



CESAR

Coastal Environment under Sargassum crisis

J.-R. Gros-Désormeaux, J.-P. Maréchal & V. David
UMR8053, LC2S CNRS-UA

International Joint call on Sargassum, 19/10/24, CWTC Guadeloupe

Plan

- ▶ The consortium
- ▶ Aims
- ▶ Management of the project
- ▶ Results expected
- ▶ Dissemination strategy

The Consortium

- ▶ CNRS, UMR8053 LC2S
- ▶ UA, UMR8053 LC2S

- ▶ Météo France-Antilles,
- ▶ UMR3589 CNRM

- ▶ IRD, UMR151 LPED
- ▶ IRD, UMR220 GRED

- ▶ UPM (Universidade Presbiteriana Mackenzie, São Paulo)

- ▶ UFPA, Clinica de Direitos Humanos da Amazônia

- ▶ CLS, Collecte, Localisation, Satellite



Aims

- ▶ To provide knowledge and propose orientation for tools and methods development to manage Sargassum influxes in the Caribbean, particularly in the French West Indies.
- ▶ To provide a better knowledge on Sargassum as well as inputs for improvement of our forecast capacities to predict Sargassum stranding events at the scale of the islands.
- ▶ To contribute to the policy decision chain processes and develop guidelines for strategic Sargassum action plans through policy briefs.

Management of the project

- ▶ WPI: Sargassum influx monitoring and forecast in the Caribbean: from satellite-based detection to environmental risk assessment
 - ▶ Task 1.1: Sargassum satellite monitoring and forecast orientations
 - ▶ Task 1.2 : Indicators and services development to support decision-making
- ▶ WP2: Towards a sustainable governance of Sargassum influx
 - ▶ Task 2.1: Current trends in facing Sargassum influxes
 - ▶ Task 2.2: Innovative tools for sustainable governance of Sargassum influx



Context for WP1

- ▶ What do we know about Sargassum distribution in the equatorial Atlantic?

Remote Sensing Letters, 2013
 Vol. 4, No. 8, 764–773, <http://dx.doi.org/10.1080/2150704X.2013.796433>



Satellite images suggest a new *Sargassum* source region in 2011

JIM GOWER^{*†}, ERIKA YOUNG[‡] and STEPHANIE KING[§]
^{*}Institute of Ocean Sciences, Fisheries and Ocean Canada, Sidney, BC, Canada
[†]Department of Geography, University of Victoria, Victoria, BC, Canada
[§]Sea This Consulting, Nanaimo, BC, Canada

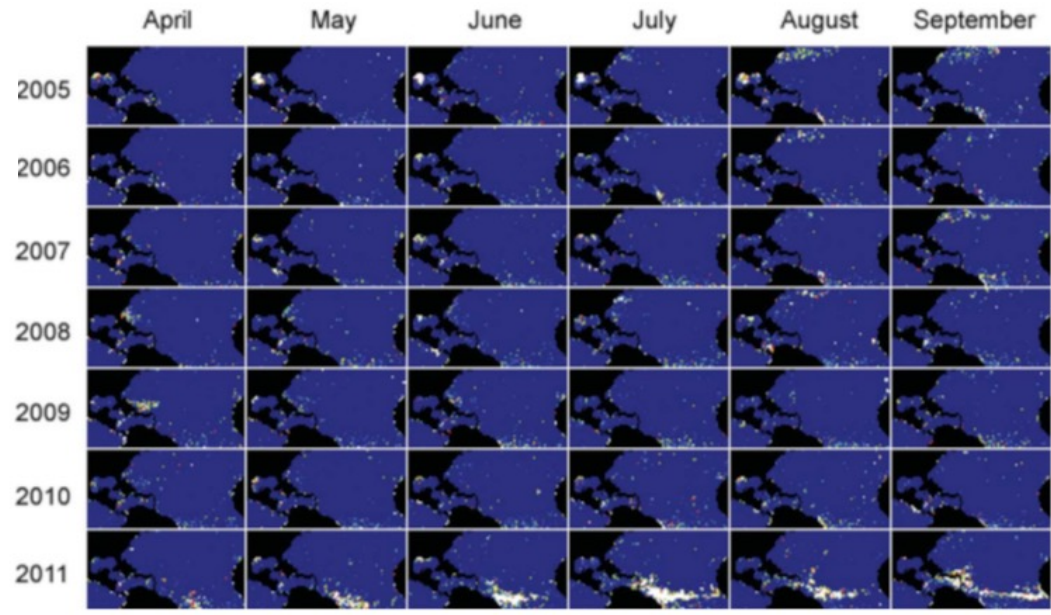
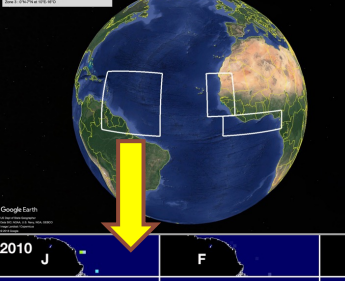
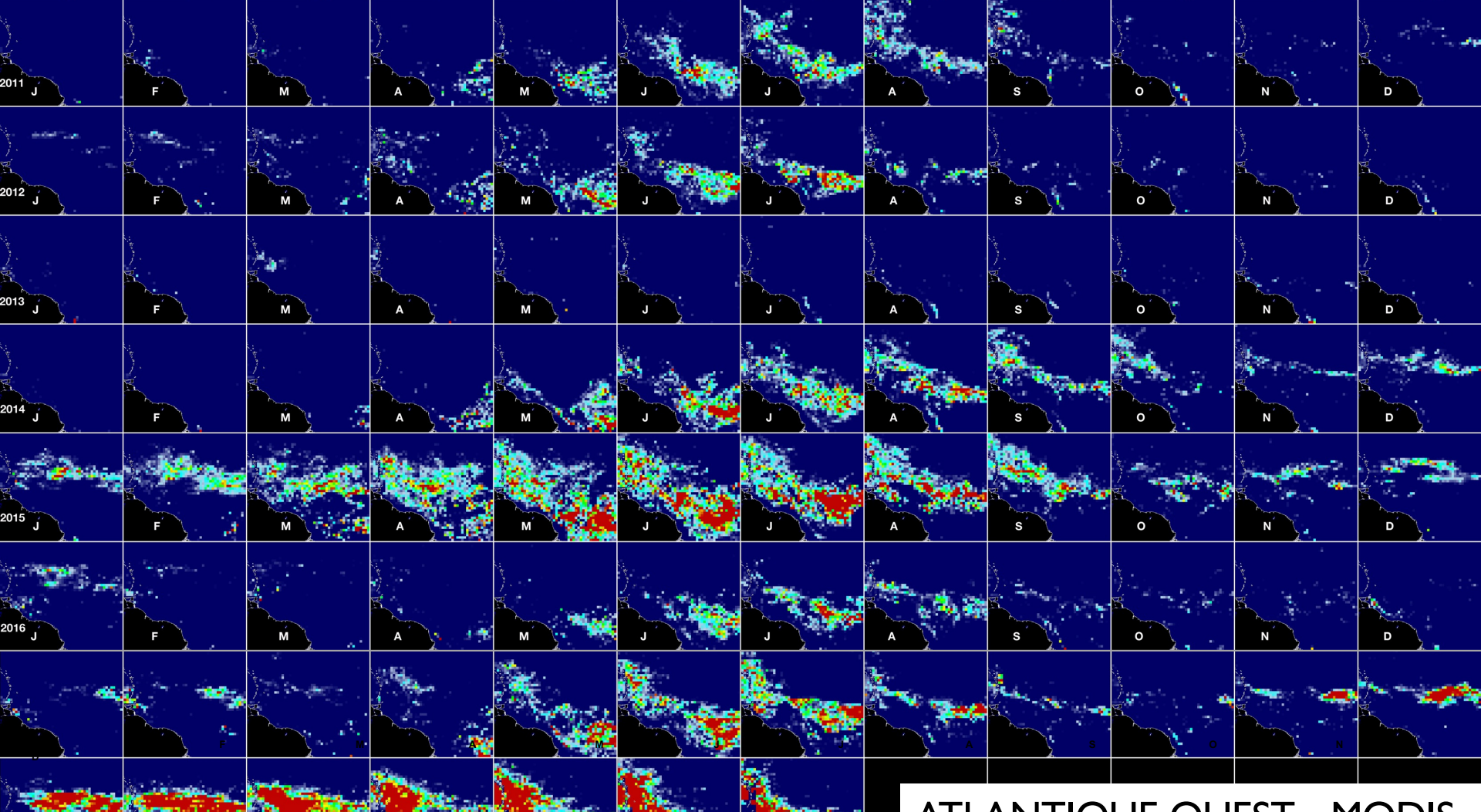


