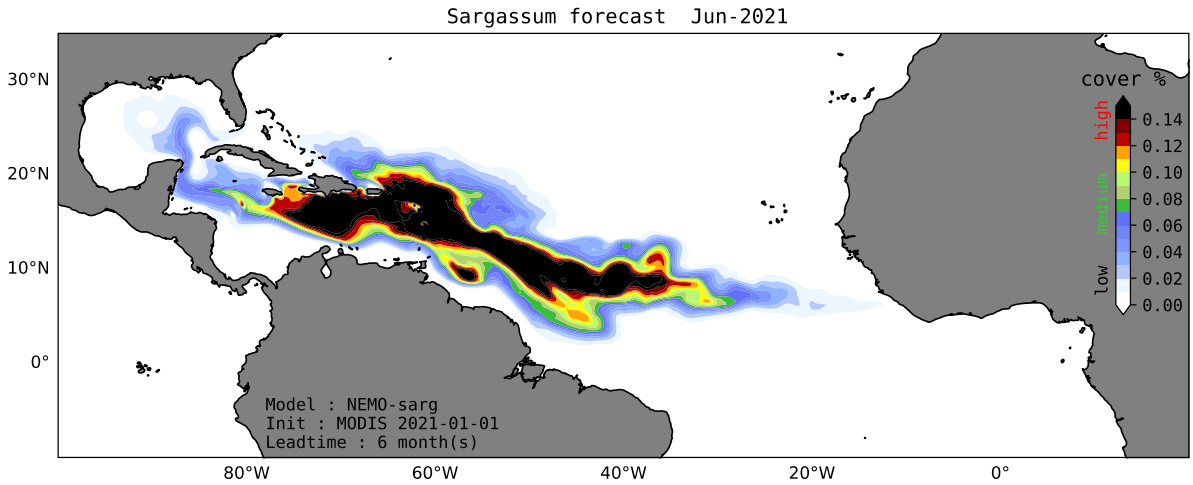
Sargassum Seasonal Forecast

Dataset DOI : 10.24400/527896/a01-2025.002



Reference: SALP-MU-P-EA-23700-CLS

Issue: 1 rev 0

Date: 17/04/2025

Aviso+ Altimetry
11 rue Hermès, 31520 Ramonville St Agne, France – aviso@altimetry.fr

Chronology Issues:		
Issue:	Date:	Reason for change:
1.0	17/04/2025	1st issue

Contents

1. Overview of this document

1.1. Acknowledgments

When using the **Sargassum Seasonal Forecast** product, please cite

"The **Sargassum Seasonal Forecast** product has been produced by IRD with support from CNES, distributed by Aviso+ (DOI 10.24400/527896/a01-2025.002)."

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

The Seasonal Sargassum Forecast relies on the system described by Jouanno et al. (2023), currently operated by at the Laboratoire d'Etude en Géophysique et Océanographie Spatiale (LEGOS) and its first version has been developed within ANR FORESEA and TOSCA SAREDA projects.

This system relies on a mechanistic model of Sargassum populations, the NEMO-Sarg 1.0 model (Jouanno et al. 2021,2023, 2025), which integrates both transport and a physiology model of the macroalgae. The model considers varying internal nutrient quotas (C, N, P). NEMO-Sarg is based on the Nucleus for European Modeling of the Ocean (NEMO) modeling system, allowing efficient parallelization and interfacing with physical–biogeochemical models. Sargassum growth is modeled as a function of internal reserves of nutrients (quotas), dissolved inorganic nutrients in seawater, irradiance, and sea temperature, while its decay depends on senescence and sea-state. Jouanno et al. (2021, 2023, 2025) describes the code and its evolution and illustrates the capacity of the model to represent the seasonal cycle of Sargassum and regime shift around 2011. The code and a set of forcing are freely available on Zenodo (https://zenodo.org/record/4275901).

