



Fonds européen de développement régional

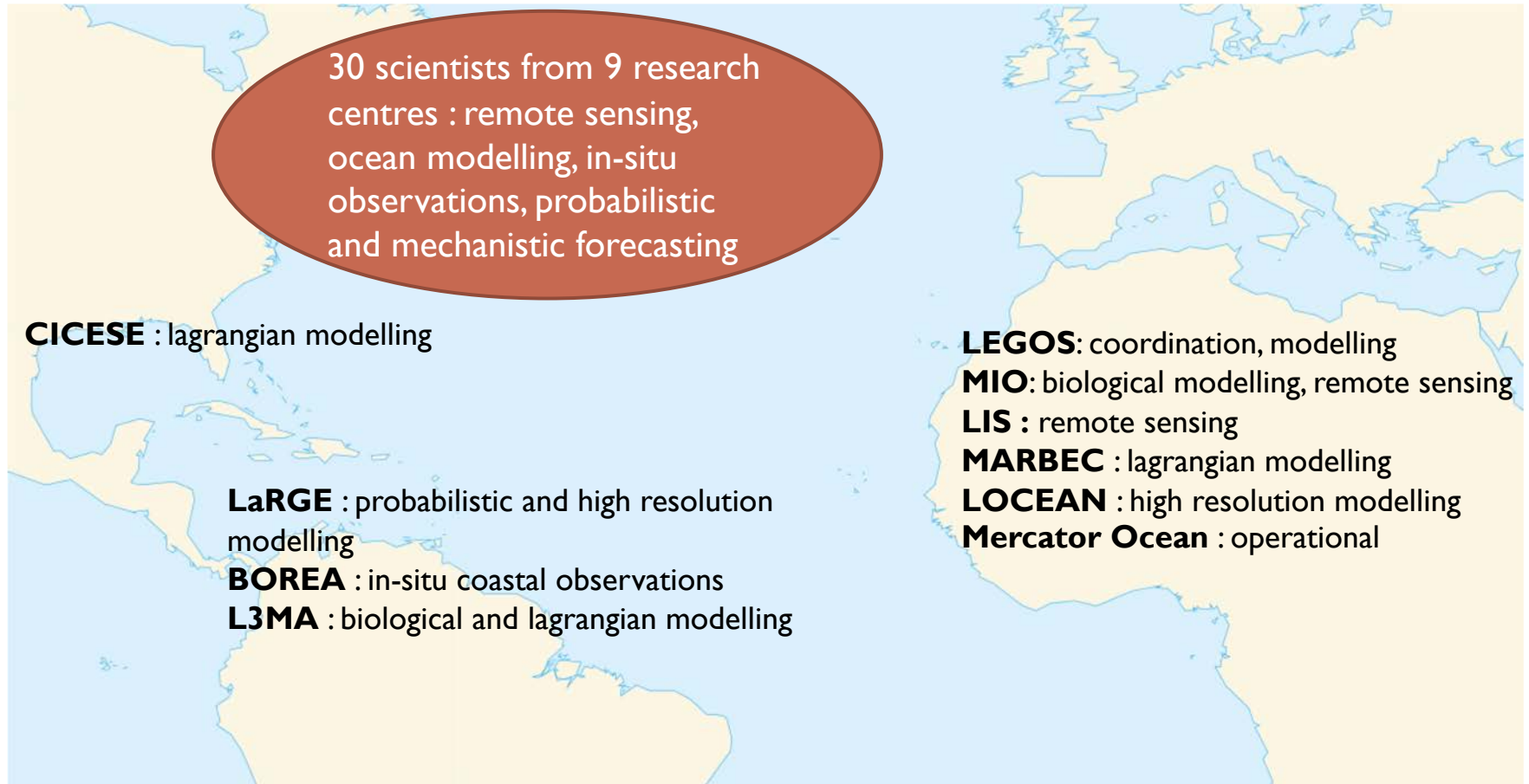
FORESEA: “FOREcasting seasonal Sargassum Events in the Atlantic”