Figure 4. Monthly time series of MERIS MCI for 2005 (top row of small images) to 2011 (bottom row) and April (left column) to August (right column) of *Sargassum* detection counts in 1-degree squares for the area 0°–45° N and 100°–10° W covering the Gulf of Mexico, Caribbean and north and tropical Atlantic across to the west coast of Africa. Land is masked to black. Colour sequence as for Figure 2. The large area of high signal off northern Brazil shows white at the bottom of the lowest row and extends from the Caribbean to Africa in July and September 2011.



Mapping and quantifying *Sargassum* distribution and coverage in the Central West Atlantic using MODIS observations

Mengqiu Wang, Chuanmin Hu*
College of Marine Science, University of South Florida, 140 Seventh Avenue South, St. Petersburg, FL 33701, USA



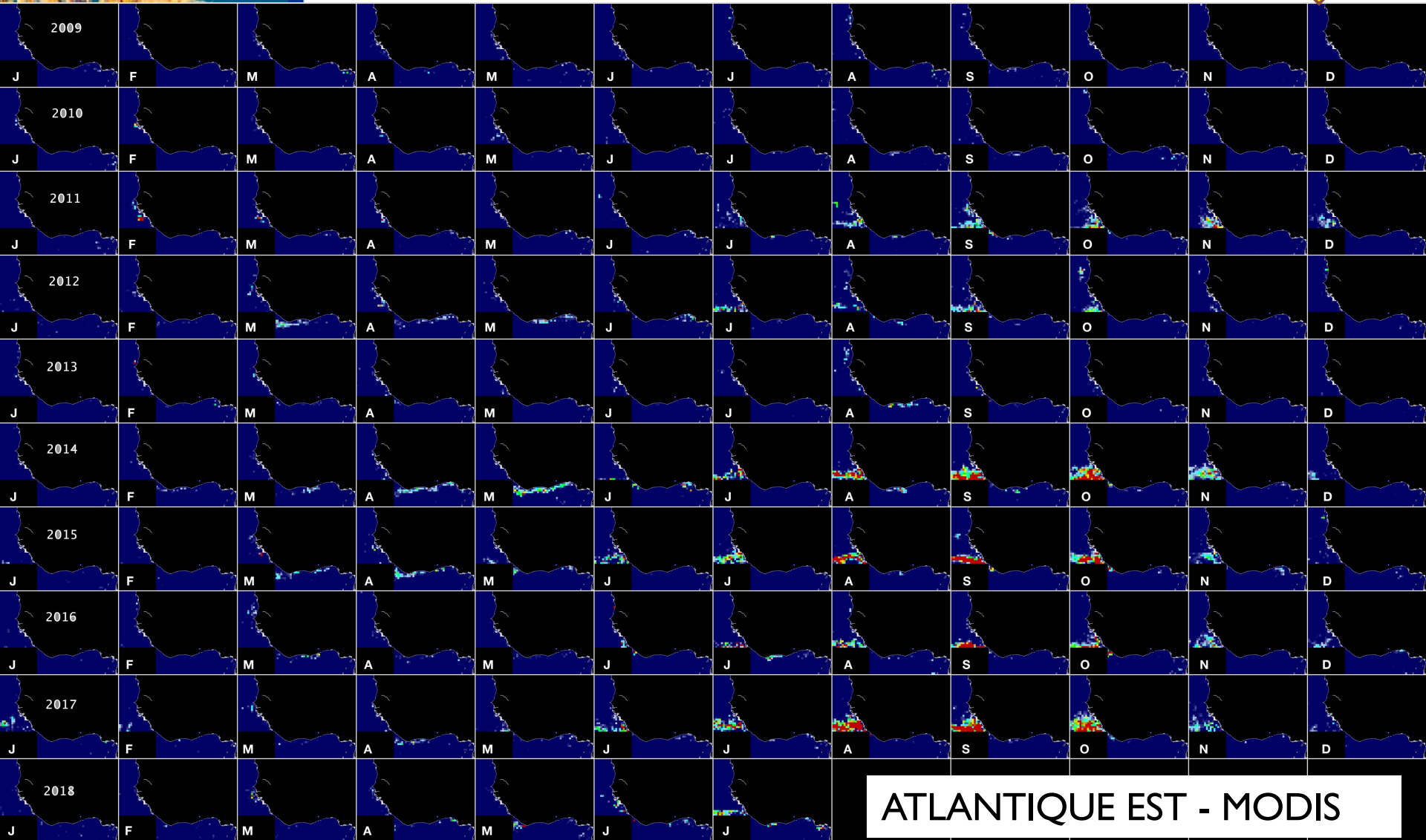
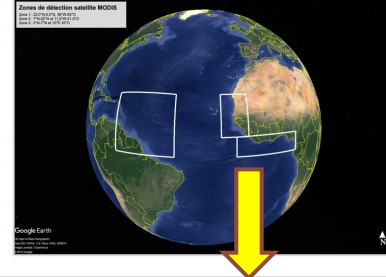
ATLANTIQUE OUEST - MODIS



Mapping and quantifying *Sargassum* distribution and coverage in the Central West Atlantic using MODIS observations

