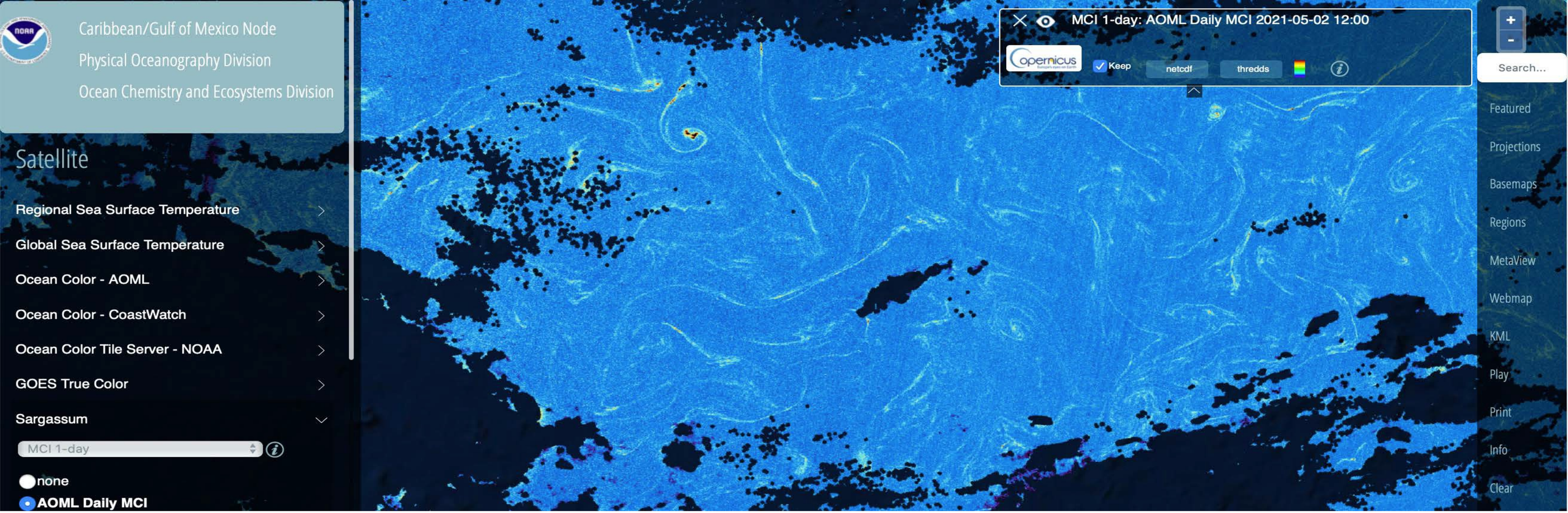
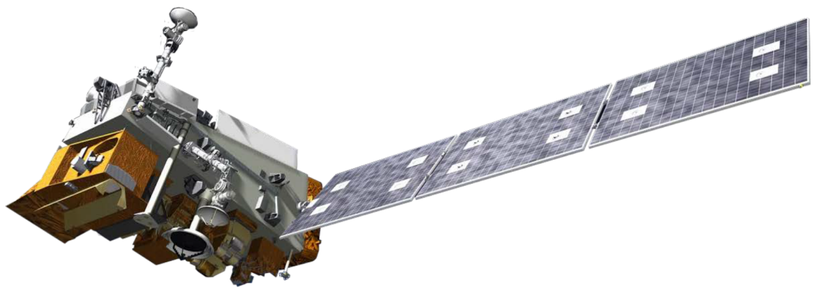
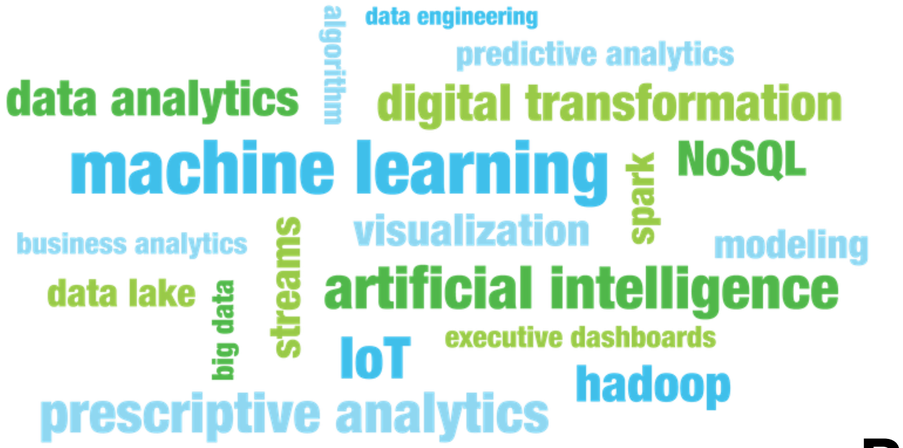


Caribbean and Gulf of Mexico Coast Watch
Atlantic Ocean

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

Joaquin Trinanes Op. Manager, NOAA/AOML





Contents

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

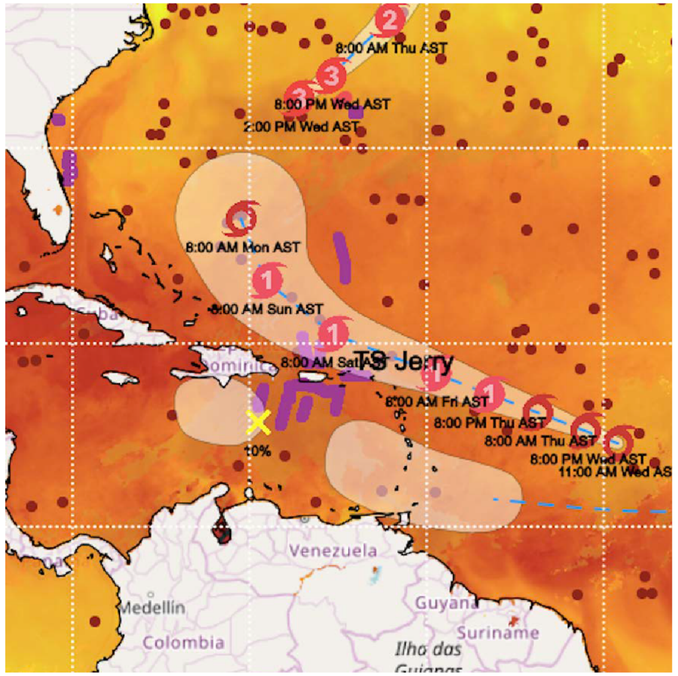
OceanWatch is an extension of CW, focusing on expanded geographical boundaries, open ocean datasets and global coverage.

