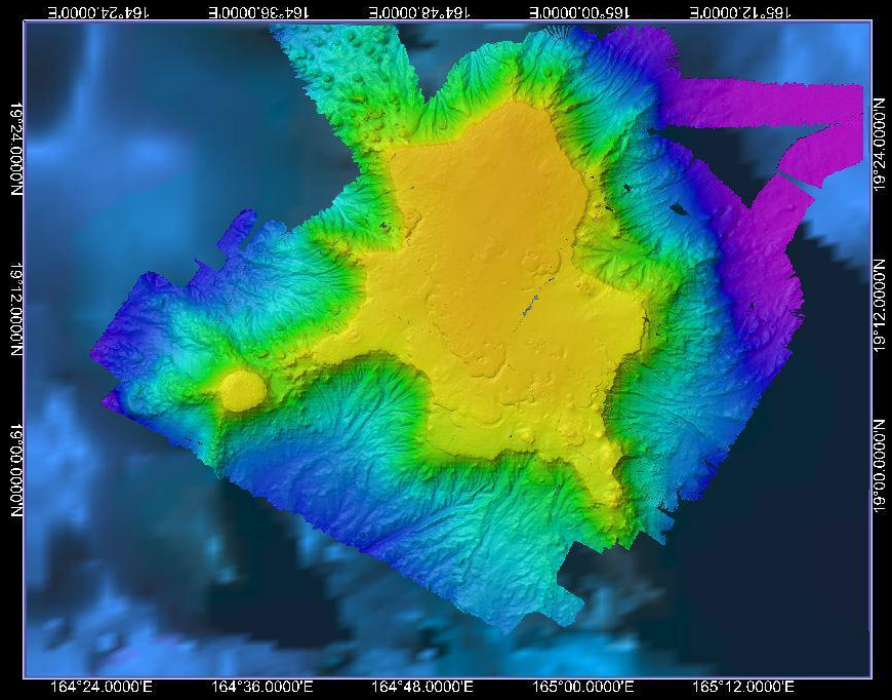
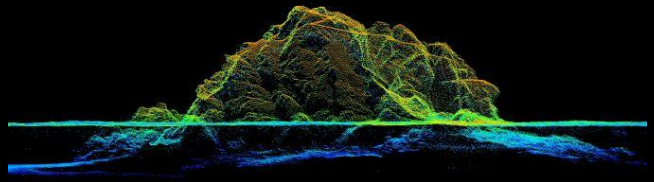


Image courtesy of the NOAA Office of Ocean Exploration and Research, Deepwater Wonders of Wake.

Modern MBES

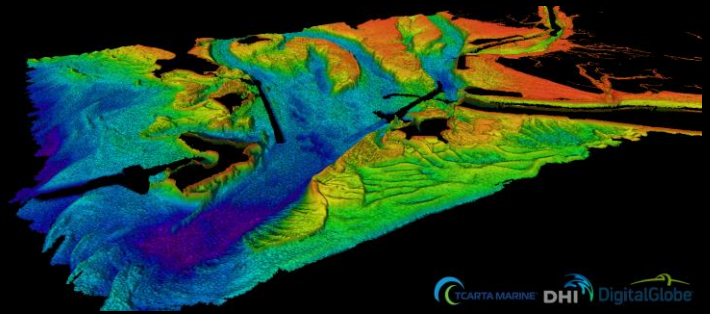
New Approaches will Drive Efficiency

Airborne LiDAR – Depths exceeding 25 meters are common, 2-3 times the secchi disk reading will become the norm.