Mengqiu Wang, Chuanmin Hu *

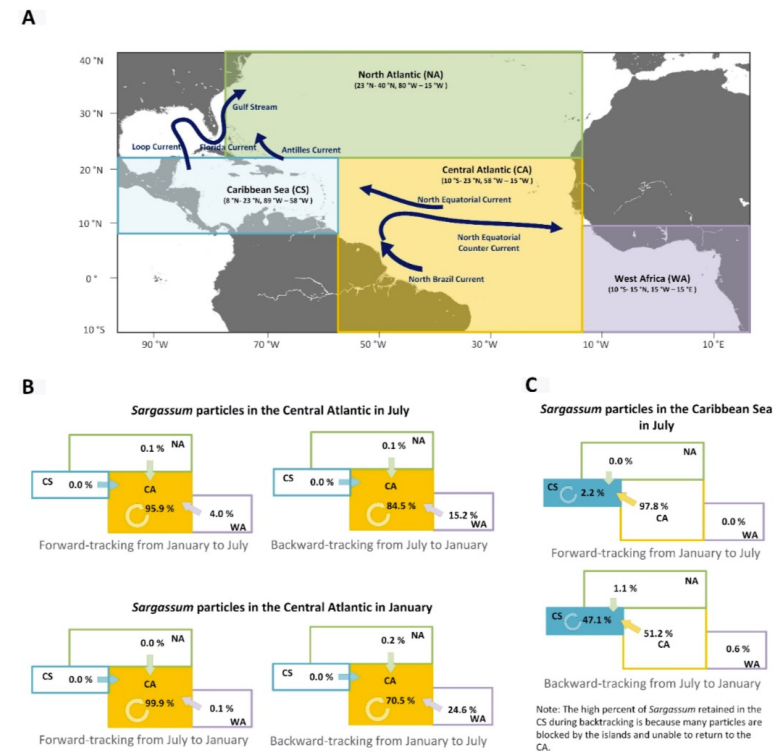
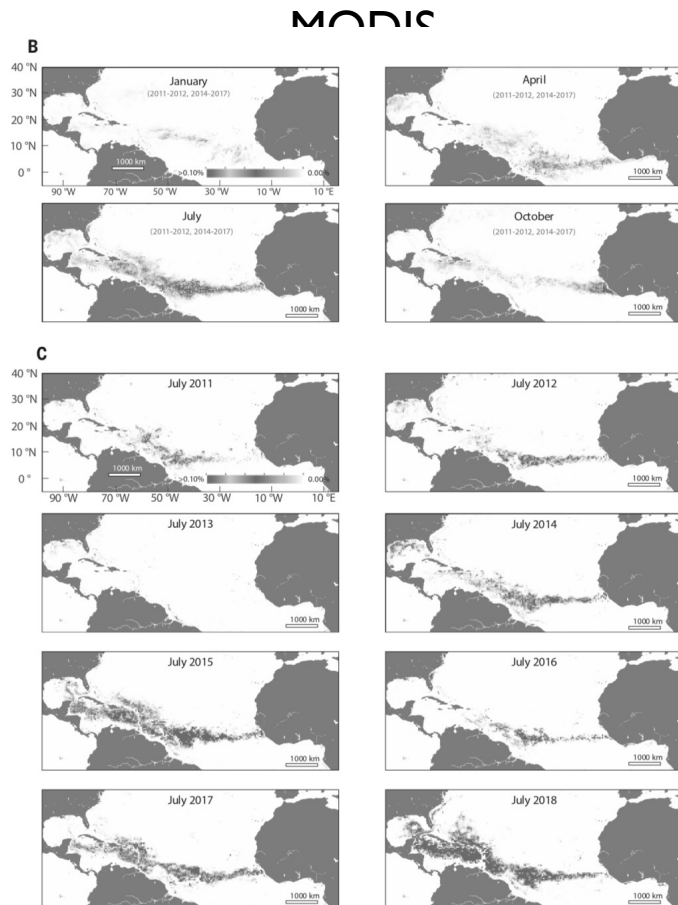
College of Marine Science, University of South Florida, 140 Seventh Avenue South, St. Petersburg, FL 33701, USA



The great Atlantic *Sargassum* belt

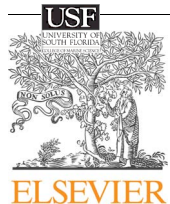
Mengqiu Wang¹, Chuanmin Hu^{1*}, Brian B. Barnes¹, Gary Mitchum¹,
Brian Lapointe², Joseph P. Montoya³

Connectivity between Equatorial Atlantic & Caribbean Basin



Sargassum occurrence probability model according to their previous spatio-temporal location

Fig. 1. Sargassum distributions in the Gulf of Mexico and the Atlantic Ocean. (A) Monthly mean Sargassum areal coverage in the Caribbean Sea and the central Atlantic Ocean, with a maximum of ~ 6000 km² or >20 million tons in June 2018. The year mark starts from January. (B) Monthly mean Sargassum density (% cover) in January, April, July, and October of 2011–2017 after excluding the nonbloom year of 2013. (C) Monthly mean Sargassum density for the month of July from 2011 to 2018. The GASB is observed in all years except 2013.



Contents lists available at ScienceDirect

Remote Sensing Applications: Society and Environment

journal homepage: www.elsevier.com/locate/rsase

2015
2016

A simple, fast, and reliable method to predict Sargassum washing ashore in the Lesser Antilles