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.

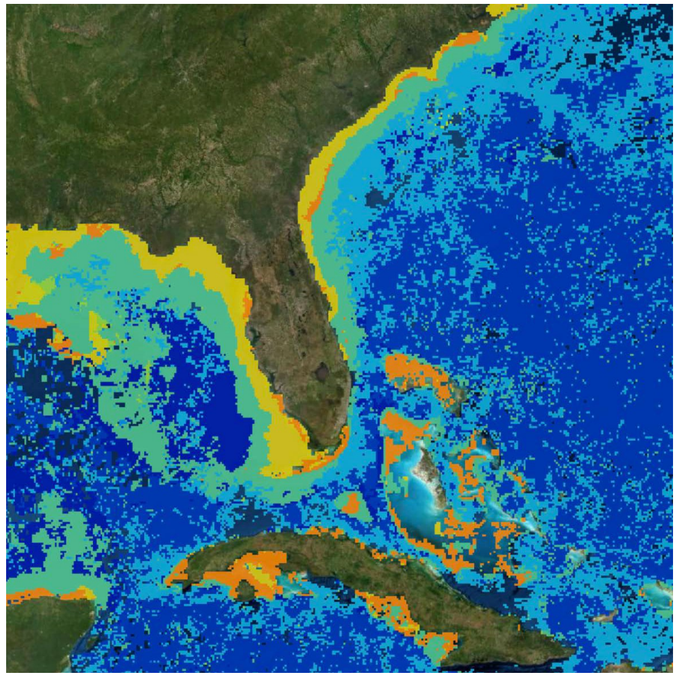
02 Applications

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, …

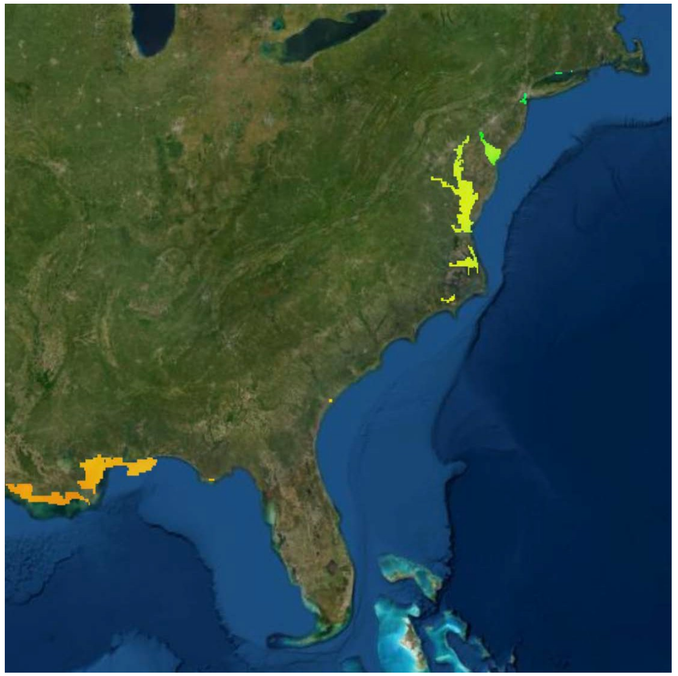
Ocean Observations Viewer
OAR,HRD, NWS, NHC, NOS, NAVO



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

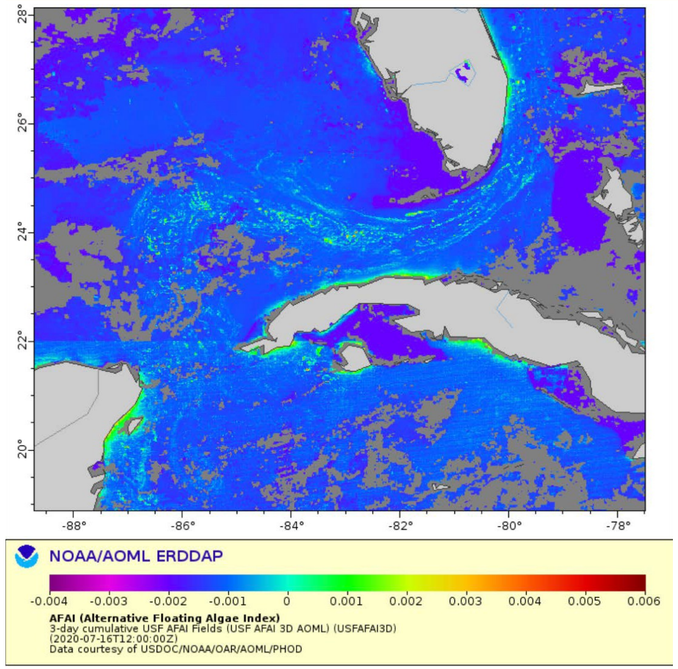
Since 2011, massive amounts of pelagic Sargassum algae began washing ashore throughout the Caribbean Sea and Gulf of Mexico

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

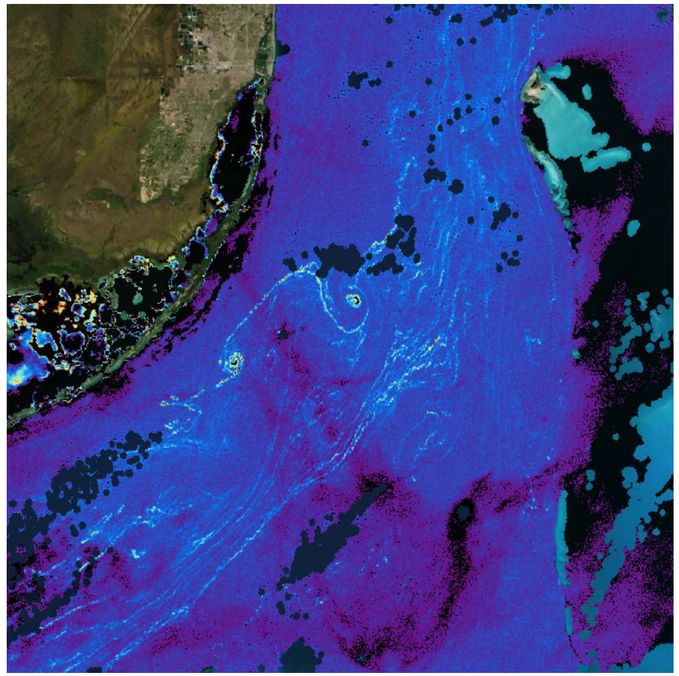
What we do? Monitor and track Sargassum. Trajectory modelling efforts. Operational.

