

New trends for Sargassum Monitoring Artificial Intelligence & Remote Sensing

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3rd EU-Caribbean Global Gateway Conference on
Sargassum

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What is Copernicus?



FULL, FREE AND OPEN
ACCESS TO DATA

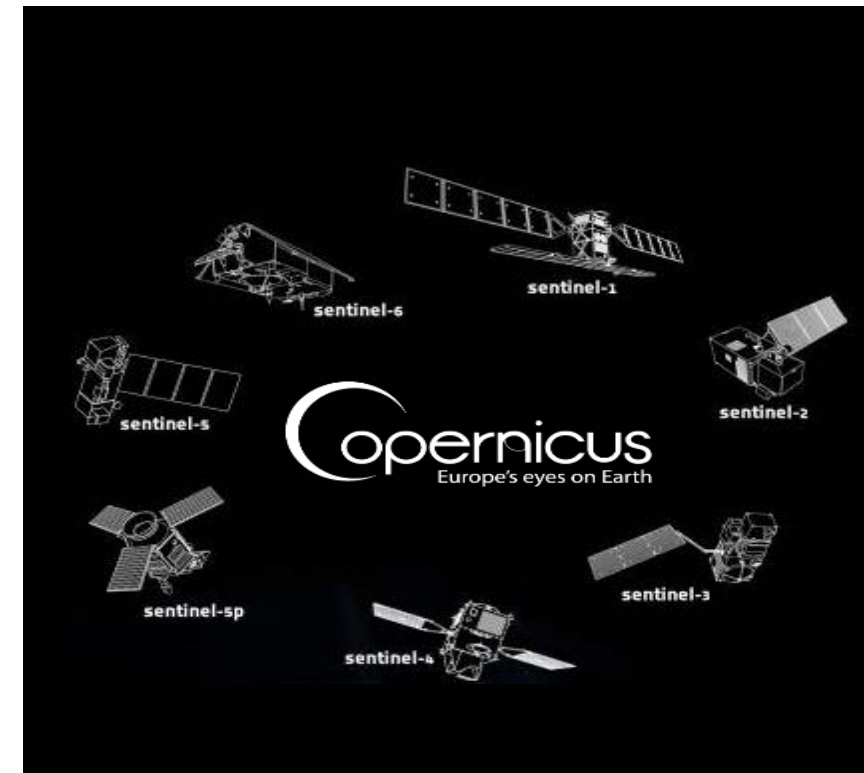


-  ATMOSPHERE MONITORING
-  MARINE ENVIRONMENT MONITORING
-  LAND MONITORING
-  CLIMATE CHANGE
-  EMERGENCY MANAGEMENT
-  SECURITY

 **opernicus**
Europe's eyes on Earth

Copernicus is the European Earth Observation Satellite Program, which consists of:

- A constellation of **Earth Observation satellites** called **SENTINEL**.
- A series of Earth Observation Services.
- All the information obtained is completely open and free.



Atmosphere
(CAMS)



Marine Environment
(CMEMS)



Land
(CLMS)



Climate Change
(C3S)

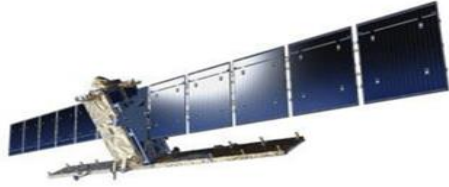


Emergency Management
(EMS)



Security

Sentinel Satellites



Sentinel 1

Launch: 1A 2014, 1B 2016, 1C 2024
 Sensor: Synthetic Aperture Radar (SAR)
 In Orbit: 1A and 1C
 Mission: Land Deformation, Ice and Glacier Monitoring



Sentinel 2

Launch: 2A 2015, 2B 2017, 2C 2024
 Sensor: Optic Multispectral with 13 bands
 In Orbit: 1A, 1B and 1C
 Mission: Earth Monitoring (Agriculture, forest, biodiversity)



Sentinel 3

Launch: 3A 2016, 3B 2018
 Sensor: OLCI and SLSTR
 In Orbit: 3A and 3B
 Mission: Earth's oceans, land, ice and atmosphere monitoring



