7-day average of Sargassum Floating Algae Index using Sentinel- 3A&B and AQUA satellites
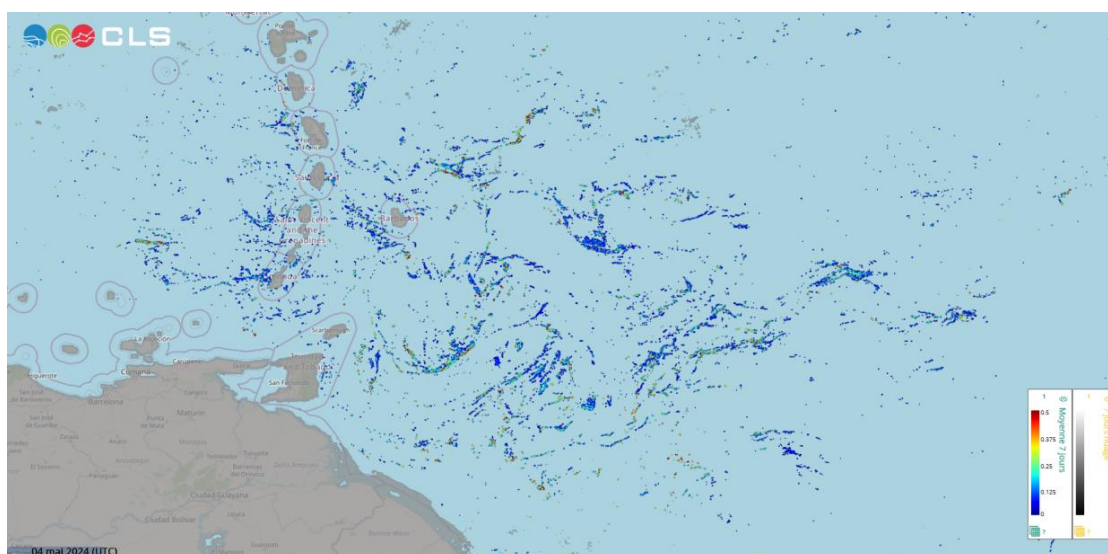
Dataset DOI : 10.24400/527896/A01-2024.014

Chronology Issues:		
Issue:	Date:	Reason for change:
1.0	22/01/2025	1st issue

Contents

1. Overview of this document

This document is the user manual for the **7-day average of Normalized Sargassum Floating Algae Index using OLCI instruments onboard Sentinel-3A&B and MODIS instrument onboard AQUA** product, processed by CLS in the frame of their operational service SAMTool (https://datastore.groupcls.com/products/samtool-sargassum-detection/).

The time series of NFAI products produced since February 2022 to month - 1 are provided through Aviso+ as part of the SeSaM project: https://www.spaceclimateobservatory.org/sesam sponsored by CNES.

1.1. Acknowledgments

When using the **7-day average of Sargassum Floating Algae Index using Sentinel- 3A&B and AQUA satellites** product, please cite

For the datasets starting in February 2022:

"The Sargassum Floating algae detection product has been produced by CLS operationally in the frame of the SAMTool service. The product is distributed by Aviso+ (DOI 10.24400/527896/A01-2024.014) with support from SCO-CNES."

1.2. User's feedback

This product is an operational product.

Therefore, each and every question, comment, example of use, and suggestion will help us improve the product. You're welcome to ask or send them to aviso@altimetry.fr.

2. Processing

Since 2011, unprecedent massive landings of sargassum seaweed (*Sargassum fluitans* and *Sargassum natans*) have been observed along the shorelines of a huge area encompassing the Gulf of Mexico, the Caribbean Sea and West Africa, having tremendous negative impacts over local communities.

Satellite imagery allows to detect the presence of floating sargassum and is a key tool to help scientists to understand the origin and the seasonality of the sargassum movements in the Atlantic, and to support local communities in the management of the next sargassum influxes. Pioneering work by Gower et al. (2006), and Hu (2009) has demonstrated the capacity of ocean colour satellites to detect sargassum rafts.

Sargassum presence is detected by the increase of the reflectance spectrum between the red and near infra-red wavelengths. Most well-known sargassum indices found in the literature, for example the Maximum Chlorophyll Index (MCI, by Gower et al., 2006), the Floating Algae Index (FAI, by Hu, 2009), the Alternative Floating Algae Index (AFAI, by Wang and Hu, 2016), follow the same mathematical statement: Index = $\rho_{NIR} - \rho'_{NIR}$

Where ρ_{NIR} denote a reflectance (or radiance) partially (or not) corrected for atmospheric effects in the near infra-red band, and ρ'_{NIR} is the equivalent NIR reflectance that would be measured at the same point in absence of sargassum. ρ'_{NIR} is approximated by a linear interpolation between the two reflectances measured at nearby wavelengths in the red and SWIR bands.

We use here a normalized version of the FAI, in which the normalization by the sum of reflectances is introduced to mitigate the variability of the FAI due to atmospheric conditions and observation geometry, as done for the NDVI over land surfaces : NFAI= = $(\rho_{NIR} - \rho'_{NIR})/(\rho_{NIR} + \rho'_{NIR})$

A cloud masking and editing procedure is also applied to the products to remove false alarms. It consists first in coarse cloud masking, followed by spectral shape tests leading to classifying the pixel as cloud, or sargassum-free.

