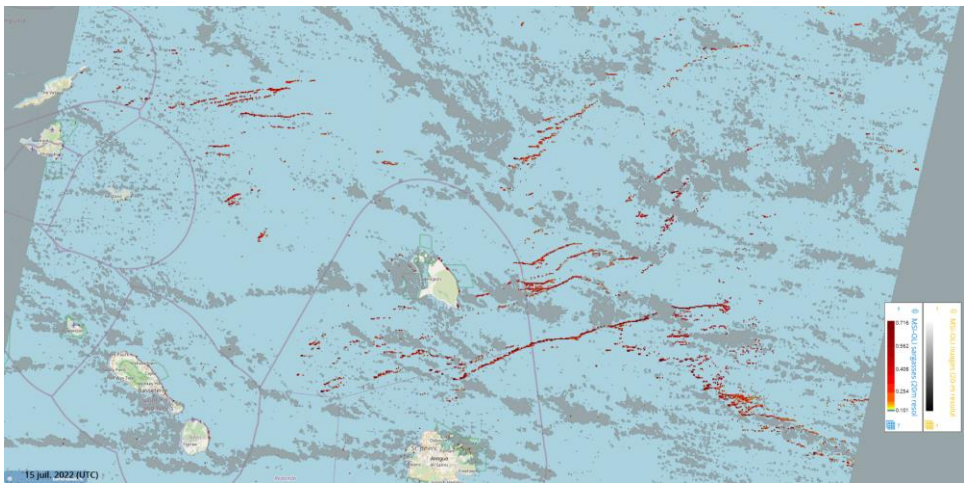
Sargassum Floating Algae Index using Sentinel-2A&B and Landsat-8&9 satellites handbook

Dataset DOI : 10.24400/527896/a01-2024.001



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Issue:	Date:	Reason for change:
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Contents

1. Overview of this document

This document is the user manual for the **Sargassum Floating Algae Index from high resolution satellites: using MSI instruments onboard Sentinel-2A&B and OLI sensor onboard LANDSAT-8** and **LANDSAT-9** product.

1.1. Acknowledgments

When using the **Floating Sargassum Algae Index using HR instruments** product, please cite:

"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/a01-2024.001) 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 detecting 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 composite maps of NFAI are built by CLS from the observation of MSI sensor on-board Sentinel-2A, Sentinel-2B and OLI sensor on-board Landsat-8 and Landsat-9 at 20m resolution, averaged in 300m resolution grids.

It is a composite product from MSI Sentinel-2A & B and OLI LANDSAT-8 & 9 data covering coastal waters in the Caribbean Sea.

Values of positive NFAI Indicate the presence of sargassum. Sargassum-free pixels are set to the value of -0.5.

3. Description of the product

3.1. Product general content and specifications

Covered period	Spatial coverage	Delivery format	Grid resolution	Update
From 2020/12/07 to month - 1	Coastal waters from 11°N to 22°N, 89°W to 57.5°W up to 20 km from the shore	Daily gridded products providing normalized floating algae index (NFAI).	300 m	Every day

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

3.2. Variables handling

The variables available in the product are:

nfai_mean = daily mean of mean value of normalized floating algae index in bin_size degree cell
nfai_max = daily maximum of mean value of normalized floating algae index in bin_size degree cell
nfai_min = daily min of mean 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 when selecting the product '**Sargassum detection product**' in your product page.

The name of the dataset for this product is:
dataset-sargassum-cls-merged-msi-oli-global-lr

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