Sentinel 4

Launch: 4A 2025
 Sensor: ultraviolet, visible and near-infrared spectrometer
 In Orbit: 4A (geostationary for Europe and North Africa)
 Mission: Air Quality Monitoring



Sentinel 5

Launch: 5A 2025
 Sensor: advanced imaging spectrometer (MetOp)
 In Orbit: 5A
 Mission: Air Quality Monitoring



Sentinel 5P

Launch: 5A 2017
 Sensor: Tropomi
 In Orbit: 5A
 Mission: Air Quality Monitoring



Sentinel 6

Launch: 6A 2020, 6B 2025
 Sensor: radar altimetry
 In Orbit: 6A and 6B
 Mission: Ocean Monitoring

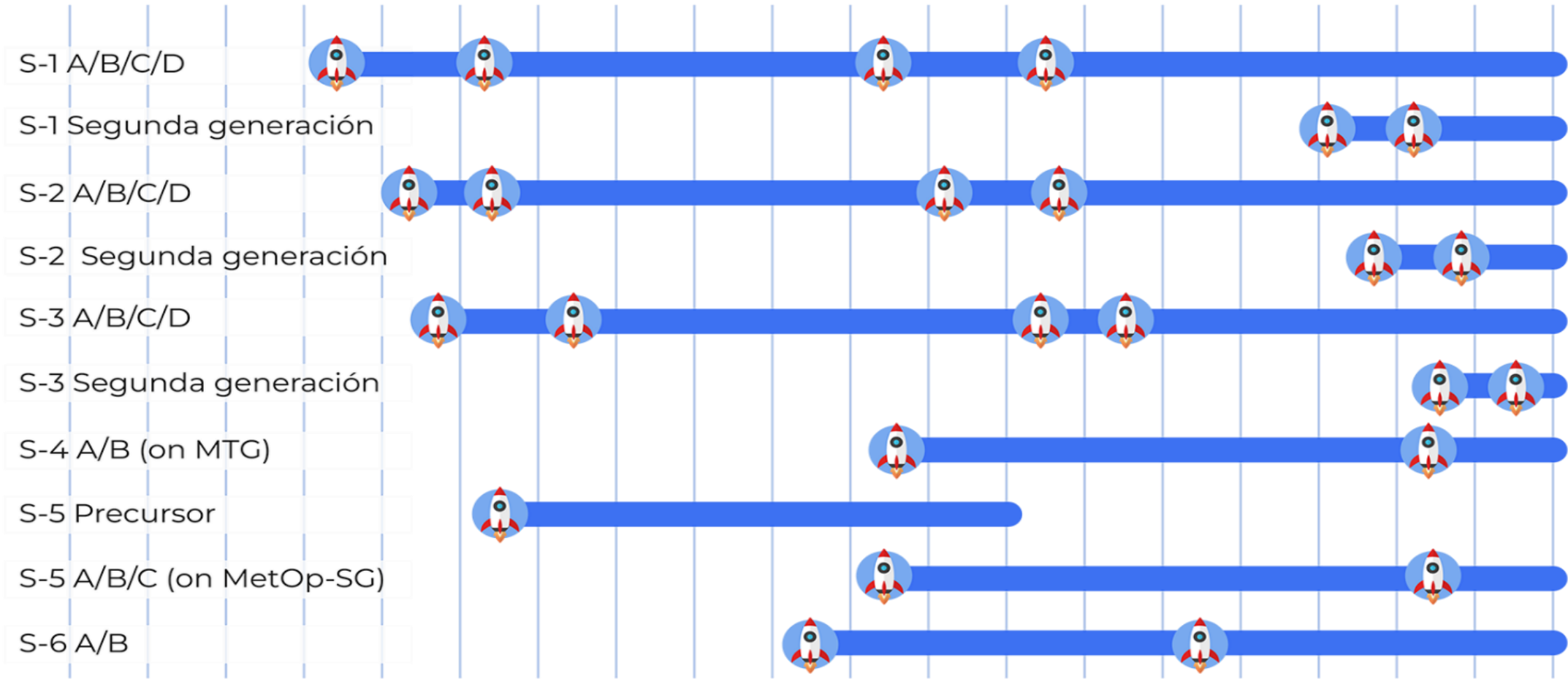
Sentinel Missions

2011

2014

2020

2030



Copernicus Regional Center for Latin America and Caribbean CopernicusLAC-Chile



Project Description

CopernicusLAC-Chile is part of the **Center for Mathematical Modeling (CMM)** of the **University of Chile**.

