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# Augmenting Ocean Data Collection Operations and Enhancing Information Generation with Blue Insight

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# Serving the entire ocean space

ENERGY | FOOD | TRANSPORTATION | RESEARCH | MINERALS | LEISURE TRAVEL | NAVAL

SURVEILLANCE

ONSHORE SERVICE CENTRES

COASTS, PORTS AND INLAND WATERWAYS

OFFSHORE WIND

OFFSHORE E&P

TANKERS

NAVAL

OFFSHORE AQUACULTURE

FISHING

CARGO AND CRUISE TRANSPORT

USVs

RESEARCH, SCIENCE AND HYDROGRAPHY



SUBSEA INSTALLATIONS

AUVs

DEEP SEA EXPLORATION

# Product Examples



Scientific Split-Beam Echosounders



From the shallowest waters to full ocean depth, we've got it covered.

M3	50 m
GeoSwath Plus	200 m
EM® 2040C	500 m
EM® 2040P	550 m
EM® 2040	600 m
EM® 712	3600 m
EM® 302	7000 m
EM® 122	11000 m

Multibeam Echosounders



Synthetic-Aperture-Sonars and AUVs

# Quantitative Mapping and Monitoring with Acoustics



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Platforms / Instrument Carriers  
Mooring, vessels, gliders, autonomous and uncrewed vehicles

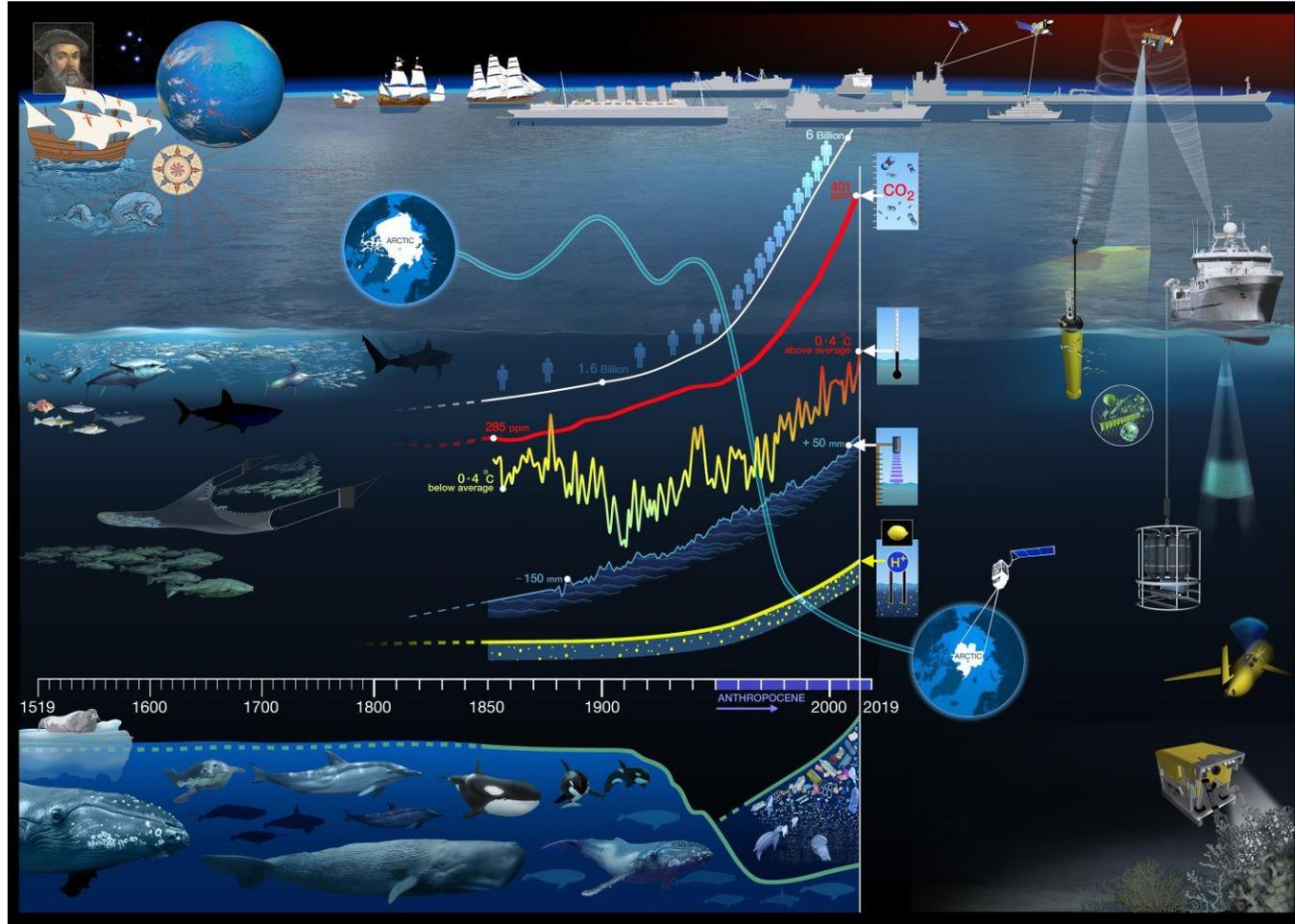
Biomass  
Fish, plankton, jellies

Non-Biological Targets  
oceanographic layers, sediment,  
seabed classification, gas bubbles,  
marine hazards

More platforms, new applications, expanded user groups  
→ More widespread sensor products  
→ Versatility, service, support, improvement, economy, ...  
→ More needed data for critical questions around ocean management

# 500 Years of Ocean Change

*“Many Sustainable Development Goals (SDGs) may not be realized without achieving SDG 14 for a healthy ocean”*

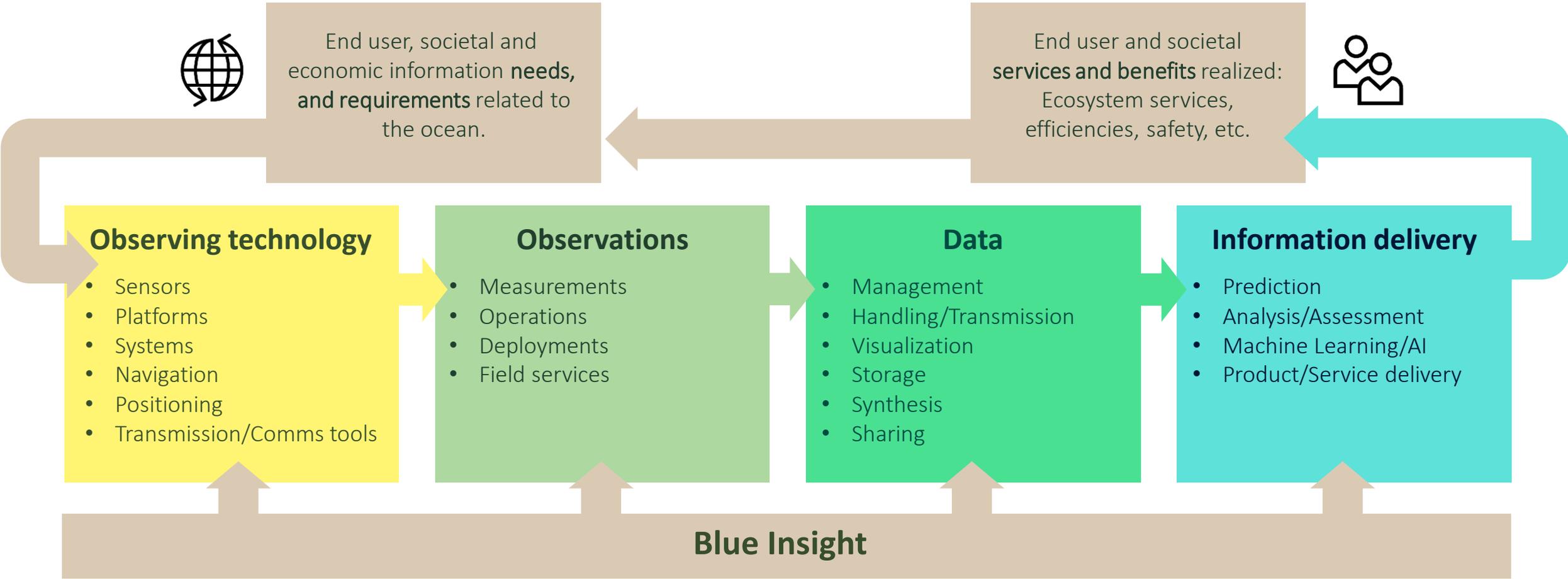


	1 PEOPLE	2 ZERO HUNGER	3 GOOD HEALTH AND WELL-BEING	4 QUALITY EDUCATION	5 GENDER EQUALITY	6 CLEAN WATER AND SANITATION	7 AFFORDABLE AND CLEAN ENERGY	8 DECENT WORK AND ECONOMIC GROWTH	9 INDUSTRY, INNOVATION AND INFRASTRUCTURE	10 REDUCED INEQUALITIES	11 SUSTAINABLE CITIES AND COMMUNITIES	12 RESPONSIBLE CONSUMPTION AND PRODUCTION	13 CLIMATE ACTION	15 LIFE ON LAND	16 PEACE, JUSTICE AND STRONG INSTITUTIONS
SDG 14.1 - Marine pollution															
SDG 14.2 - Environmental restoration															
SDG 14.3 - Ocean acidification															
SDG 14.4 - End overfishing															
SDG 14.5 - Marine protection															
SDG 14.6 - End harmful subsidies															
SDG 14.7 - Small Island Developing States															

Ocean observation data and services are **critical** for the growing **Blue Economy** and **society**.