The ensemble version of the Sargassum model at 1/4° horizontal resolution has been implemented and allows for the production of 7-month forecasts every month, initialized from Sargassum areal coverage near-real time estimates from the Moderate Resolution Imaging Spectroradiometer MODIS (Berline & Descloitres, 2021). The forecast is the result of 25-member ensembles to account for uncertainties in the predictability of the coupled ocean-atmosphere system. For each member, the surface winds and the solar radiation are obtained from a member randomly extracted among the 51 members of the fifth-generation seasonal forecast system SEAS5 of the European Centre for Medium-Range Weather Forecasts (ECMWF, Johnson et al., 2019). The surface currents, temperature and salinity are obtained from ensembles of 25 regional physical ocean forecasts based on NEMOv4.0 (Nucleus for European Modelling of the Ocean, Madec & The NEMO System Team, 2023) forced with meteorological fields from the SEAS5 members. A climatology based on the biogeochemical analysis and forecast system BIO4 from Mercator Ocean International is used for nutrients as there are no skillful biogeochemical seasonal forecasts available to the community. The 7-month limit of the Sargassum forecast is imposed by the length of the ECMWF's operational forecasts.

The forecasting performances for the period 2010-2022 are described in Jouanno et al. (2023)

3. Description of the product

3.1. Product general content and specifications

Covered period	Spatial coverage	Delivery format	Grid resolution	Update
2011/01 - ongoing	**100°W to 15°E and 15°S to 50°N**	Monthly dataset	0.25°	15 of the month

Table 1: Characteristics of the Sargassum Seasonal Forecast dataset.

3.2. Variables handling

The variables available in the products are:

Sarg_FC = monthly mean Sargassum surface cover (in % of pixel surface for pixel area of ¼° x ¼°). An ensemble mean of 25 simulation is provided.

Sarg_FC_member_std = standard deviation between members (in % of pixel surface)

4. How to download a product

4.1. Data access

- CNES AVISO FTP/SFTP access (with AVISO+ credentials):
    - ftp://ftp-access.aviso.altimetry.fr:21
    - sftp://ftp-access.aviso.altimetry.fr:2122
        - /value-added/sargassum/dataset-sargassum-ird-nemo-sarg-global
- CNES AVISO THREDDS Data Server access
  https://tds%40odatis-ocean.fr:odatis@tds-odatis.aviso.altimetry.fr/thredds/catalog/sargassum/dataset-sargassum-ird-nemo-sarg-global.html

5. Bibliography

Berline, L., & Descloitres, J. (2021). Cartes de répartition des couvertures de Sargasses dérivées de MODIS sur l'Atlantique [Dataset]. AERIS/ ICARE - CNES/TOSCA. https://doi.org/10.12770/8fe1cdcb-f4ea-4c81-8543-50f0b39b4eca

Johnson, S. J., Stockdale, T. N., Ferranti, L., Balmaseda, M. A., Molteni, F., Magnusson, L., et al. (2019). SEAS5: The new ECMWF seasonal forecast system. Geoscientific Model Development, 12(3), 1087–1117. https://doi.org/10.5194/gmd-12-1087-2019

Jouanno, J., & Benshila, R. (2020). Sargassum distribution model based on the NEMO ocean modelling platform (0.0) [Software]. Zenodo. https://doi.org/10.5281/zenodo.4275901

Jouanno, J., Benshila, R., Berline, L., Soulié, A., Radenac, M. H., Morvan, G., et al. (2021a). A NEMO-based model of Sargassum distribution in the tropical Atlantic: Description of the model and sensitivity analysis (NEMO-Sarg1.0). Geoscientific Model Development, 14(6), 4069–4086. https://doi.org/10.5194/gmd-14-4069-2021

Jouanno, J., Morvan, G., Berline, L., Benshila, R., Aumont, O., Sheinbaum, J., & Ménard, F. (2023). Skillful seasonal forecast of Sargassum proliferation in the Tropical Atlantic. Geophysical Research Letters, 50, e2023GL105545. https://doi.org/10.1029/2023GL105545

Jouanno, J., S. Berthet, Muller-Karger, Aumont and Sheinbaum (2025). An extreme North Atlantic Oscillation event drove the pelagic Sargassum tipping point. Nature Communications Earth and Environment.

Madec, G., & The NEMO System Team. (2023). NEMO ocean engine reference manual [Software]. Zenodo. https://doi.org/10.5281/zenodo.8167700