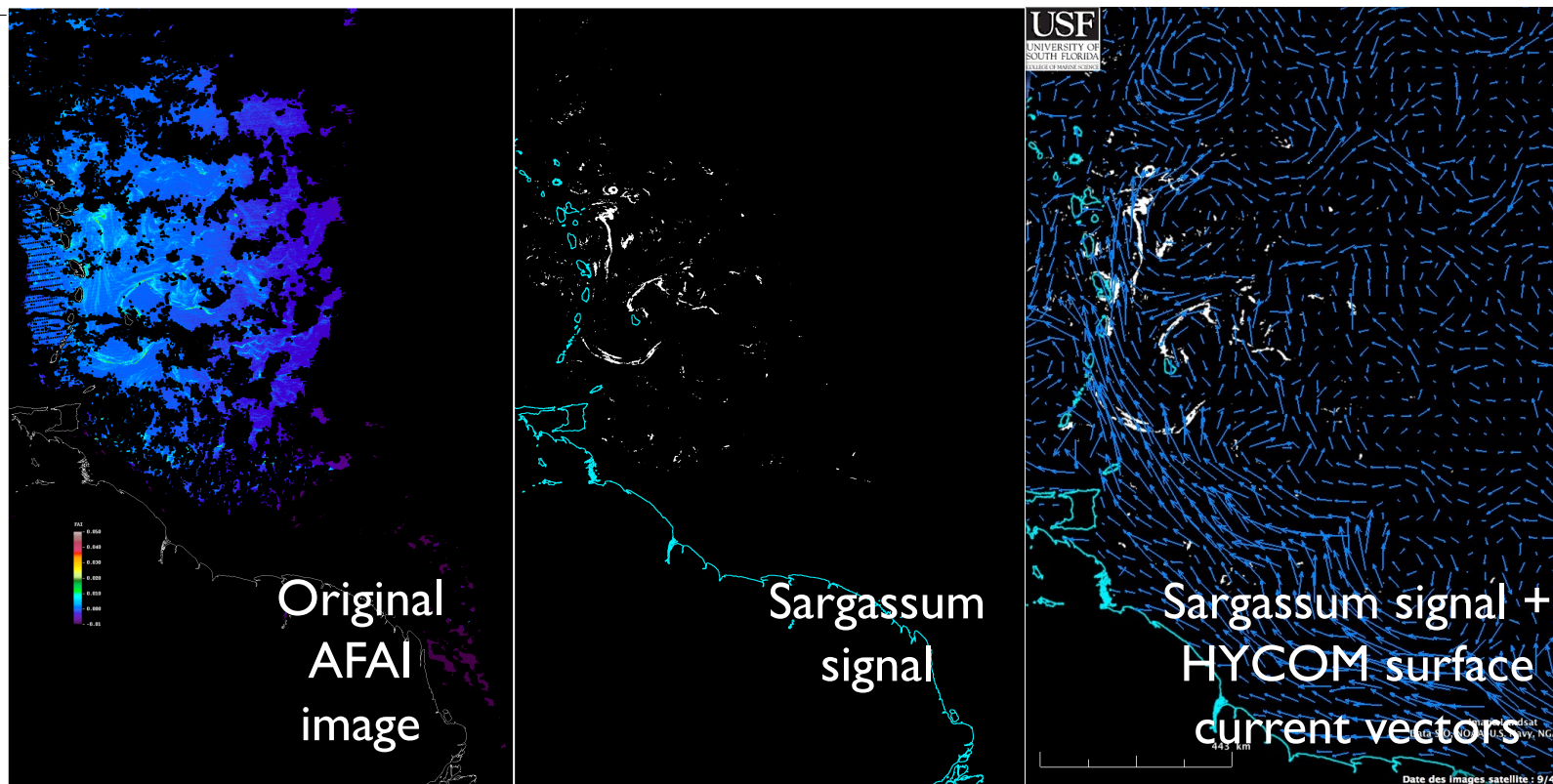


Jean-Philippe Maréchal^{a,*}, Claire Hellio^b, Chuanmin Hu^c

^a Nova Blue Environment, 14 rue Chery Rosette, Fond Lahaye, 97233, Schoelcher, Martinique, French West Indies, France

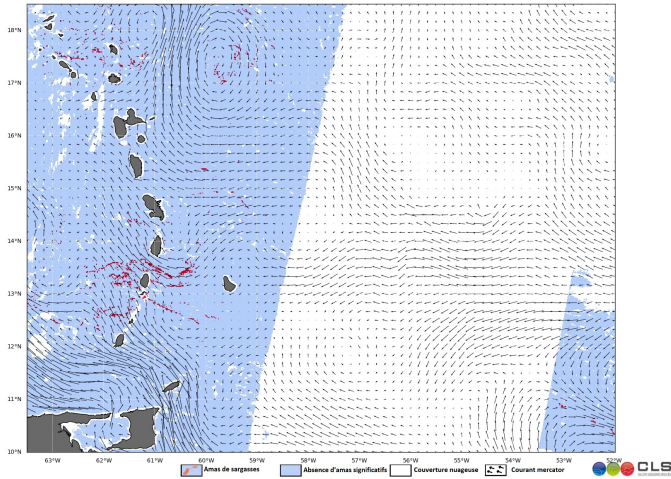
^b Biodimar/LEMAR UMR 6539, Université de Bretagne Occidentale (UBO), 6 Avenue Victor Le Gorgeu, CS93837, 29238 Brest cedex 3, France

^c College of Marine Science, University of South Florida, 140 Seventh Avenue South, St. Petersburg, FL 33701, USA

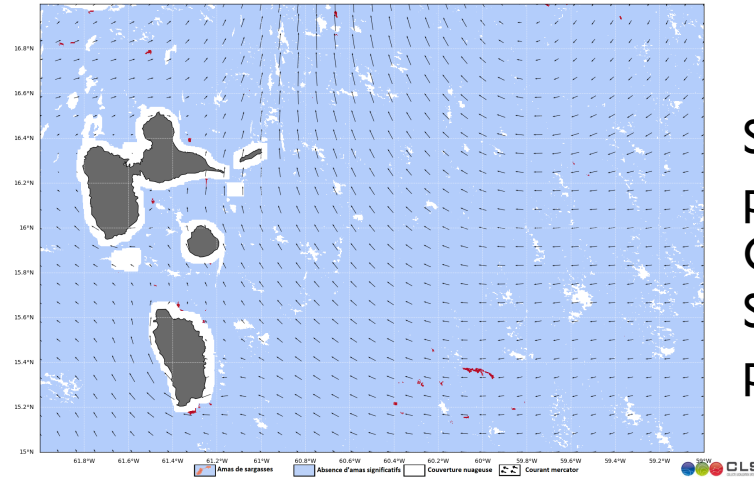


Météo France Bulletins

OLCI-53 NFAI CLS (2019-09-01 12:00:00 UTC)

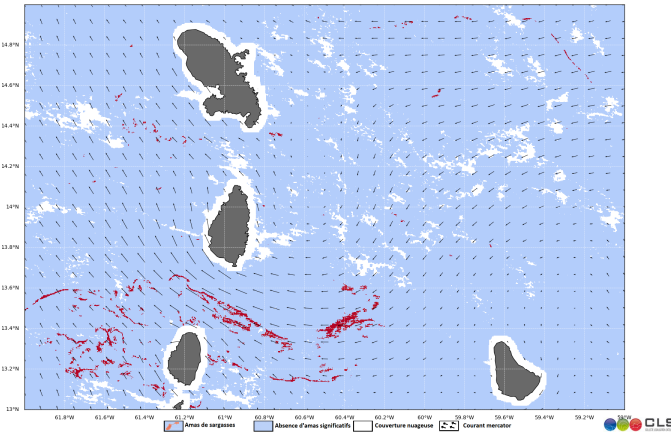


OLCI-53 NFAI CLS (2019-09-01 12:00:00 UTC)

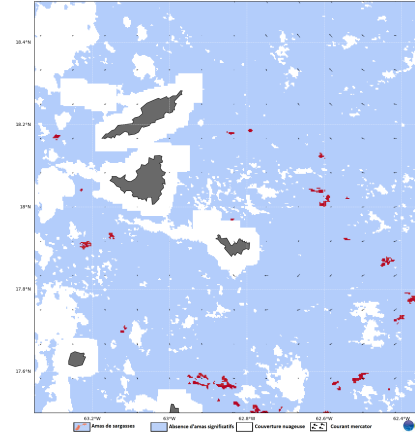


Sargassum web platform – CLS/NBE Sargassum monitoring project - ESA

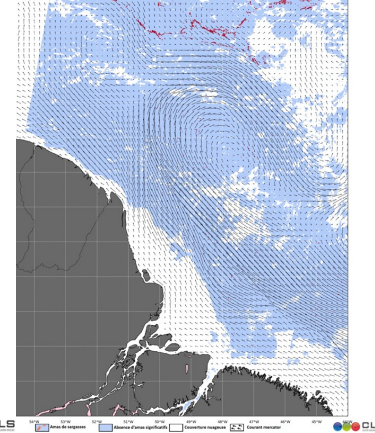
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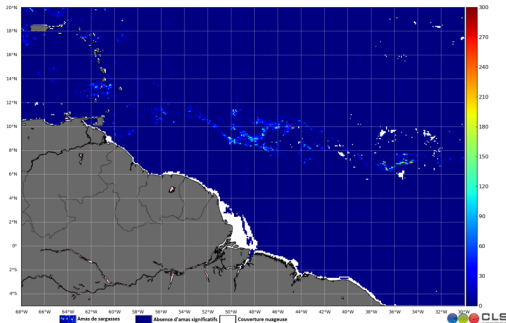
OLCI-53 NFAI CLS (2019-09-01 12:00:00 UTC)