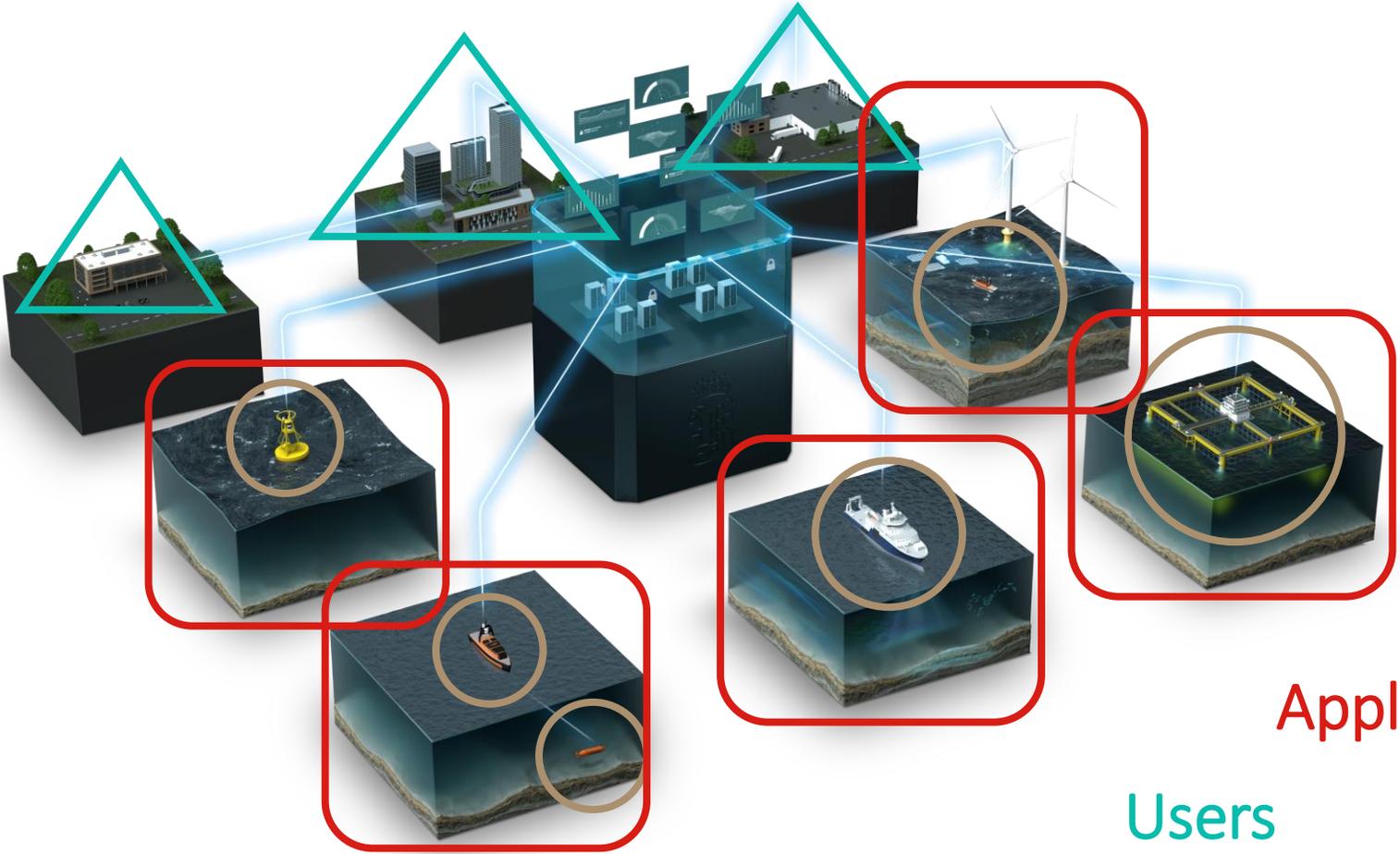
- Ocean management – ecosystem services, sustainable fisheries and aquaculture, **biodiversity** protection
- **Climate Change** – forecasts, adaptation, investment in carbon storage
- Small-footprint transport and tourism
- Sustainable offshore energy

# Ocean Observing Value Chain of the New Blue Economy



Supporting sustainable ocean activity through science and ocean data management

# Blue Insight



*The ocean data management platform to offer cloud-native, self-hosted, and vessel-side deployments to accommodate the needs of the modern spatial-temporal data analysis professional.*

Sensors & Platforms

Applications

Users

From ping to insight

# Ocean data management

## Use cases

- Oceanographic research
- Maritime surveillance
- Environmental monitoring
- Aquaculture
- Fisheries
- Offshore energy
- Commercial shipping and ports

## Software

Autonomy

Navigation & Control

Detection / Tracking

Remote Payload Control

Acoustic Data Processing

## Data

Data Exploration

Historic Data

Third-party Data

Metadata Management

## Hardware

Observation platforms:  
AUV/USV/RV

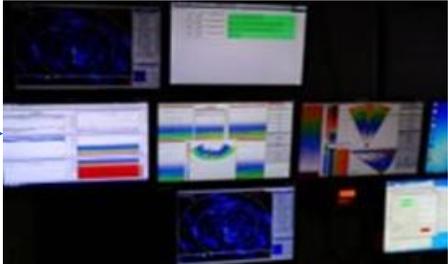
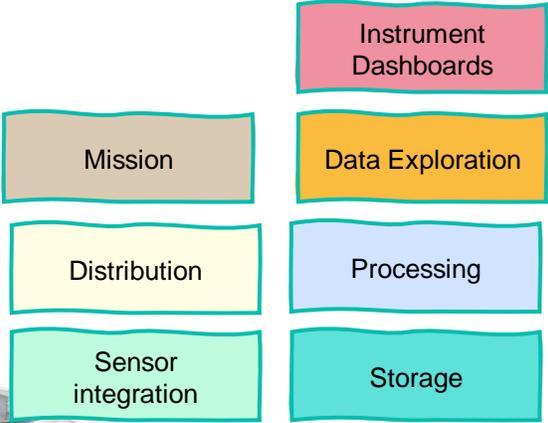
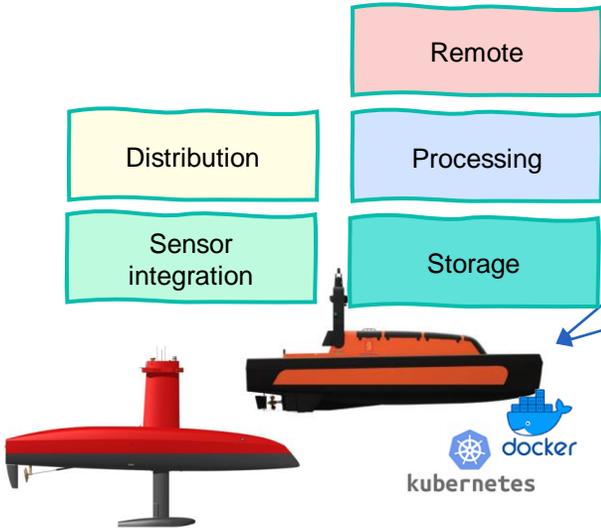
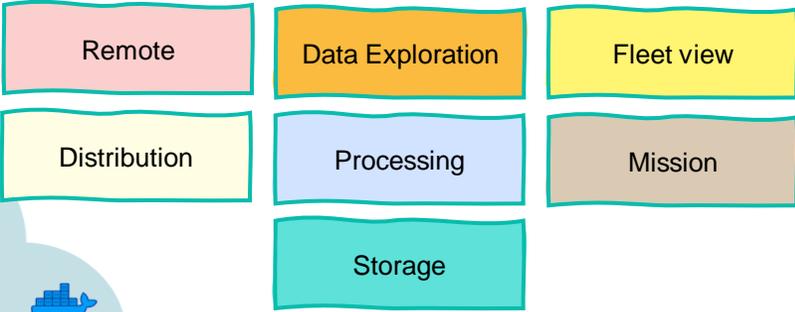
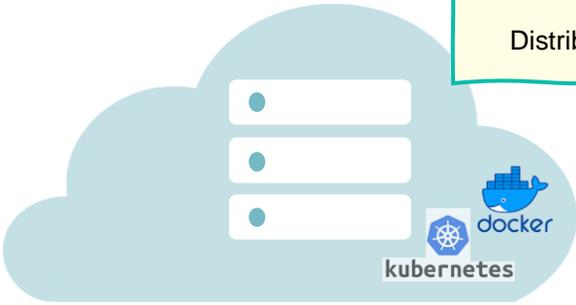
Sensors:  
Simple, Video, Acoustic



