OUTLINE

1. Introduction

2. Ocean observation: why & how?

3. Ocean observing value chain

4. Examples of thematic use cases

Why do we need to observe the ocean?

The ocean covers 71% of our planet and is our planet's life support system

Living inland or in a coastal area **WE ALL** rely on the ocean and its resources

Climate change and human activities are taking an ever-growing toll on the marine world and so is the urgency to better protect marine ecosystems, safeguard coastal communities and use the ocean resources in a sustainable and responsable way.

Earth observation is more than ever needed to understand the changing state of marine environments, make accurate projections and provide the evidence needed to find solutions and make effective decisions.
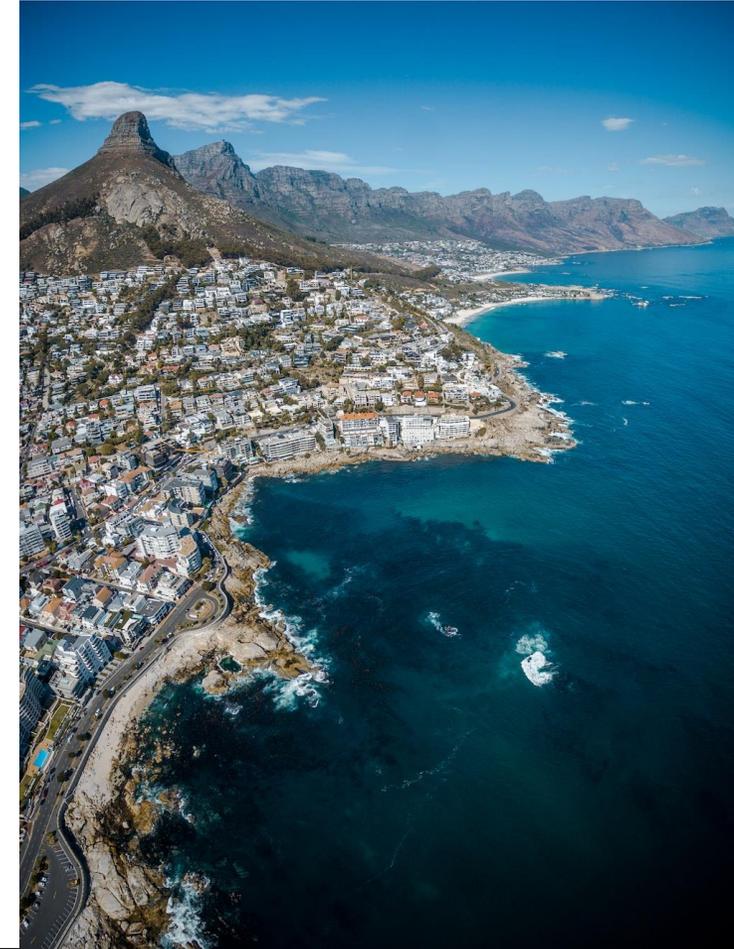
How do we observe the ocean?

Earth observation has revolutionized our understanding of the ocean and changes it is undergoing.

Thanks to space-based data, together with ground-based data, scientists can accurately and effectively gather data related to a multitude of ocean parameters such as:

temperature, salinity, oxygen, currents, sea ice thickness, wave height, productivity, and so much more,

Providing crucial information on climate and anthropogenic impacts such as ocean warming, acidification, sea level rise, plastic pollution, biodiversity loss, etc.

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A wide range of platforms allow man-operated and autonomous observations at sea (*in situ*)