CopernicusLAC-Chile is co-funded by the University of Chile and the Directorate-General for International Partnerships (DG INTPA) of the European Commission.

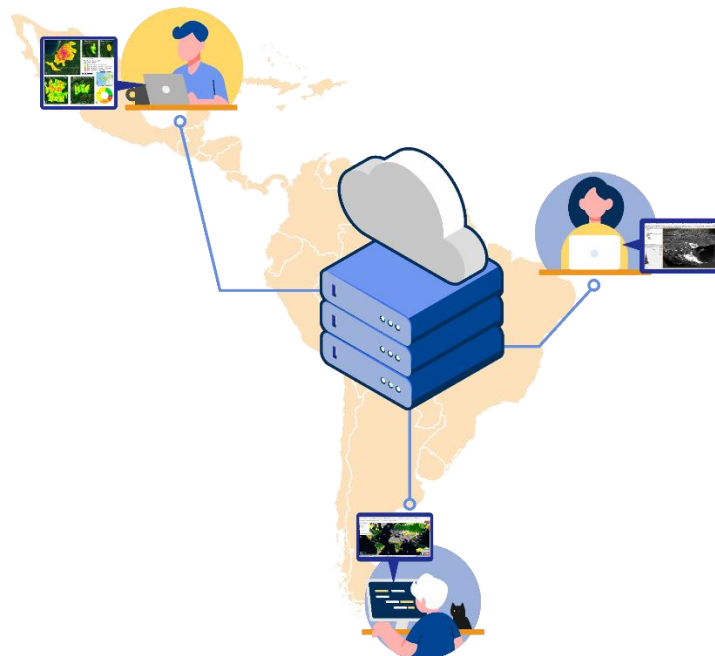
It was inaugurated by the Executive Vice President of the European Commission, Commissioner Margrethe Vestager, together with the Rector of the University of Chile, Rosa Devés, on **March 11, 2023**.



