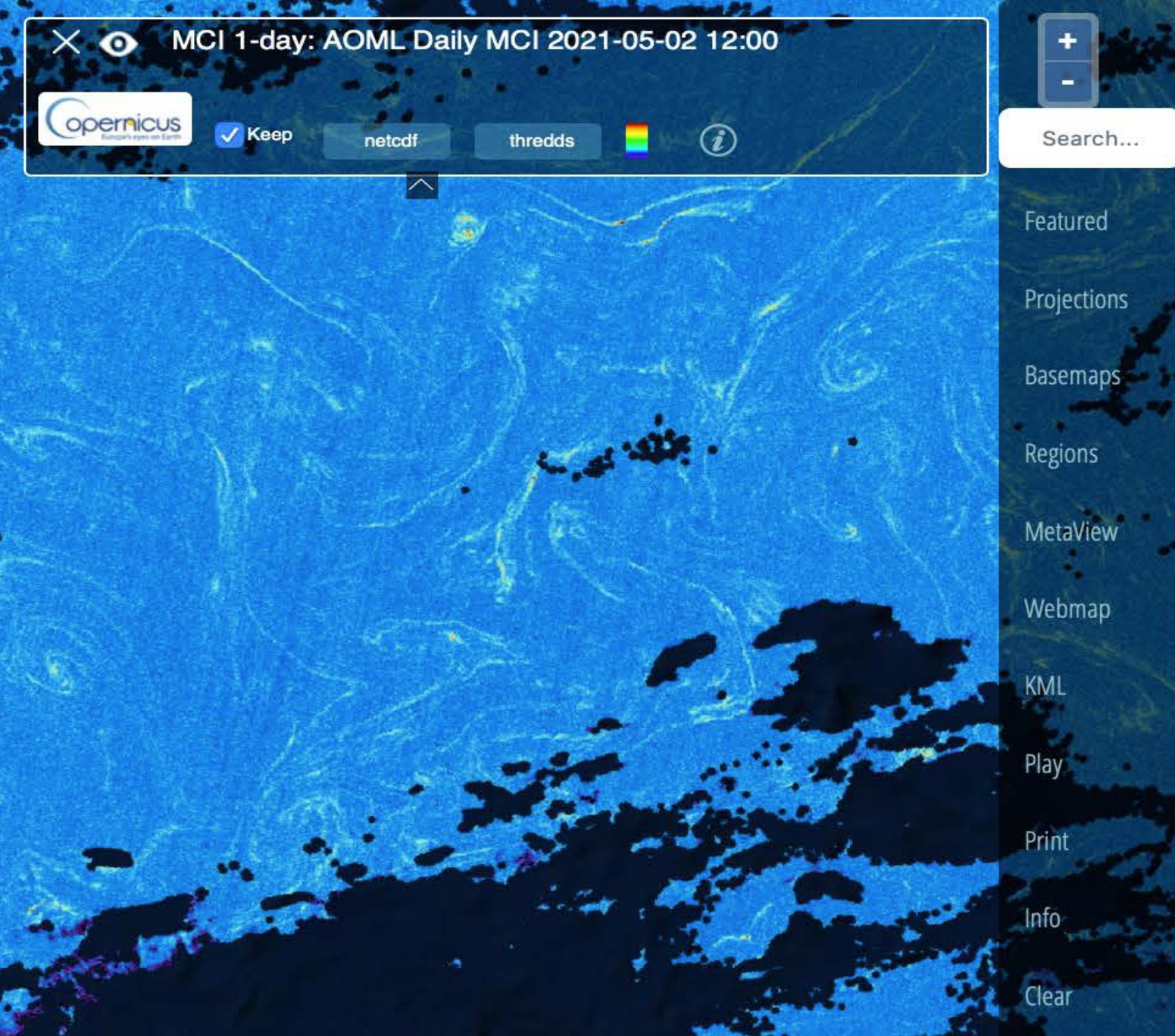




Caribbean/Gulf of Mexico Node  
Physical Oceanography Division  
Ocean Chemistry and Ecosystems Division

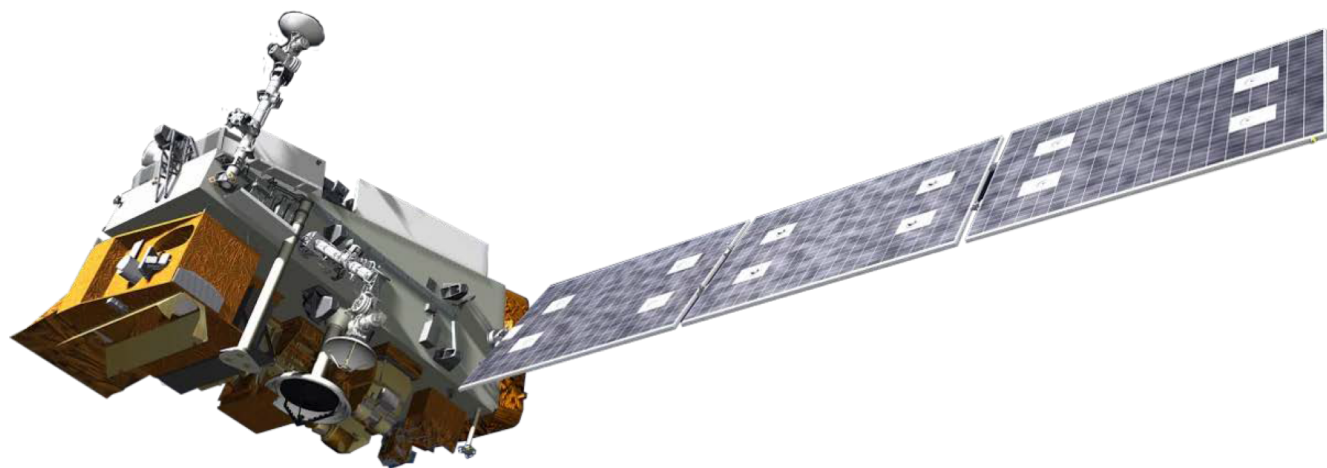


# Caribbean and Gulf of Mexico Coast Atlantic Ocean Watch

Satellite Tracking of Sargassum in the Atlantic, Caribbean and Gulf of Mexico

Joaquin Trinanes

Op. Manager, NOAA/AOML



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01 CW/OW nodes at AOML

02 Applications

03 *Sargassum* products

04 Beyond satellite data

05 Data discovery,  
distribution, delivery

06 Research and  
Collaboration priorities

## Partners:

NOAA (Gustavo Goni, Rick Lumpkin, Veronica Lance, Emily Smail)

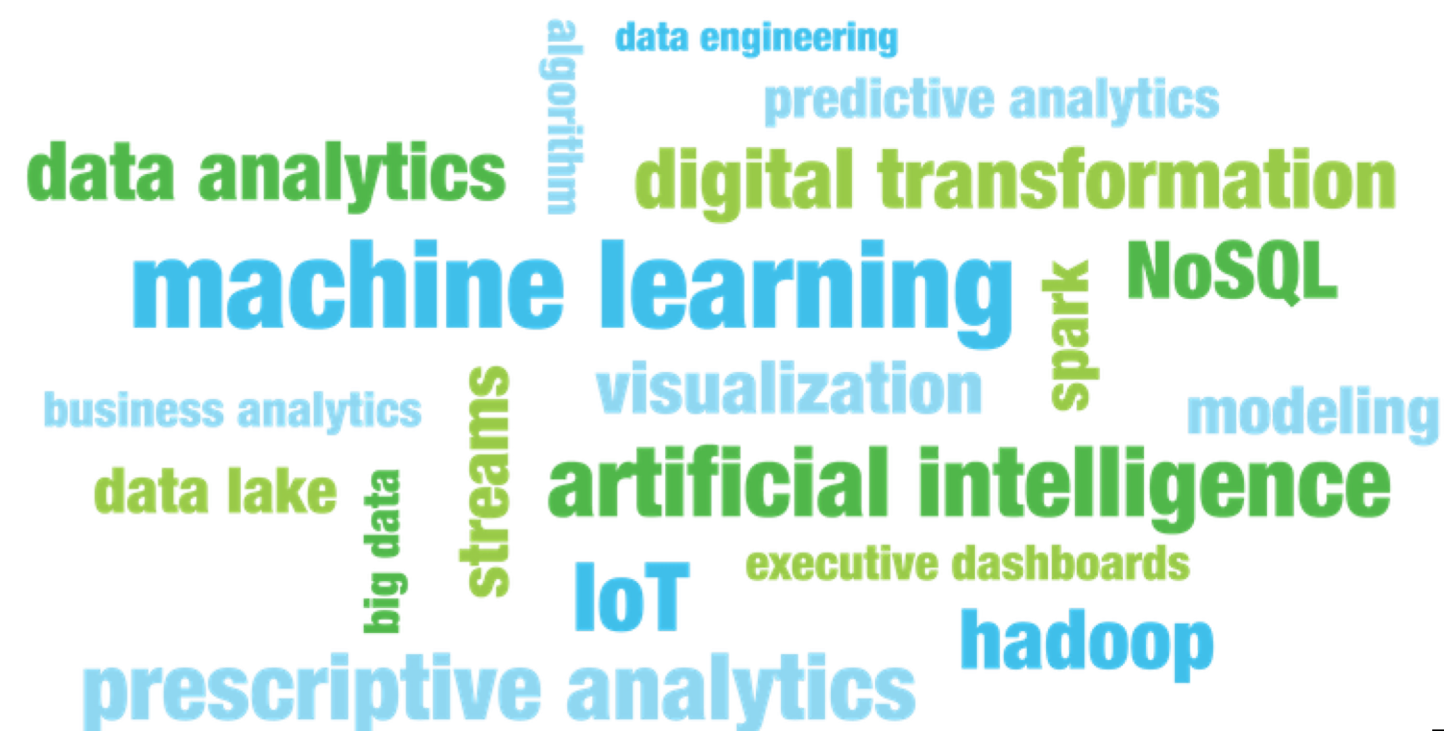
USF (Chuanmin Hu, Mengqiu Wang)

UM (Josefina Olascoaga, Javier Beron-Vera, Philippe Miron)

LGL Ecological Research Associates (Nathan Putman)

FIU (Lowell Andrew Iporac)

CARICOOS (Julio Morell)



# 01 CW/OW nodes at AOML

## Mission statement

NOAA CoastWatch/OceanWatch provides easy access for everyone to global and regional satellite data products for use in understanding, managing and protecting ocean and coastal resources and for assessing impacts of environmental change in ecosystems, weather, and climate

Managed by NOAA National Environmental Satellite Data and Information Service (NOAA/NESDIS)

Since 1999, AOML hosts the CW Caribbean and Gulf of Mexico regional node.

Main purpose: to serve NRT satellite-derived products for the Caribbean Sea and Gulf of Mexico

AOML also hosts one of the 2 OW nodes: Atlantic OceanWatch

OceanWatch is an extension of CW, focusing on expanded geographical boundaries, open ocean datasets and global coverage.

Both CoastWatch and OceanWatch efforts run in parallel, with the latter focusing on a larger region of interest, primarily the Atlantic basin and global oceans.

