



2021 United Nations Decade  
2030 of Ocean Science  
for Sustainable Development

# Sparkly fountains need robust plumbing systems

Digital Twins for ocean science

# The Ocean Decade



## Data

The Science We Need  
for  
the Ocean We Want

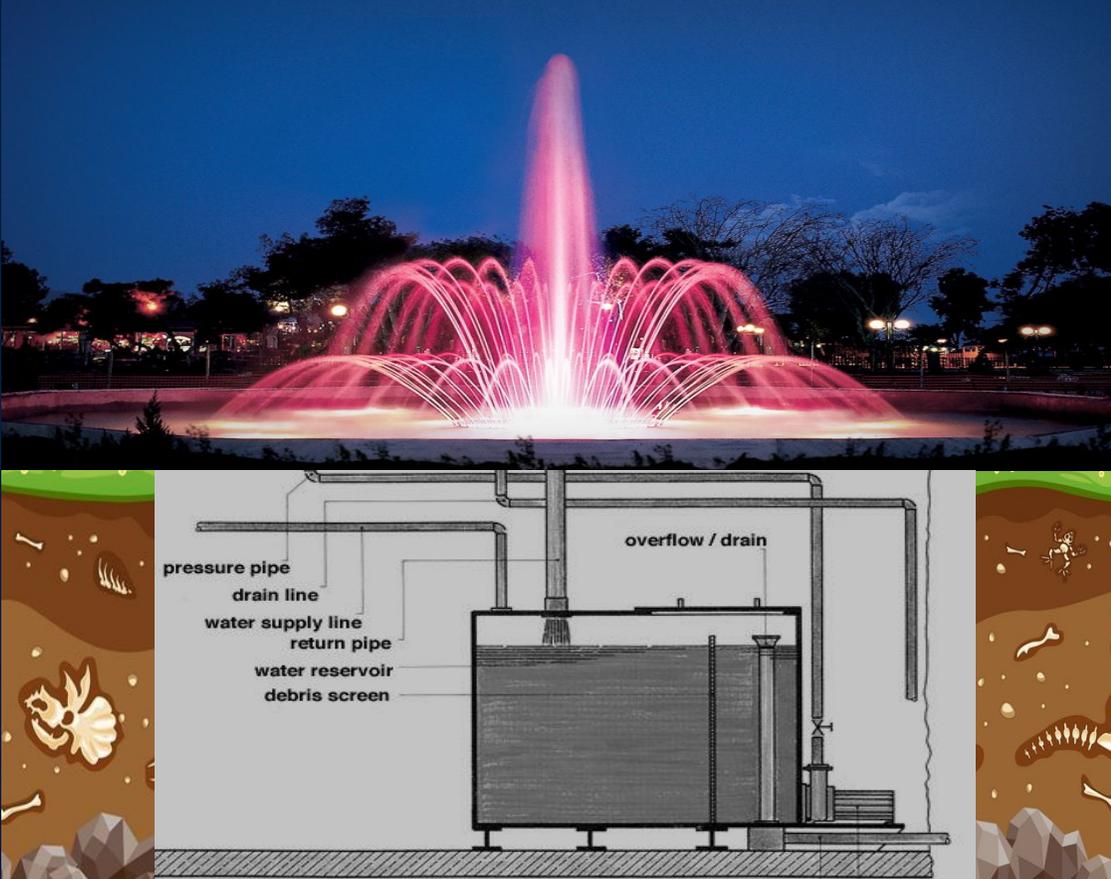


The dissemination of information / knowledge about the ocean to policy makers is fundamental to the success of any Ocean science program

Digitizing, preserving, managing, exchanging and, most importantly, creating and distributing knowledge from, a significantly increased volume and range of ocean-related data will be fundamentally important to a successful outcome.

# What is a Digital Twin?

The sparkly fountain



Digital Twins:

Are the visible part of a complex digital data eco-system

Are empowered by that digital data eco-system

and

Dictate the design of the digital data eco-system.

