

COPERNICUS MARINE 8th GENERAL ASSEMBLY

- Sargassum Operational
Detection Algorithms
(SODA)



Copernicus
Marine Service

SODA (Sargassum Operational Detection Algorithms)

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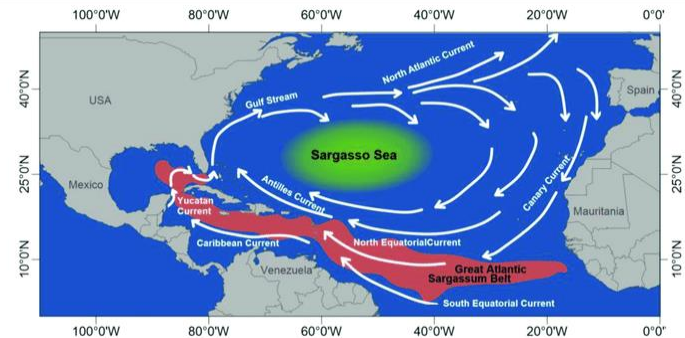


HYGEOS

The new Great Atlantic Sargassum Belt

Sargassum fluitans and *sargassum natans* are brown pelagic algae

- First sight of Sargassum by Christopher Columbus in 1492 in the Sargasso Sea
- Anomaly in North Atlantic Circulation in winter 2009-2010
- In 2011, massive strandings have occurred in the wider Caribbean region and West African countries
- Sargassum found good conditions causing their proliferation in the GASB and making sargassum influxes in the Caribbean a “new normal”



Lopez Miranda et al. 2021

Societal, economic and environmental impacts



● Public authorities:

- Mandates in public beach management and public health management
- In charge of cleaning beaches and monitor H₂S concentration

● Tourism sector:

- Key source of revenue for most countries
- Sargassum ruins the visual aspect of beaches and nuisance for nautical activities

● Fisheries:

- Hampered by floating sargassum, especially net fishing
- Fishermen can be trapped in port by Sargassum



\$120 million in 2018 in the Caribbean

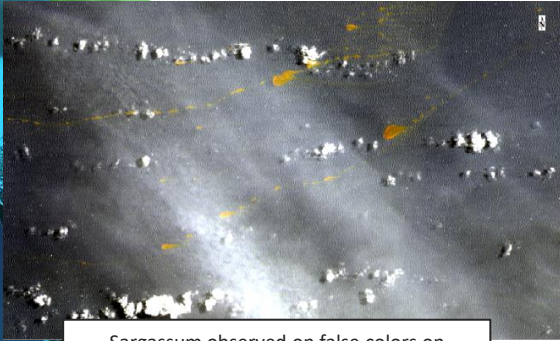


+12 months after an event



60% fishermen reported reduction

Operational Detection from Satellite



Sargassum observed on false colors on Landsat-8 image

Satellite is a key tool to monitor floating sargassum:

- Applying an automated Sargassum Detection Algorithm on the reflectances of the satellite signal:

Sargassum Index inherited from Hu, 2009 (Floating Algae Index)

- 8 Satellites sensors in used in the Operational CLS SAMTool system since 2018:

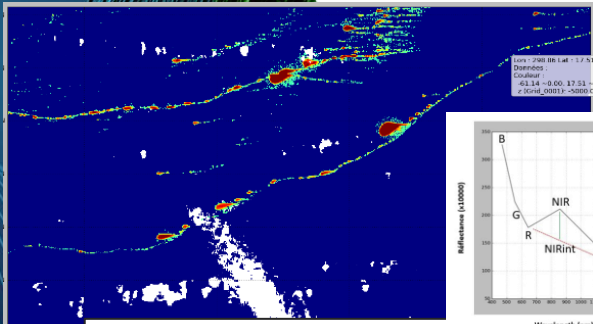
SODA aims at improving all Operational Algorithms for Sargassum Detection & build a multi-sensor product

Helio-synchronous satellites:

- MODIS on board Aqua
- OLCI on board Sentinel-3A and 3B
- MSI on-board Sentinel-2A and 2B
- OLI onboard Landsat-8 and -9

1 geostationary sensor

- ABI on board GOES-16



Sargassum detected with Operational Algorithm



Geographical coverage of MODIS & OLCI sargassum products

Complementarity of sensors

Sargassum seen by Sentinel-2 on
20m-pixel resolution every 2-3 days

- Different pixel resolution, time resolution, time passage, sensitivity to cloud