OLCI-53 NFAI CLS (2019-09-01 12:00:00 UTC)



Composite NFAI CLS cumulé 7 jours (2019-09-01 00:00:00 UTC)



Sources multi sensors : MODIS, Sentinel 3, Sentinel 2

MERCATOR currents



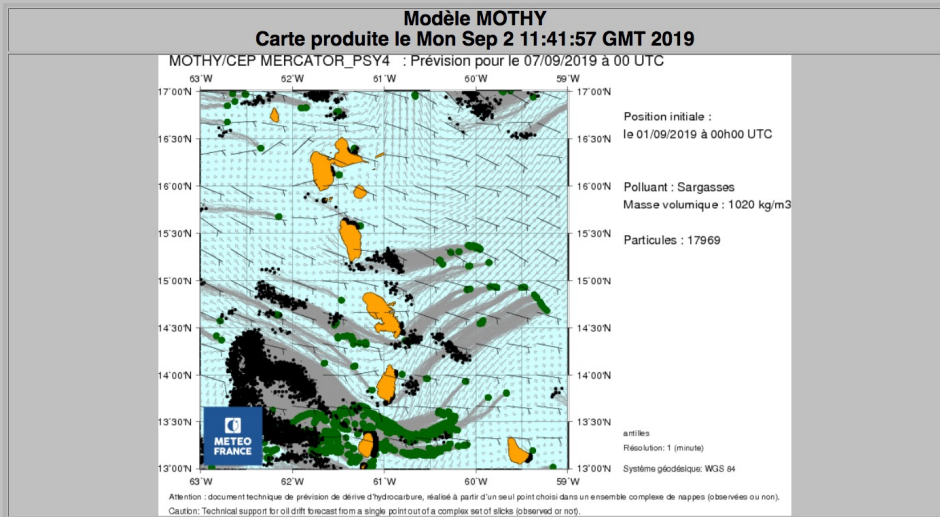
COLLECTE LOCALISATION SATELLITES

Modèle MOTHY

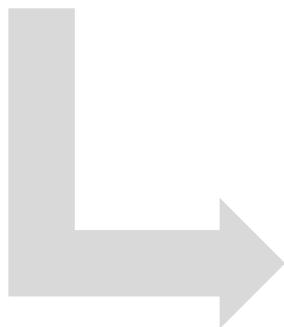
Accueil


- Trajectoires**
- 02/09/2019 à 12 UTC
 - 03/09/2019 à 00 UTC
 - 03/09/2019 à 12 UTC
 - 04/09/2019 à 00 UTC
 - 04/09/2019 à 12 UTC
 - 05/09/2019 à 00 UTC
 - 05/09/2019 à 12 UTC
 - 06/09/2019 à 00 UTC
 - 06/09/2019 à 12 UTC
 - 07/09/2019 à 00 UTC

Animation



Météo France



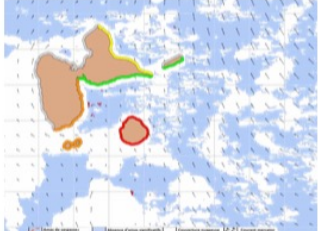


Bulletin de surveillance et de prévision d'échouage des « Sargasses » pélagiques pour la Guadeloupe

Bulletin élaboré le jeudi 5 septembre 2019

Prévission d'échouages pour les 4 prochains jours :

Source Satellite : MODIS NFAI CLS 04/09/2019



■ Risque d'échouages Faible
 ■ Risque d'échouages Fort
 ■ Risque non expertisé

■ Risque d'échouages Moyen
 ■ Risque d'échouages Très Fort

Indice de Visibilité : 52 %

Indice de confiance : 3 / 5

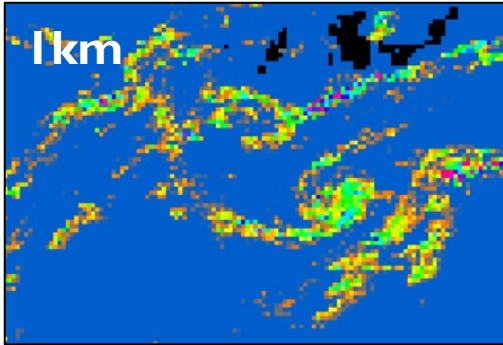
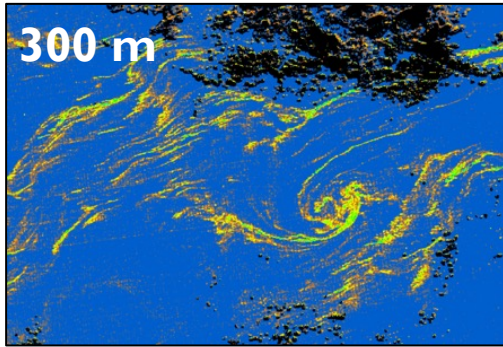
Zone	Estimation du Risque
Nord Grande Terre	Moyen
Sud Grande Terre	Faible
Désirade	Faible
Basse Terre (côte sud-est)	Fort
Les Saintes	Fort
Marie Galante	Très Fort

*Risque calculé à partir du modèle de dérive "Mothy" Météo-France.
En cas de couverture nuageuse (cf. Indice de visibilité), la détection des nappes de sargasses et la dérive associée sont altérés.*