NEW Leica HawkEye–5, 50 meter system

Satellite Derived Bathymetry
Depths 15-20 meters



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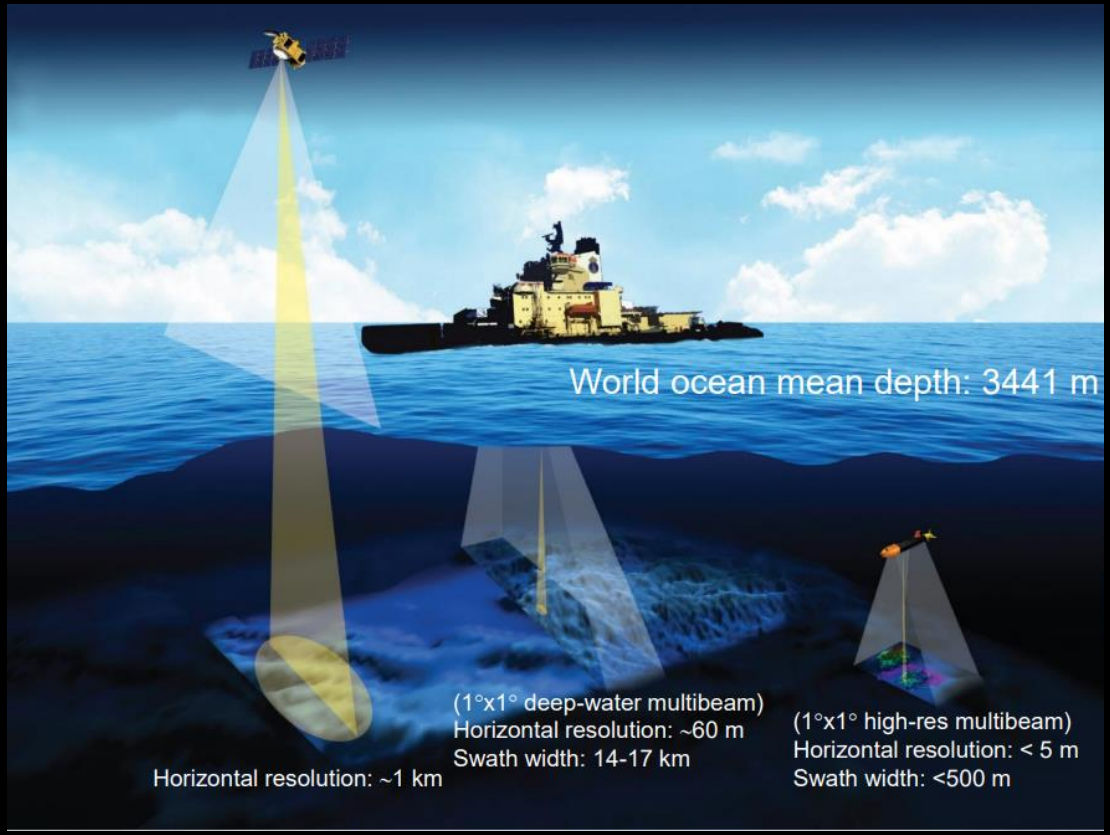
Persistent Ocean and Great Lakes Surveillance

Collaborative Approach



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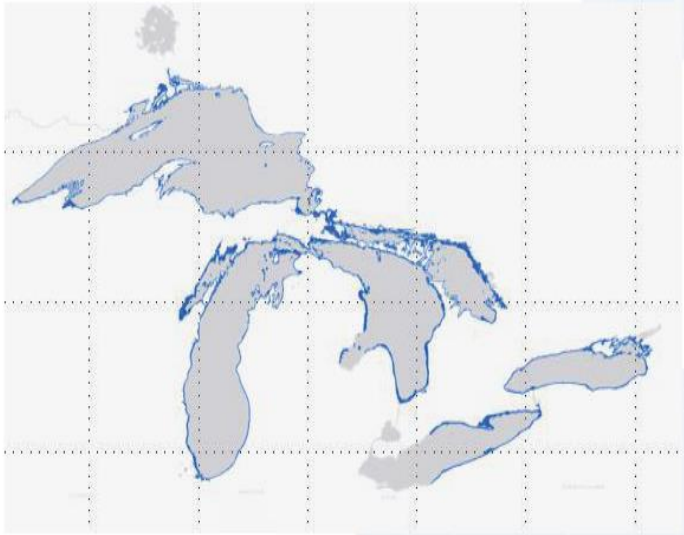
Cost Benefit Analysis



Mapping all possible area using SDB at 2 meter resolution would cost between $1 and $1.9 million, and at 10 meter resolution would cost between $200,000 and $300,000.