Manta nets
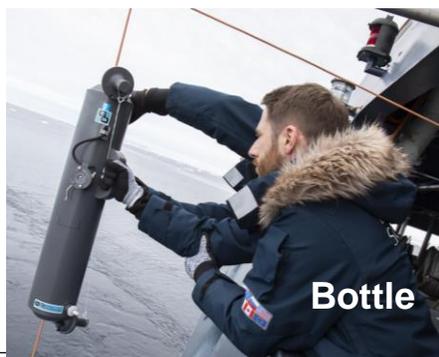
Argo profiling floats

© Olivier Dugornay/ Ifremer

Gliders

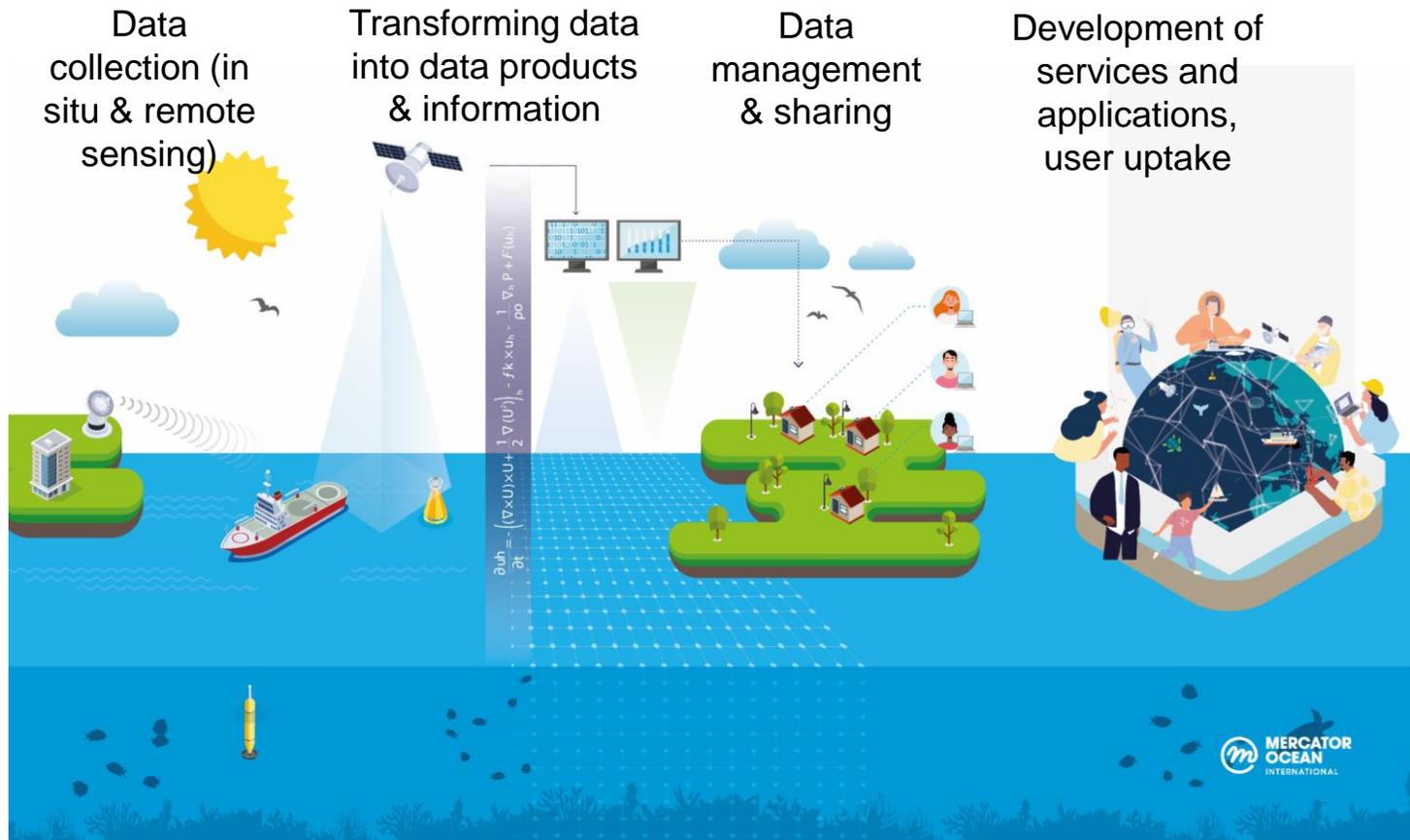**Sensors on board and deployed from vessels**

Bottle

Since the 70s satellites have been providing a global coverage of sea surface parameters (remote sensing)

Right: **EU Copernicus Sentinel-3** (3A launched in 2016 and 3B in 2018), measures sea temperature, ocean colour, topography, among others.