# What is a Digital Twin?

The tip of the iceberg



## Knowledge Delivery

Web GIS, Visualisation,  
Digital Twin

## Data Analytics & Insight

Value added, Data Science, Modelling

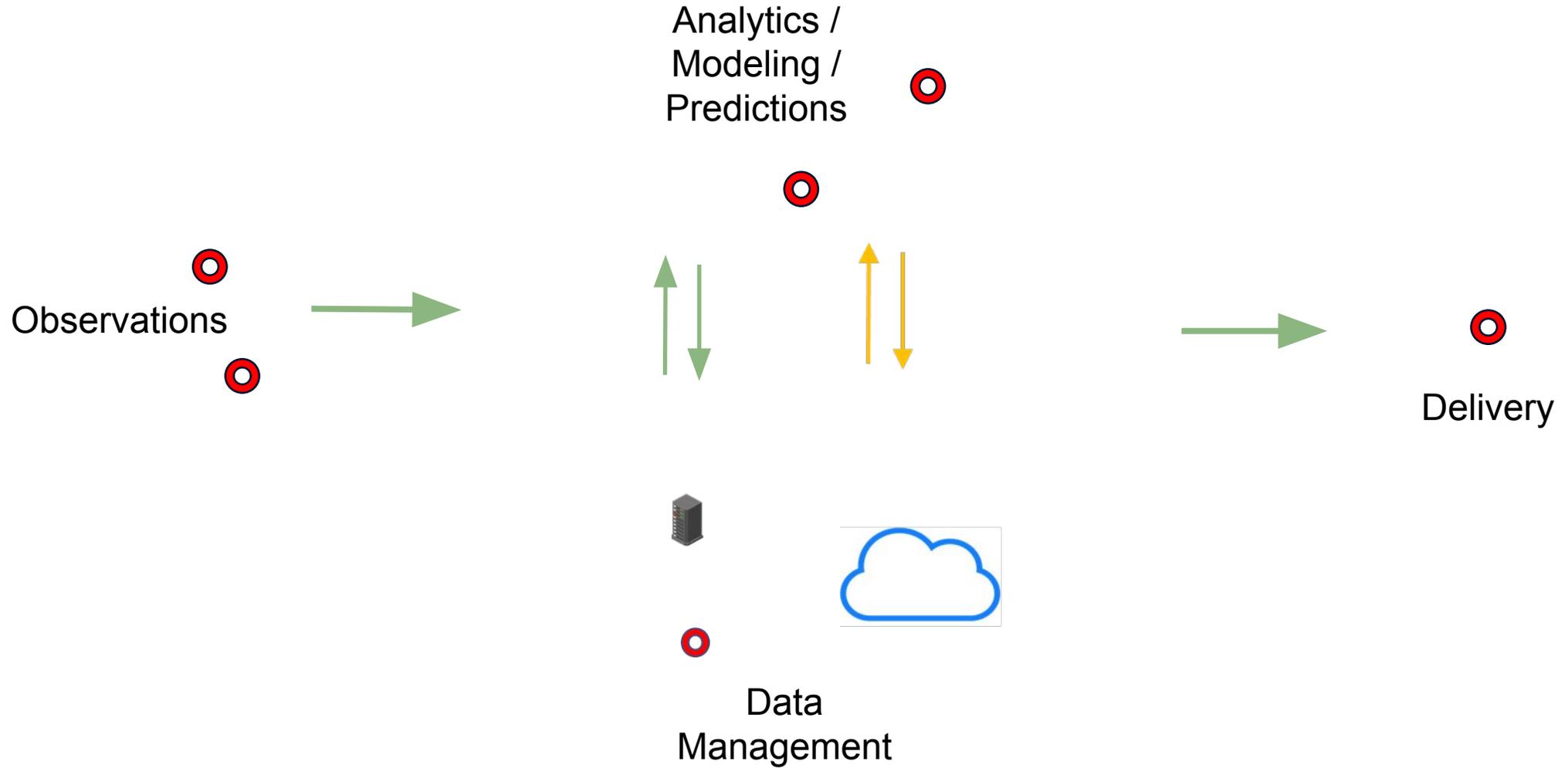
## Data Management

Manipulation, Management, Access Control

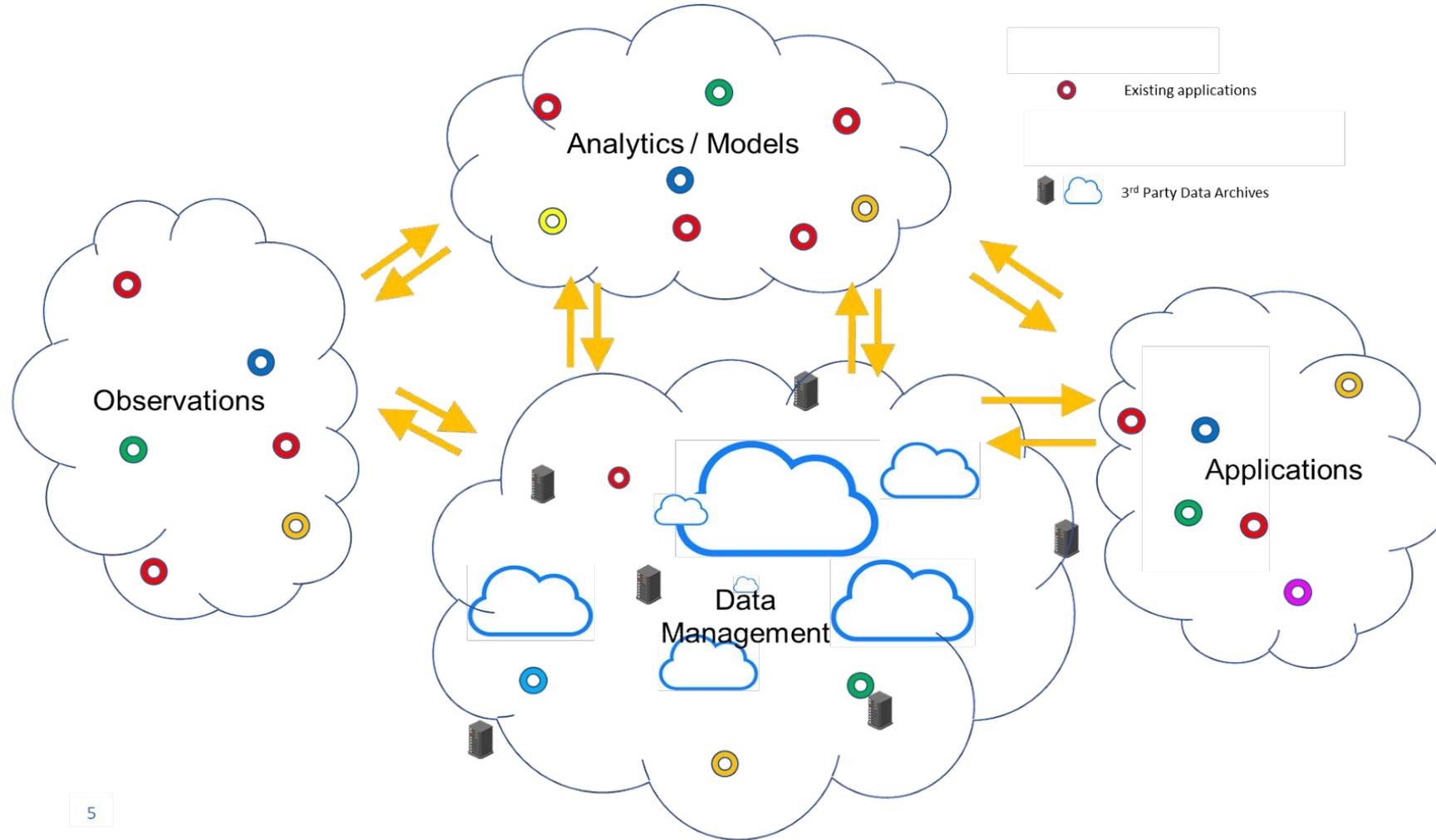