Source GLOS

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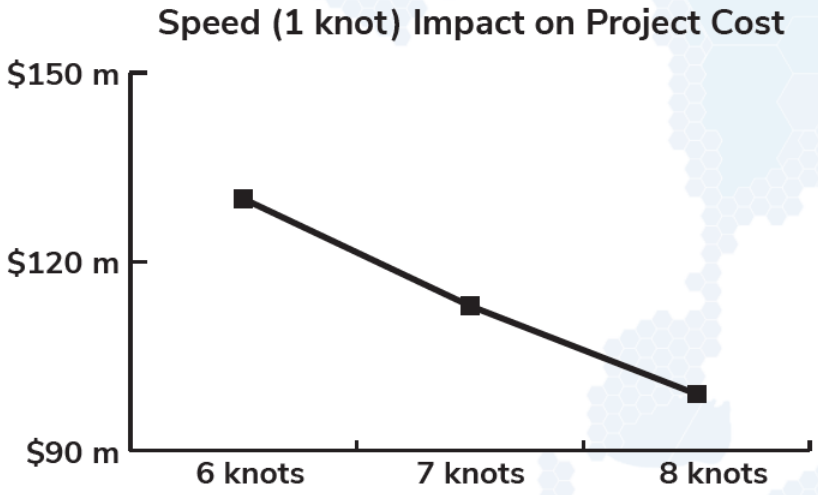
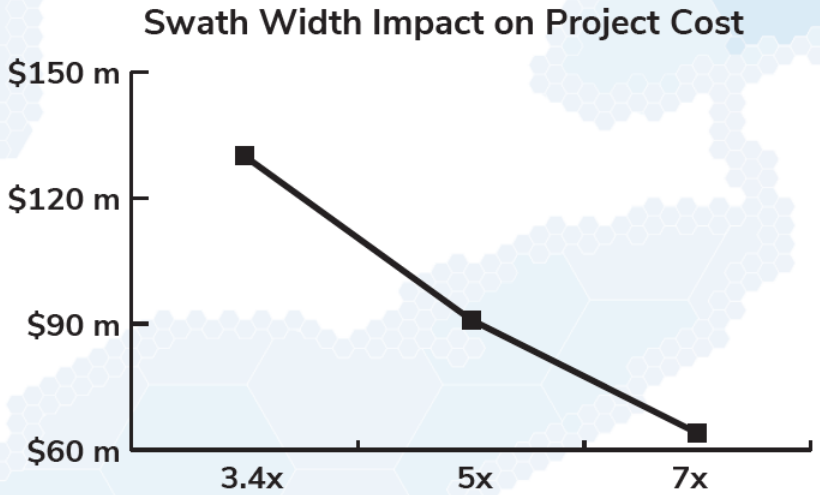
Improvements in Performance
Lakebed 2030 Projections



Every one knot increase in speed reduces the overall cost by 13%.



Doubling the swath width reduces cost by 30%.

Source GLOS

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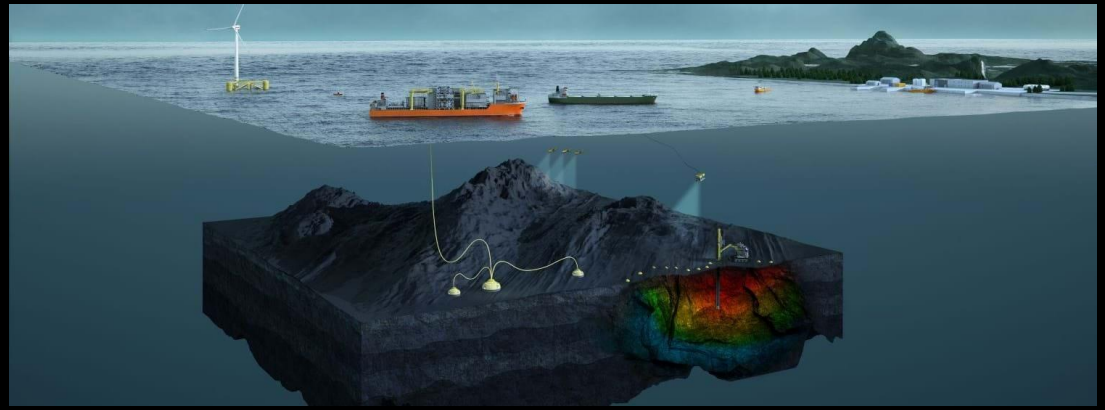
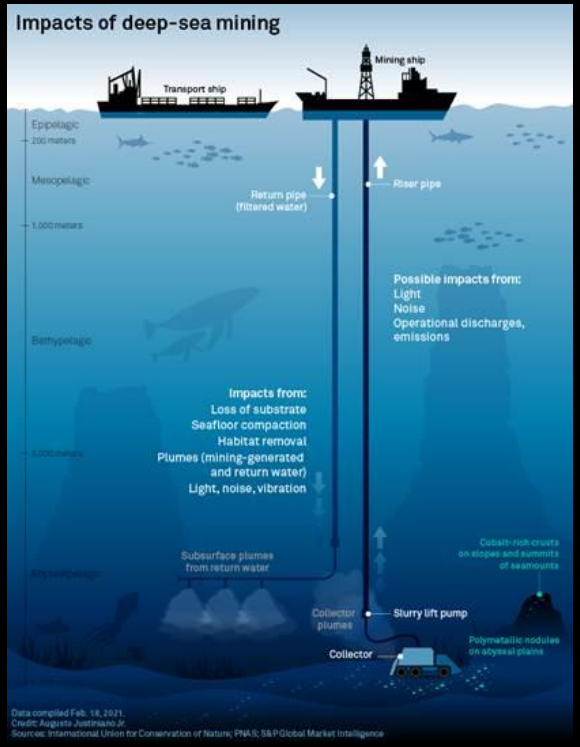
New Markets are Driving Needs – Mineral Mining