Sargassum seen by GOES-16 on 1-km
pixel resolution

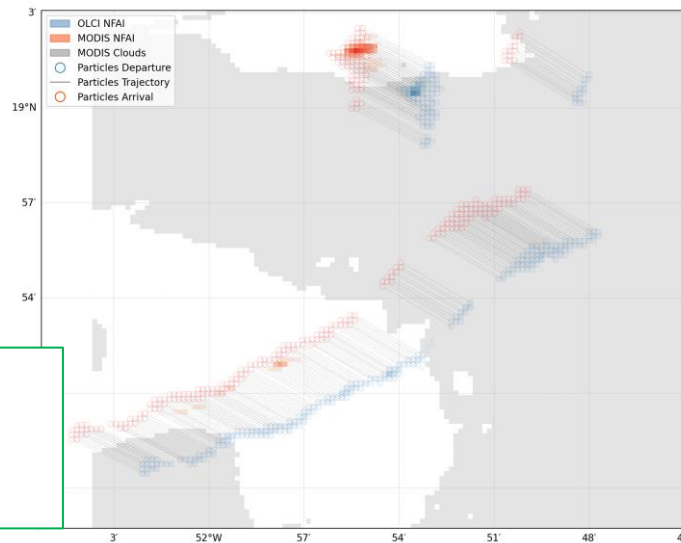
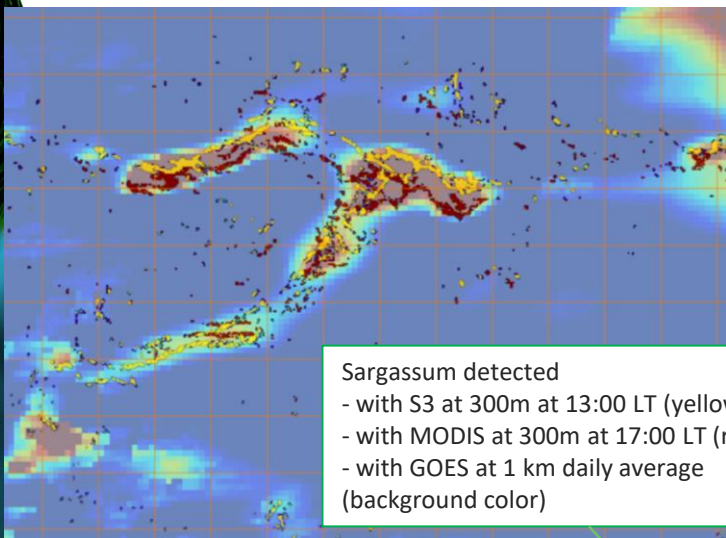
Daily average from 10-min images

Sargassum seen by Sentinel-3 on
300m-pixel resolution daily

Towards a merged multi-sensors product

- First set of tasks: **improving the mono- sensors products** (sunglint, adjacency effects, noise reduction)
- Challenge: Merging images at different time with different resolution

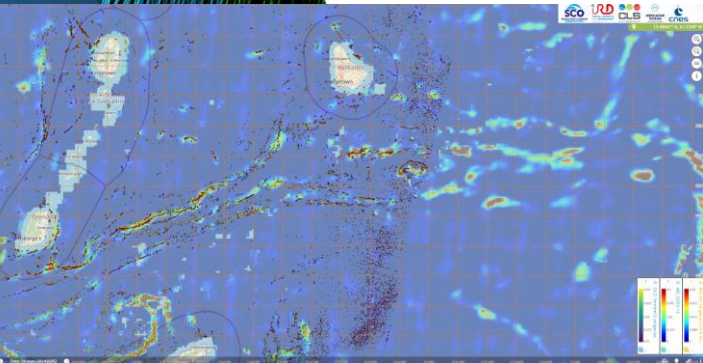
Using drift modelling with Copernicus currents models & clustering methods to identify identical mats in different images



Uptake by Copernicus Marine Service

Adding Sargassum products in Copernicus Marine Service:

- will enhance the Copernicus Marine Catalogue with high quality sargassum products:
 - *mono-sensors products from Ocean Color, High Resolution and Geostationary radiometric sensors*
 - *multi-observation products merging satellite, ocean model with innovative clustering method*
 - *covering the full Tropical Atlantic at once*



Uptake by Copernicus Marine Service

Adding Sargassum products in Copernicus Marine Service:

- will fill a gap in the actual European offer
- will enlarge the Copernicus Marine user community and attract new users:
 - *Supporting the international public sector and scientific community*
 - *Stimulating downstream applications and private sector*
- *Historical sargassum products are already shared since January 2024 and used by the scientific community with the support of CNES under Space Climate Observatory Program*
 - <https://www.spaceclimateobservatory.org/fr/sesam>
 - <https://www.aviso.altimetry.fr/en/data/products/value-added-products/sargassum.html>



● Thanks for your attention!

