Floating Sargassum Algae detection using GOES-16 satellite

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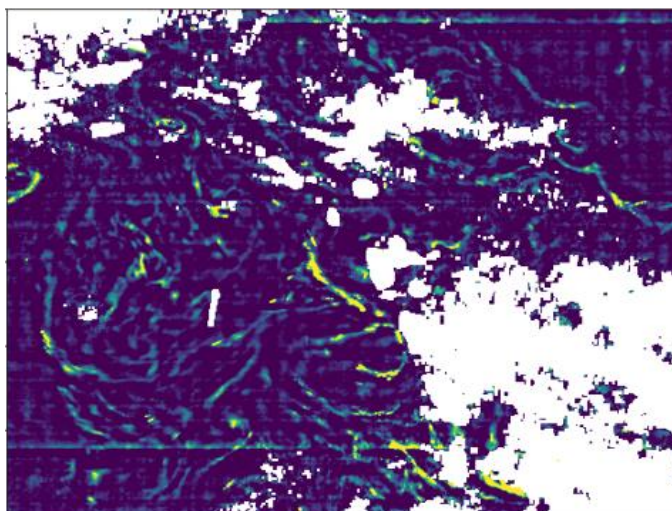
Floating Sargassum Algae detection using GOES-16 satellite

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Chronology Issues:		
Issue:	Date:	Reason for change:
1.0	13/04/2022	1st issue

<div style="background:navy;color:white">**Contents**</div>

1. Overview of this document

This document is the user manual for the **Floating Algae Index using GOES-16 satellite** product, processed by CLS and Hygeos.

1.1. Acknowledgments

When using the **Floating Algae Index using GOES-16** satellite product, please cite

"The Floating sargassum algae detection product has been produced by CLS and Hygeos with support from CNES, distributed by Aviso+ (DOI 10.24400/527896/a01-2022.008)."

1.2. User's feedback

This product is an **experimental** 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

CLS and Hygeos have been contracted by CNES to process and distribute to the scientific community one year of sargassum products derived from the Advanced Baseline Imager (ABI) on board the GOES-16 geostationary satellite. The core processing is made by the new software designed by Hygeos and is operated by CLS **since March 2022**. The chief advantage of this geostationary satellite is the capability to acquire one image every 10 min over a visibility circle centered on the 75W meridian, thus covering the Atlantic ocean from the Gulf of Mexico to the offshore of Western Africa. This capability offers a much greater probability to measure the ocean surface within one day, which is not the case for sun-synchronous satellites. The daily spatial coverage improves by a factor of 2 to 3 thanks to the daily movement of the clouds, compared to a single slot. The multi-temporal observation also provides the ability to monitor the evolution of the sargassum position.

The drawback is the much-reduced radiometric sensitivity of the sensor, together with the coarser pixel resolution (1 km), compared to the ocean colour sensors typically used for sargassum monitoring (OLCI, MODIS or Sentinel-2). The sargassum index used by Hygeos is the FAI anomaly, which is the difference between the pixel FAI (Hu, 2009) and a background FAI value of sargassum-free FAI. This index also includes several steps to enhance the data quality: radiometric correction, masking and denoising. A previous R&T study led by HYGEOS for CNES, in which first developments of this method were carried out, led to the conclusion that a detection of sargassum based on a threshold of 0.001 on the FAI anomaly was possible with pixel coverage of sargassum as low as 1.3%. Values of FAI anomaly below this threshold of 0.001 may be contaminated by the sensor radiometric noise. An example of the observation of sargassum by the MODIS and GOES sensors, is presented on Figure 1.
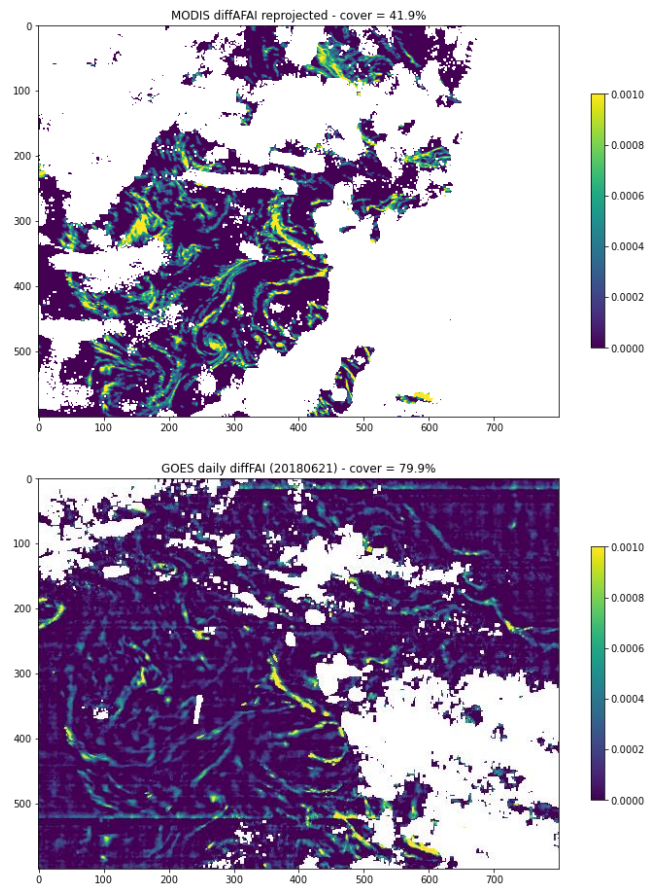