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New Markets are Driving Needs
Wave Energy and Offshore Wind

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New Technologies Ready for the Great Lakes

XOCEAN's uncrewed survey vessels are more versatile, safer, and often less expensive due to being remotely controlled by onshore pilots. They also offer significant environmental benefits, producing 1,000 times less carbon than traditional survey vessels. XOCEAN is quickly ramping up production of their vehicles and driving down costs. Multi-vessel "swarm" missions are becoming more possible, potentially leading to a dramatically shortened timeline for mapping the Great Lakes.

Photo by XOCEAN

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New Technologies Enhancing Hydrospatial Opportunities

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HUGIN ENDURANCE

- 15 day mission profile
- 6000 m depth rating
- Shore to shore, Coast to coast operations

KONGSBERG

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New Technologies Enhancing Hydrospatial Opportunities

SAILDRONE

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Breakthrough Platforms and Data Access

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Smart Devices

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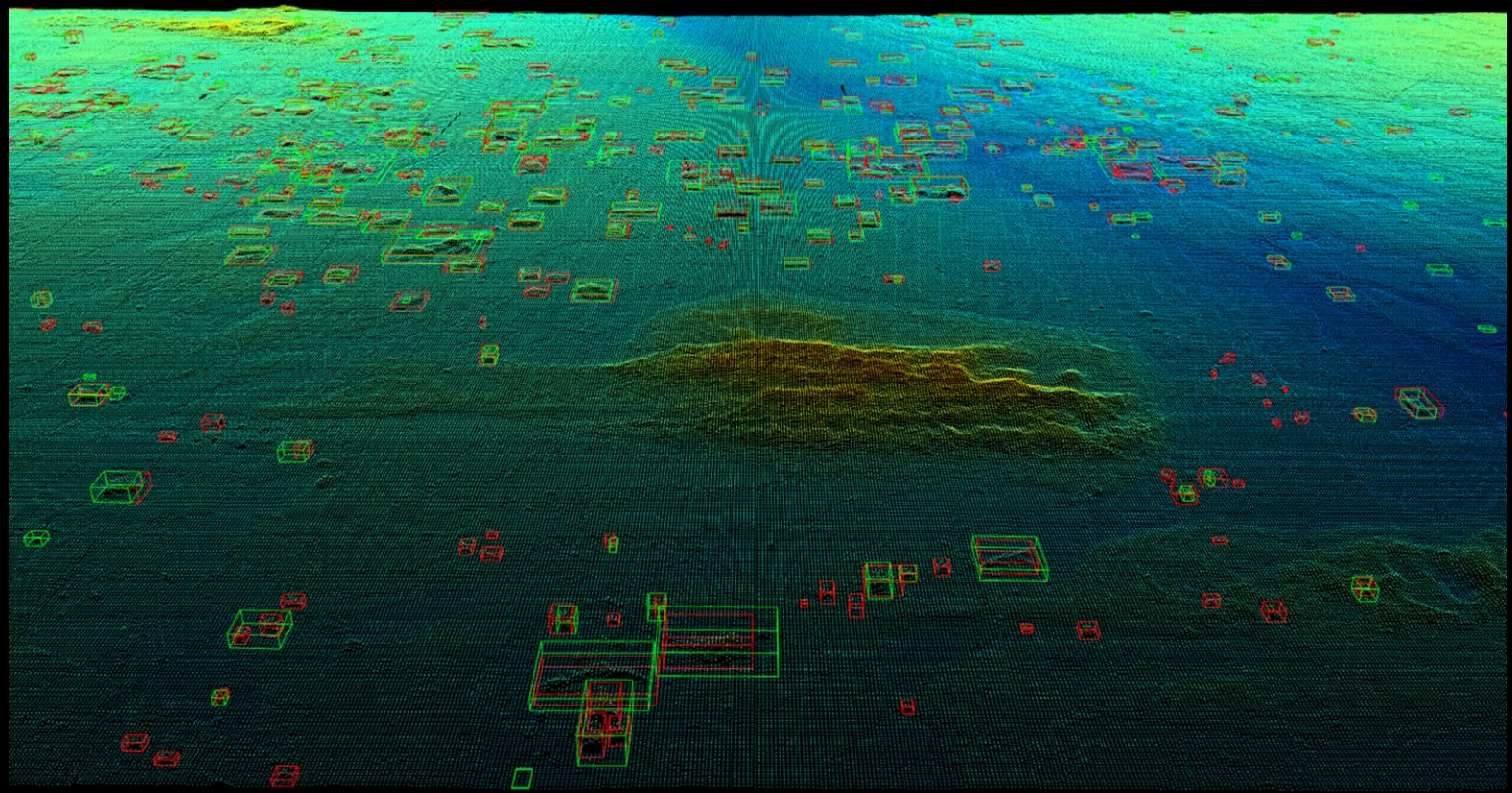
Machine Learning / Artificial Intelligence