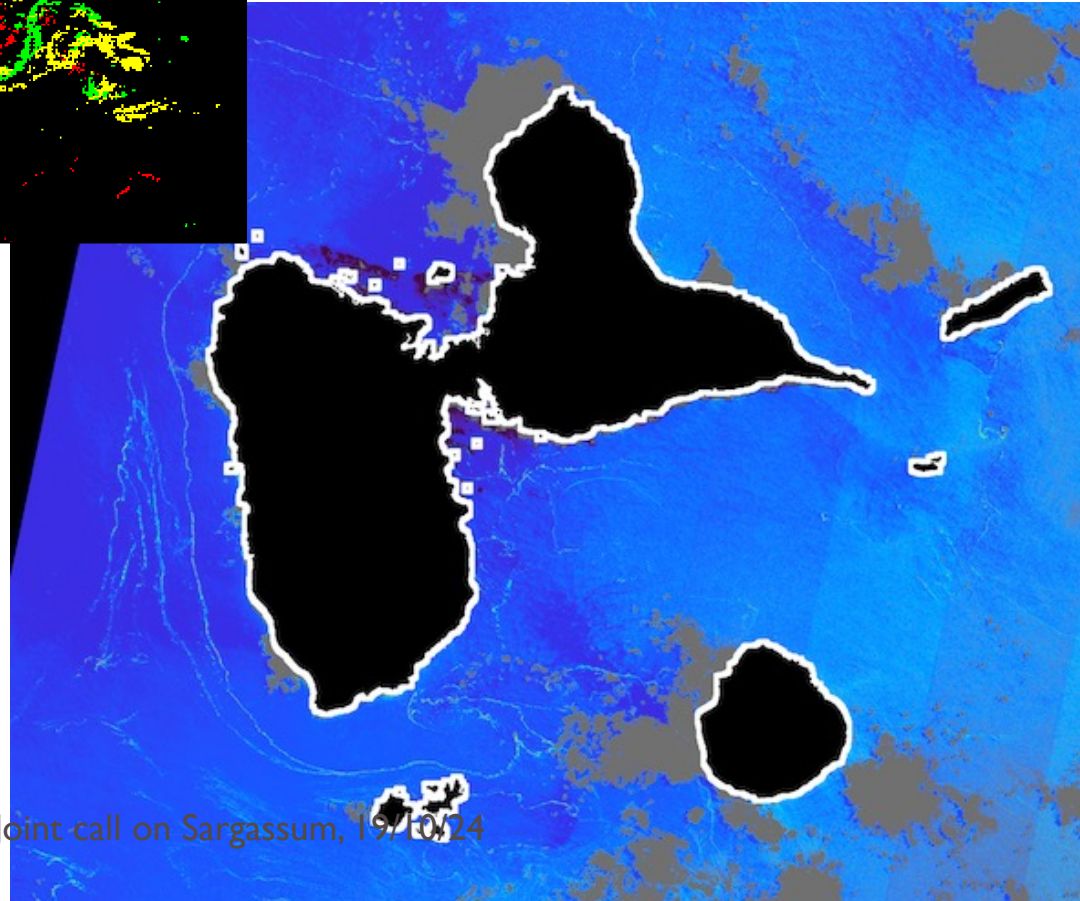
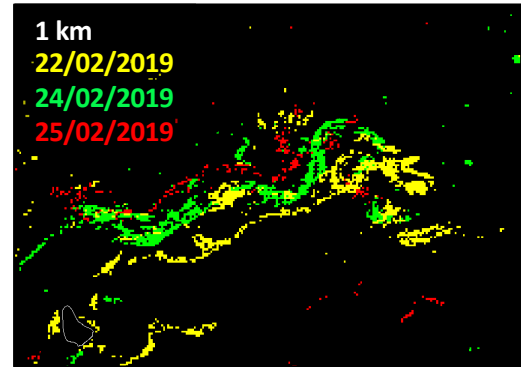
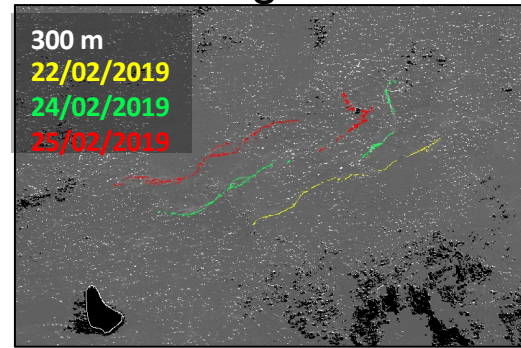
Météo France-Division Prévission Antilles-Guyane. Aéroport BP 379 - 97288 Le Lamentin Cedex 02
Téléphone : 0596 57 23 23 - Fax : 0596 51 29 40
Prévissions : 0892 68 08 08 (0,32 €/min + prix appel) - web : <http://www.meteofrance.gp>



Resolution



Drift tracking



WP I: Sargassum influx monitoring and forecast in the Caribbean: from satellite-based detection to environmental risk assessment

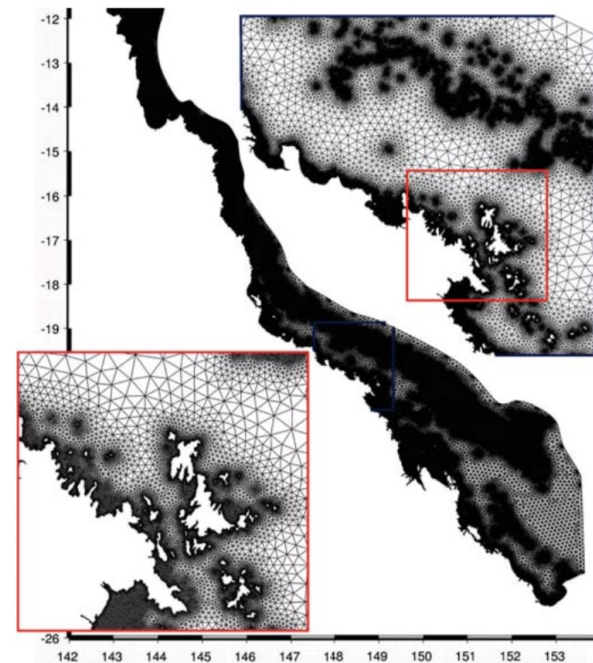
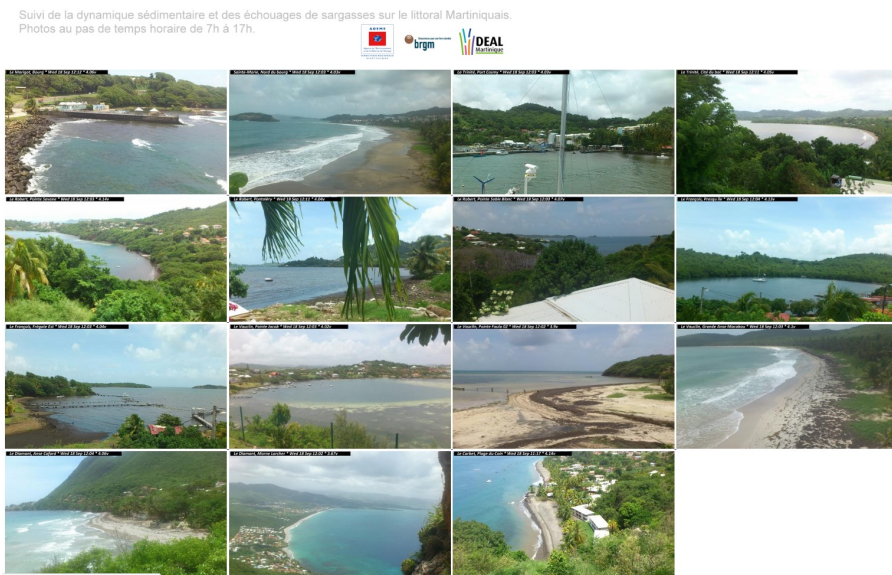
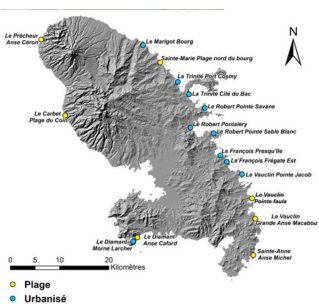
How we can do something new and unique AND make an impact to Sargassum forecasting?