Julien Jouanno, IRD-LEGOS



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

The consortium

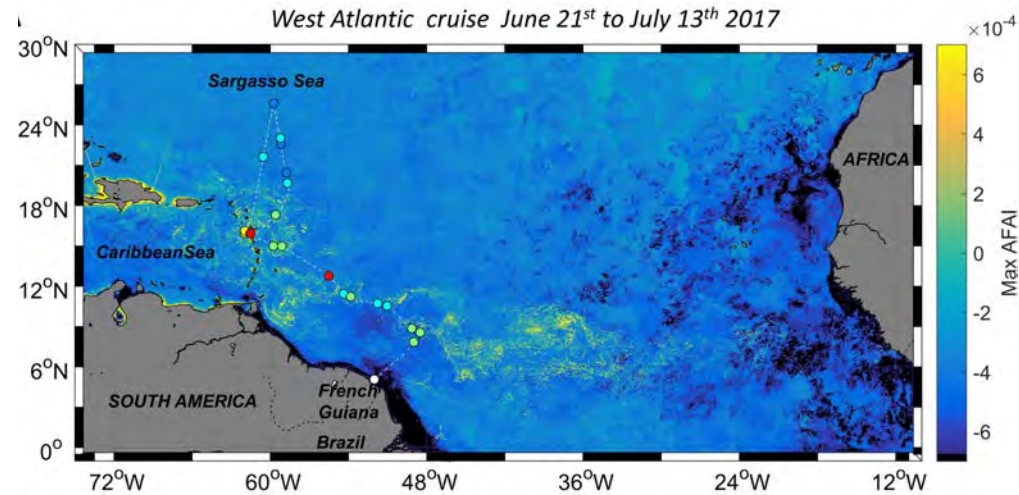


Already planned interactions with : ANR SARGASSUM-ORIGINS, ANR SAVE-C, Interreg CaribCoast, H2020 Blue Growth TRIATLAS, TOSCA SAREDA-DA project, ICARE and ODATIS data centers

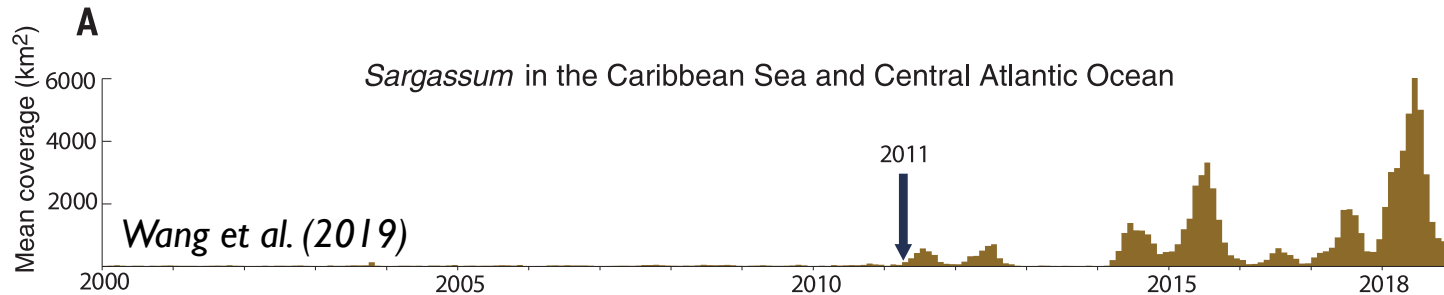
Context

- ▶ A basin scale phenomenon

MODIS Sargassum observations
(Ody et al., PlosOne, 2019)



- ▶ Large year to year variability of Sargassum



Improving our capacities of seasonal forecast will help the civil society to face the intensity of the large-scale bloom at the scale of the Tropical Atlantic

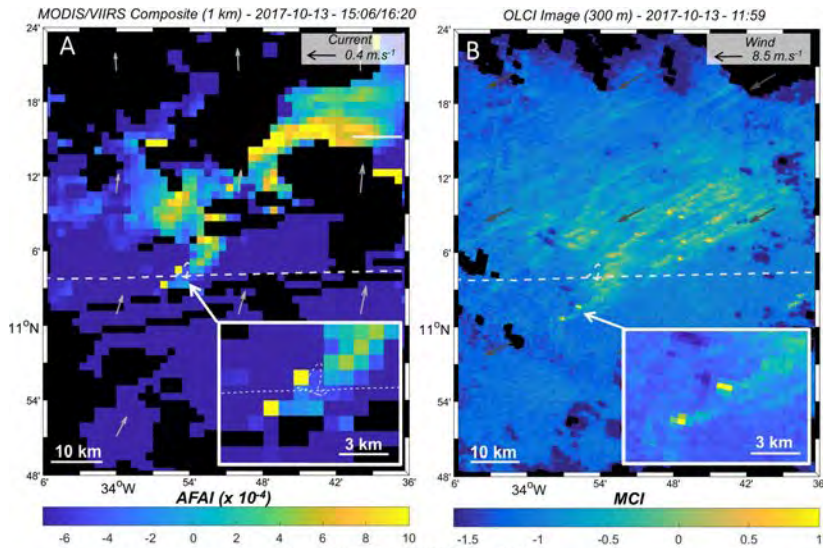
Context

► Some difficulties to overcome...