## Data Acquisition

Spatial, Temporal, Historical, Knowledge

# The data journey

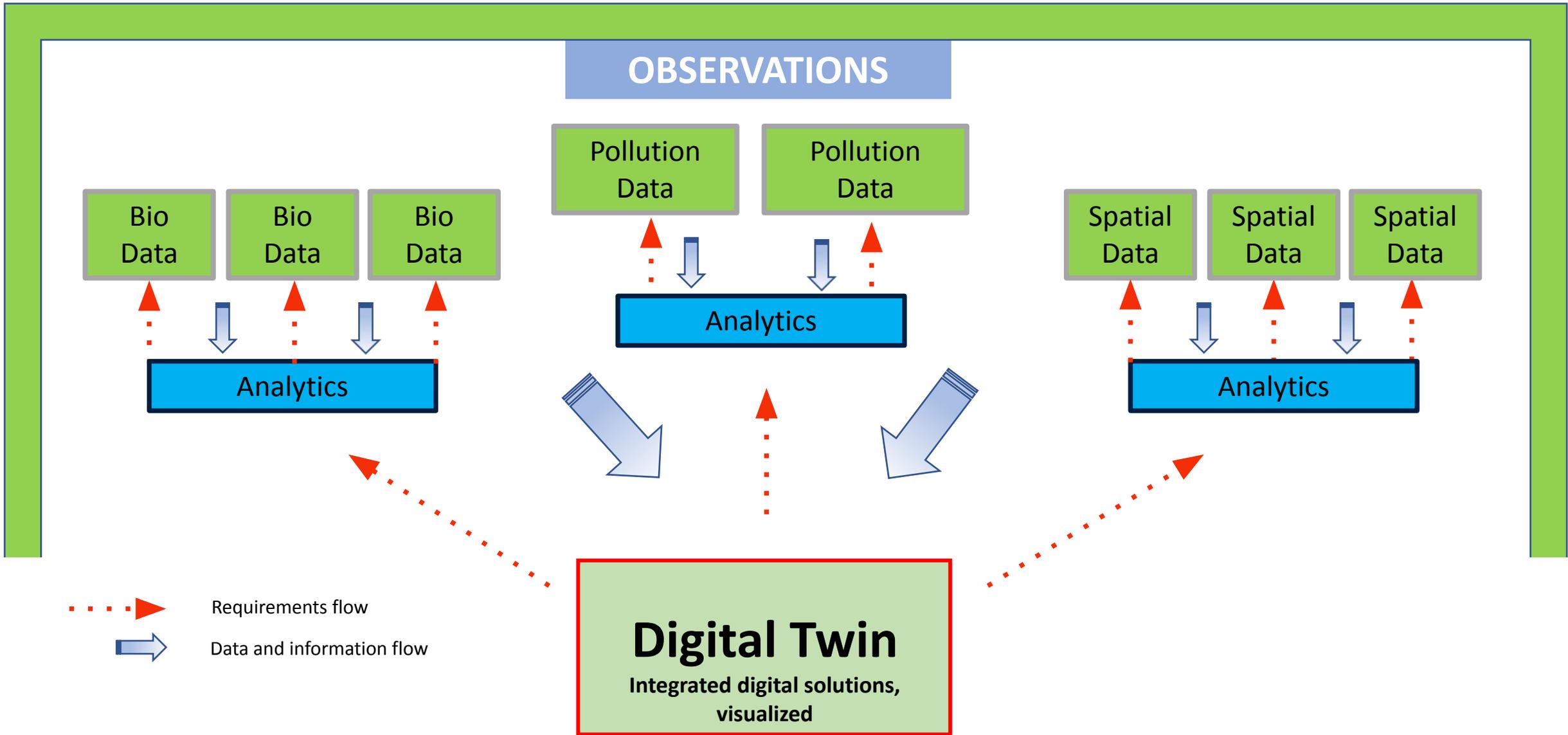


# Federated and interoperable



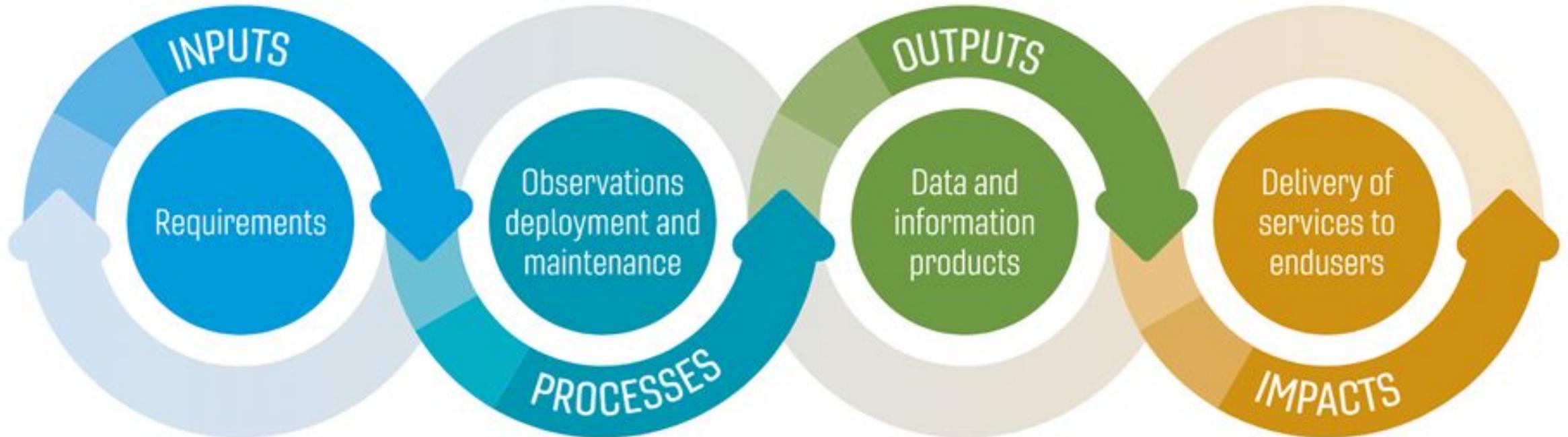
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# Empowered by, and empowering....



# Ocean data flow: From observations to end user

Courtesy of GOOS



# Start from the end user

International Ocean Data Conference: Sopot, February 2022

- Challenge on the value of Digital Twins:  
*‘Will Digital Twins truly add value or are they just a sexy distraction?’*
  - The response, delivered by John Siddorn, Pier Luigi Buttegieg and others:  
*‘Digital Twins can be used to promote and drive interest for an expansion of the need for Ocean data and the creation of a solid ocean data management system.’*
- Key Message: To be truly successful the development of an Ocean Data Digital Eco-system **MUST** be driven by the end-user, **NOT** by the implementation / technical team.