Our Mission



Hub of
Copernicus



Virtual
Machines

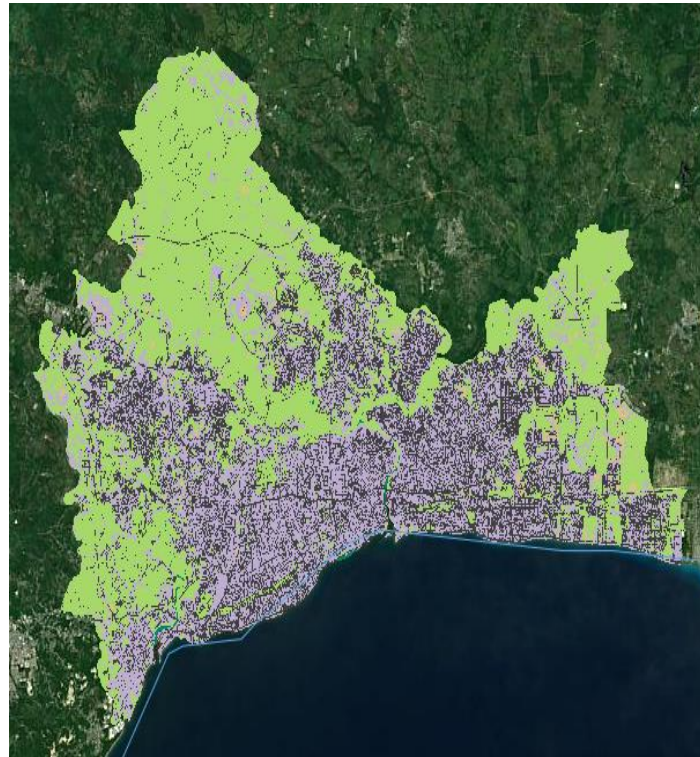


In situ Data

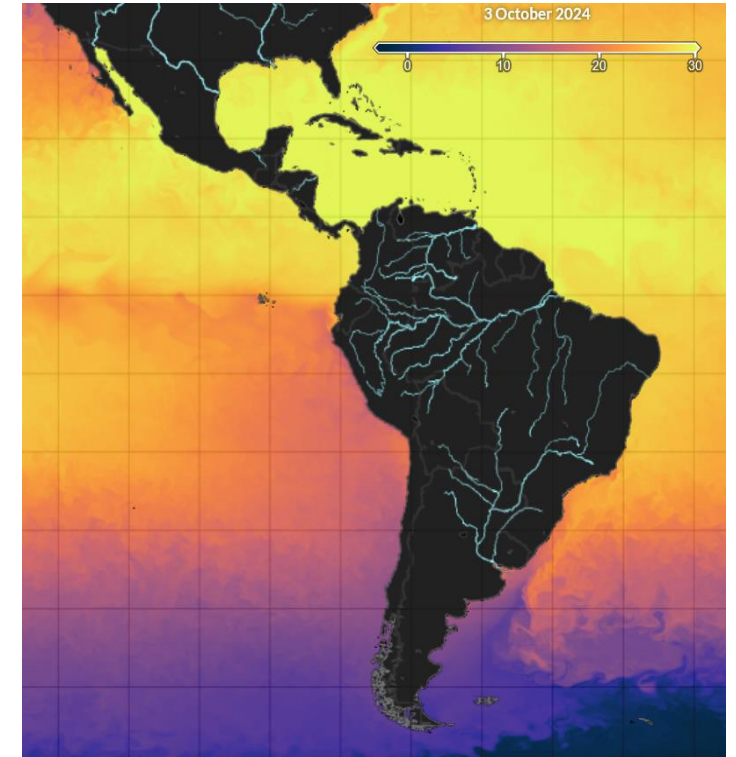
Add Value Services



Maps of Land Cover
and Land Use



Urban Atlas



Ocean Coast
Monitoring

Why Sargassum?



The Sargassum Bloom

This year the Caribbean region had a tremendous **Sargassum Bloom**, but the sargassum apparition had an increasing volume during the last years.

The **effects of sargassum** are various affecting **different economic activities as tourism, fishing, among others** and **affect seriously fragile ecosystems as the mangroves and coral.**