# Value Creation through Digital Services



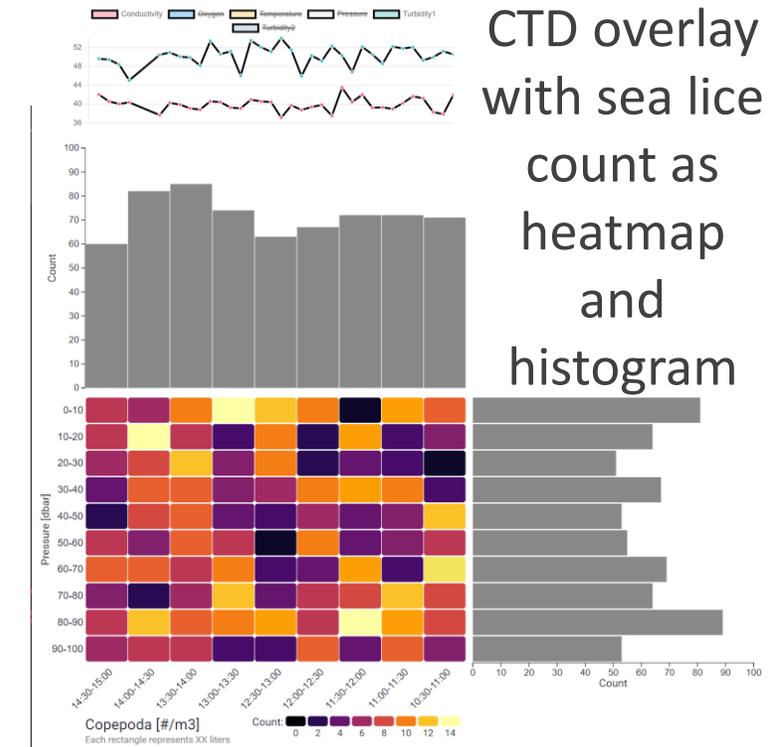
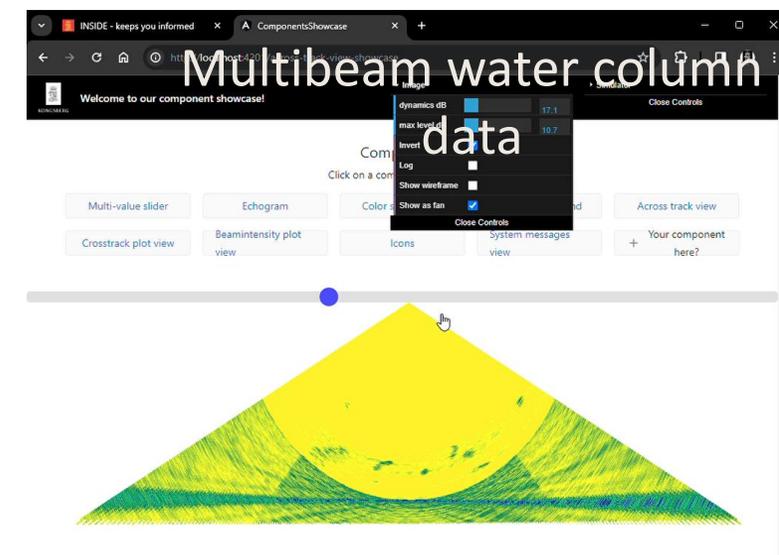
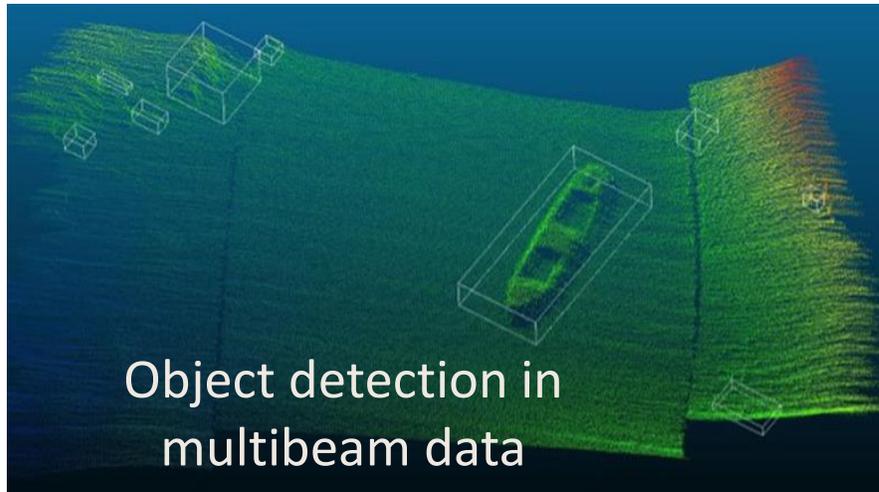
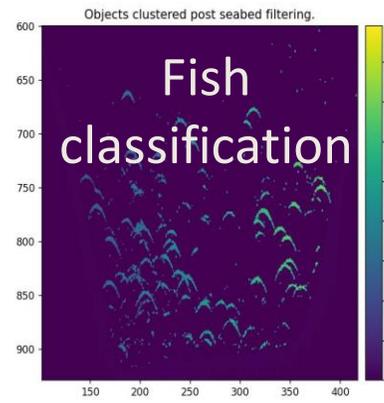
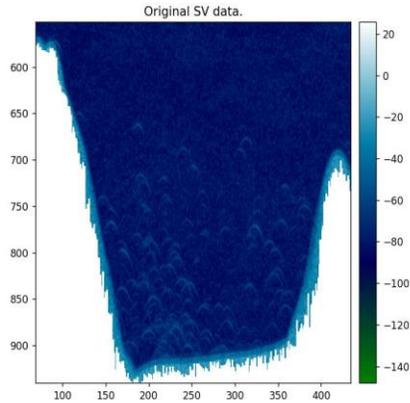
Users  
*anywhere  
anytime*