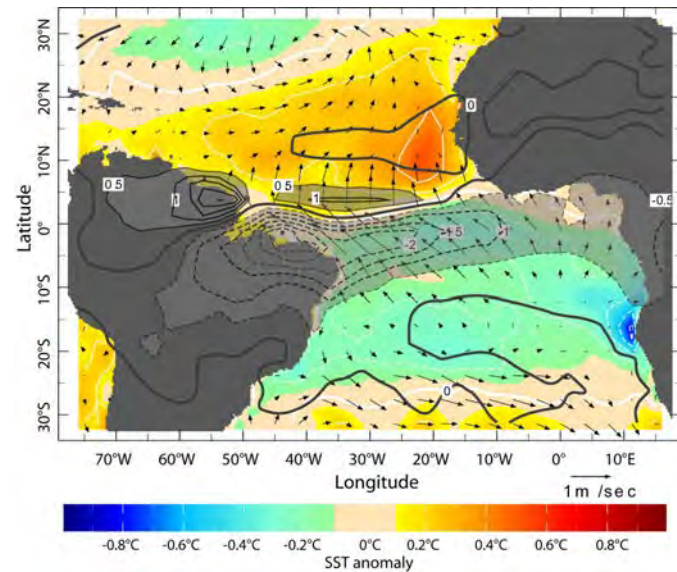
✓ Large uncertainties on biomass estimates from space

✓ Forecasting the seasonal circulation, heat and biogeochemical content

- river forcing
- climatic mode
- ...



Ody et al. (2019)



Context

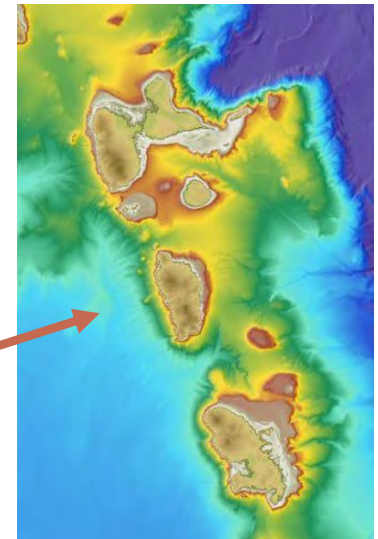
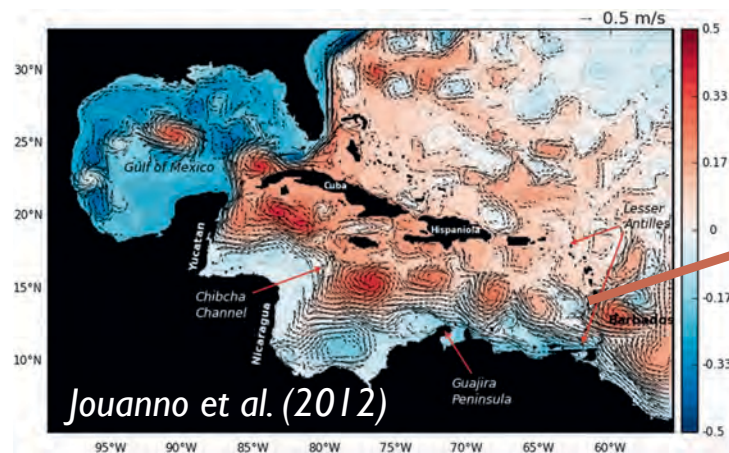
► Some difficulties to overcome...