→ Sargassum evolution is multi scale and requires seamless multi scale modelling for accurate forecasting.

→ Develop the first Sargassum forecasting model capable of following Sargassum entire life-cycle, from basin to bay (not possible with traditional methods).

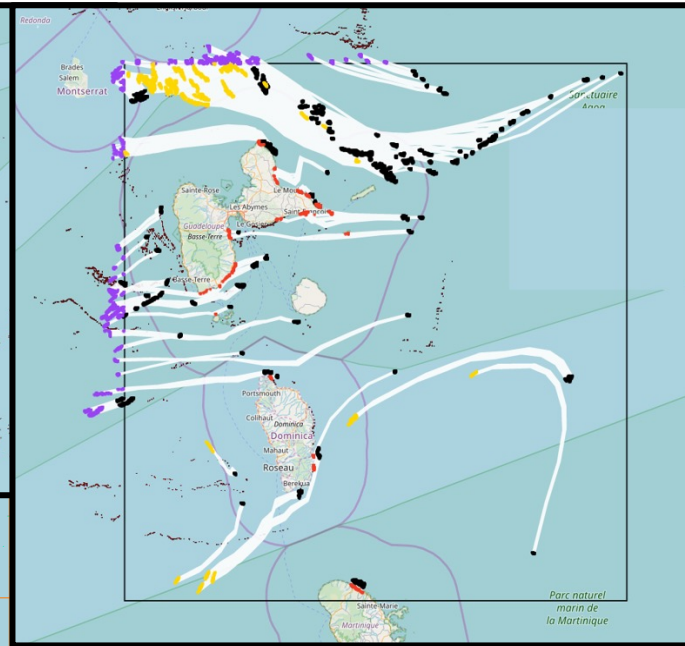
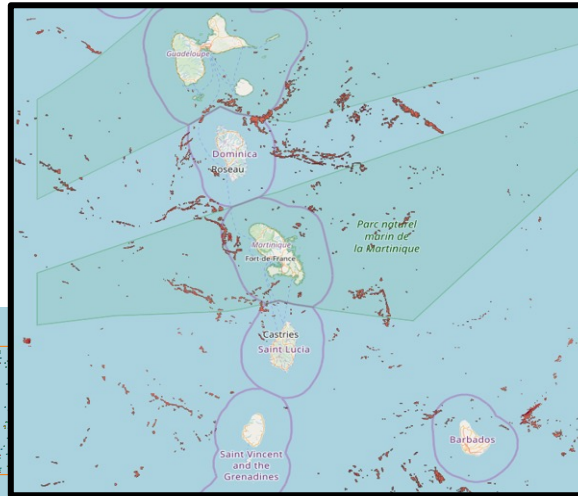
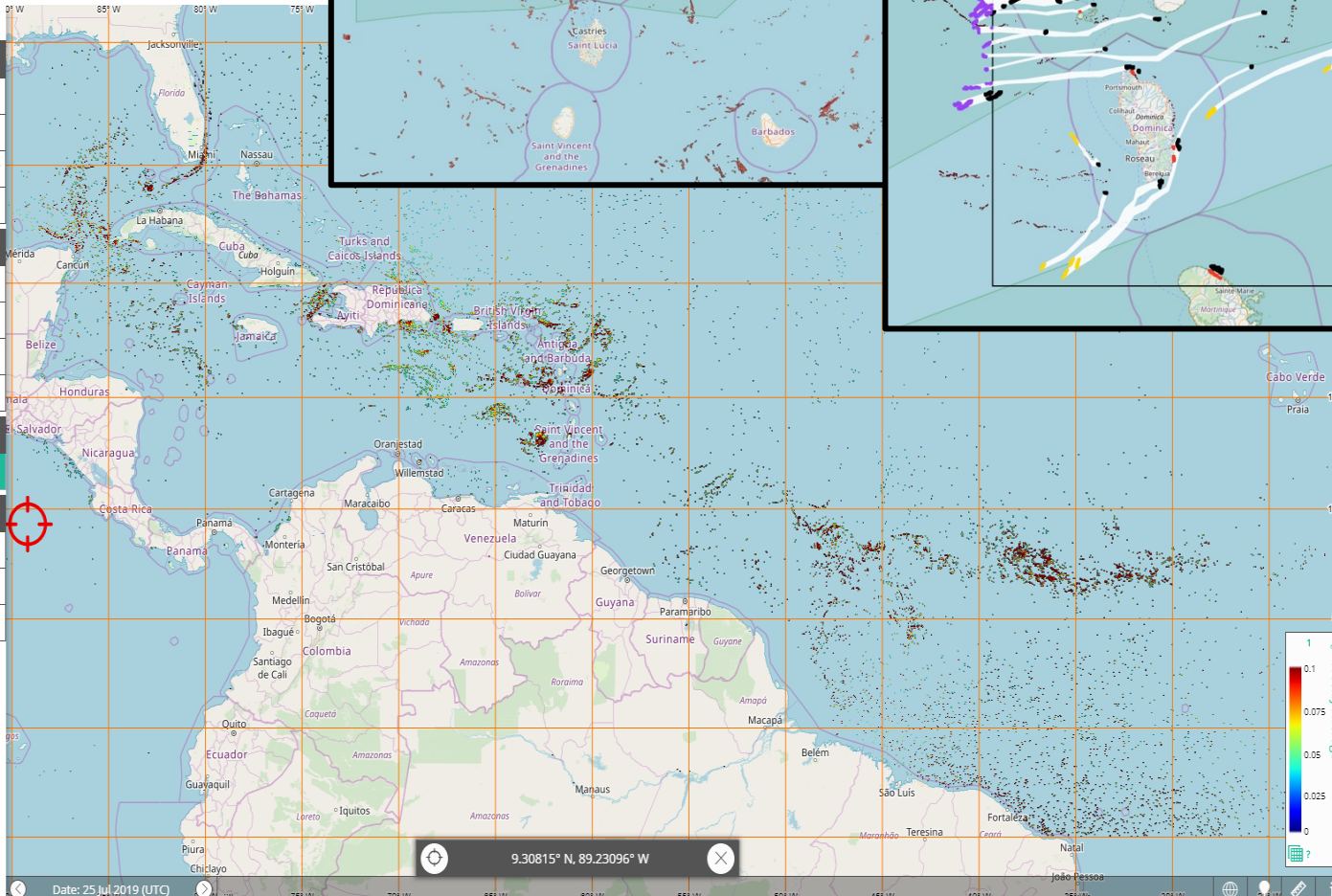


Fine-scale observations (using Sentinel data and in-situ camera/drone measurements) combined with a multi-scale modelling approach is exactly what is needed.