Figure 1: Observation of sargassum FAI anomaly from MODIS (top) and GOES-16 (bottom, daily composite) over western Caribbean. The geostationary observation leads to a significant improvement of the daily spatial coverage, in addition to the possibility of motion estimation
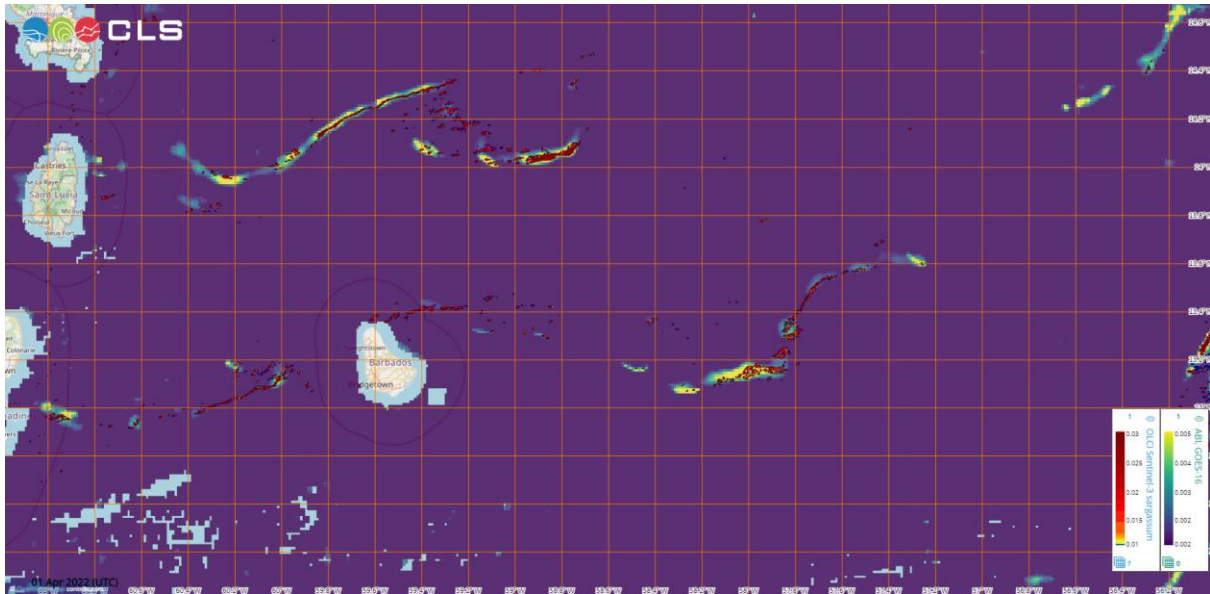
Figure 2: : Detection of sargassum data at 1-km from GOES16 in yellow, validated with OLCI sensor at 300-m resolution in red for April 1st 2022

3. Description of the product

3.1. Product general content and specifications

Covered period	Spatial coverage	Delivery format	Grid resolution	Update
28/03/2022 – ongoing	Tropical Atlantic from -5˚S to 40˚N, 100˚W to 12˚W	**hr** dataset: maps of Sargassum FAI anomaly computed between 10h and 19h50 ITC every 10 minutes. One day contains 60 maps	0.01°	Every day
		dm dataset: daily means of the 60 instantaneous maps of Sargassum FAI anomaly.		

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

3.2. Variables handling

The variables available in the products are:

for **dm** dataset : fai_anomaly_daily_mean = floating algae index anomaly daily mean
for **hr** dataset : fai_anomaly = floating algae index anomaly

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

Hu, C., 2009 : A novel ocean color index to detect floating algae in the global oceans. Rem. Sensing of Environment 113, 2118-2129