03 *Sargassum* products

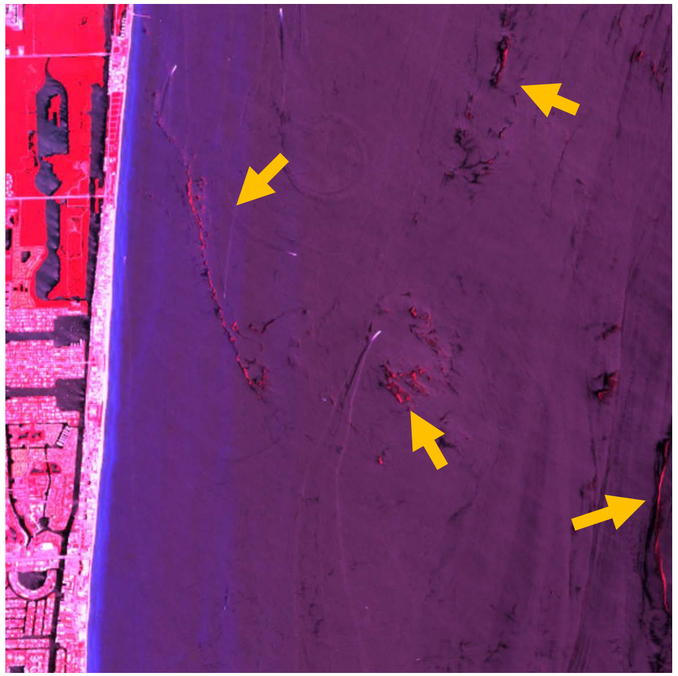
MODIS/VIIRS (source: C. Hu, USF)
Resolution: ~ 1km



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)

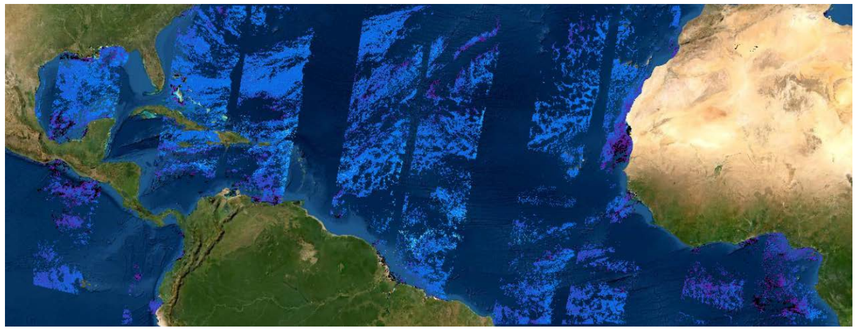
03 *Sargassum* products

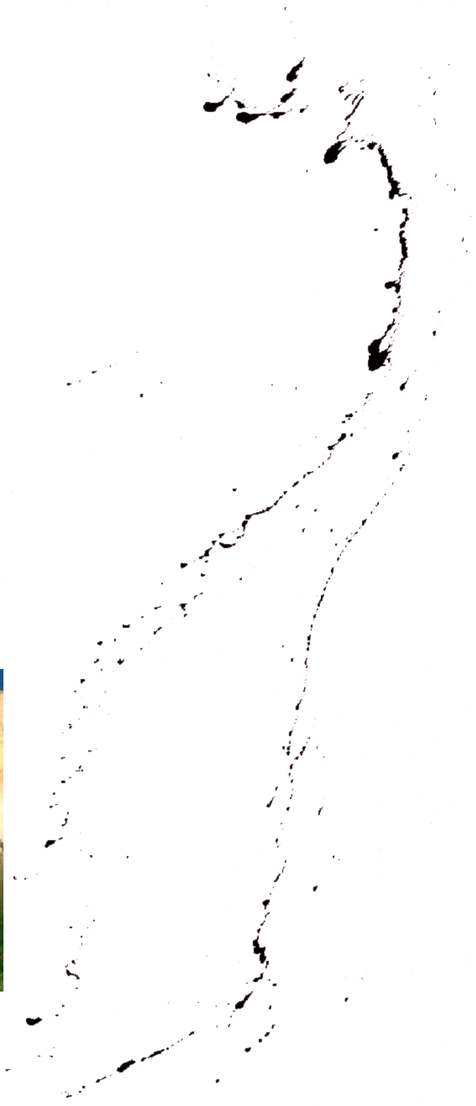
Resolution:

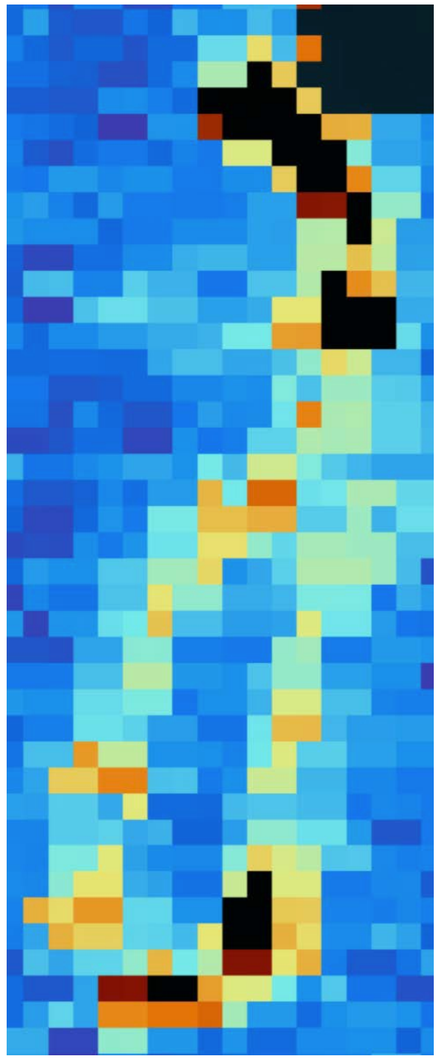
20m -> 300m (ratio:15)