But they **represent also a possible interesting economic activity.**

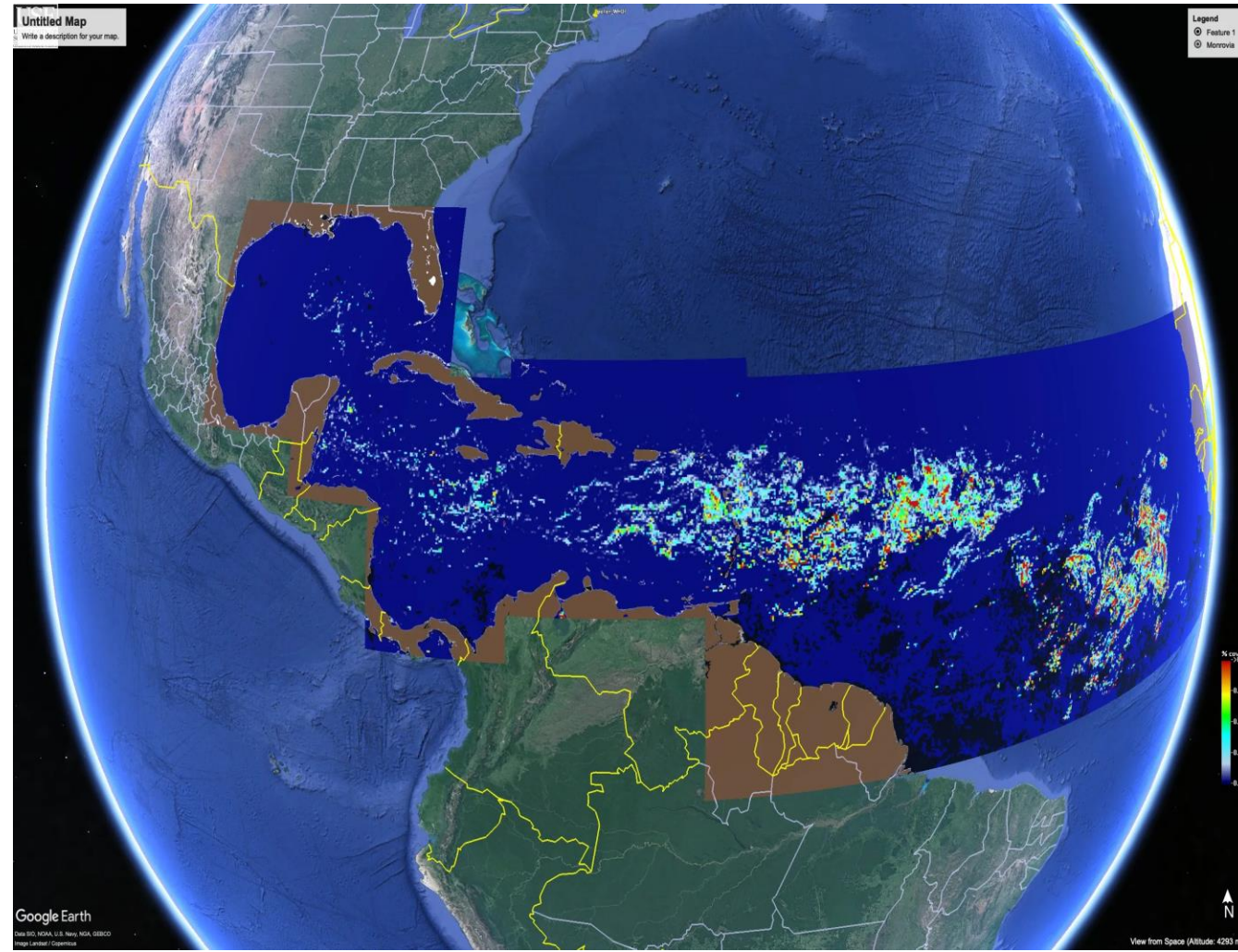


Climate change?

The climate change produces variations in the behavior of the seas.

For instance, changes on the temperature, nutrients, chlorophyll, among others,

These changes can have an influence in the apparition of sargassum blooms, but this influence must be analyzed quietly.