Users  
*at sea*

From ping to insight

# Ocean data management



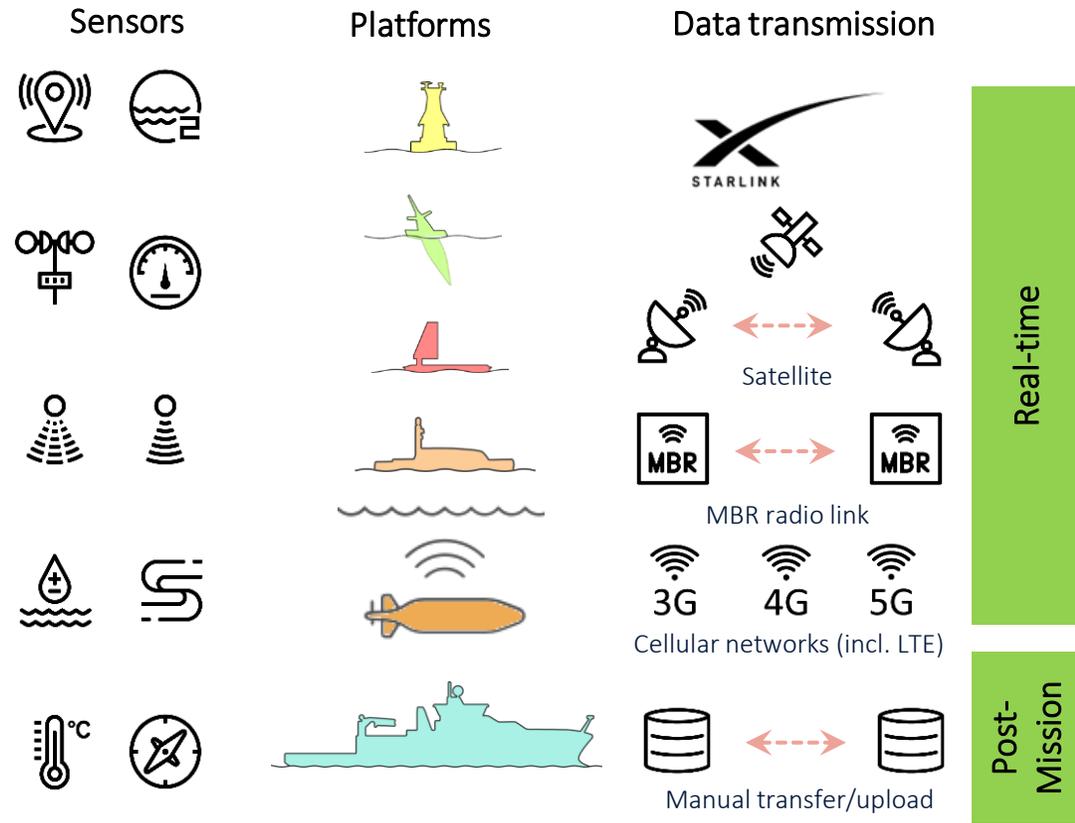
Digital platform supporting multiple sensors, platforms, transmissions and processing options

# Blue Insight – Technical Dimensions

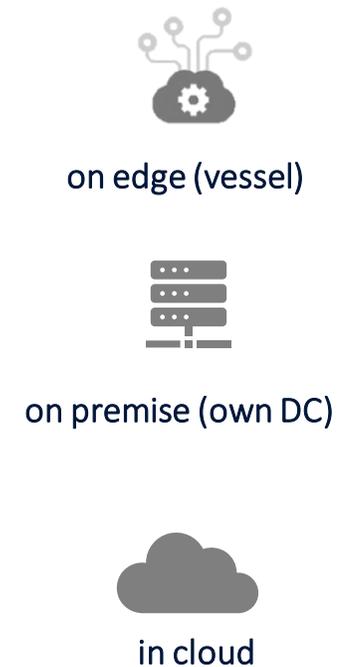
## Features

-  Collect
-  Integrate
-  Manage
-  Analyze
-  Predict
-  Visualize
-  Share

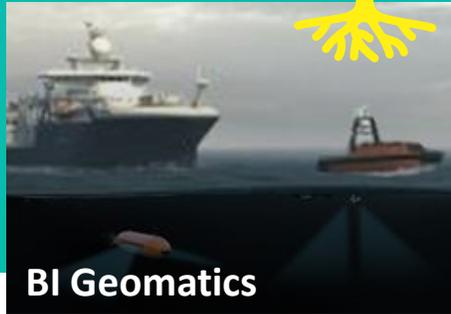
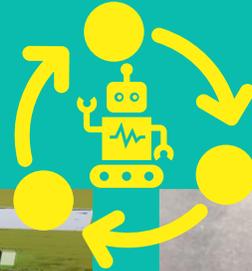
## Data collection and ingestion



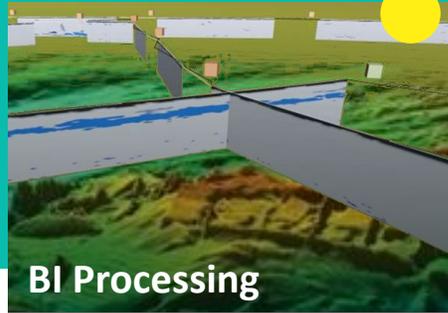
## Processing



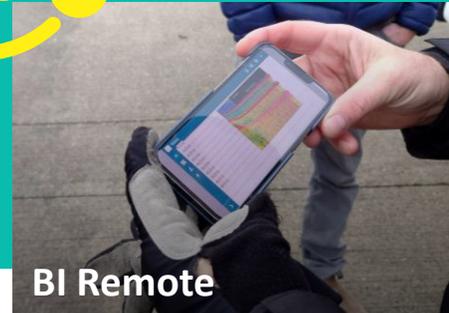
# Blue Insight



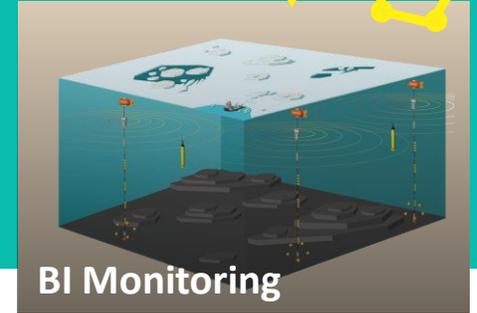
**BI Geomatics**



**BI Processing**



**BI Remote**



**BI Monitoring**

## Who?

Survey/research vessel operators

## What?

Retrieve, organize, and transfer data to across sensor platforms. Includes both raw data and metadata. Visualizations.

## Benefit

Reliable and secure management of ocean data. Dashboards.

Ocean businesses

Simplified deployment of algorithms on vessels with workflow management of automated processing pipelines

Faster results and reduced cost with automated analysis

Vessel operator, scientists

Control echosounder operation and data quality from remote app.

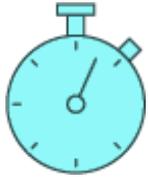
Efficient operation of sensors to assist decision making

Institutes, service providers, operators

A digital representation of the physical world. Links and visualize internal and external data

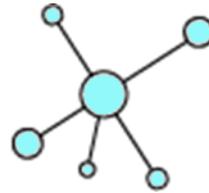
Improved understanding of oceanographic processes

# Benefits



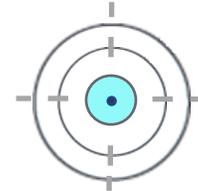
## Operational Efficiency

- ✓ **Streamlined** data collection & sharing
- ✓ **Automated** analysis of large data sets
- ✓ **Supports** decision making



## Improved Collaboration

- ✓ **Full ownership** & control of data & visualizations
- ✓ **APIs** for 3rd party integration & interaction
- ✓ **Agnostic** regarding multiple platforms, sensors and thus applications



## Better Value

- ✓ **Partner** with the largest marine technology specialist organization in the world
- ✓ **Reliability** and security
- ✓ We make it **work** and spare you the details
- ✓ We **free** your valuable time

# Examples and Success Stories



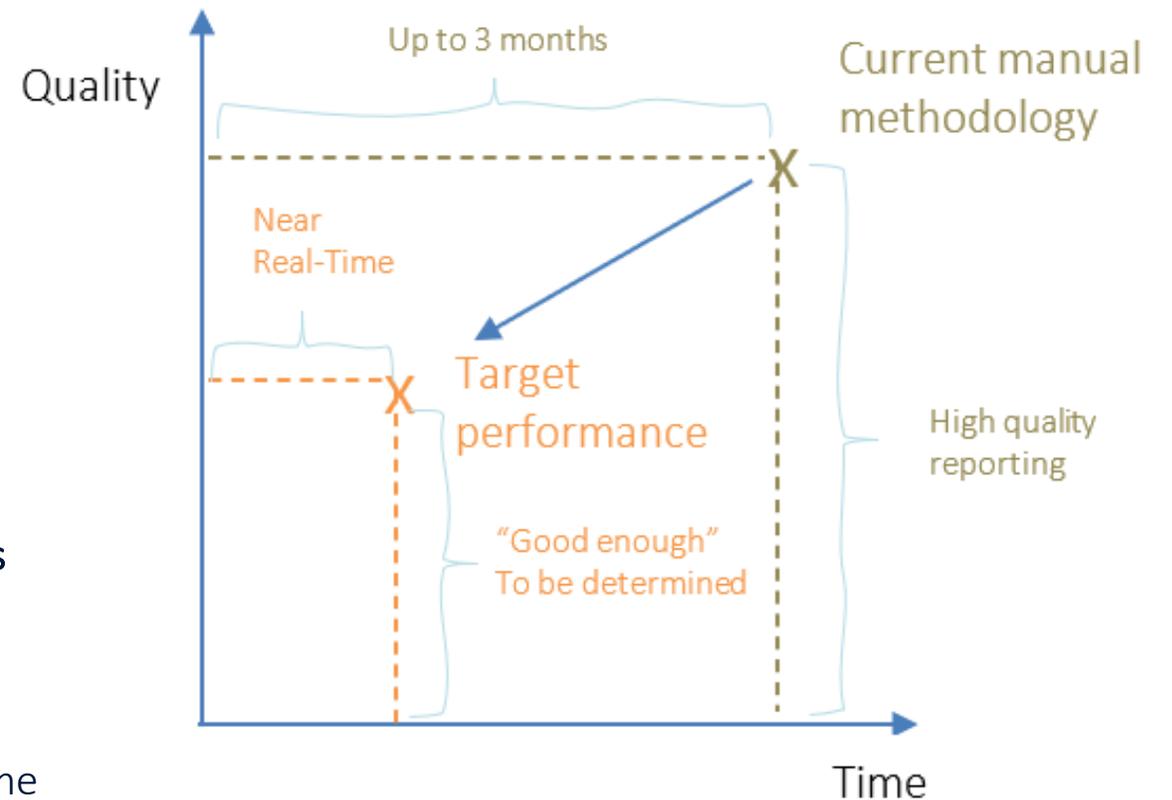
# Augmentation of MBES Mapping Operations (AMMO) with Real Time Capabilities