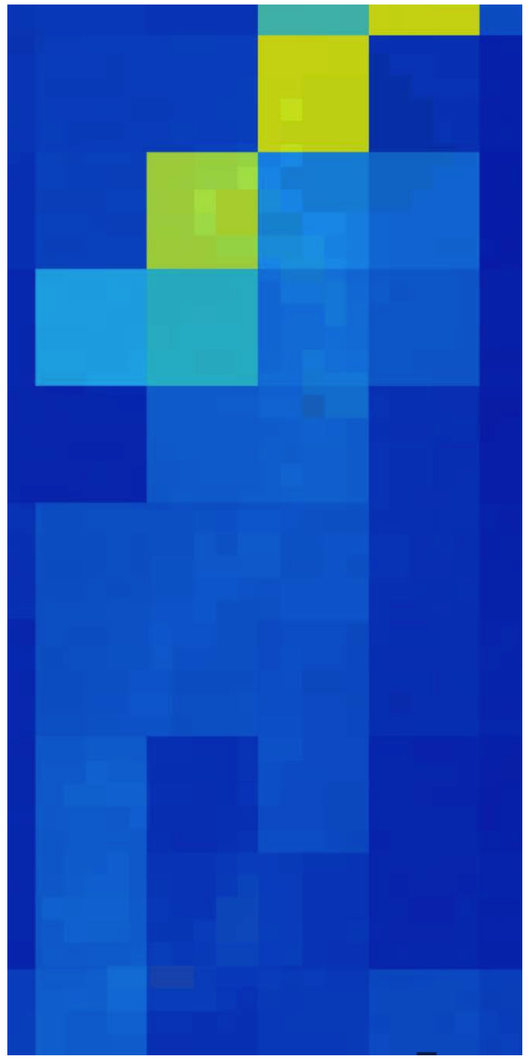
300m -> 1km (ratio:3.3)