Sargassum NFAI satellite products

- Sargassum mats only
- 1- MODIS Aqua, sargassum mats only
300m resolution, daily
- 2- OLCI Sentinel-3, sargassum mats only
300m resolution, daily
- 3- Martinique, MSI Sentinel-2, sargassum m...
20m resolution, every 2-3 days
- 4- Guadeloupe, MSI Sentinel-2, sargassum ...
20m resolution, every 2-3 days
- Cloud cover
- 1- MODIS Aqua, cloud cover
300m resolution, daily
- 2- OLCI Sentinel-3, cloud cover
300m resolution, daily
- 3- Martinique, MSI Sentinel-2, cloud cover
20m resolution, every 2-3 days
- 4- Guadeloupe, MSI Sentinel-2, cloud cover
20m resolution, every 2-3 days
- Weekly Composite
- Weekly Average
1 km, 7-days average of max NFAI
- Satellite Expert data
- MODIS Aqua, raw NFAI
300m resolution, daily
- OLCI Sentinel-3A, raw NFAI
300m resolution, daily
- OLCI Sentinel-3B, raw NFAI
300m resolution, daily





WP2: Towards a sustainable governance of Sargassum influx

Context for WP2

- *The Sargassum crisis has been constructed as a public problem only recently*

Decision making has been critical since the early times of Sargassum beaching events as local authorities and most stakeholders were not prepared for such environmental issues

=> no Sargassum specific Treaty or legislation

=> Very little information is available on internal legal issues raised by

Sargassum events.

- **Various stakeholders**

- international and regional institutions, national (federal) and local (state) governments, sovereign Island States and non-independent territories, researchers, Met services, NGOs, fishermen communities, economic sectors etc...

Objectives

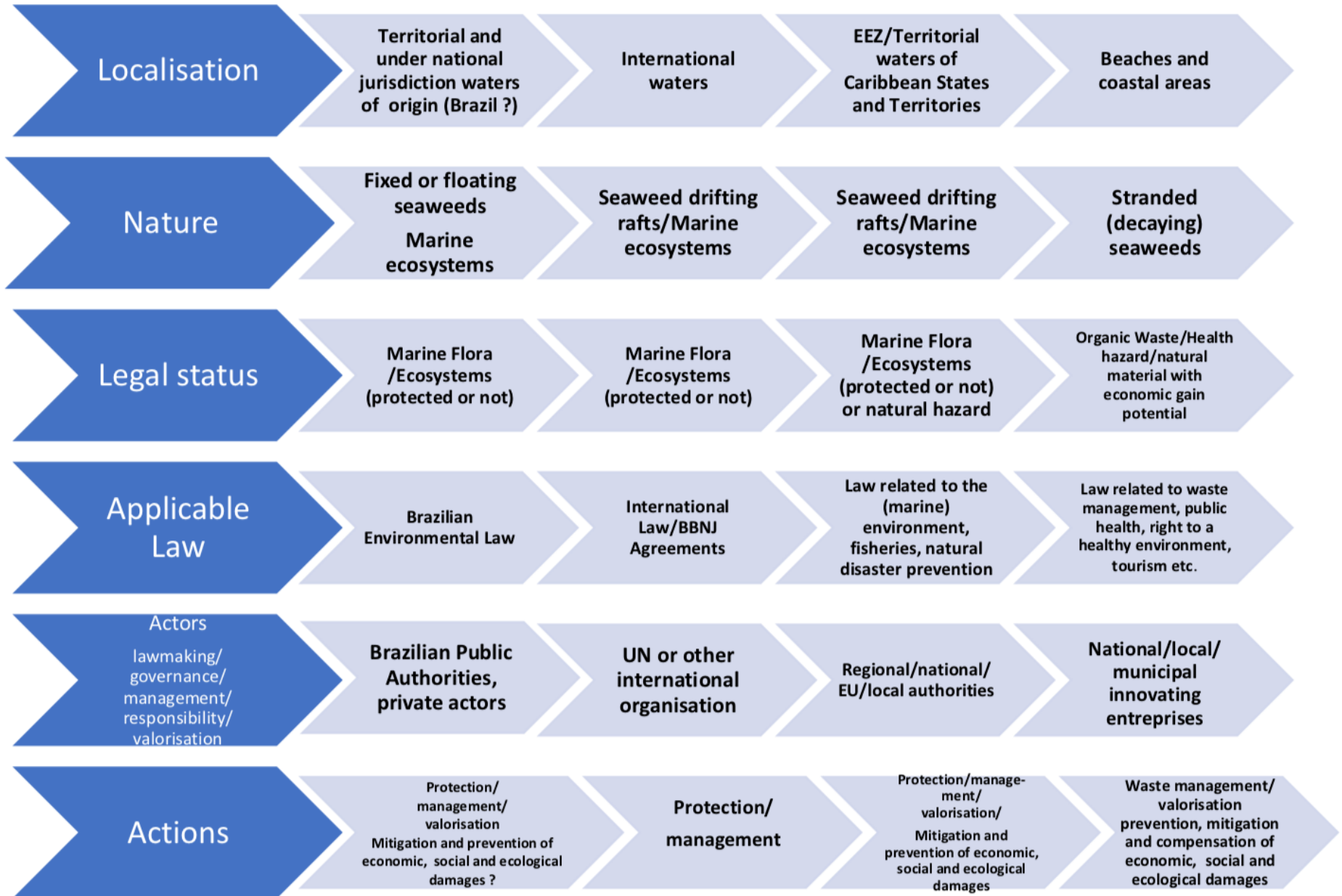
Propose legal evolution and governance mechanisms to improve sargassum management.

Tasks

- Current trends in facing Sargassum influxes
- Identifying obstacles and levers to Sargassum governance: a stakeholder-centred perspective
- Innovative tools for sustainable governance of Sargassum influx

CESAR PROJECT

The multiple (legal) lives of the Sargassum as they drift in the Ocean
(Initial postulate: Sargassum originating in Brazilian Waters)



Results expected

- ▶ WPI: Sargassum influx monitoring and forecast in the Caribbean: from satellite-based detection to environmental risk assessment
 - ▶ D 1.1
 - ▶ Review report on satellite observation and drift models (Month 12).
 - ▶ Retrospective analyses of transportation patterns of Sargassum and coastal processes (Month 24).
 - ▶ Algorithm and semi-automation detection for Sentinel series (Month 12).
 - ▶ Report on the action implemented for improving the quality of MOTHY drifting models for Sargassum (Month 18).
 - ▶ D 1.2
 - ▶ Report on the improvement of final products for decision makers (Month 18)
 - ▶ Final products training and workshop with decision makers and local authorities (Month 24)

Results expected

- ▶ WP2: Towards a sustainable governance of Sargassum influx
 - ▶ D 2.1
 - ▶ Scientific report on law and public policies for Sargassum management in Amazonia and the Caribbean (month 24)
 - ▶ Interactive mapping of actors (Month 12)
 - ▶ Scientific report on international tools for Sargassum management (Month 36)
 - ▶ D 2.2
 - ▶ Policy briefs on regional and international cooperation (Month 36)
 - ▶ Executive summary and policy brief on Improvement of legal instruments and public action (Month 36)

Dissemination strategy

- ▶ The dissemination strategy will be drawn to meet the following aims:
 - ▶ Ensure concerns and input of the stakeholders are taken into account by the project to guarantee the relevance and transferability of the project results.
 - ▶ Contribute to raising awareness on Sargassum stranding issues.





Thank you for your attention