Each day, maps of NFAI are built by CLS by averaging the observations of the last 7 days of OLCI sensor on-board Sentinel-3A and Sentinel-3B at 300m and of MODIS sensor onboard AQUA at 250m and 1000m. The data are available in a 0.01˚ resolution grid.

This dataset is covering the whole Tropical Atlantic Basin and Gulf of Mexico.

Values of positive NFAI Indicate the presence of sargassum. Sargassum-free pixels are set to the value of -0.5. Cloud pixel are NA values
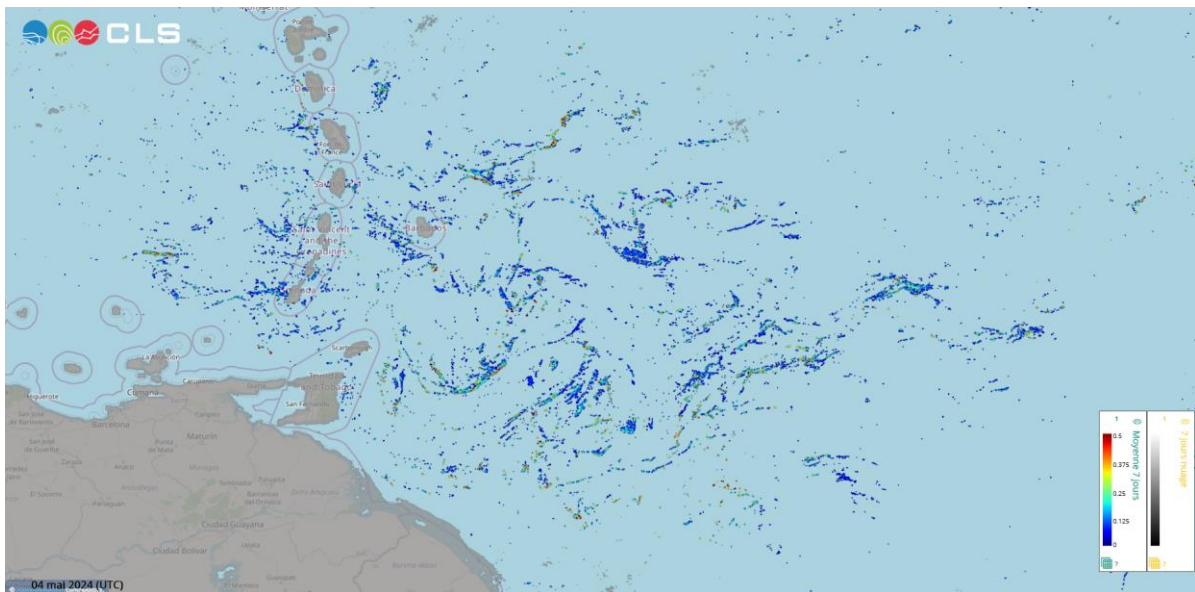
Figure 1: average detections of MODIS and OLCI of the last 7 days for May 4th 2024. Sargassum mats are shown in blue, cloud and land are shown in grey

3. Description of the product

3.1. Product general content and specifications

Covered period	Spatial coverage	Delivery format	Grid resolution	Update
From 2022/02 to month-1	Tropical Atlantic from -5°S to 30°N, 100°W to 13°E	Gridded product providing normalized floating algae index (NFAI) averaged on the last 7-day.	0.01°	Every day

Table 1: Characteristics of the Floating Sargassum Algae Index dataset.

3.2. Variables handling

The variables available in the products are:

- nfai_mean = weekly mean value of normalized floating algae index in bin_size degree cell
- nfai_max = weekly maximum value of normalized floating algae index in bin_size degree cell
- nfai_min = weekly minimum value of normalized floating algae index in bin_size degree cell
- nfai_nbpts = weekly number of pixel values of normalized floating algae index in bin_size degree cell

Each variable is also provided with an isolated version (where all sea pixels are set to no data) and a mask (*_missing), indicating no observation pixels for the variable.

4. How to download a product

4.1. Registration

To access data, registration is required. During the registration process, the user shall accept using license for the use of AVISO+ products and services.

- if not registered on AVISO+, please, fill the form and select the product '**Sargassum detection product**' on
  http://www.aviso.altimetry.fr/en/data/data-access/registration-form.html
- if already registered on AVISO+, please request the addition of this '**Sargassum detection product**' on your personal account on https://www.aviso.altimetry.fr/en/my-aviso-plus.html

4.2. Access Services

Note that once your registration is processed (see above), AVISO+ will validate your registration by e-mail as soon as possible (within 5 working days during working hours, Central European Time).

Those data are delivered on the Thredds Data Server with authentication.

The access information will be available in your personal account on https://www.aviso.altimetry.fr/en/my-aviso-plus.html.

5. Bibliography

Gower, J., C. Hu, G. Borstad, and S. King, 2006: Ocean color satellites show extensive lines of floating sargassum in the Gulf of Mexico. IEEE Trans. Geoscience Rem. Sensing, vol. 44, n° 12

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Wang, M., and C. Hu, 2016: Mapping and quantifying sargassum distribution and coverage in the central west Atlantic using MODIS observations. Rem. Sensing of Environment 18