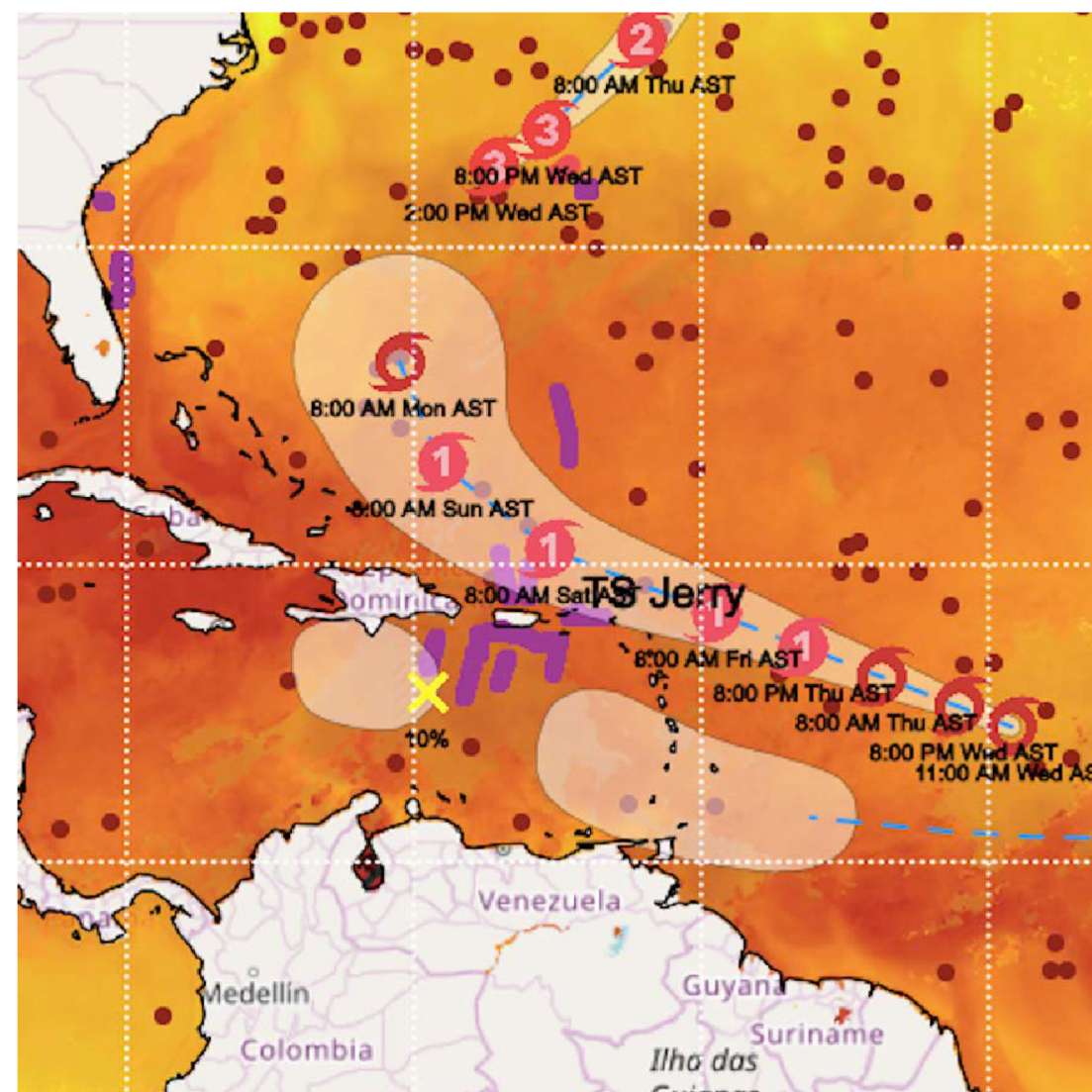


# 02 Applications

**Applications:** Fisheries, oil platforms, research cruise support, hurricane operations, public health, biogeographic research, omics, coastal environment, operational oceanography, *Sargassum* monitoring, glider operations, Argo/drifter deployments, carbon SOOP ship monitoring, ocean acidification, ocean debris, carbon fluxes, ...

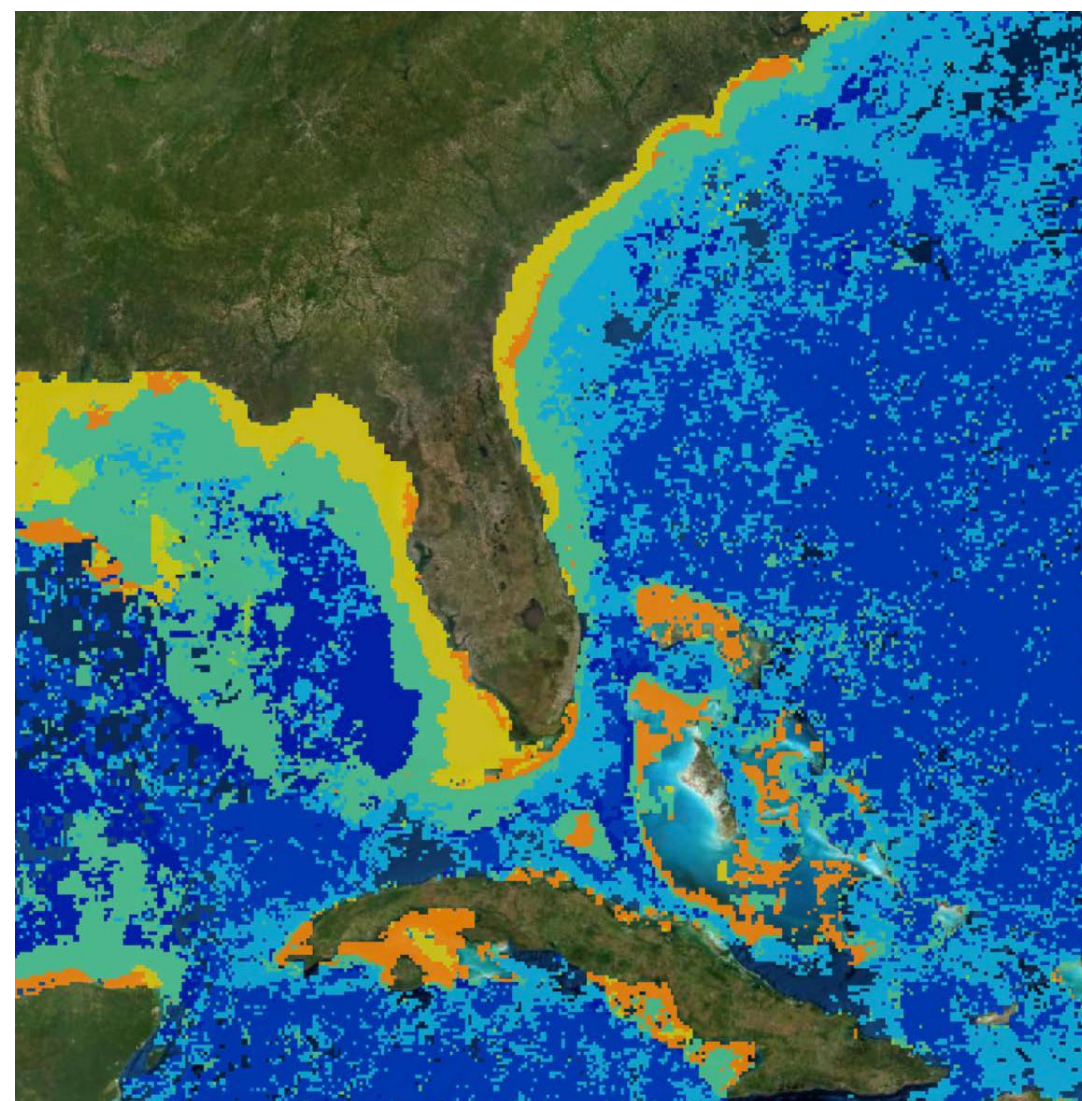


**Ocean Observations Viewer**  
OAR,HRD, NWS, NHC, NOS, NAVO



**Seascapes**

MBON, OSU, USF, NASA, UAF, IOOS, NMS



**Vibrio Bacteria Suitability Index**  
ECDC, FAO



# 03 Pelagic *Sargassum*

Floating macroalgae that forms large rafts that function as a drifting ecosystem, providing valuable habitat for diverse marine organisms

Since 2011, massive amounts of pelagic Sargassum algae began washing ashore throughout the Caribbean Sea and Gulf of Mexico

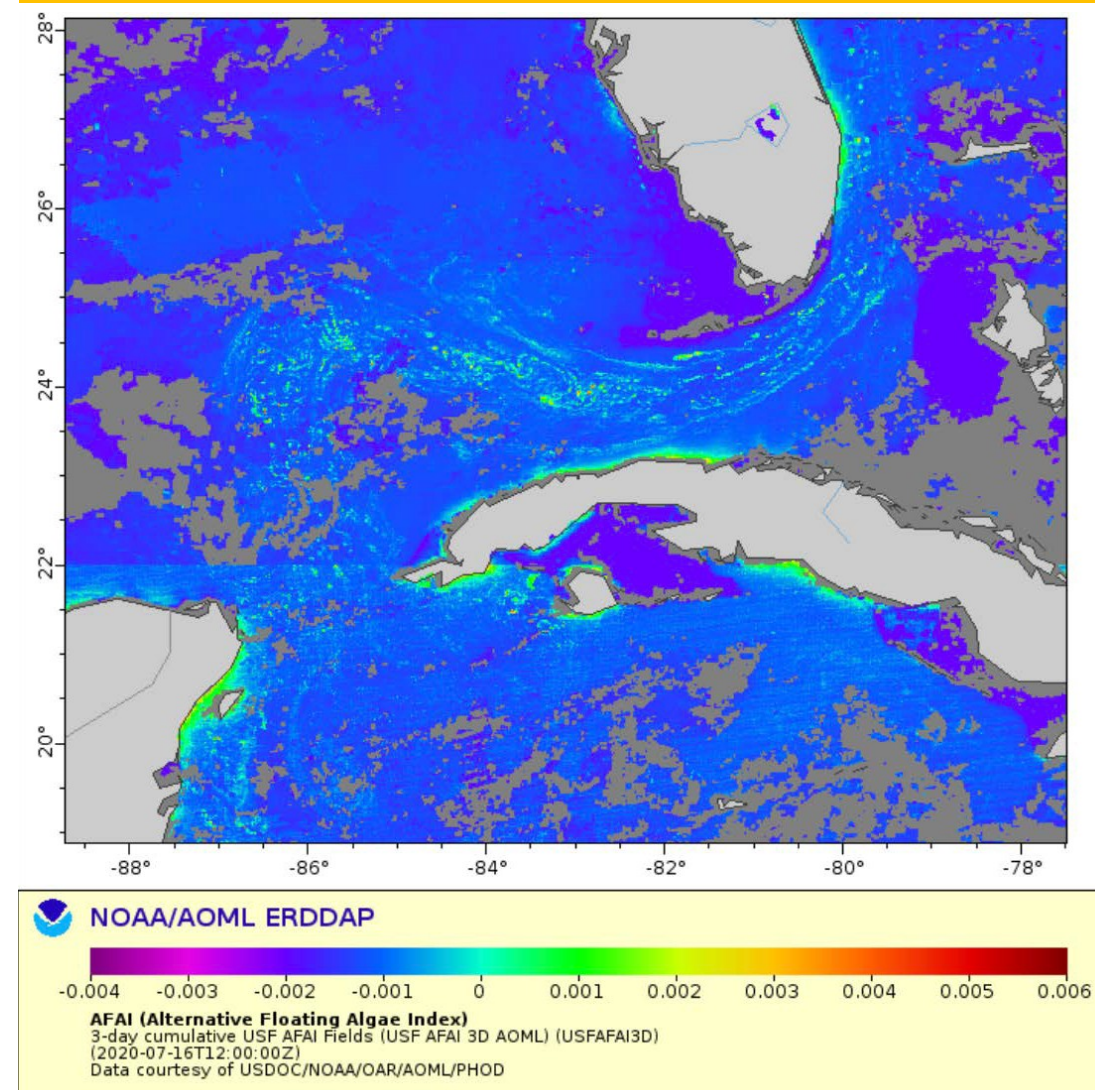
Disrupts shipping, tourism, fishing, industry, and coastal ecosystems.