✓ Sargassum physiology and dynamics

- Growth
- Mortality
- Aggregation
- Drift

✓ Local ocean circulation and its fluctuations

- Transport from the open sea to the coasts
- Possible accumulation of Sargassum

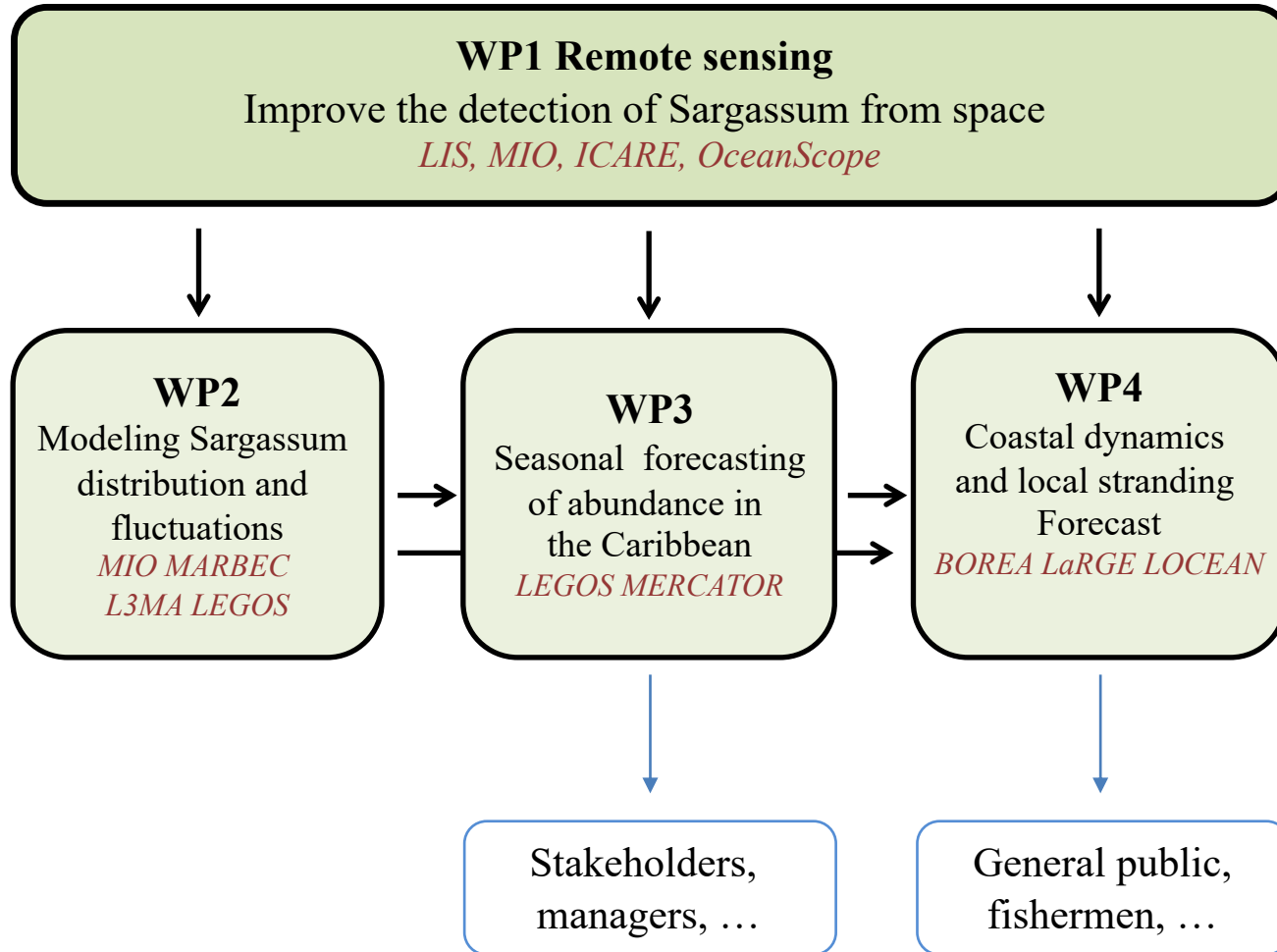


Aims

FORESEA proposes interdisciplinary research activities to

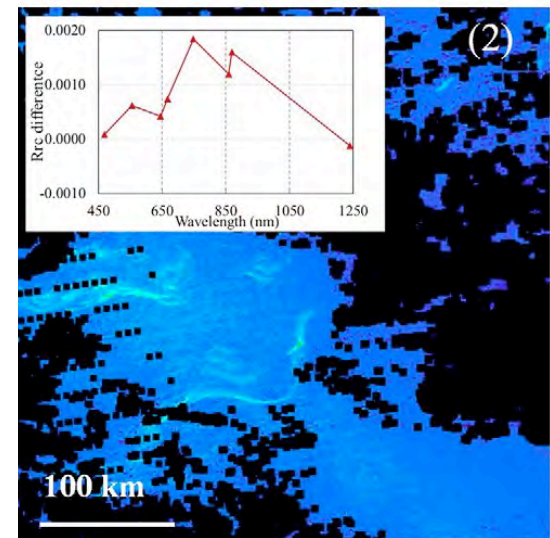
- ▶ advance our current knowledge on the large-scale distribution and variability of the Sargassum events
- ▶ integrate this knowledge into a mechanistic seasonal forecast
- ▶ refine the forecast through cost effective probabilistic methodologies at the scale of the Martinique and Guadeloupe coastal areas (short term and seasonal)