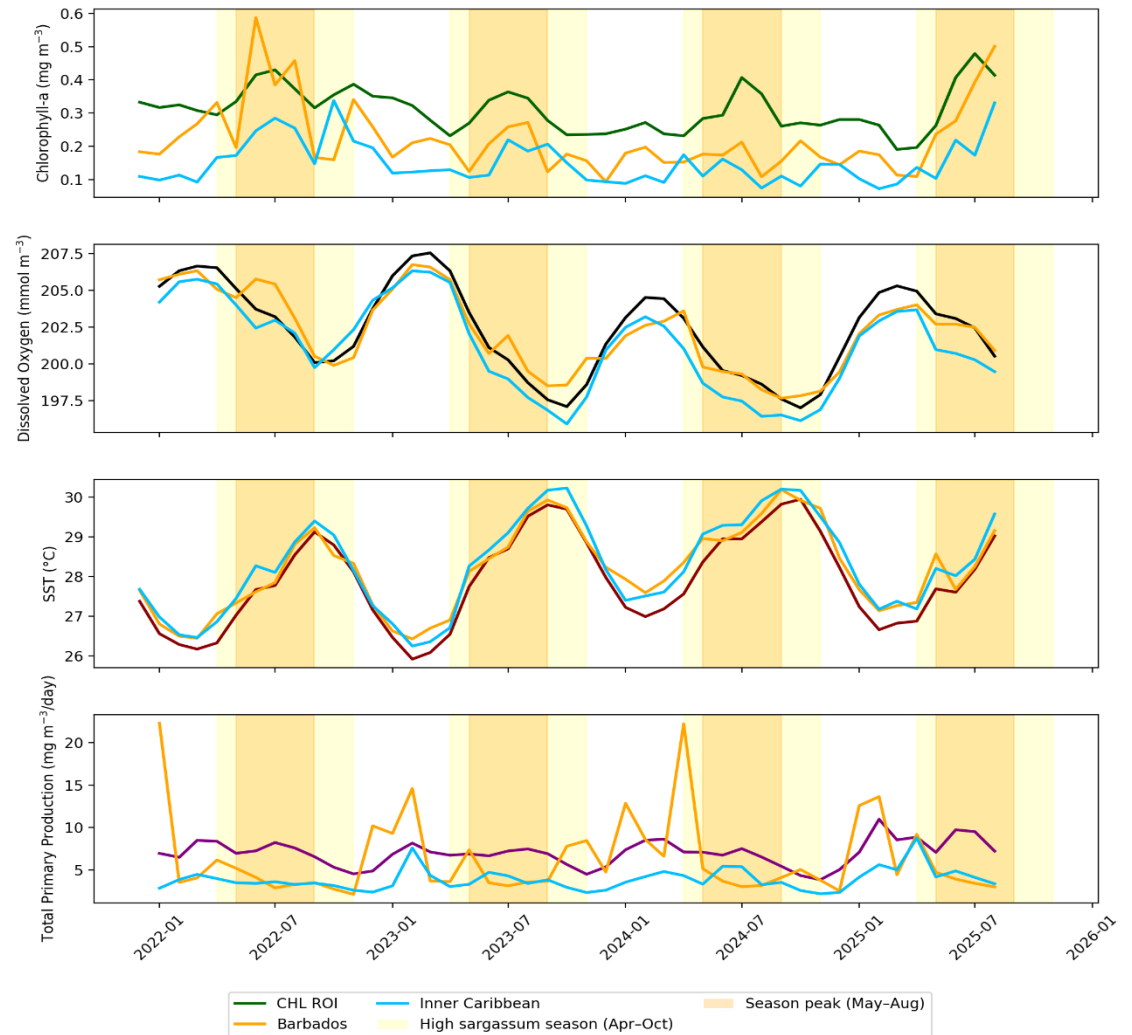
The Data

With satellite information and another sources of information it is possible to study different KPI.

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Monitoring and Forecasting



Project Description

To produce an **evolving monitoring service** that produces **Near Real Time (NRT) estimates** of the Sargassum strands for quick viewing as well as improved observations/forecast that consider longer periods of time (~1 month).

The initial model is planned to evolve into one where the Sargassum is dynamically “followed” using the model **NEMOSarg** Sargassum transport-physiology model and later “high probability” Sargassum blossoms maps are produced to improve detection and follow up.



SO1. To generate a **Near Real Time (NRT) Sargassum detection**.

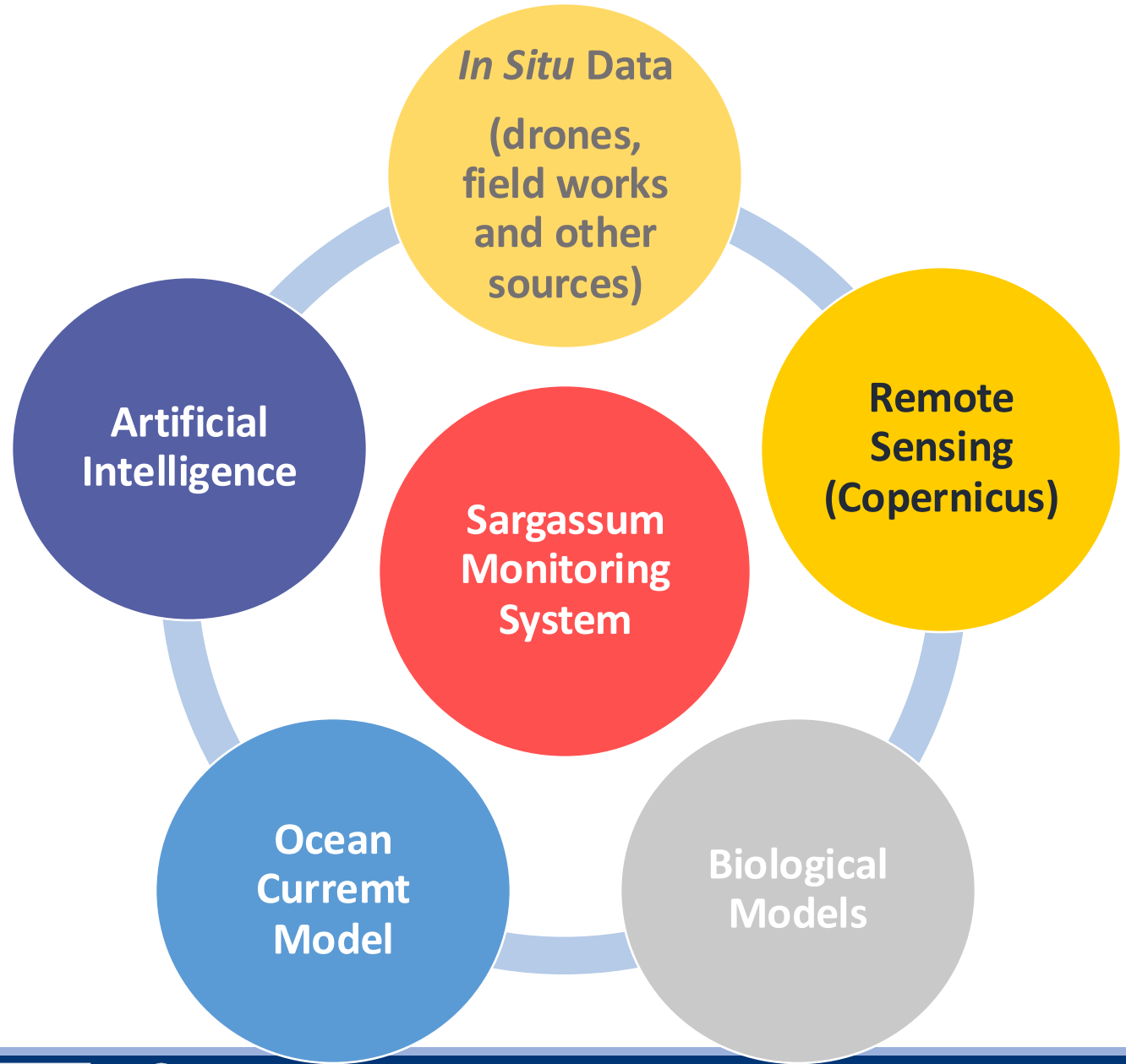
SO2. To produce a **dynamic time-averaging** to increase observability/initial forecast conditions.