**What we do?** Monitor and track Sargassum. Trajectory modelling efforts. Operational.

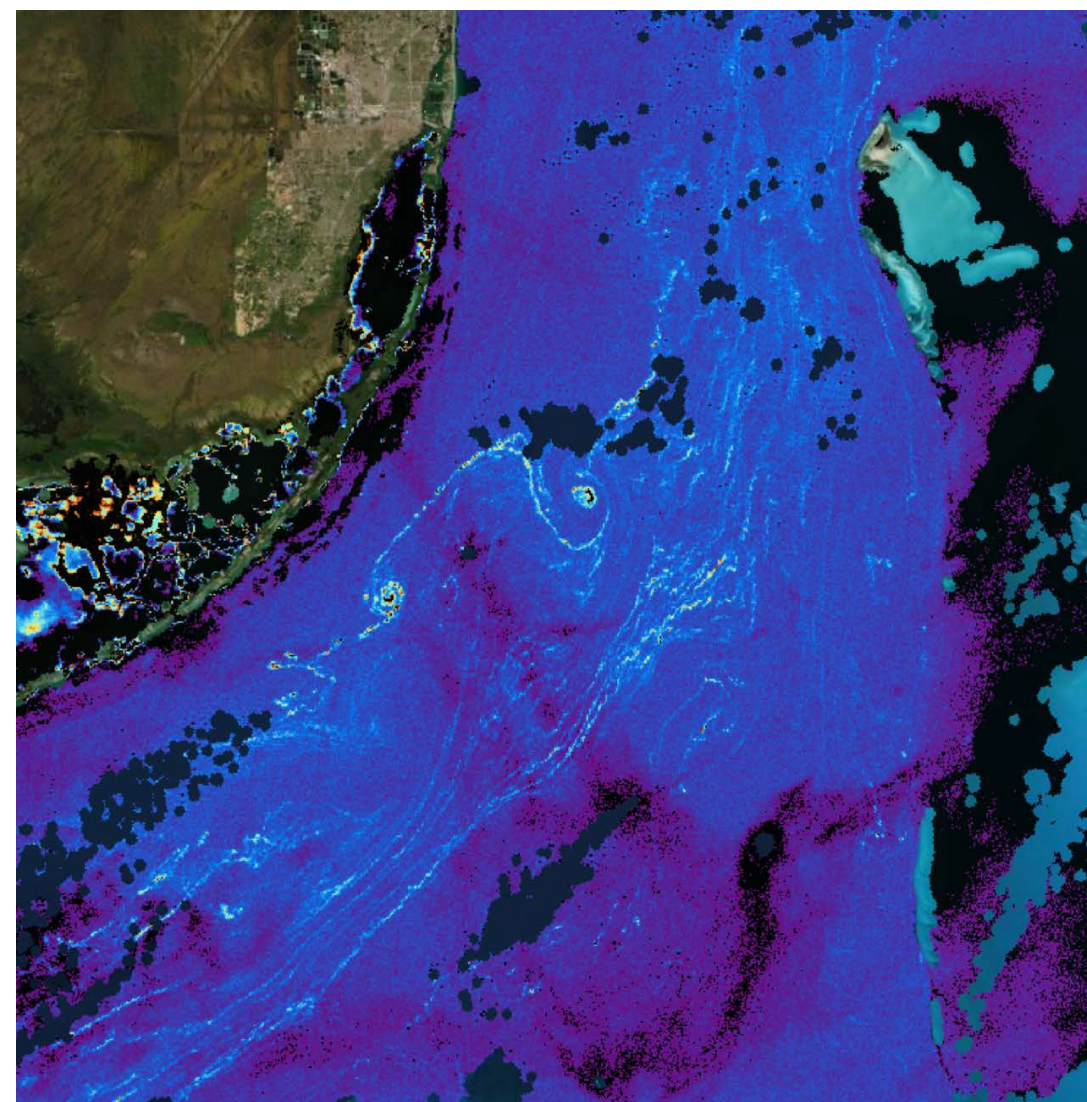


# 03 *Sargassum* products

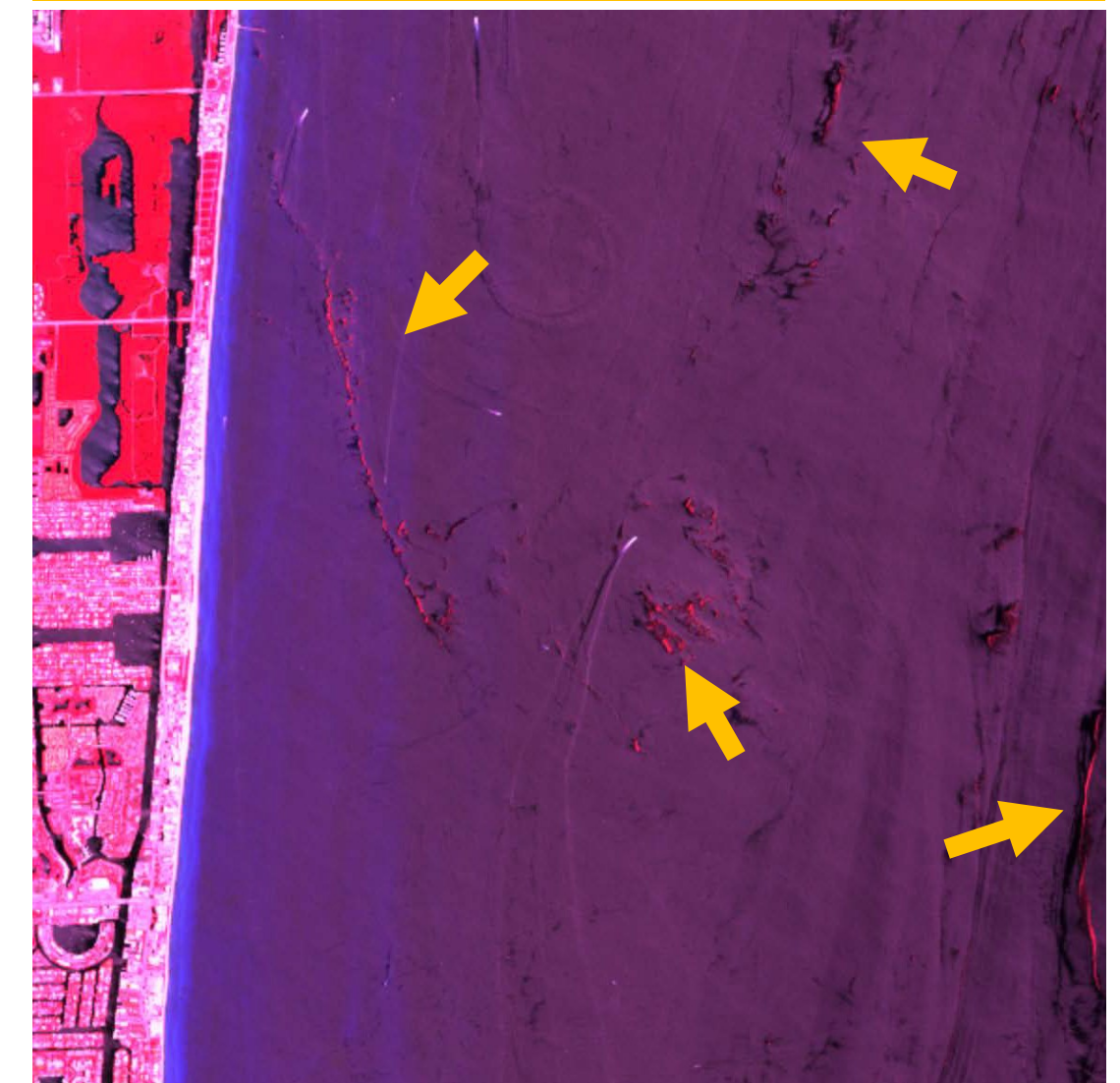
MODIS/VIIRS (source: C. Hu, USF)  
Resolution: ~ 1km