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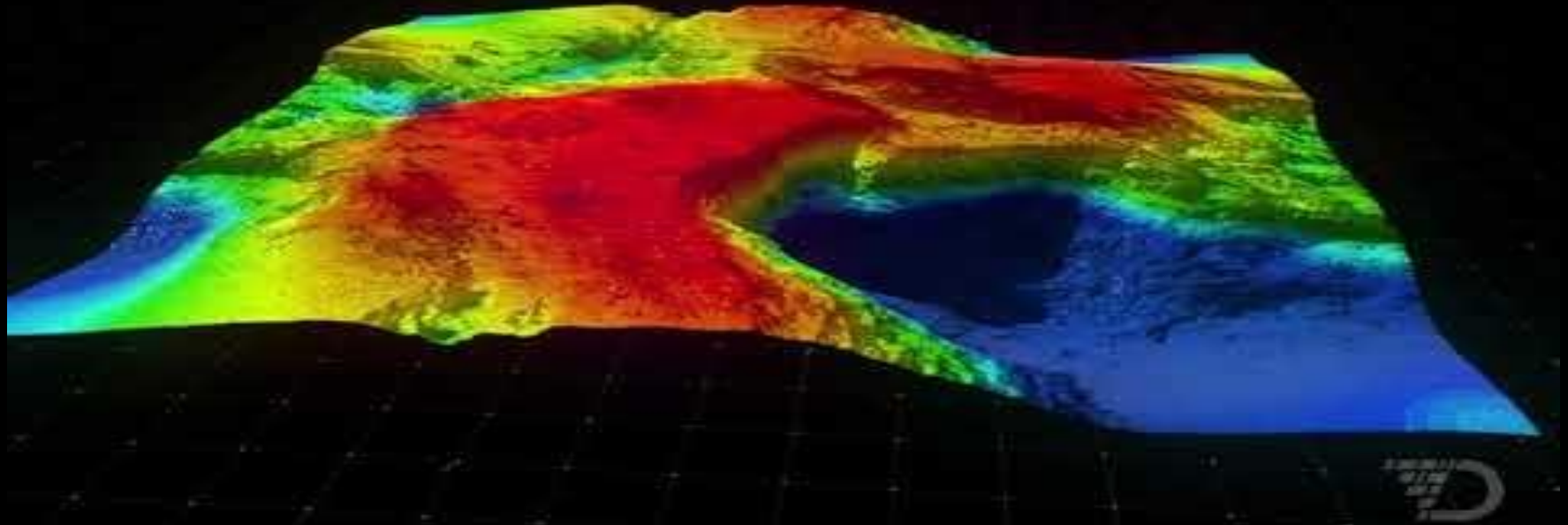