## Current challenges in seismic and bathymetric data collection and analysis

- Data **volume** and management
- Data interpretation **complexity**
- **Expert** analysis dependencies
- Environmental **changes**
- Lack of **automated real-time** processing

## Rationale for adopting AI and ML technologies in MBES operations

- Enhanced data processing **capabilities**
- Delivering new **insights**
- Real time **processing** and adaptability
- **Reduction** in operational costs and time
- **Scalability** and learning over time



# Augmentation of MBES Mapping Operations (AMMO) with Real Time Capabilities

- Vessel/platform with a MBES (and/or additional sensors) as the basis
  - Mind synergies with additional data from e.g. single beam echosounders, sub-bottom profilers, backscatter (calibration)
- Understanding and characterizing the platform-specific MBES performance
  - Sample data → Improvements possible/wanted/needed?
- Transforming MBES mapping operations by integrating cutting-edge AI and ML methodologies
  - Improve operational, collection and data processing efficiency – cost- and time-wise
  - Enable scalability
  - Determine, improve and/or maintain the accuracy and reliability of seabed mapping
  - Facilitate real-time decision-making through improved processing and analysis capabilities, real-time adaptability

# Augmentation of MBES Mapping Operations (AMMO) with Real Time Capabilities

Fast and easy access to bathymetric data

High resolution bathymetry of specific areas/objects

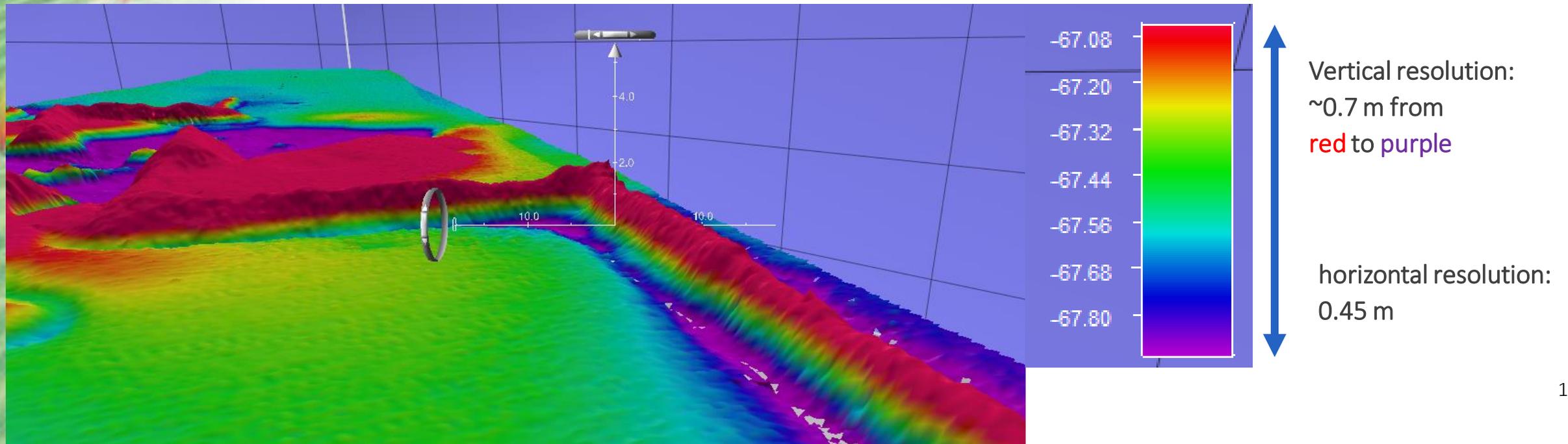
Automatic subsidence indication, scouring and seabed deformation monitoring

Automated target detection at the sea floor

Automatic seep detection

Statistical Multibeam Reports

Data sharing and Stakeholder interfacing



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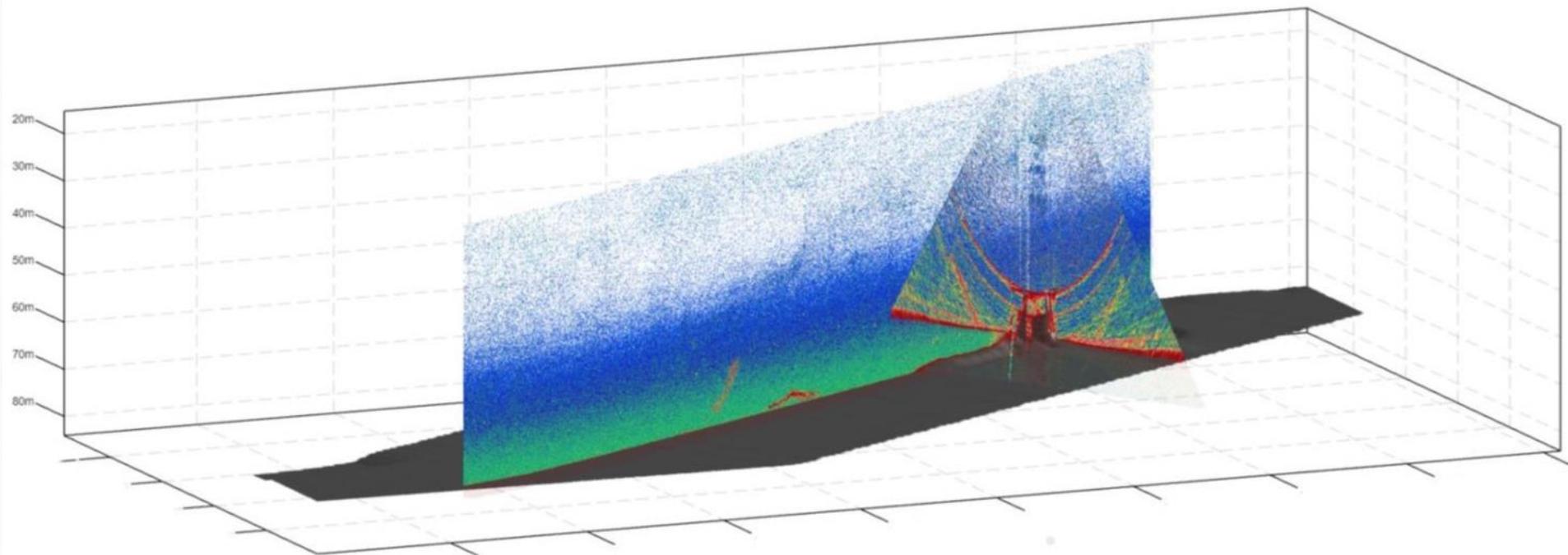
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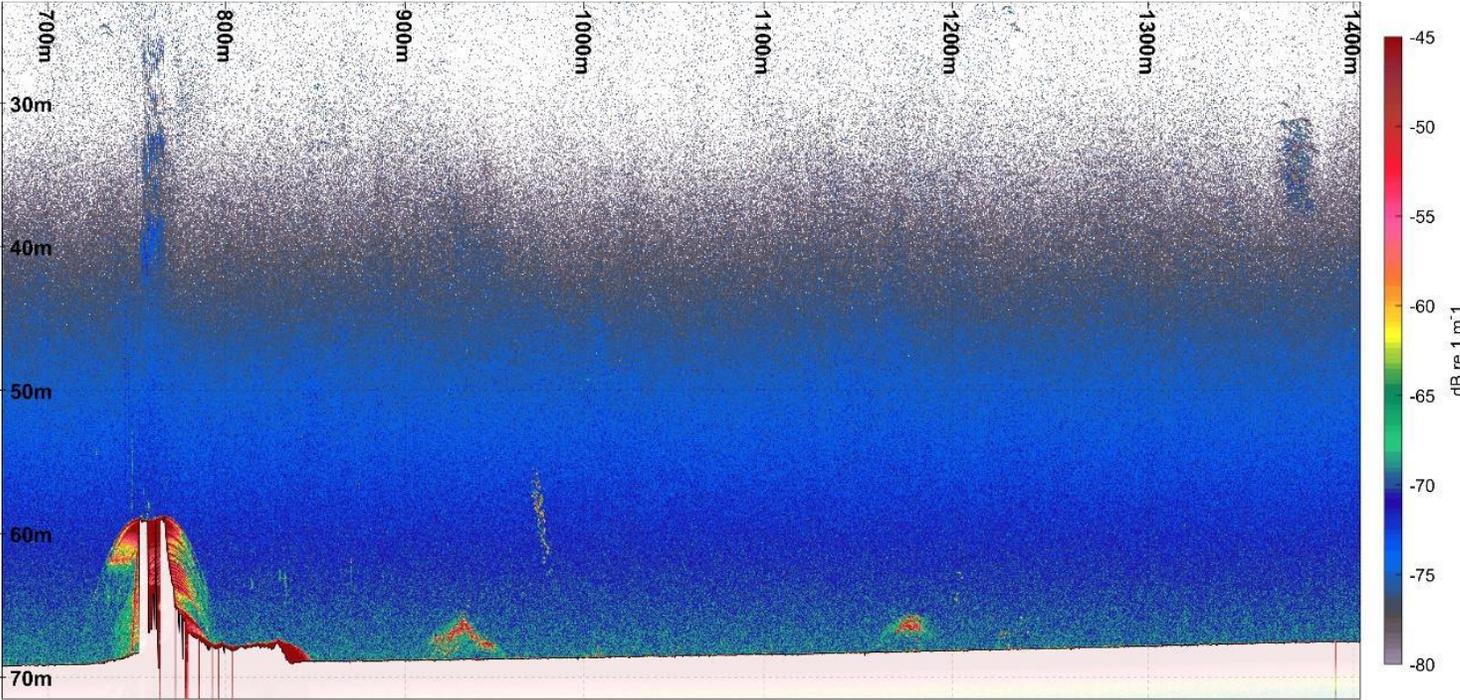
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Data sharing and Stakeholder interfacing