OLCI data  
Resolution: 300 m



MSI  
Resolution: 10-20m



**Goals:** NRT monitoring and tracking of pelagic *Sargassum*

**Revisit times:** daily (MODIS , VIIRS), ~2 day (OLCI), ~5 day (MSI)

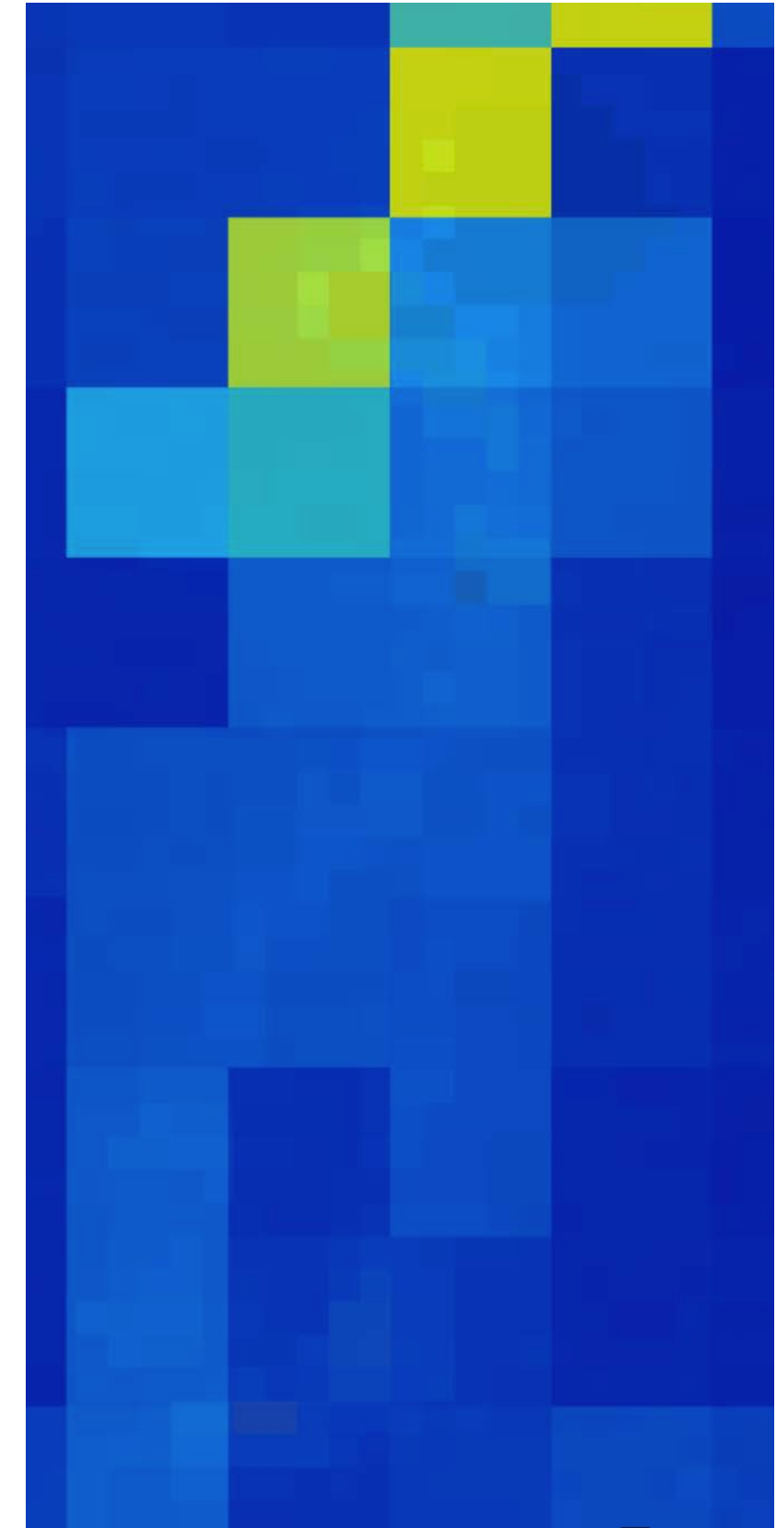
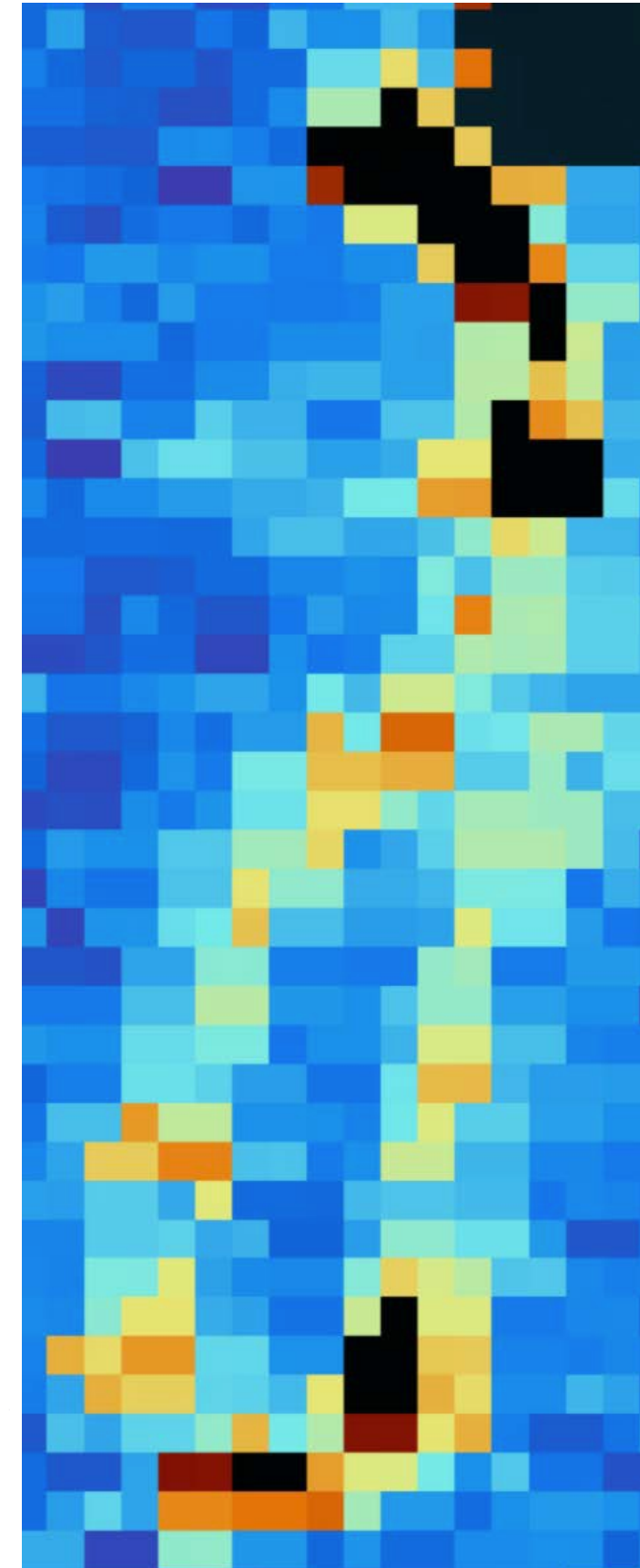
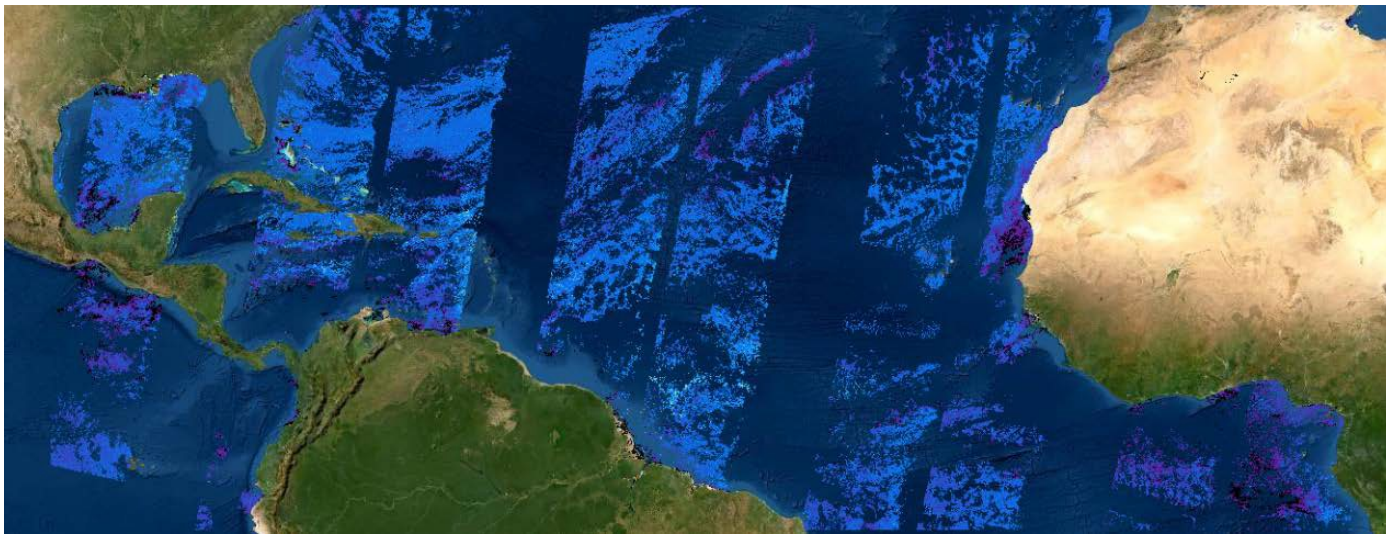
# 03 *Sargassum* products

Resolution:

20m -> 300m (ratio:15)

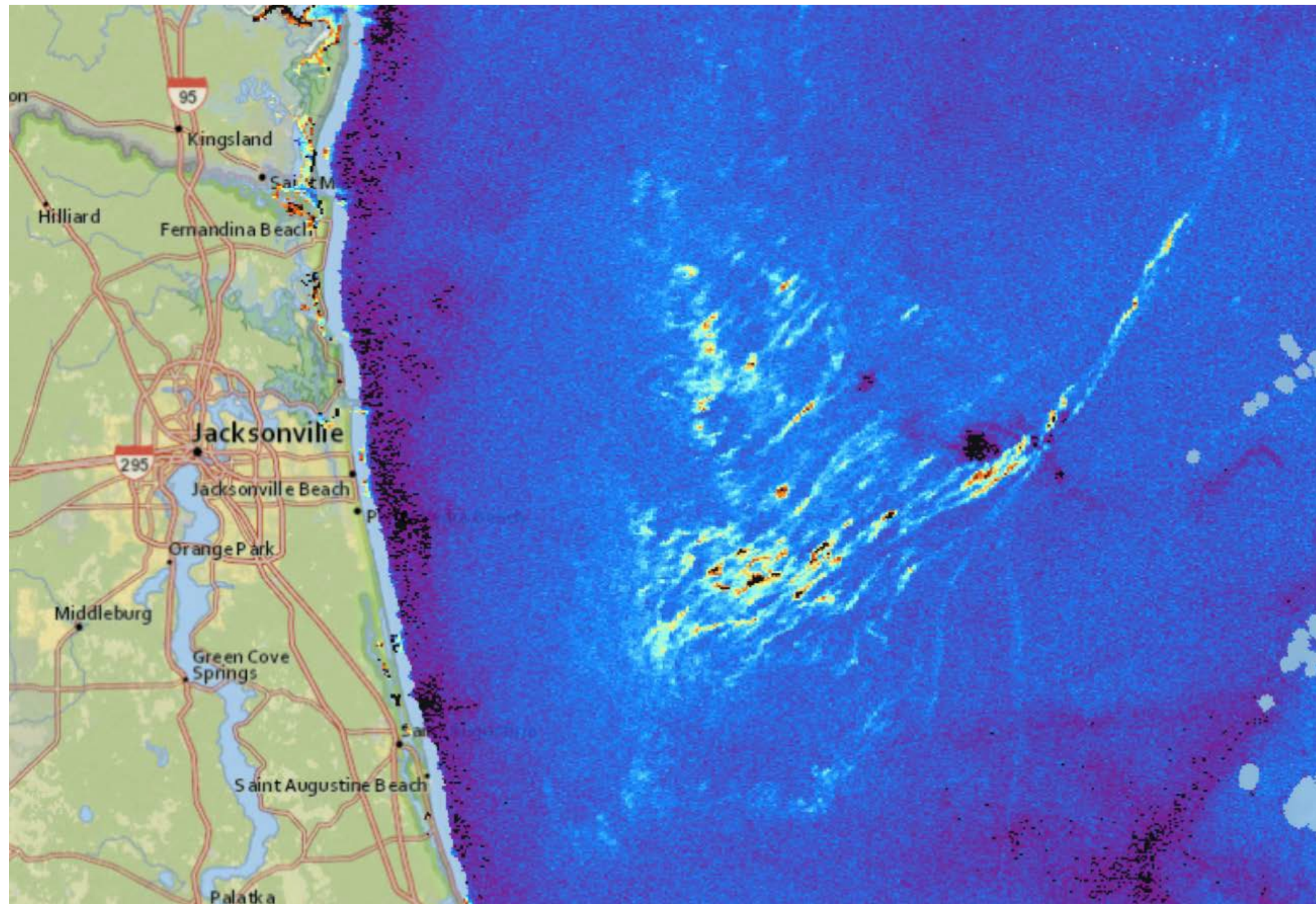
300m -> 1km (ratio:3.3)