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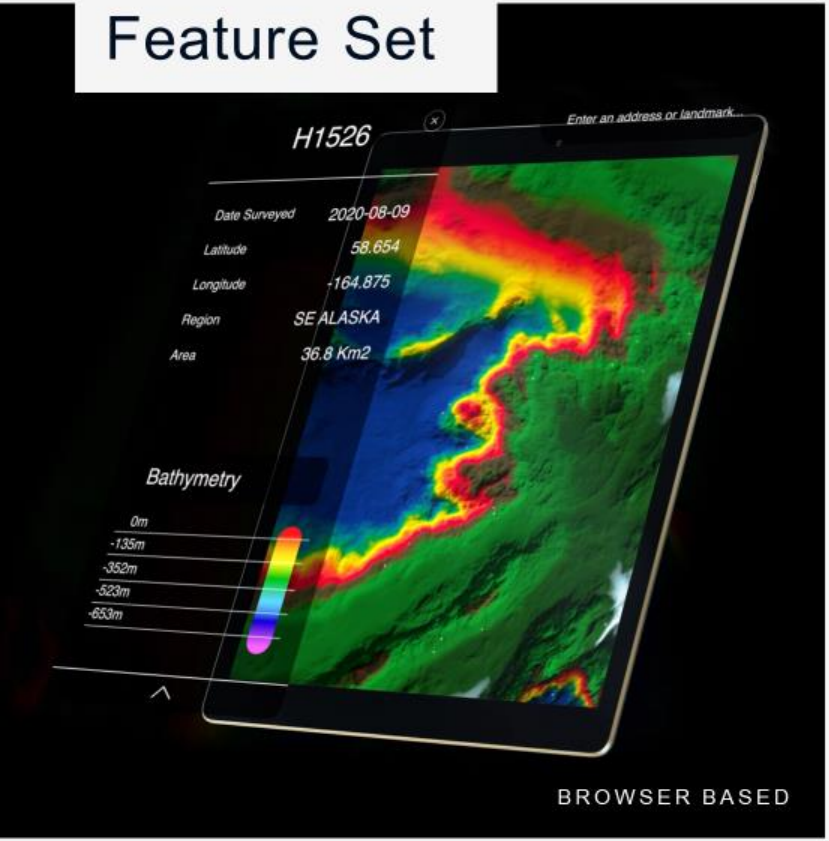
ABSOLUTE OCEAN

Feature Set



DATA MANAGEMENT

User-uploaded data can be shared broadly or limited through permissions management.

COLLABORATE EFFICIENTLY

Share data, reports, custom dashboards, and in-depth visualizations among your team or external partners.

CONDUCT SPATIAL & TEMPORAL SEARCHES

Explore and manage geospatial datasets from around the world.

AUTOMATIC TARGET RECOGNITION

Identify targets like pipelines, boulders, hazards, and other objects of interest.

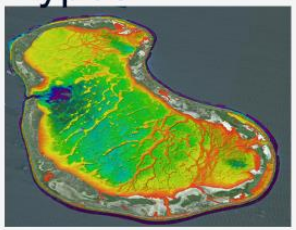
RAPID DATA QUALITY ASSURANCE ANALYSIS

Data quality assurance checks can quickly and easily be executed.

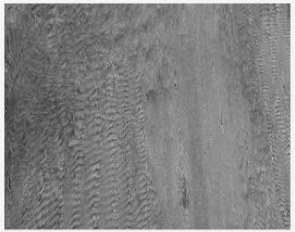
MOBILE READY

Log in anywhere, anytime, on any device.