Left: **NASA-CNES SWOT** satellite (Surface Water and Ocean Topography) launched on 16 December 2022

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The ocean observation value chain

Data collection (in situ & remote sensing)

Transforming data into data products & information

Data management & sharing

Development of services and applications, user uptake

Given the ever-growing need for information to drive **evidence-based decision making**, ocean observation needs to be transformed into **actionable products** answering users' requirements.

Ocean observation is fundamental for and make the basis of a **complex value chain** that combines numerical modelling and data management to provide a **comprehensive picture of the ocean's state and assess impacts of human activities**.

Ocean observation essential for actionable ocean information
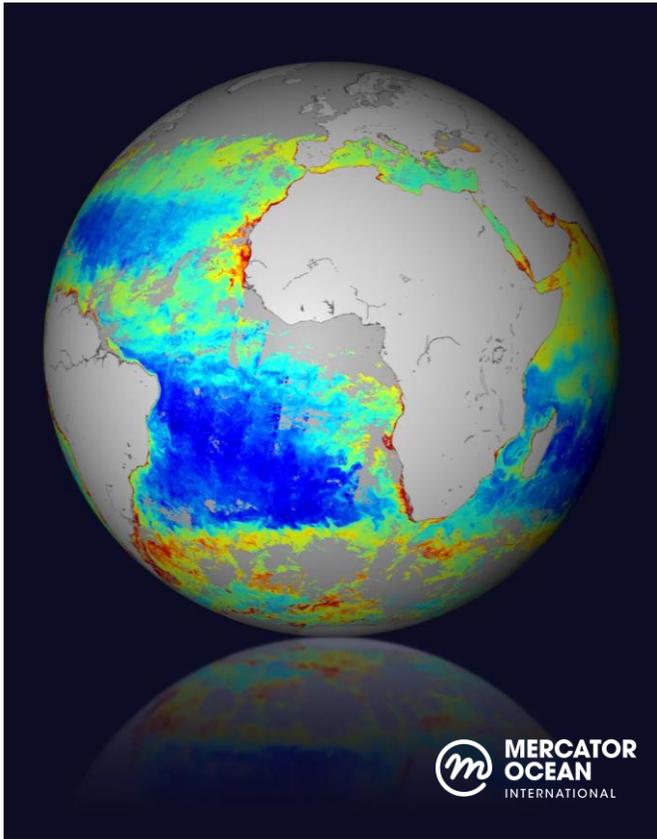
- provides **ground truth** data for research on the baseline state and changes in the ocean

- transformed into **indicators** and other data products to assess and monitor the state of the ocean and marine and coastal ecosystems

- used to develop and improve **operational monitoring and forecasting systems**

- assimilated into numerical models to provide **forecasts, real-time analyses and re-analyses time series** over several decades

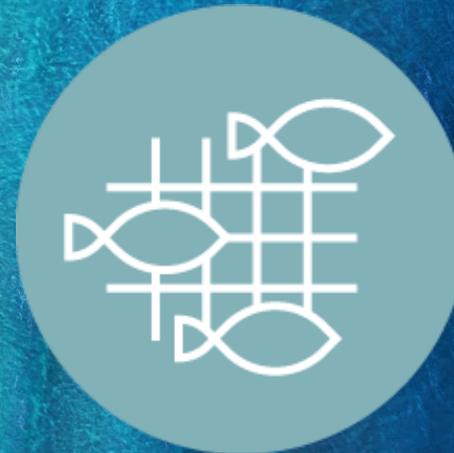- fed into tools and other downstream services for **focused applications and information products**

Ocean observation responds to the information needs of multiple stakeholders

#TheEarthTalks

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SEA STATE
OCEAN MODELLING
BATHYMETRY
GEO-REFERENCED DATA
TEMPERATURE AND SALINITY
OTHER OBSERVATIONS
OCEAN OBSERVATIONS
DECISION MAKING
POLITICIANS
REGIONAL ORGANISATIONS
END USERS
UN SPECIALISED AGENCIES
OTHER STAKEHOLDERS