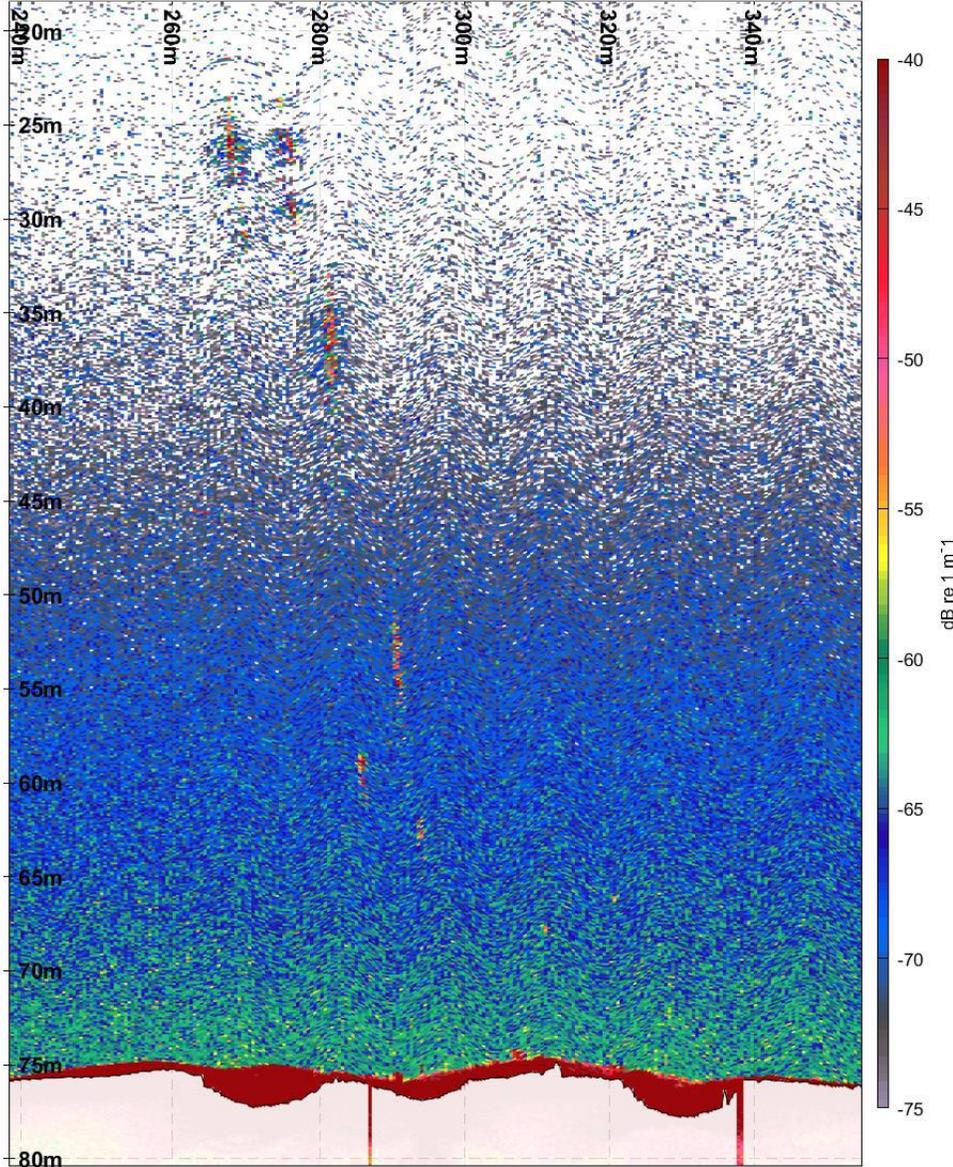


# Gas seep mapping

Sv(dB re 1 m<sup>-1</sup>) for EM2040\_40 : EM\_22\_Apr\_2024\_\_0001\_20240422\_152237\_kmall\_\_0002\_20240422\_15294