MSI- Coastal areas

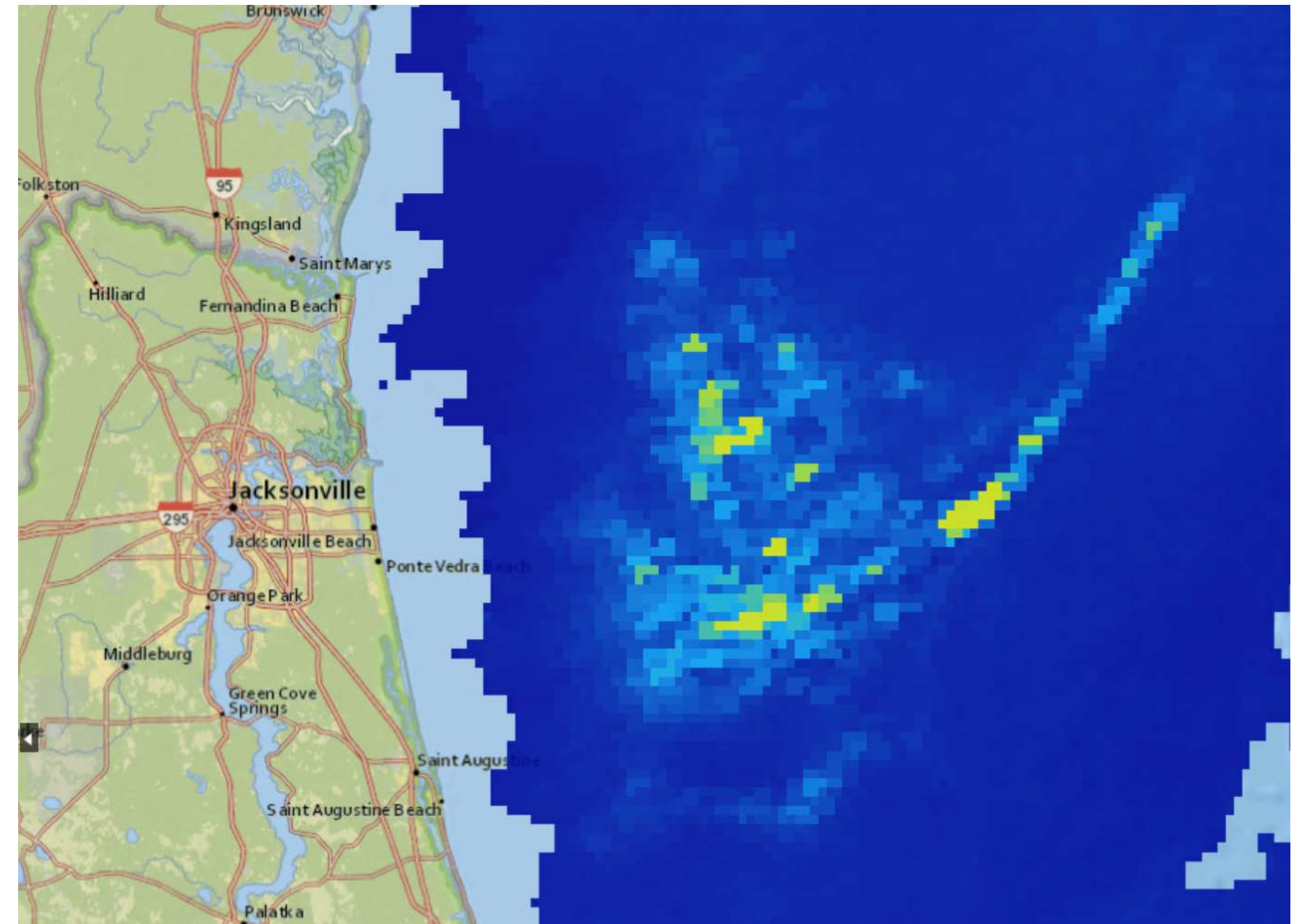


# 03 *Sargassum* products

Resolution: 300m



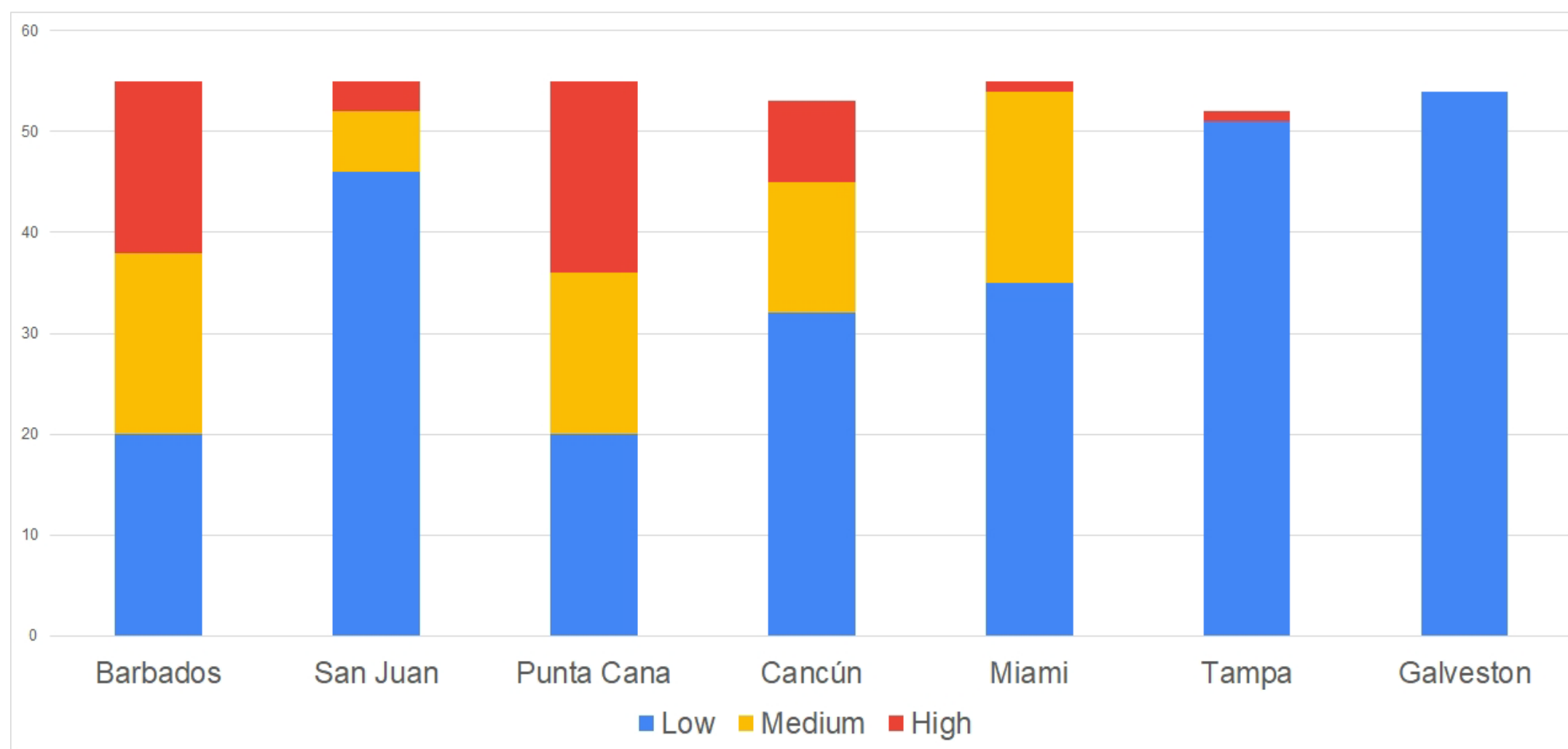
1km



# 03 *Sargassum* products

**Goals:** To provide an overview of the risk of Sargassum coastal inundation in the Caribbean and Gulf of Mexico regions.

Transition into operations in progress.



Joaquin Trinanes, N.F. Putman, G. Goni, C. Hu, M. Wang .**Monitoring pelagic Sargassum inundation potential for coastal communities.** *Journal of Operational Oceanography* Pub  
Date : 2021-03-18 , DOI: [10.1080/1755876x.2021.1902682](https://doi.org/10.1080/1755876x.2021.1902682)

## SIR

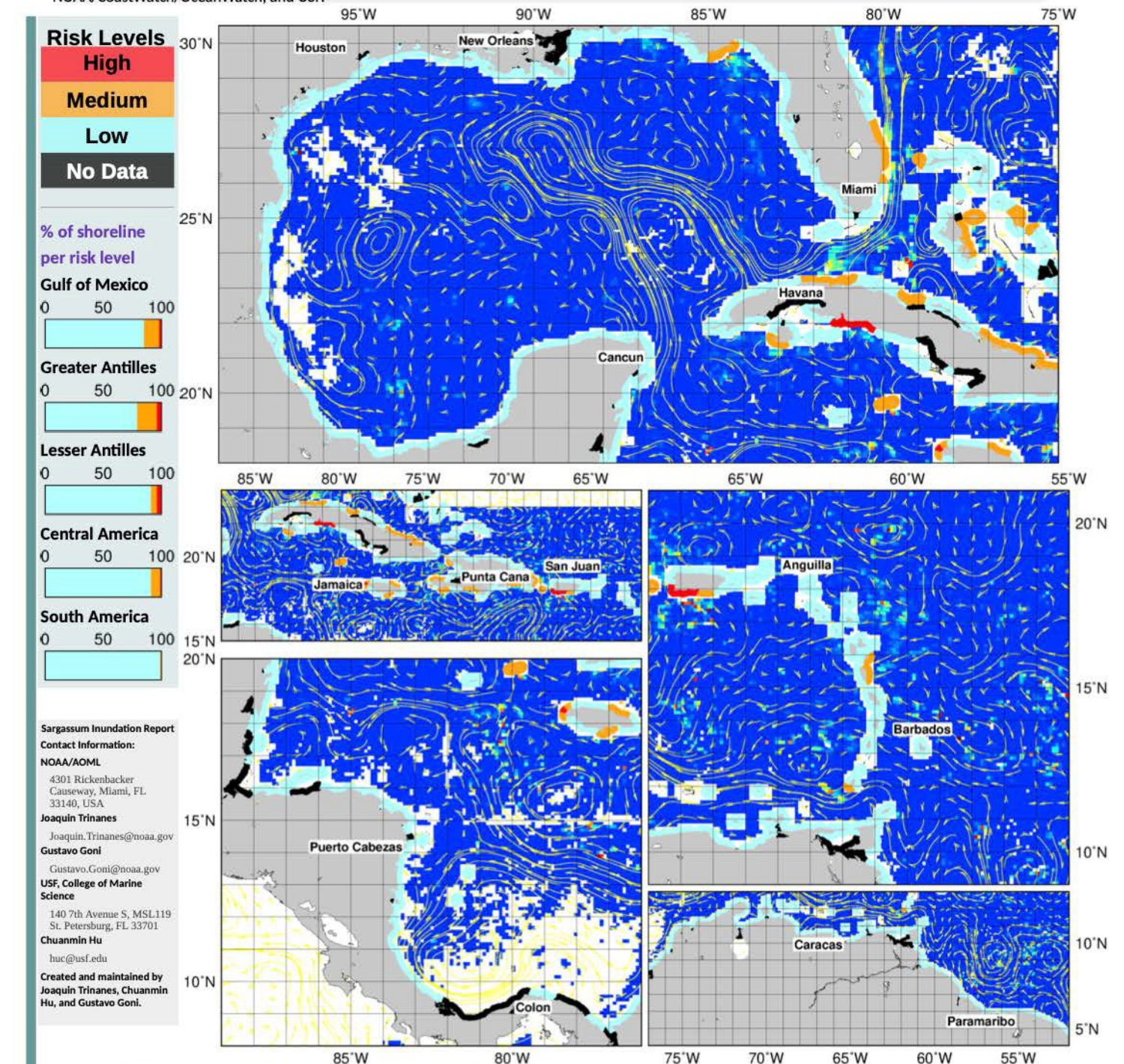


### Experimental Weekly Sargassum Inundation Report (SIR v1.2)

By the National Oceanic and Atmospheric Administration (NOAA), and the University of South Florida (USF)

Status: Nov 23-29, 2021

Since 2011, large accumulations of Sargassum is a recurrent problem in the Caribbean Sea, in the Gulf of Mexico and tropical Atlantic. These events can cause significant economic, environmental and public health harm. These experimental Sargassum Inundation Reports (SIR) provide an overview of the risk of sargassum coastal inundation in the Caribbean and Gulf of Mexico regions. Using as core inputs the AFAI (Alternative Floating Algae Index) fields generated by the University of South Florida (USF), the algorithm analyses the AFAI values in the neighborhood (50 km) of each coastal pixel and, computing the difference between those values and a multiday baseline, classifies the risk into three categories: low (blue), medium (orange) and high (red). In black are areas with not enough data. The two ad-hoc thresholds used for classification are 0.001 and 0.003. The vectors in the images represent the geostrophic currents. SIR is the result of the collaboration between the Atlantic Oceanographic and Meteorological Laboratory (NOAA/AOML), NOAA/CoastWatch/OceanWatch, and USF.