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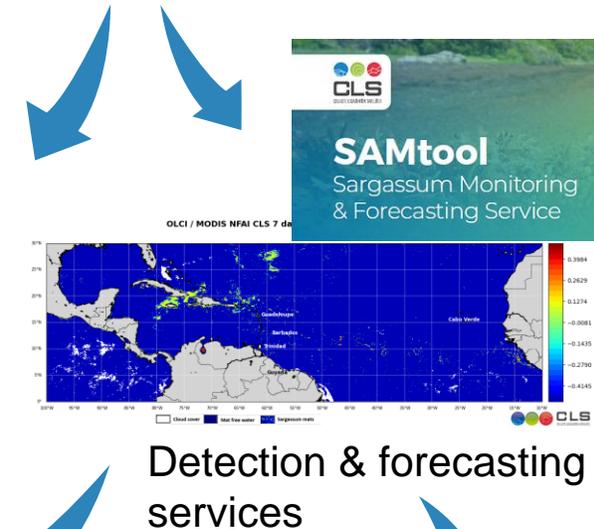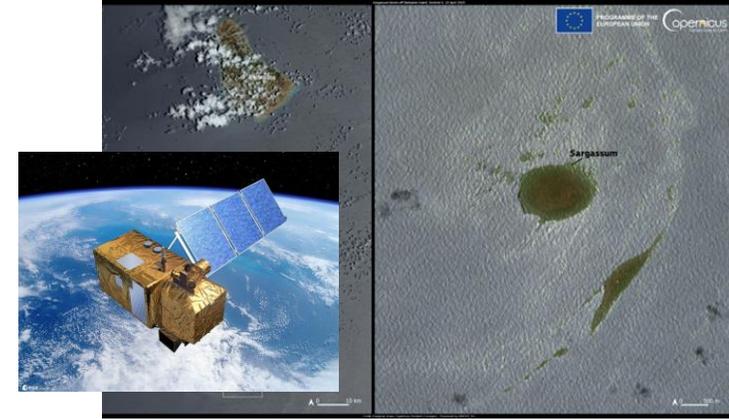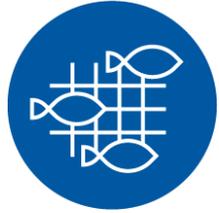REPUBLIC OF SOUTH AFRICA

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BLUE PLANET

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Ocean observation value chain to detect, monitor and forecast *Sargassum* inundation and spread

- **Stakeholders & end-users:** policymakers, public authorities, blue economy industries (transport, fisheries, tourism, etc.) coastal communities
- **Decision points:** early warning systems, seasonal forecasts & monitoring reports
- **Benefits:** effective mitigation & adaptation plans, timely clean-up operations/harvesting, coastal resilience & preparedness, reduced environmental & socioeconomic impacts
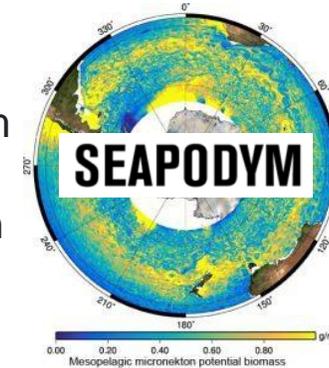
SODA: Sargassum Operational Detection Algorithms

Data products

SAMtool
Sargassum Monitoring & Forecasting Service

OLCI / MODIS NFAI CLS 7 da...

Detection & forecasting services

SARGASSUM INFORMATION HUB

GEO BLUE PLANET

Sargassum Management

Ocean observation value chain to support **sustainable fisheries**

- **Stakeholders & end-users:** policymakers, public & local authorities, fishers farmers, coastal communities
- **Decision points:** monitor and forecast fish stocks, establish marine protected ares, enforce regulations, monitor illegal, unreported and unregulated (IUU) fishing, weather forecasts, optimal vessel routing
- **Benefits:** safety-at-sea, sustainable fishing practices, safeguard marine ecosystems, food & job security