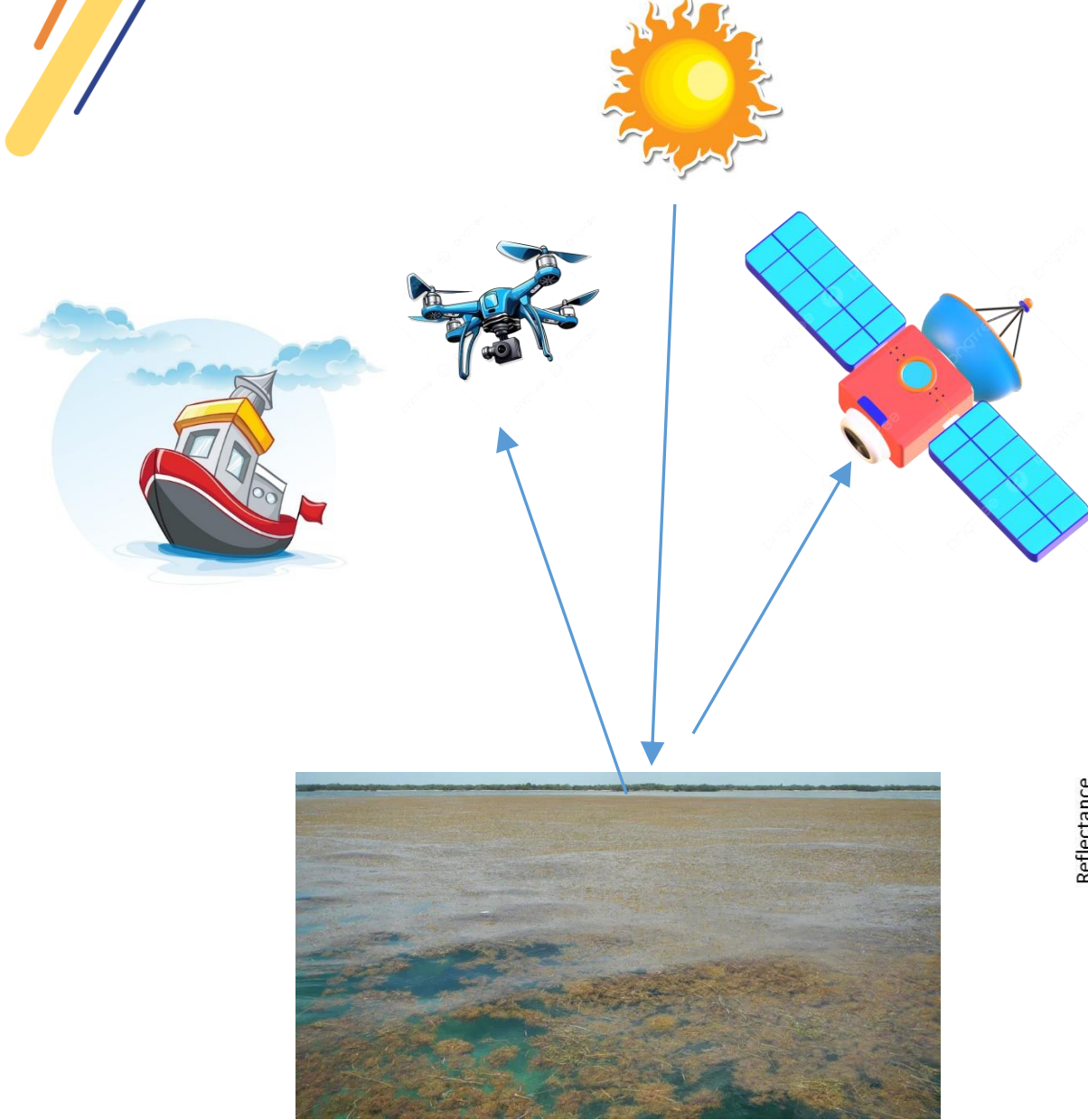
SO3. To perform *spectral analysis of S2/S3 images* based on fieldwork to determine the **Sargassum cover fraction** from spectral unmixing techniques.