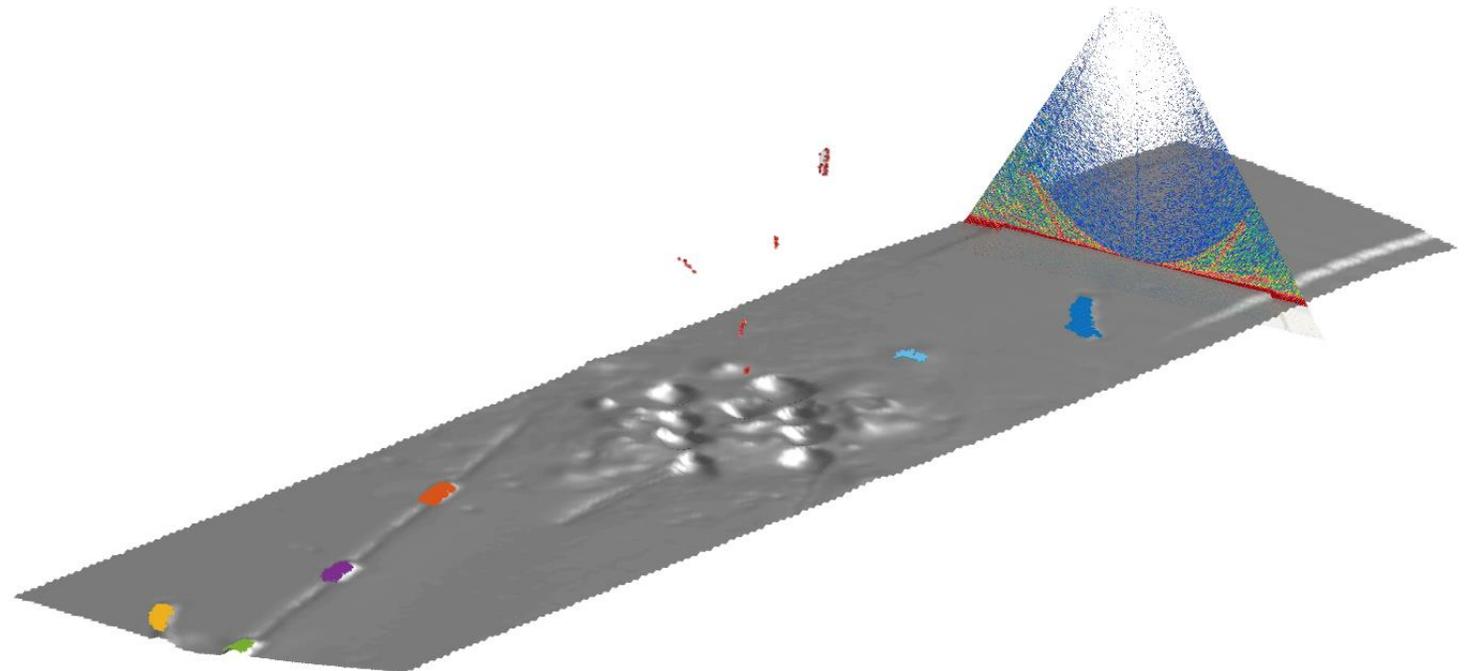
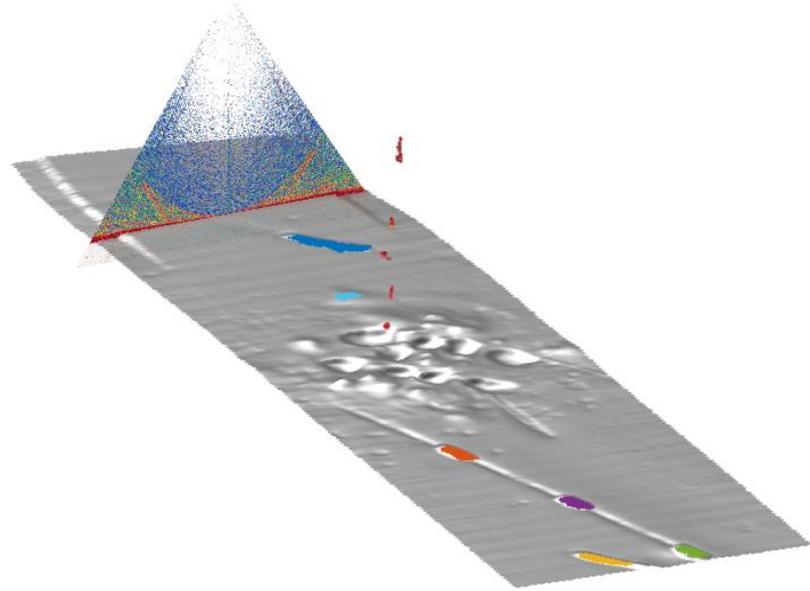


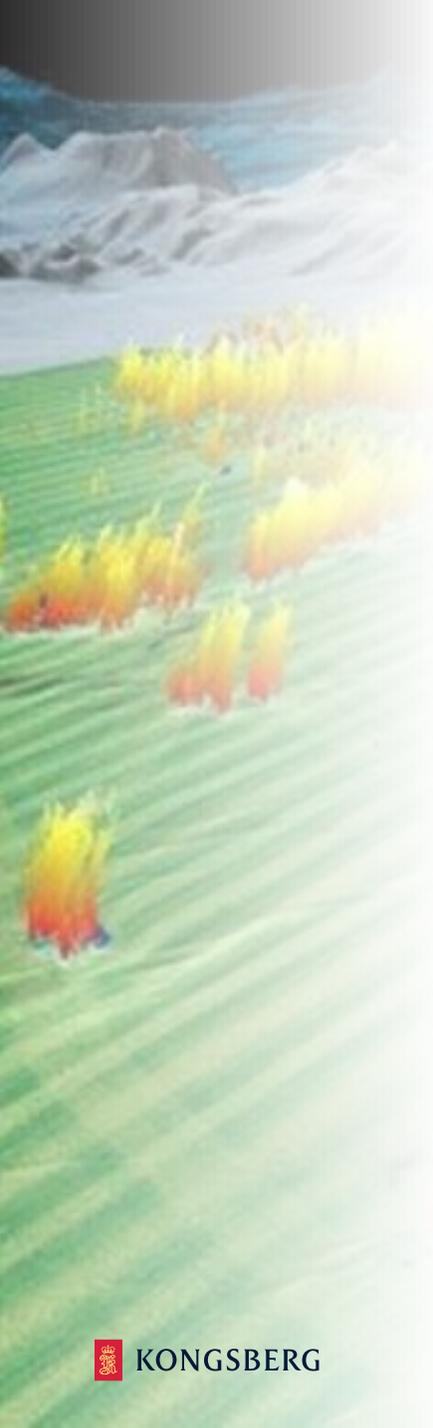
Sv(dB re 1 m<sup>-1</sup>) for EM2040\_40 : EM\_22\_Apr\_2024\_\_0004\_20240422\_140444\_kmall



# Gas seep mapping

Combination of automated seafloor and water column target detection





# Augmentation of MBES Mapping Operations (AMMO) with Real Time Capabilities

- Combining knowhow from the experts and different KD departments
- Direct cost benefits on customer side with “good enough” data and real-time features
- Realize a “multi-use-experience”; may have bought multibeam for bathymetry but expand capabilities to water column
- Expanding user group from experts to “operationalist”; lowering access barrier
- Different development status of the different elements; transitioning a demonstrator towards automation/implementation with automated analytics and reporting for scaled applications
- Sensor remote control and operations as a general enabler

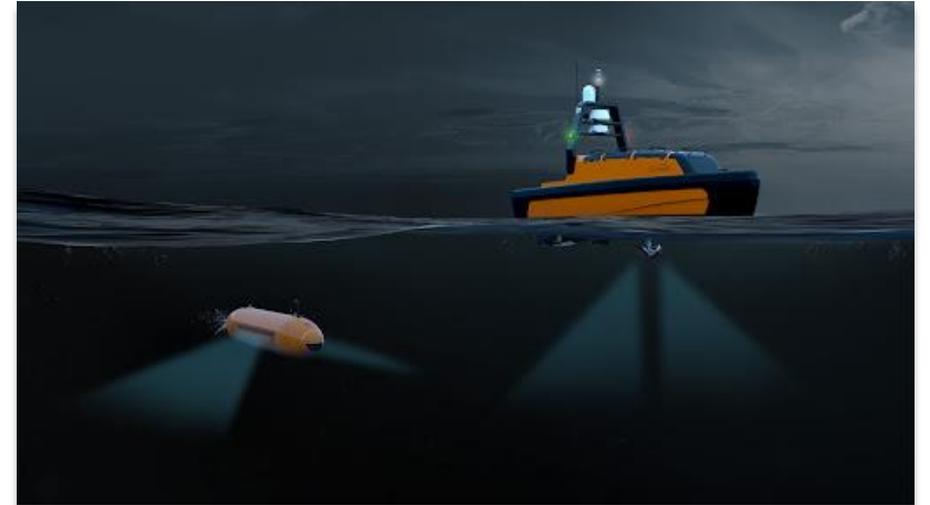
# IMR Robotics

## Challenge

Automate detection and classification of biology on uncrewed platforms to allow for efficient upscaling of ecosystem data collection.

## Solution

Enabling remote operation and classification of targets through machine learning (deep learning on broadband echo sounder data) onboard vessels and modern platforms.