MSI- Coastal areas





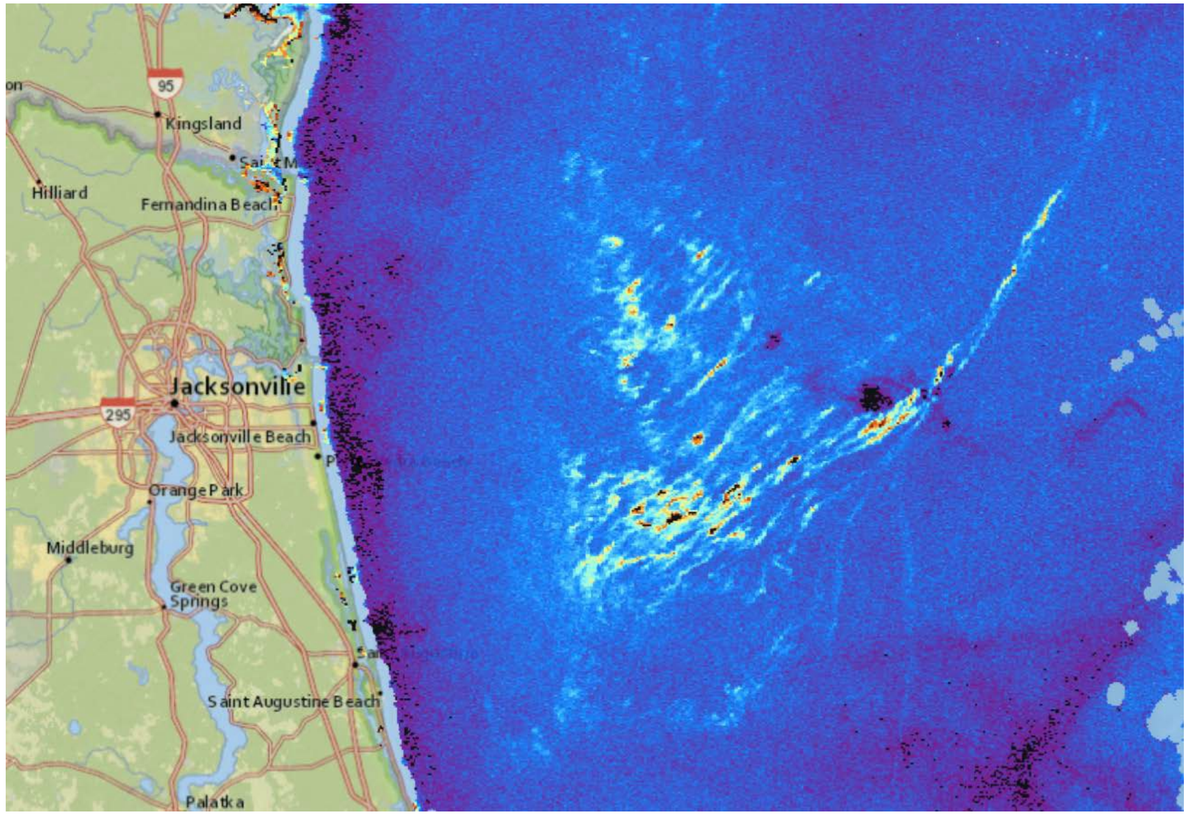




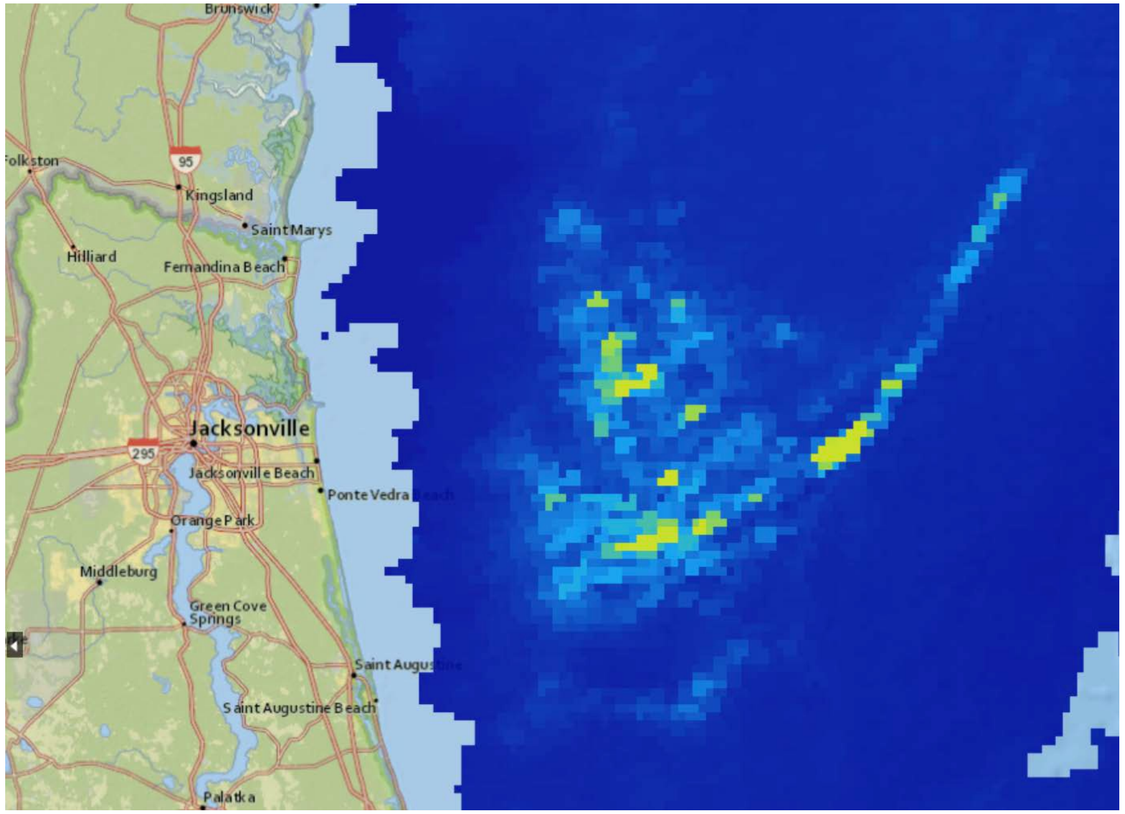
03 *Sargassum* products

Resolution:

300m



1km

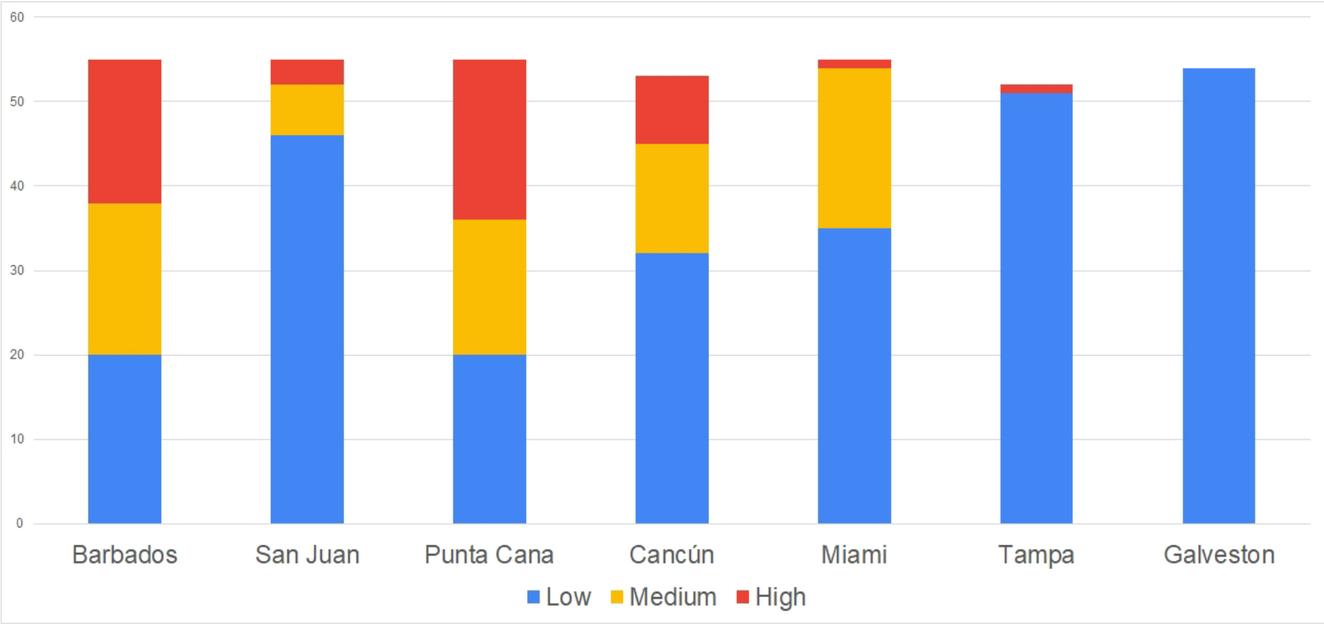


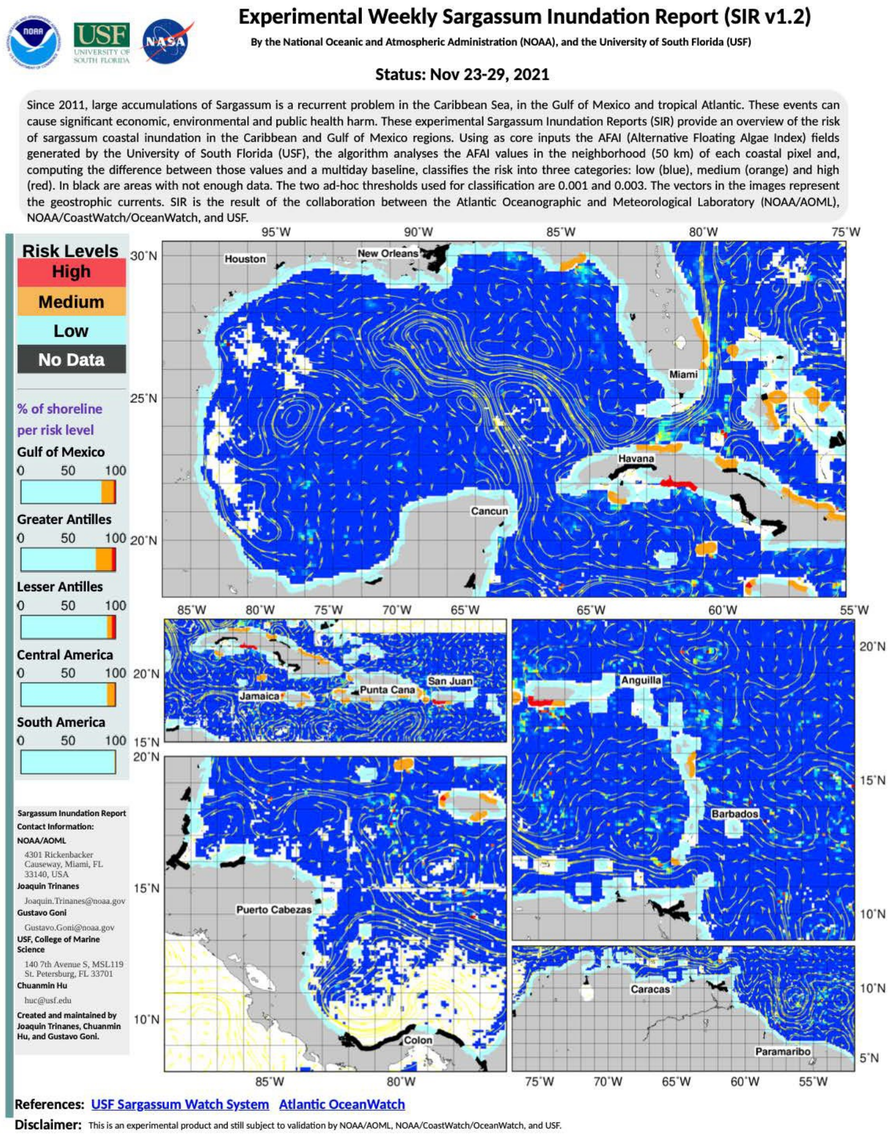
03 *Sargassum* products

SIR

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.



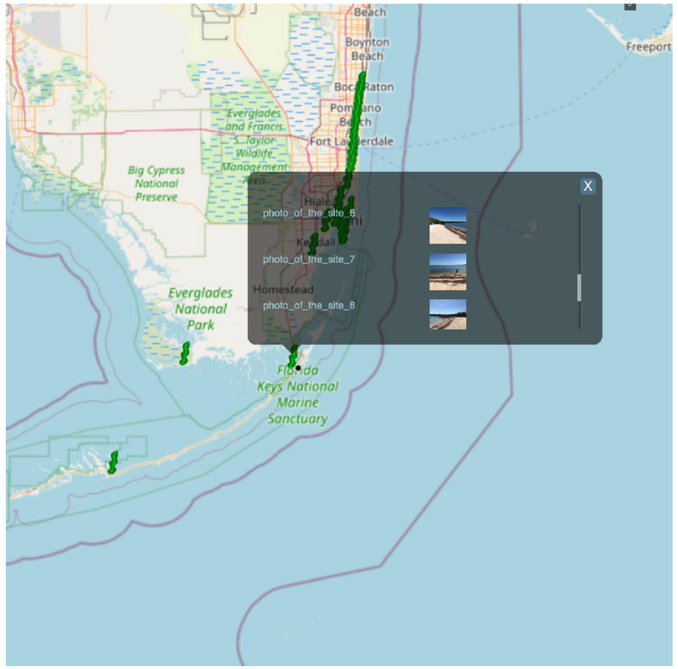


Joaquin Trinanes, N.F. Putman, G. Goni, C. Hu, M. Wang .**Monitoring pelagic Sargassum inundation potential for coastal communities**. *Journal of Operational Oceanography* **Pub Date : 2021-03-18** , *DOI: 10.1080/1755876x.2021.1902682*