References: [USF Sargassum Watch System](#) [Atlantic OceanWatch](#)

Disclaimer: This is an experimental product and still subject to validation by NOAA/AOML, NOAA/CoastWatch/OceanWatch, and USF.

# 04 Beyond satellite data

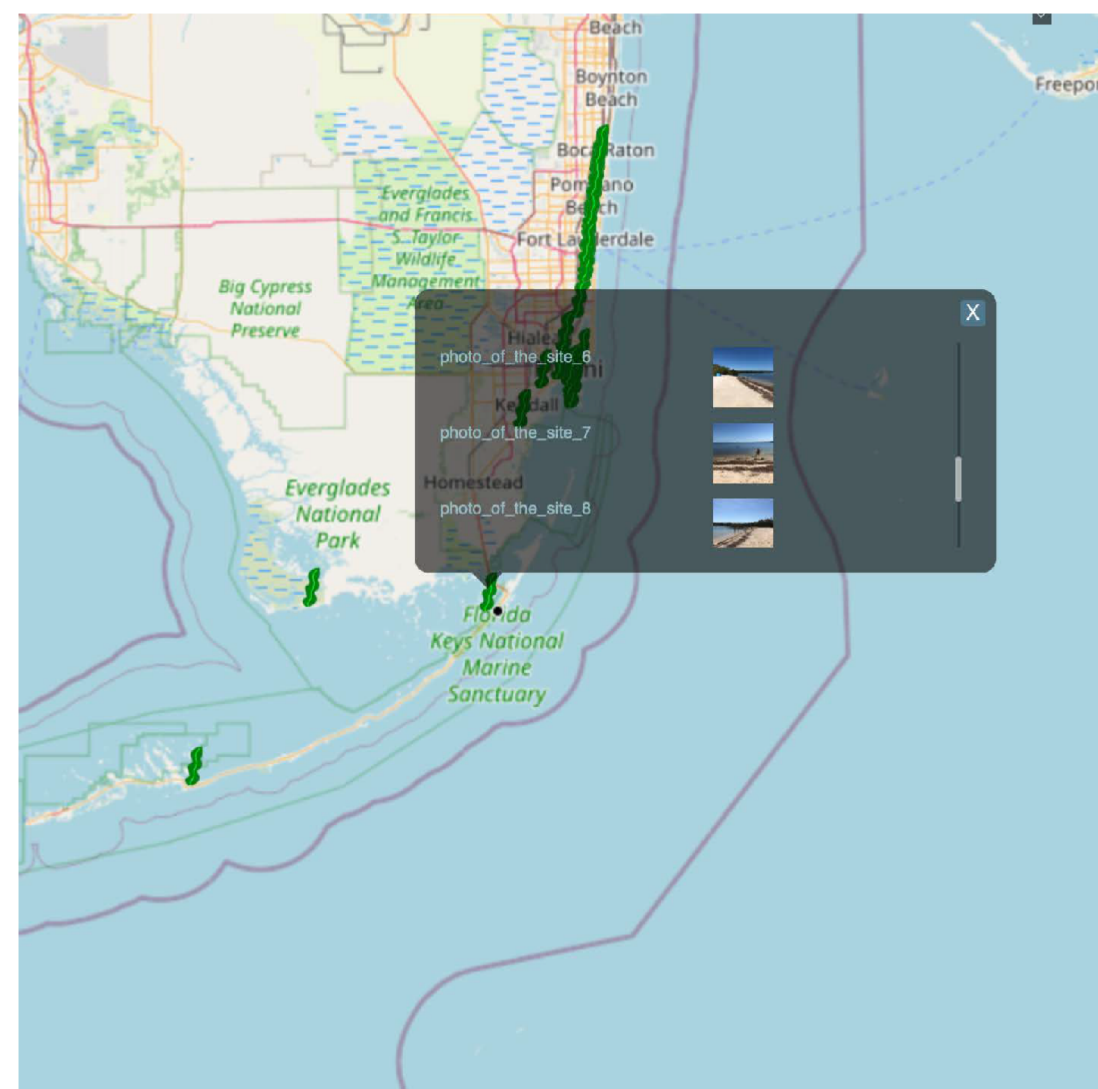
**Models, analysis and overlays:** OA, Fluxes, EEZs, trajectories, genomics,

**In-situ:** Sargassum (Integration external repositories +ESRI Survey123 form). Argo, drifter, glider, XBT, CO<sub>2</sub> SOOP.

**Machine Learning:** Partial Pressure CO<sub>2</sub> in seawater, HABs, Sargassum detection.

**Other:** Visualization (Projections, basemaps, metaview, template, animations, palettes, multilayer).

## Sargassum Observations In-situ Database




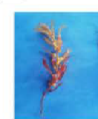













## Survey123 Multidevice data collection

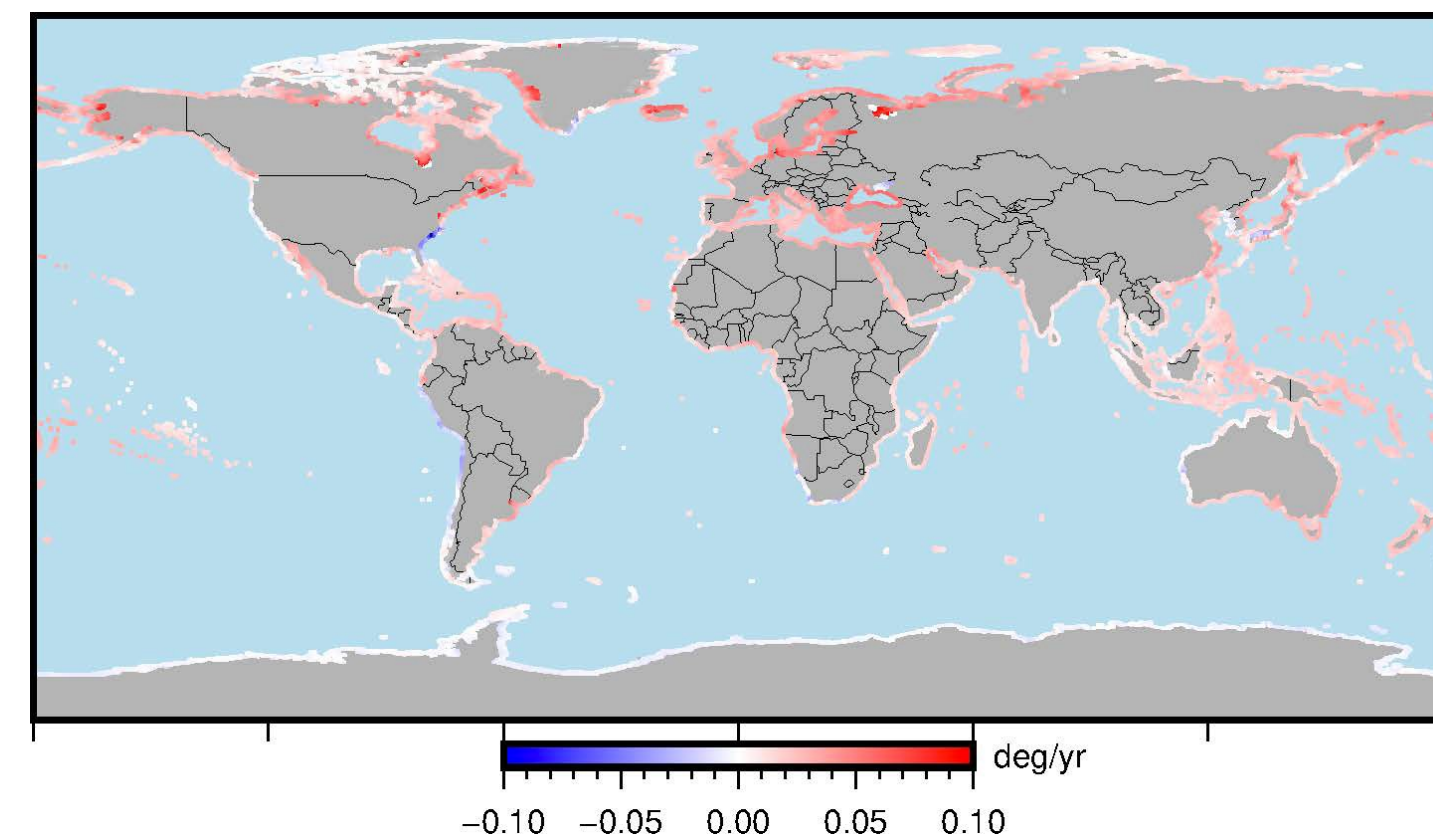
<input type="checkbox"/> Washed-up on the shore	<input type="checkbox"/> Floating along the shoreline	<input type="checkbox"/> Floating in bays, channels, harbors
<input type="checkbox"/> Floating over reefs or seagrass	<input type="checkbox"/> Offshore	

### Sargassum Observed As

<input type="checkbox"/> Line(s) of Sargassum	<input type="checkbox"/> Mats/rafts	<input type="checkbox"/> Scattered clumps
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### Species of Sargassum

<input type="checkbox"/> Natans I	<input type="checkbox"/> Natans VIII	<input type="checkbox"/> Fluitans III
		
		
		
		
		