# Technical requirements

## Technical requirements for a digital data eco-system support of Digital Twins:

- The technical solutions we need are already in place – we just need to coordinate and expand their wider implementation and monitor their adoption.
- The standardization practices, protocols and tooling that we need are already in place – we just need to standardize the standards; to coordinate and expand their wider implementation and monitor their adoption.
- Data management is boring and therefore underfunded and under-resourced. When in fact it is the engine that will drive the science needed for the ocean we want.
  - Allocation of funding and technical resources to the underlying data engine is as, if not more, critical than is funding Digital Twins

# Working together

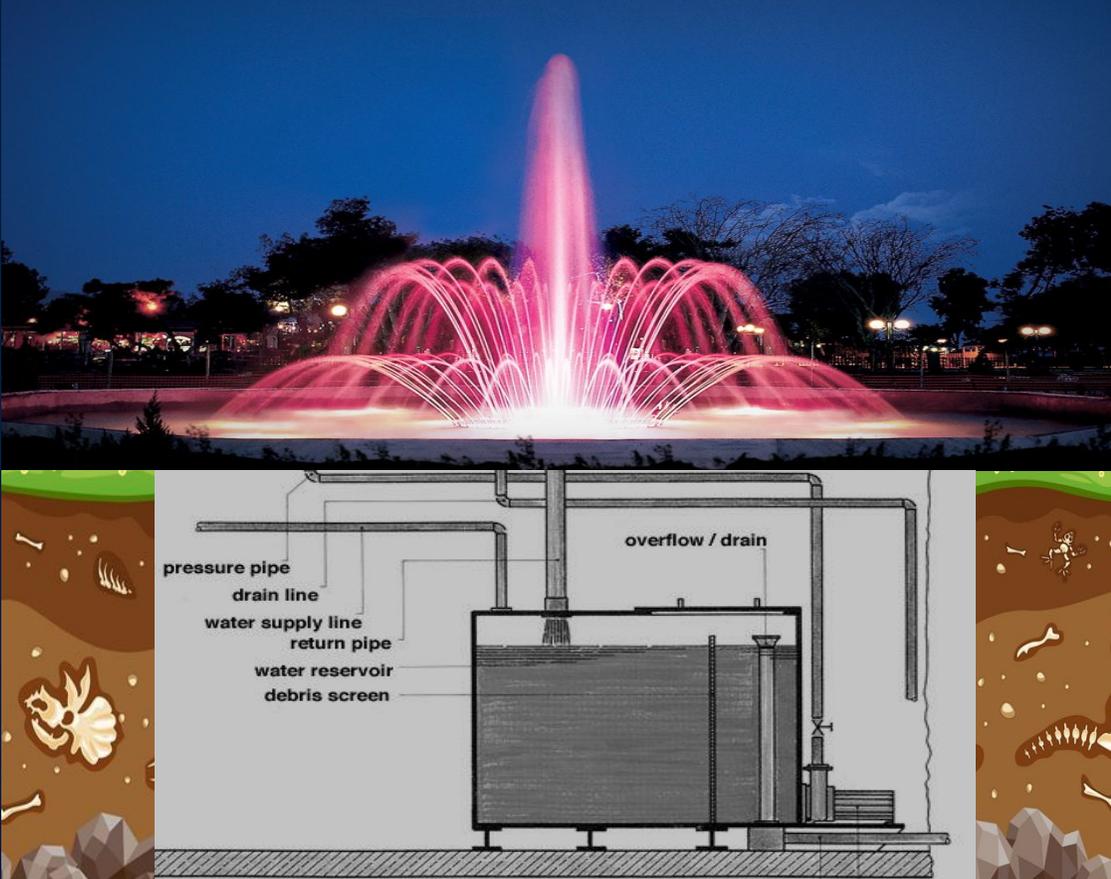
## Community / Organizational Structure

- The Ocean Community is not unique in its data challenges and knowledge requirements.
  - Engagement with other sectors, public and private, is critical to developing an acceptable, standard approach to developing a Digital Eco-system for Ocean Data.
- Communications will be key to driving acceptance and adoption of any common approach.
  - The need for marketing and storytelling must not be underestimated to develop cohesion.