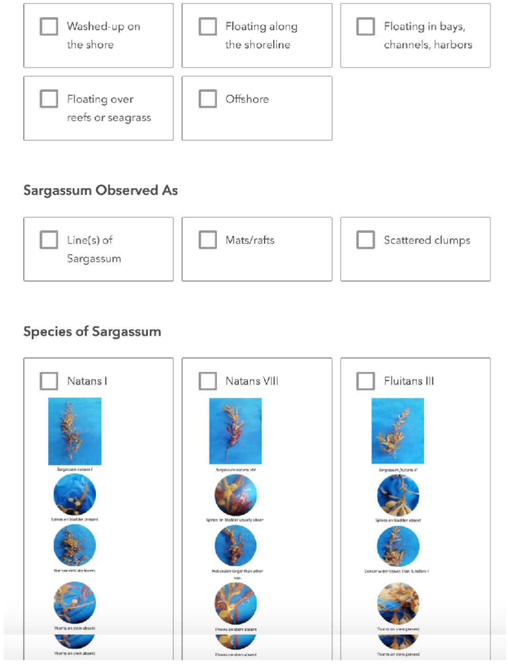
04 Beyond satellite data

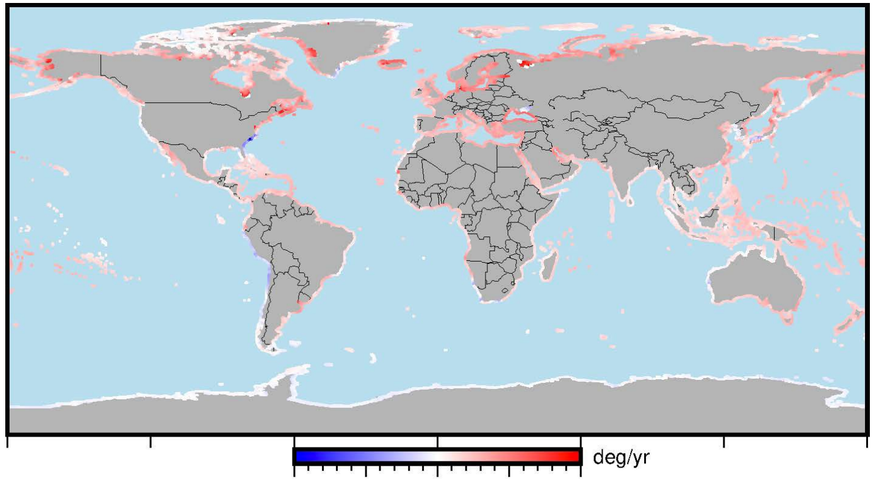
Models, analysis and overlays: OA, Fluxes, EEZs, trajectories, genomics,
In-situ: Sargassum (Integration external repositories +ESRI Survey123 form). Argo, drifter, glider, XBT, CO_2 SOOP.
Machine Learning: Partial Pressure CO2 in seawater, HABs, Sargassum detection.
Other: Visualization (Projections, basemaps, metaview, template, animations, palettes, multilayer).

Sargassum Observations
In-situ Database

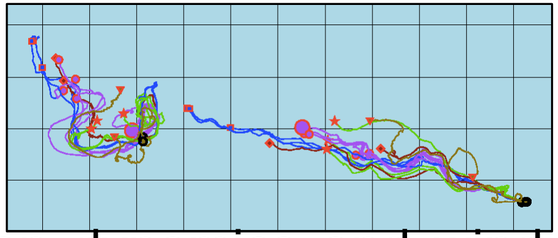


Survey123
Multidevice data collection





04 Trajectory Modelling



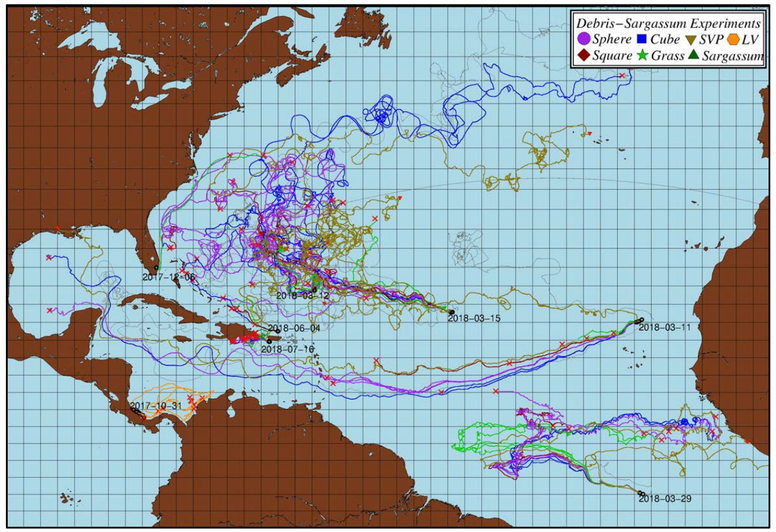
Ocean Debris Tracking

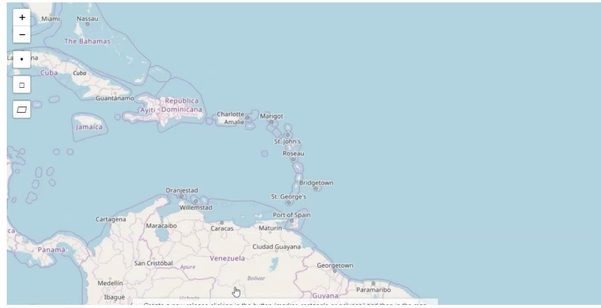
Goal: understand and assess impact of ocean dynamics and wind on sargassum (and debris in general)

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

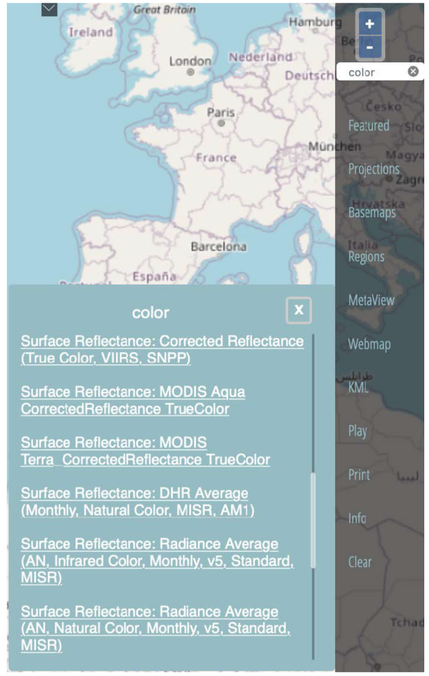




05 Data discovery, distribution, delivery

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

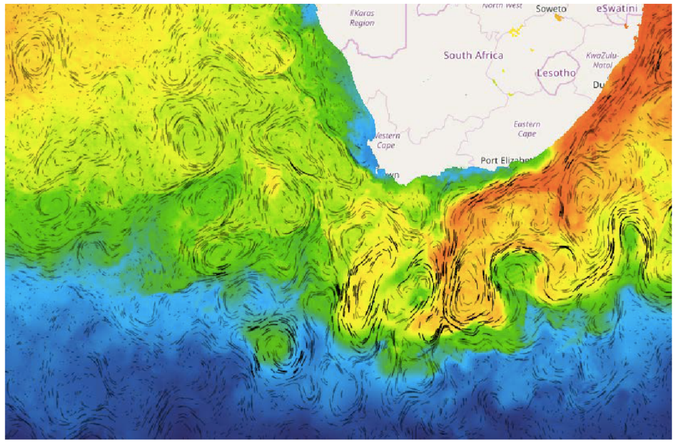
Data Discovery
Metadata search in ERDDAP/OV