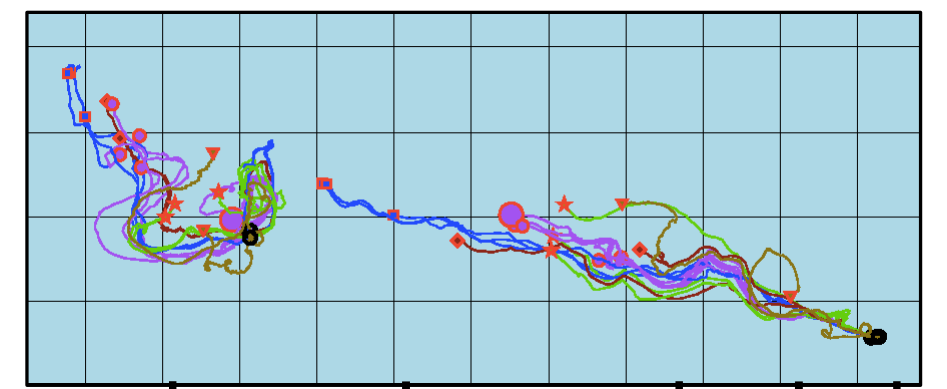


# 04 Trajectory Modelling

## Ocean Debris Tracking

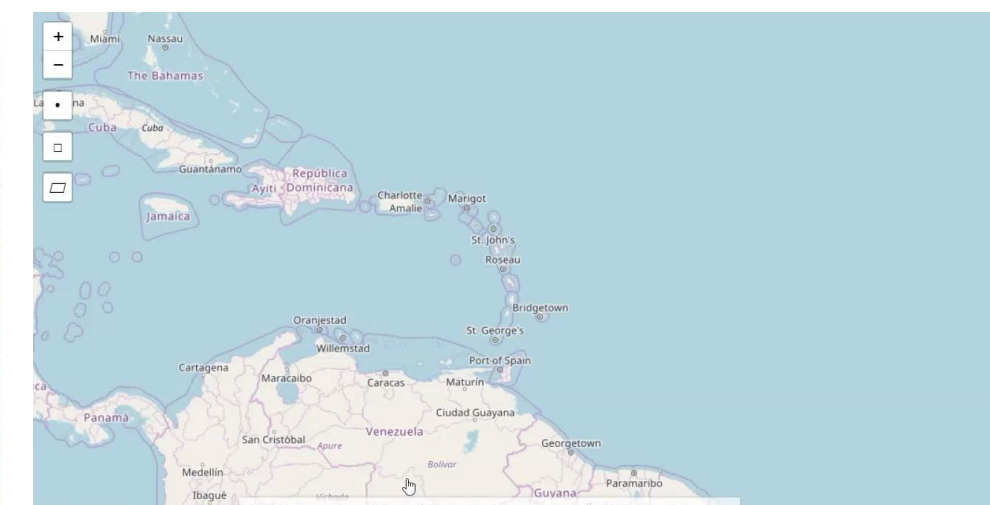
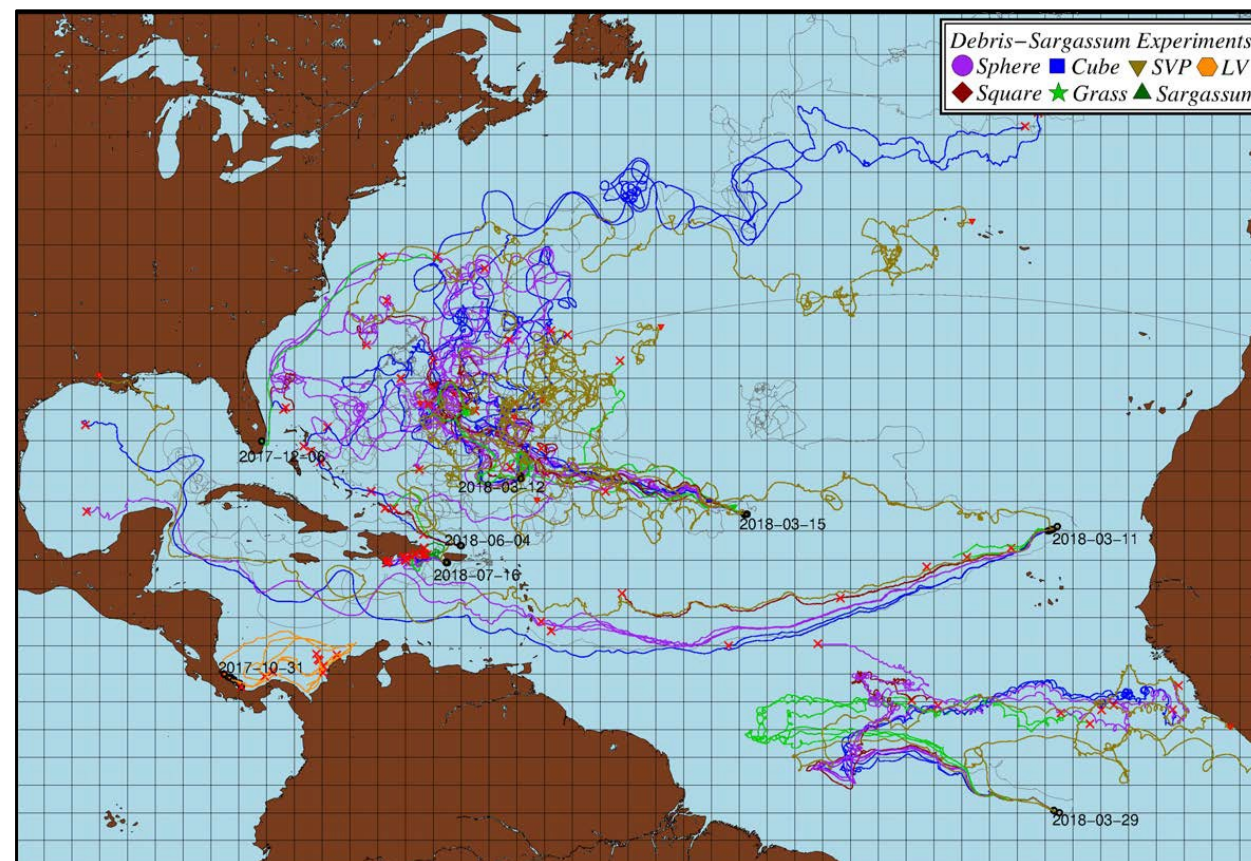
**Goal:** understand and assess impact of ocean dynamics and wind on sargassum (and debris in general)

Field experiments with GPS-tracked, undrogued buoys of varying shapes, simulating debris and Sargassum. This project will help us better understand the trajectories of floating debris, sargassum, and plankton including marine larva.



Putman, N.F., Lumpkin, R., Olascoaga, M.J., Trinanes, J. and Goni, G.J., 2020. Improving transport predictions of pelagic *Sargassum*. *Journal of Experimental Marine Biology and Ecology*, 529, p.151398.

Miron, P., Olascoaga, M. J., Beron-Vera, F. J., Putman, N. F., Triñanes, J., Lumpkin, R., and Goni, G. J., 2020. Clustering of Marine-Debris- and *Sargassum*-Like Drifters Explained by Inertial Particle Dynamics. *Geophysical Research L.*, 47(19), <https://doi.org/10.1029/2020GL089874>



# 05 Data discovery, distribution, delivery

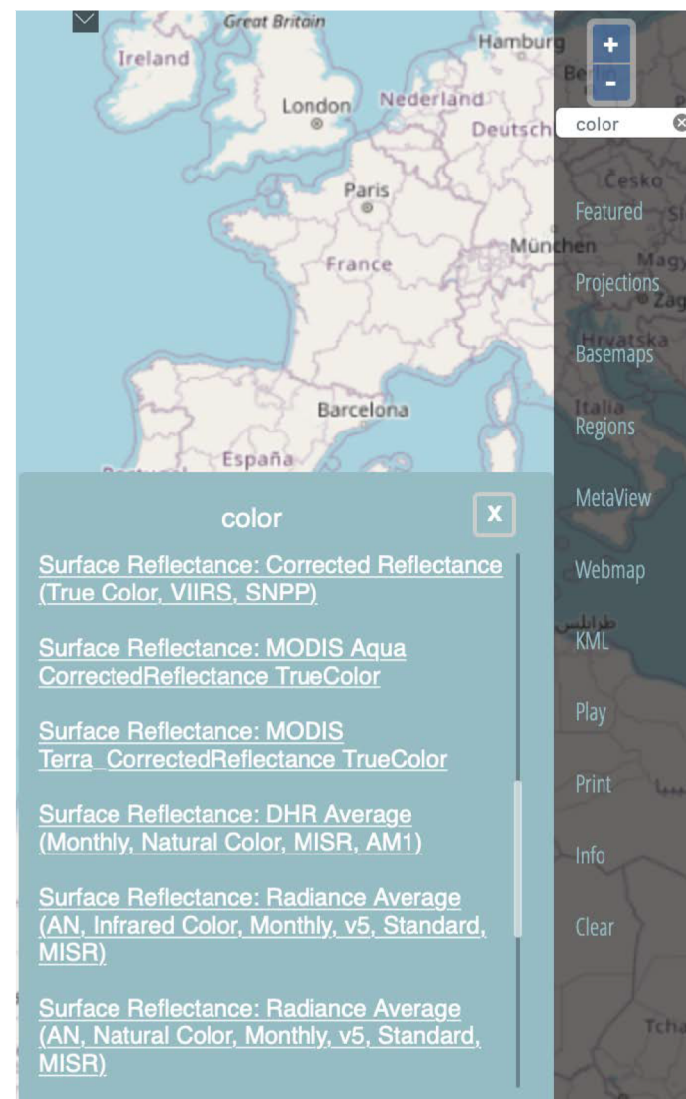
**Data Discovery:** Traditional TDS and ERDDAP capabilities. OV: enhanced with search capabilities and Webmap. Metadata available for evaluating data quality. Integrating OV with tool for searching in multiple ERDDAPs

**Data Distribution:** Interoperable tools.

**Data Delivery:** AOML OOS (GTS), reports, customized products (e.g. research cruises) and backup

## Data Discovery

Metadata search in ERDDAP/OV



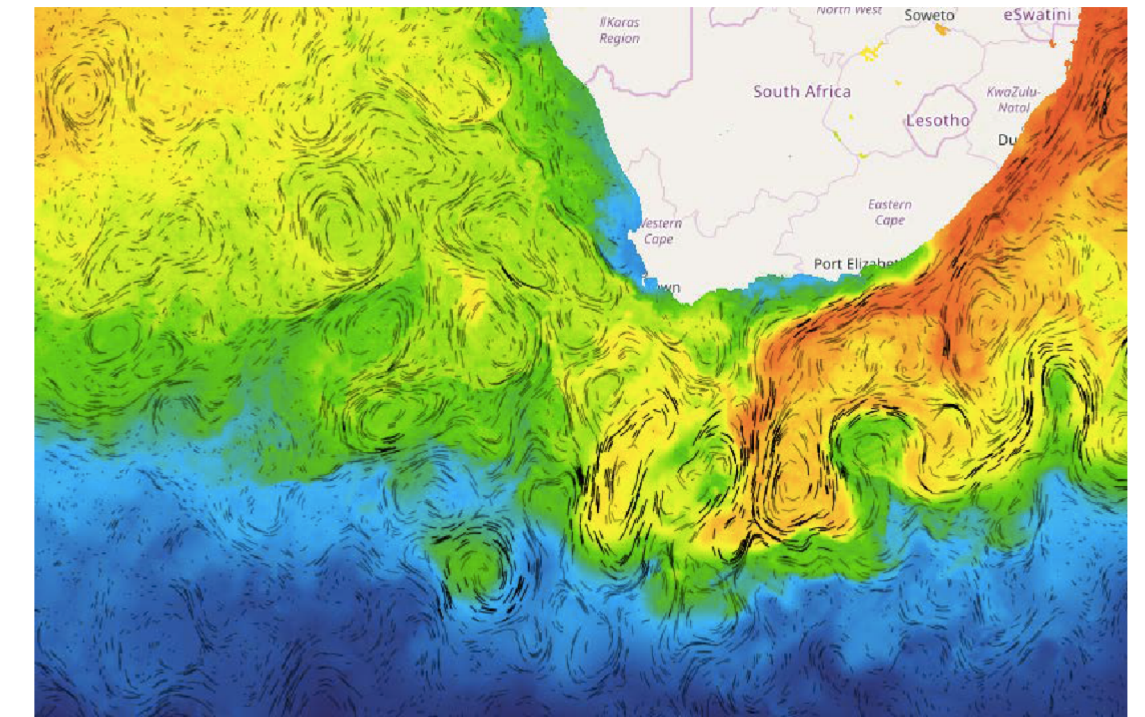
## Distribution

TDS/ERDDAP/OV/Tile Server

Tile Server  
OCEANVIEWER  
ERDDAP  
TDS

## Delivery

Customized products



# 05 Interoperable Environment

Caribbean/Gulf of Mexico Node  
Physical Oceanography Division  
Ocean Chemistry and Ecosystems Division