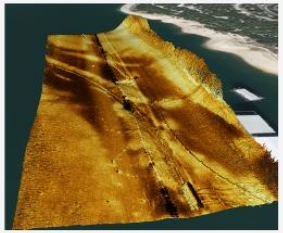
AO: Example Geophysical Data Types



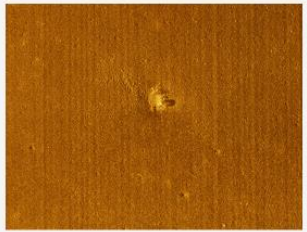
Bathymetry



Backscatter

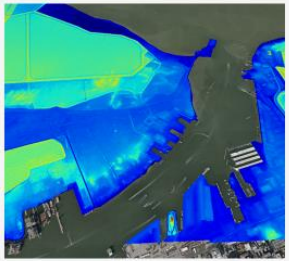


Side Scan Sonar

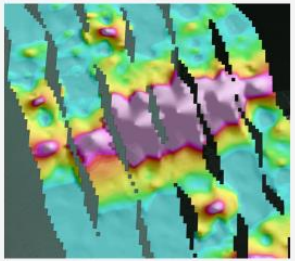


SAS

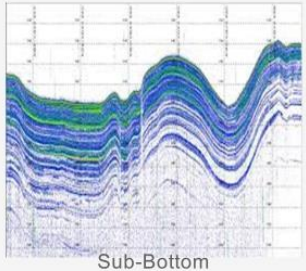
Optical



LiDAR



Magnetometer



Sub-Bottom Profiles

(Coming soon)

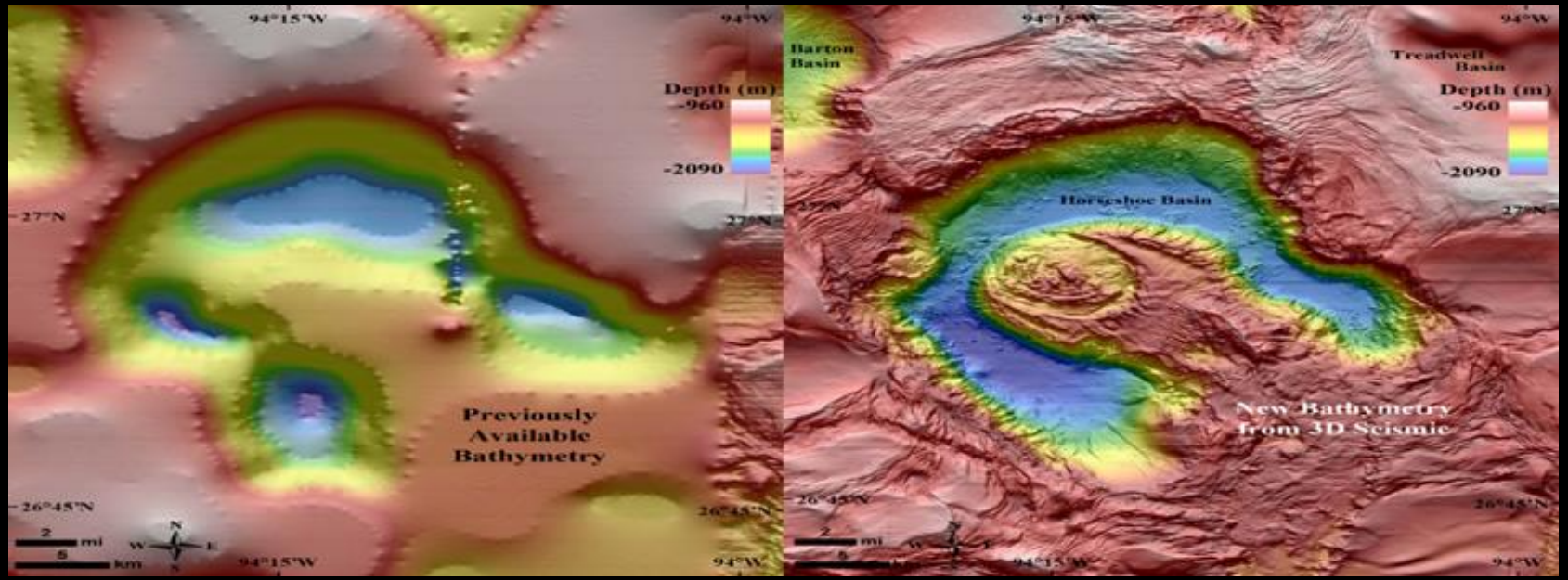
FILE FORMATS SUPPORTED

– **Grid/Raster**: GeoTIFF

– **Point Cloud**: LAS, LAZ, XYZ

– **Vector**: KML/KMZ, GeoJSON

Monetizing Information



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What Can We Learn from these separate explorations?

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Rapidly Changing…

- Long duration USV
- Long duration AUV
- Machine Learning and Artificial Intelligence
- Remote operations and remote services
- Enhanced SDB and airborne bathymetric LiDAR capabilities
- Advancements in sonar platforms
- Cloud based, real-time, data management

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Join us September 19-21, 2023!

Thank you

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