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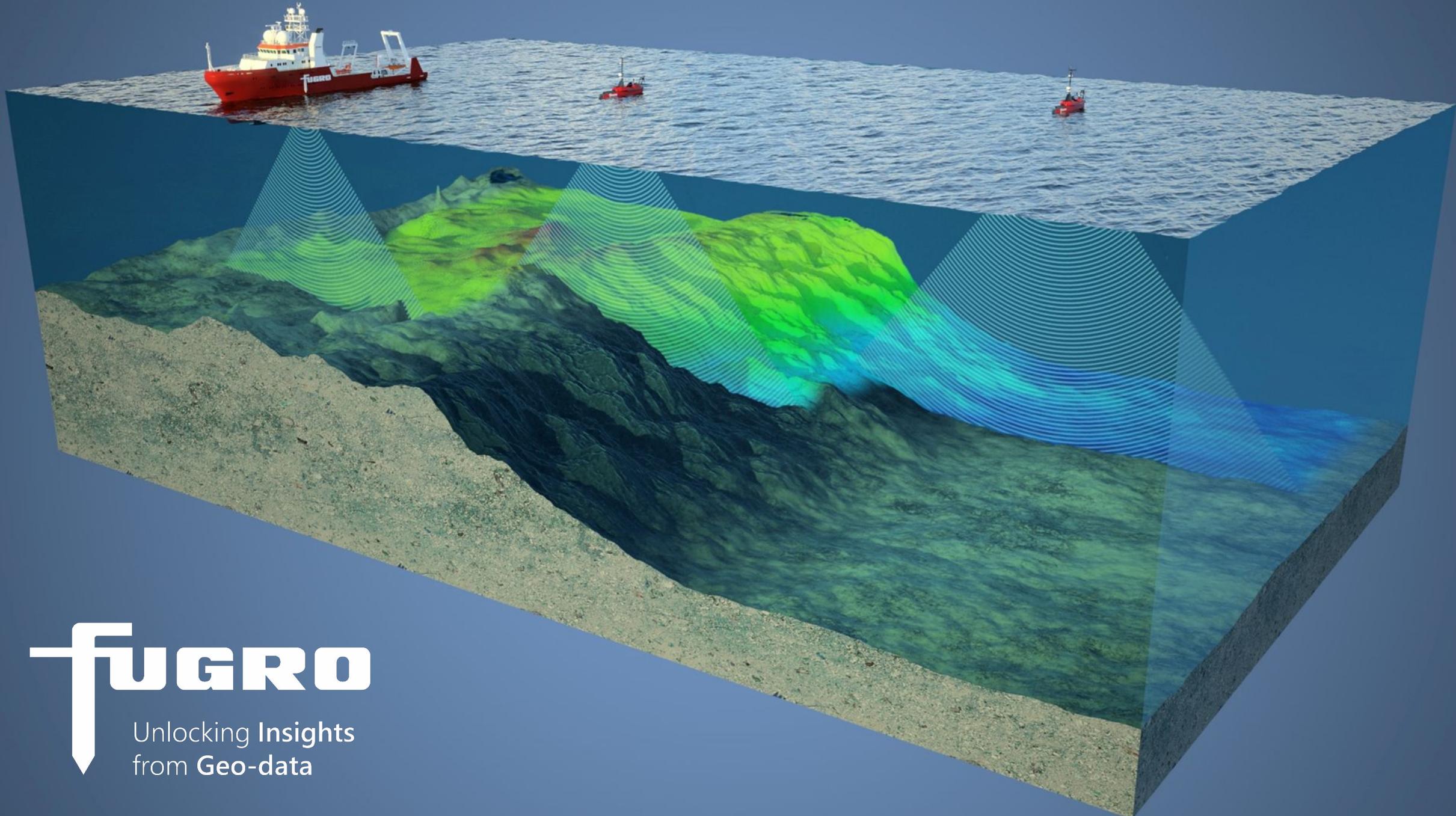
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**FUGRO**  
Unlocking Insights  
from Geo-data