Management of the project



WP1 Remote sensing

- ▶ Improve identification algorithms
- ▶ Synergies/merging between different sensors
- ▶ Detection of Sargassum pathways near the coast with high resolution satellite sensors
- ▶ Near-real time daily estimates of Sargassum remote sensing with km resolution using MODIS (ICARE best effort operational chain)



Wang and Hu (2016)

WP2 Understanding and modelling Sargassum distribution

Build an integrated Lagrangian-physiological Sargassum model to simulate the large-scale distribution of Sargassum biomass

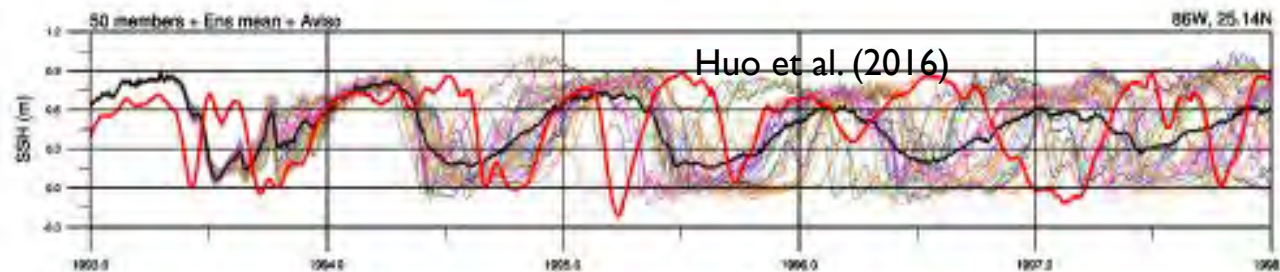
- ▶ Sargassum growth and mortality (mesocosm experiments)
- ▶ Sargassum drift, dispersion and aggregation drivers

Comparison with long term and large scale satellite observations (2009-2019)

→ Useful for carry out sensitivity studies to different forcing (e.g., Amazon, warming, circulation interannual variability)

WP3 Seasonal forecast

Provide a seasonal and mechanistic ensemble forecast of the large scale Sargassum distribution (from t_0 to t_0+7 months)



- ▶ Implementation of a Sargassum module in the MERCATOR operational platform
- ▶ Validation/tuning in re-forecast mode over the last ten years and operational implementation for the last year of the project
- ▶ Production / Free diffusion through web interface

WP4 Toward fine-scale forecast of sargassum stranding in Martinique and Guadeloupe

Downscale the seasonal forecast at the scale of the Martinique and Guadeloupe islands :
→ Need to consider as closely as possible the complexity and nature of the coastline

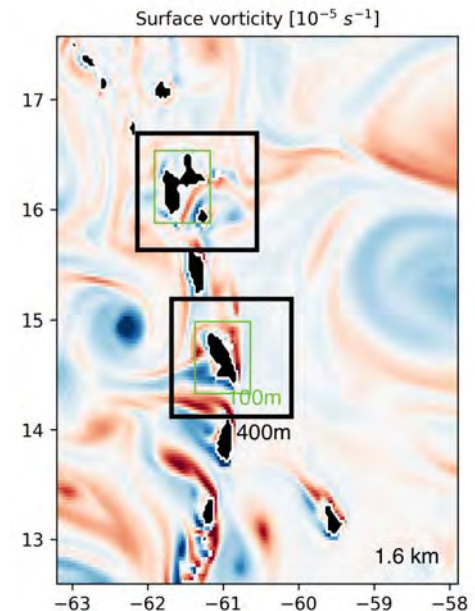
4.1 In-situ hydrodynamics observations



4.3 Probabilistic forecasting

Statistical forecast using satellite-derived algae indexes and simulated high resolution hydrodynamic trajectories

4.2 High-resolution ocean circulation modelling



Results expected

Observations. Improved teledetection techniques

Causes of the phenomenon. A better understanding of the causes of the proliferation and sensitivity to river runoff, upwelling, equatorial dynamics, warming

Tools A mechanistic modelling of the Sargassum populations that will implement the biology and complex drift properties of the Sargassum drafts.

Forecast A seasonal and mechanistic forecast of the Sargassum distribution with confidence interval :

→ large scale

→ Martinique and Guadeloupe regional scale

Web-application providing large scale distribution and stranding forecast



Thank you for your attention