SO4. To produce a **10-day forecast** using **NEMO-Sarg model**.

SO5. To analyze the Sargassum influx and the drivers that promote its development: the **“Perfect Storm”** conditions, that is, to **predict its appearance** and **serve as input to improved NRT estimates** and follow-up.

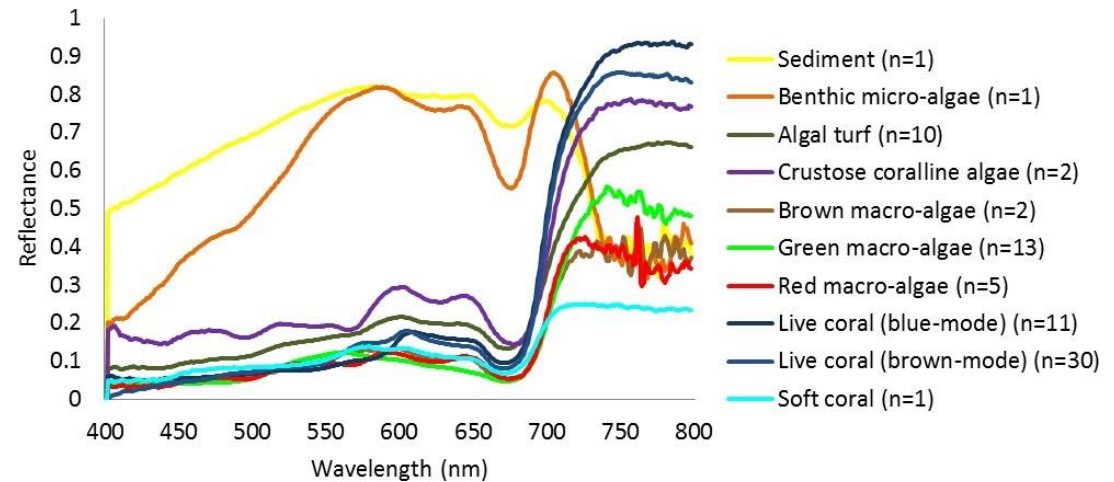
SO6. To estimate the **volume of sargassum** from the spectral signatures and AI algorithms





To perform the **volume estimation**, we consider:

- **Field data acquisition:** Collection of in-situ measurements of reflectance and volume.
- **AI-based correlation:** Using Deep Learning models to correlate volume estimates with spectral signatures.
- **Spectral calibration:** Calibration of the spectral signatures using satellite imagery.



The Team!!



CentroGeo



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COMISIÓN NACIONAL PARA EL
CONOCIMIENTO Y USO DE LA BIODIVERSIDAD



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