Satellite

Regional Sea Surface Temperature >

Global Sea Surface Temperature >

Ocean Color - AOML >

Ocean Color - CoastWatch >

Ocean Color Tile Server - NOAA >

GOES True Color >

Sargassum

MCI 1-day

● none

● AOML Daily MCI

Jan 18, 2021 12:00

rainbow2

color bands: linear

min/max: -0.1 0.6

opacity: cache:

Regional Acidification >

Global Altimetry >

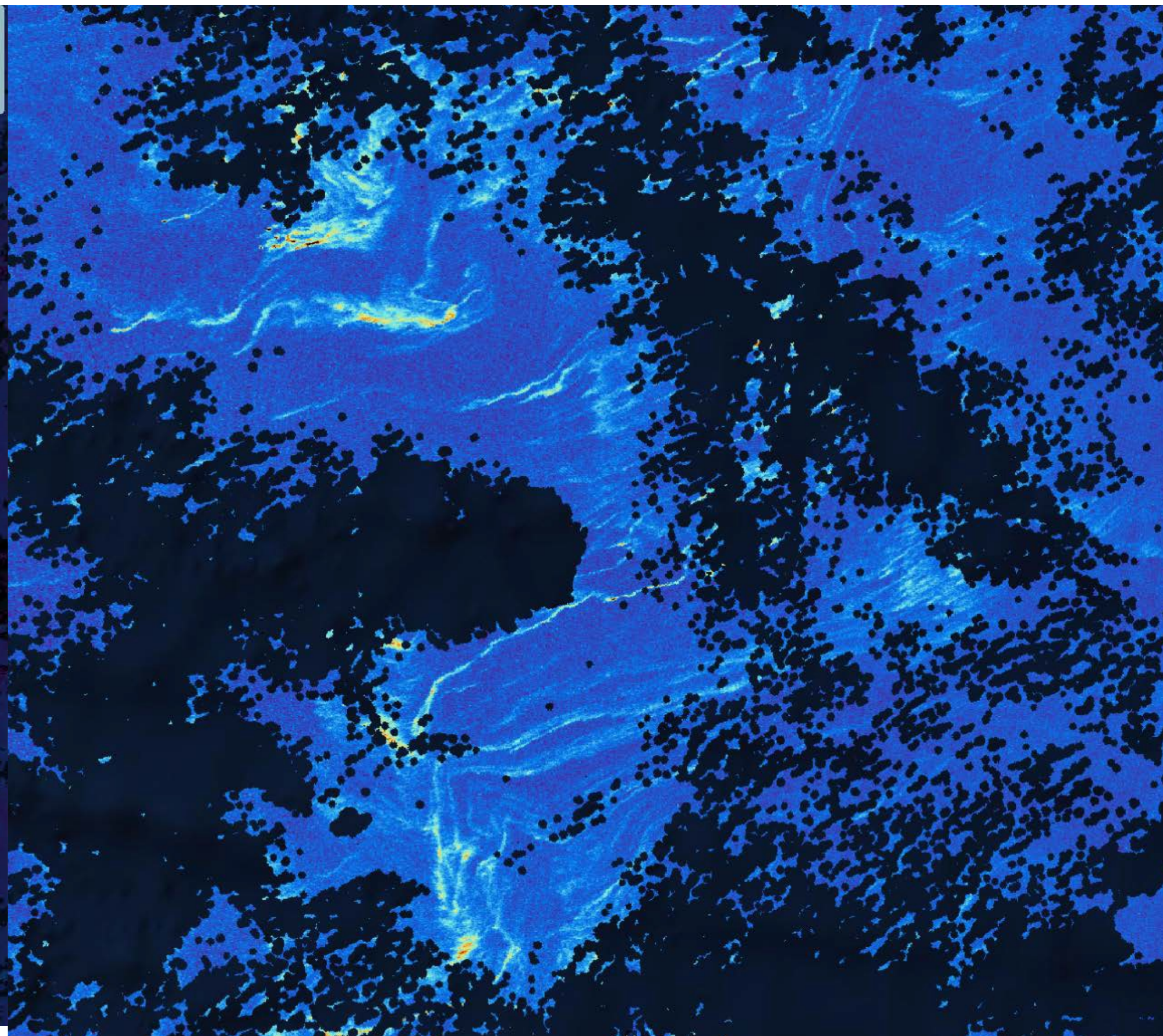
Global Carbon >

Vibrio Risk >

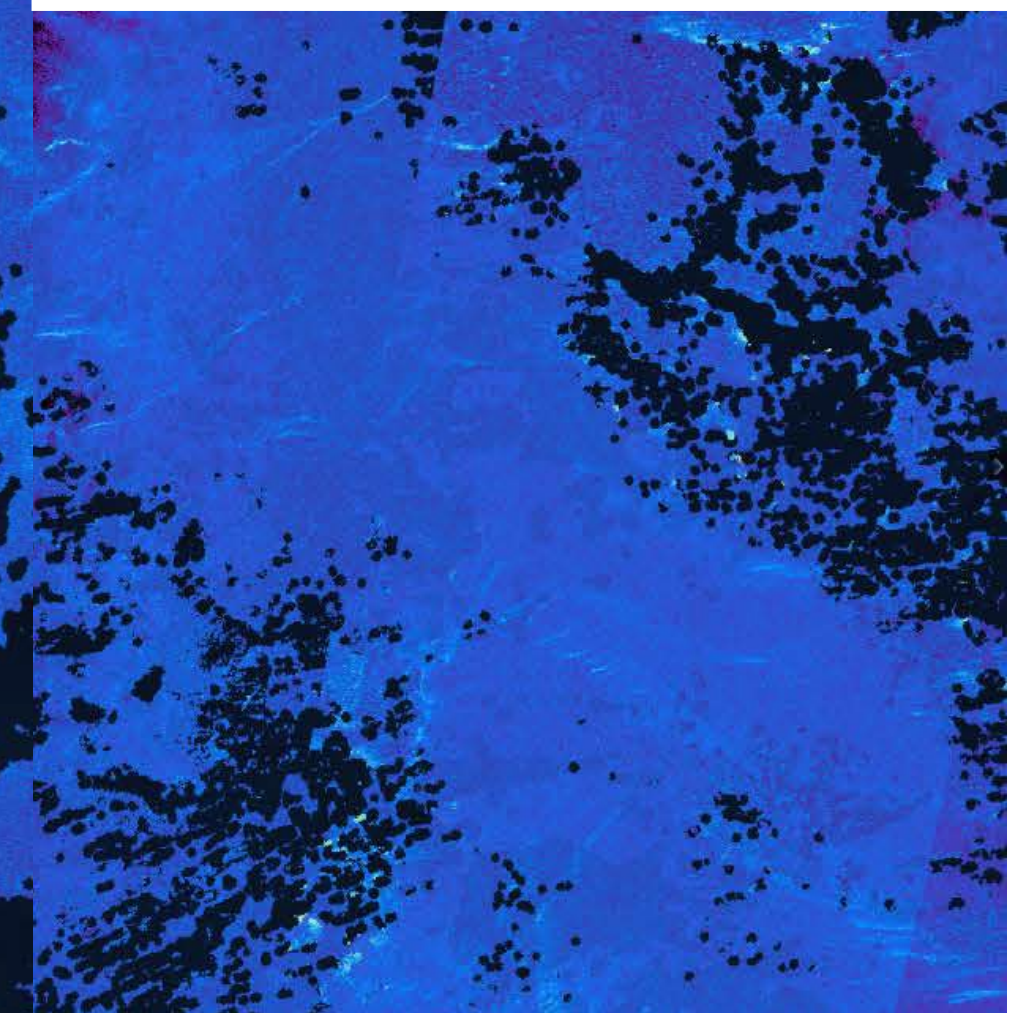
Global Seascapes >

Weather >

Hurricanes >



Tile Server  
OCEANVIEWER  
ERDDAP  
TDS



# 06 Research&Collaboration priorities

Improve *Sargassum* Inundation risk model (coastal areas)

Partnership with IOC

Trajectory modelling (in general, not only for *Sargassum*). Field experiments.

SIR (in GeoJSON) available on OceanViewer. Increase spatial coverage. Daily?

Better coverage in the coastal zone:

Ground truth (e.g. citizen science projects, beach management agencies, autonomous vehicles )

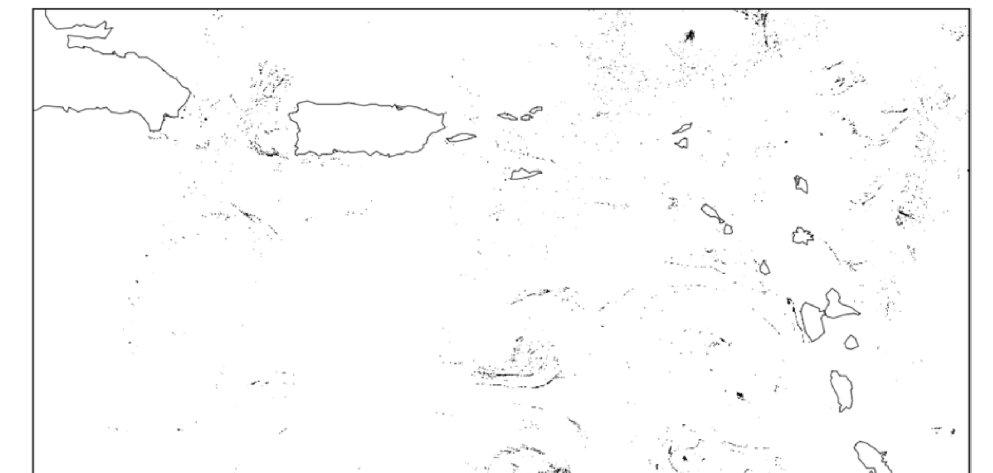
Winds, Currents (e.g. HF radars), Waves

Satellites

Enhance local and regional engagement. Training materials.

Integrate RS datasets and generating vector products (e.g. *Sargassum* detection RF, ANNs)

Adapt data distribution and visualization interfaces



# Thank you!

[Joaquin.Trinanes@noaa.gov](mailto:Joaquin.Trinanes@noaa.gov)

**Atlantic OceanWatch OceanViewer**

**Caribbean and Gulf of Mexico node**

**Hurricane OceanViewer**

**Sargassum Inundation Reports**

**Survey123**

**TDS**

**ERDDAPs**

<https://cwcgom.aoml.noaa.gov>

<https://cwcaribbean.aoml.noaa.gov>

[https://cwcgom.aoml.noaa.gov/index\\_HOV.html](https://cwcgom.aoml.noaa.gov/index_HOV.html)

[https://\[www.aoml.noaa.gov/phod/sargassum\\\_inundation\\\_report/\]\(https://www.aoml.noaa.gov/phod/sargassum\_inundation\_report/\)](https://www.aoml.noaa.gov/phod/sargassum_inundation_report/)

[https://cwcgom.aoml.noaa.gov/survey123\\_sargassum.html](https://cwcgom.aoml.noaa.gov/survey123_sargassum.html)

<https://cwcgom.aoml.noaa.gov/thredds/>

<https://oceanwatch.aoml.noaa.gov/thredds/>

<https://cwcgom.aoml.noaa.gov/erddap/>

<https://oceanwatch.aoml.noaa.gov/erddap/>