Copernicus Marine Service
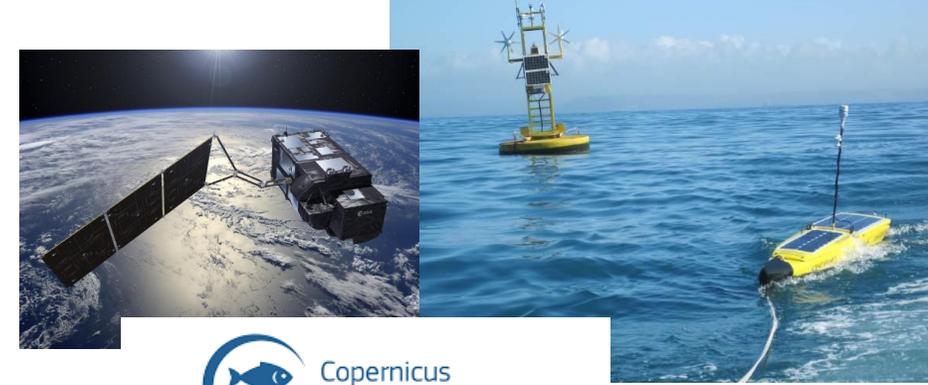
Marine ecosystem data & data products

Spatial Ecosystem And Population DYnamics Model

SEAPODYM

Mesopelagic micronekton potential biomass

Fish stock assessments

Fisheries Management

Pacific Community
Communauté du Pacifique

SPC Oceanic Fisheries Programme

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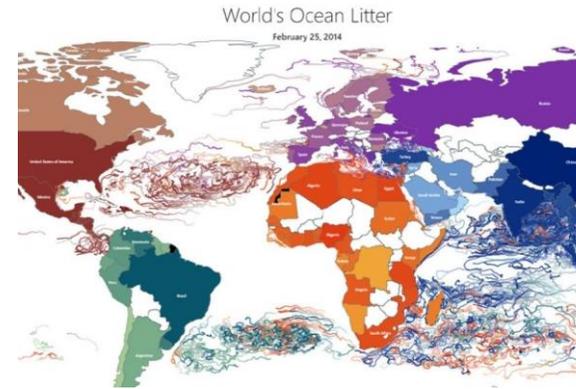Department: Science and Innovation
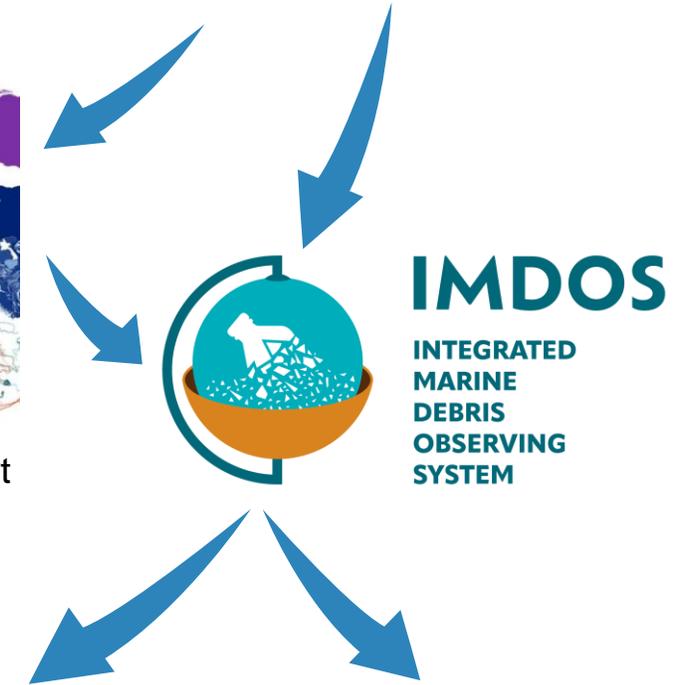REPUBLIC OF SOUTH AFRICA

GROUP ON EARTH OBSERVATIONS

Ocean observation value chain to detect and monitor marine litter

- **Stakeholders & end-users:** UN-level policy making, governments, public & local authorities, civil society
- **Decision points:** monitoring reports (distribution & quantity), trajectory modelling & forecasting, indicator, targets
- **Benefits: evidence for international negociations for the global treaty on marine litter,** effective mitigation & adaptation plans, prevent and reduce plastic pollution, monitor efficiency of policy directives, etc.

Marine litter modelling effort by E. Chassignet (FSU)

IMDOS
INTEGRATED MARINE DEBRIS OBSERVING SYSTEM