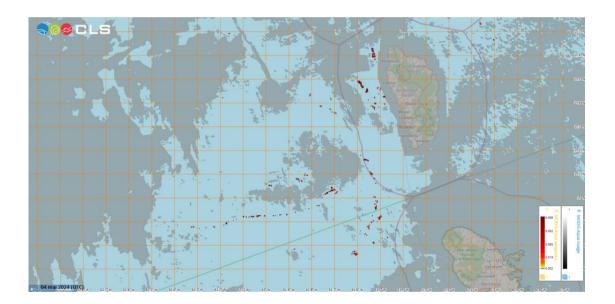# Sargassum Floating Algae Index using AQUA satellite

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Reference:
Issue: 1 rev 0
Date: 03/02/2025

Chronology Issues:		
Issue:	Date:	Reason for change:
1.0	03/02/2025	1st issue

Contents

1. Overview of this document

This document is the user manual for the Normalized **Sargassum Floating Algae Index using MODIS instruments 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 December 2020 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 **Sargassum Floating Algae Index using MODIS instrument** product, please cite: "This sargassum Floating Algae Detection product using AQUA satellite was produced operationally by CLS in the frame of the SAMTool service, distributed by AVISO+ (DOI 10.24400/527896/a01-2024.018) with the support of 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.

Daily maps of NFAI are built by CLS from the observations at 250m and 1km (depending on spectral band) of MODIS sensor on-board AQUA and are available at both high resolution (hr – 0.0025°) and averaged at low resolution (lr - 0.01°). Daily maps of raw NFAI, prior to data editing (only atmospheric corrections applied) are also provided.

These two datasets (daily operational hr and daily operational lr) produced from MODIS AQUA data are 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 pixels are NA values
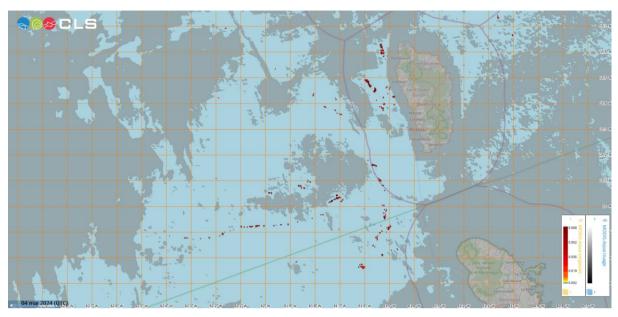
Figure 1: Detection of sargassum of MODIS AQUA for May 4th 2024. Sargassum mats are shown in red, cloud is shown in grey

3. Description of the product

3.1. Product general content and specifications

Covered period	Spatial coverage	Delivery format	Grid resolution	Update
From 2020/12 to month-1	Tropical Atlantic from -5°S to 30°N, 100°W to 13°E	Daily high-resolution gridded products providing normalized floating algae index (NFAI).	0.0025 °	Every day
From 2020/12 to month-1	Tropical Atlantic from -5°S to 30°N, 100°W to 13°E	Daily low-resolution gridded products providing normalized floating algae index (NFAI).	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:

For hr maps :

- normalized_floating_algae_index: daily value of NFAI in bin-size degree cell. Cloud is NA, Sargassum-free pixel is set to -0.5
- normalized_floating_algae_index_isolated: daily value of NFAI above sargassum threshold only (sargassum only)
- no_observation_of_normalized_floating_algae_index: daily cloud mask
- raw_normalized_floating_algae_index: daily value of raw NFAI in bin-size degree cell
-

For lr maps:

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

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

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