Algorithm development within the Centre for Research-based Innovation in Marine Acoustic abundance estimation and backscatter Classification

<https://crimac.no/en>



# IMR Robotics – Sounder Deployment

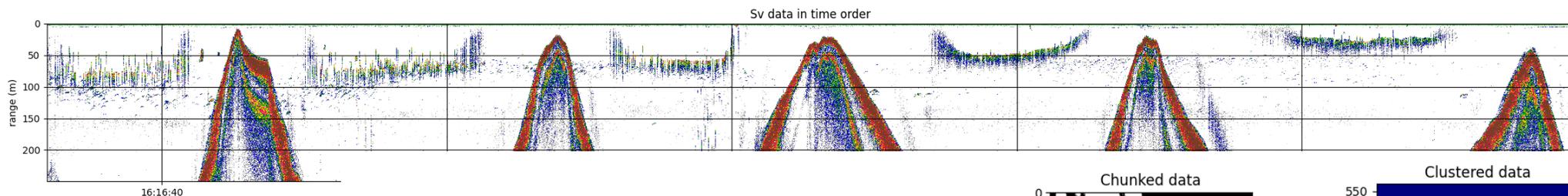
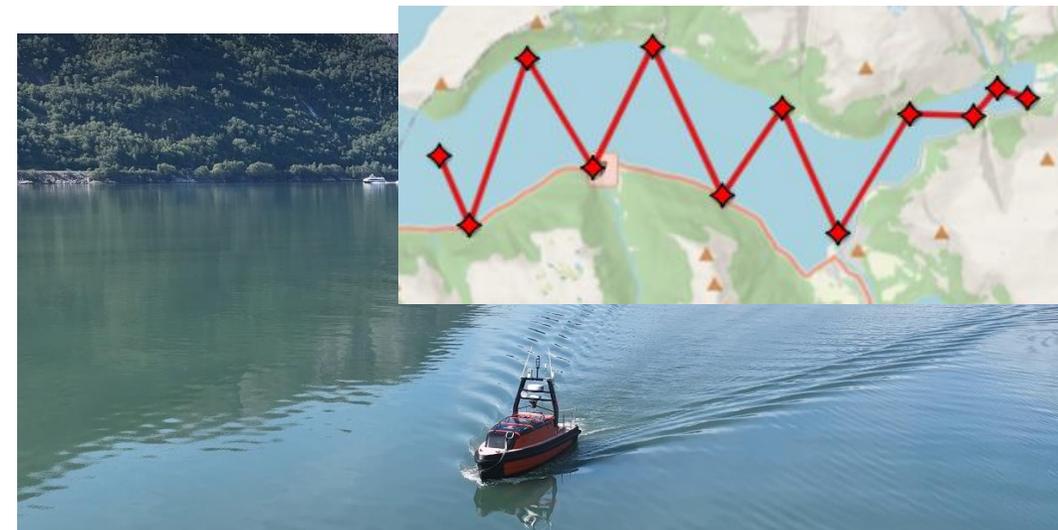
Sounder USV survey track in a fjord

Sounder control station on the research vessel

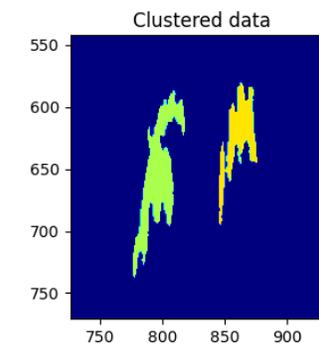
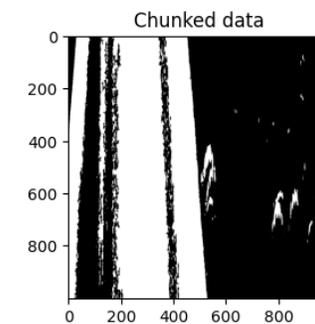
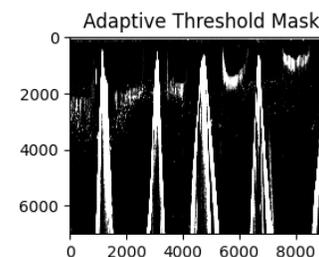
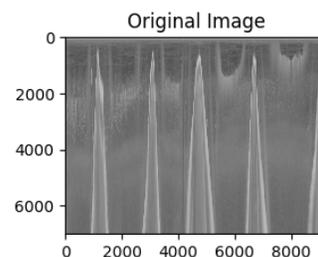
EK remote via MBR

Acoustic backscatter data

Sprat in shallow waters (>8m) not visible in RV data



ML operations:  
Target classification



# IMR Robotics

## 2024 Demonstration

Estimate the abundance and biomass of sprat by length and age groups in fjords.

## 2025 Aim

Sprat advice should use data from USV surveys.

Realization of:

- A functional data pipeline for acoustic categorization,
- Data decimation,
- Ensured data quality (e.g. false bottom overlap with targets),
- Automated classification; ML & manual expert checks of the classification and mask adjustments.

See Statement of Proprietary information

## Institute of Marine Research Pioneers Use of USV for Fisheries Research

eco | 15 october 2024

**eco**  
environment coastal & offshore



The unmanned vessel Frigg is measuring the sprat population in Hardangerfjorden. (Image credit: Christine Fagerbakke/Institute of Marine Research)

<https://ecomagazine.com/news/fisheries-aquaculture/institute-of-marine-research-pioneers-use-of-usv-for-fisheries-research>



# Monitoring Activities by Akvaplan-niva

## Challenge

Efficiently manage and collect data from a fleet of unmanned vehicles while providing services to industrial and academic users.

## Solution

Ocean View, a flexible map-based solution with fleet overview combining real time- and historical data in a map with user selectable input of external layers and objects, such as ice maps, wind, currents etc.

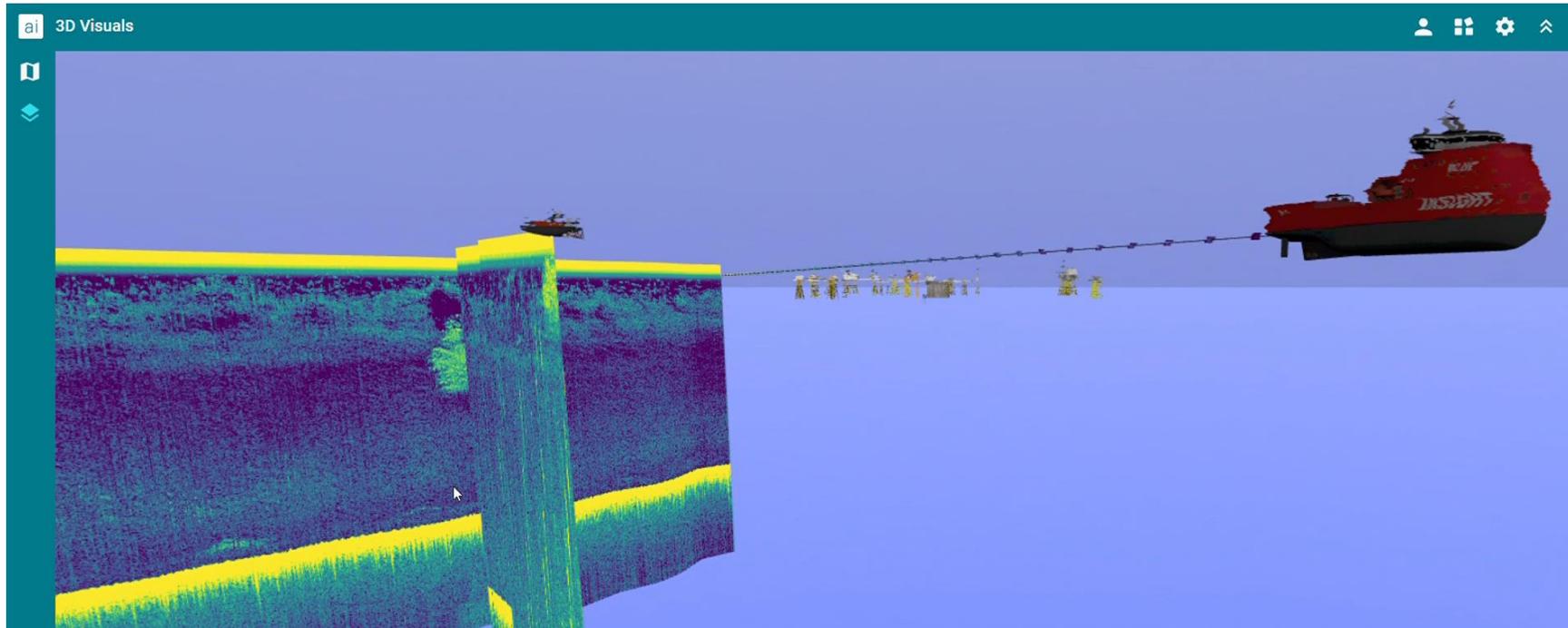


# Monitoring Activities by Akvaplan-niva



Intuitive data visualization for scientific and operational purposes

# Monitoring Activities by Akvaplan-niva



Akvaplan  
niva

- Behavioral effects on fish from seismic shooting? (Glider 2, ZoopZeis)
- May 2022: Seismic vessel, research vessel (R/V Kristine Bonnevie), USVs,...



Photo: Magseis Fairfield



Photo: Geir Pedersen, IMR





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**Thank you!**

***Let's discuss applications and project ideas!***

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