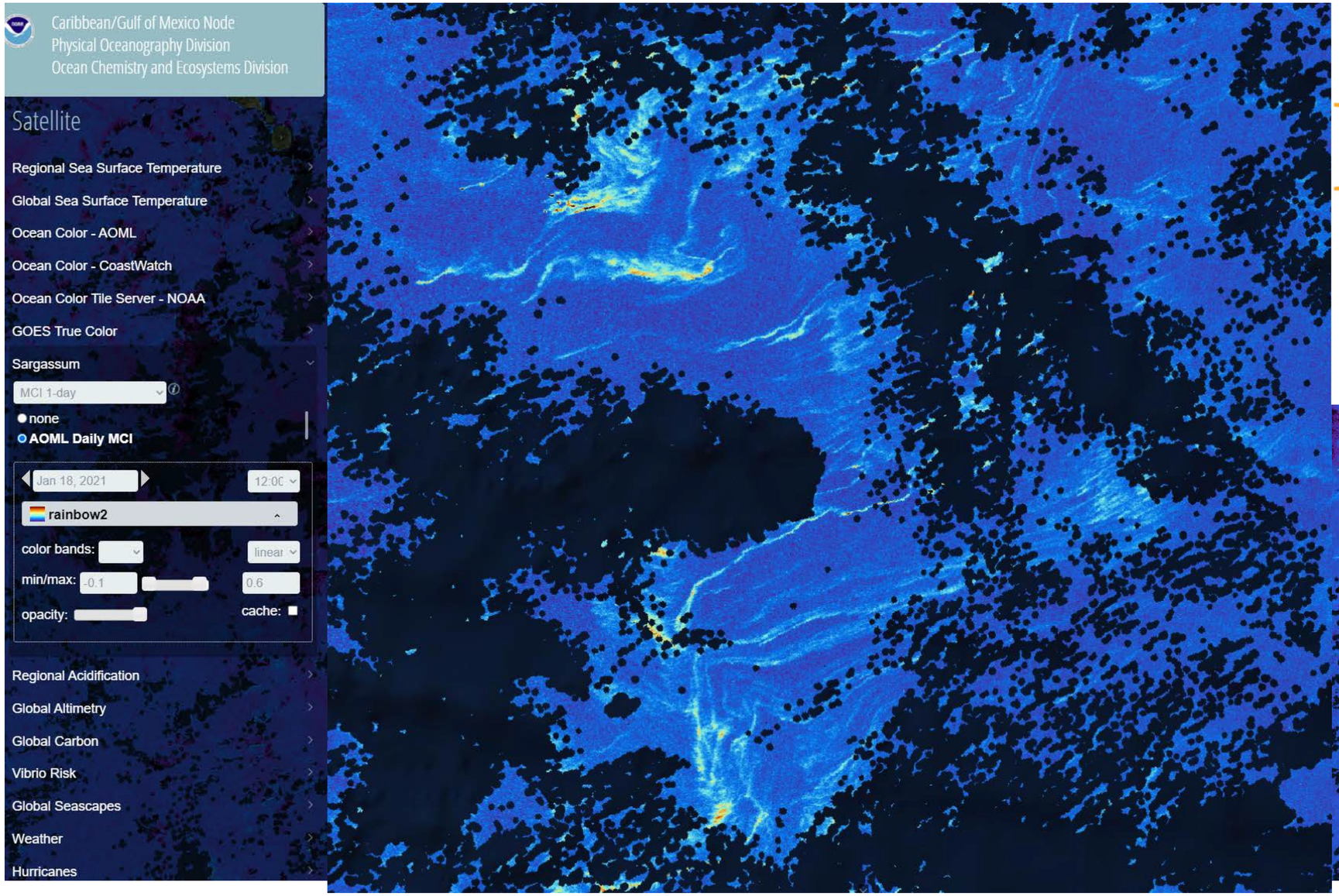
Distribution
TDS/ERDDAP/OV/Tile Server

Tile Server
OCEANVIEWER
ERDDAP
TDS

Delivery
Customized products



05 Interoperable Environment

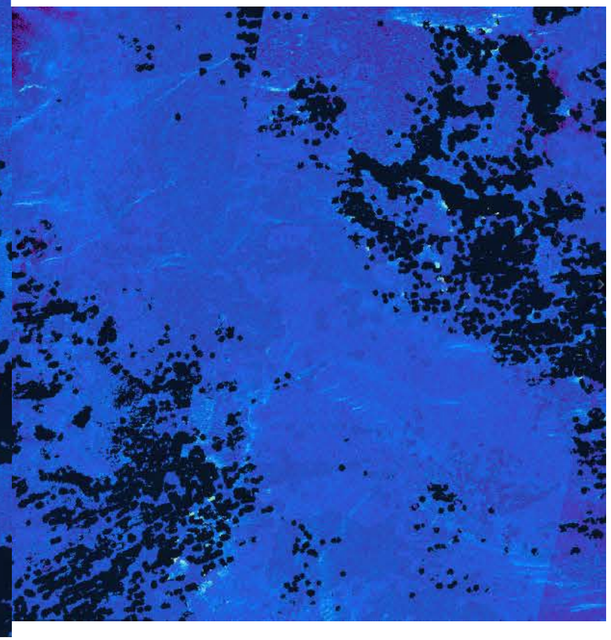


Tile Server

OCEANVIEWER

ERDDAP

TDS



06 Research&Collaboration priorities

Improve *Sargassum* Inundation risk model (coastal areas)

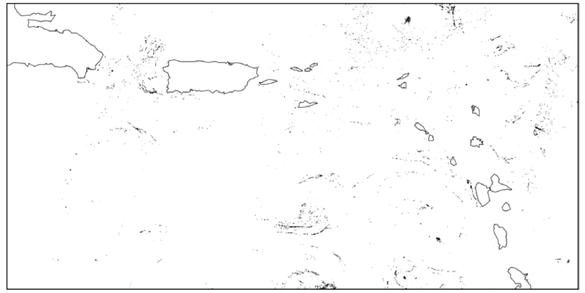
Partnership with IOC

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

Atlantic OceanWatch OceanViewer	https://cwcgom.aoml.noaa.gov
Caribbean and Gulf of Mexico node	https://cwcaribbean.aoml.noaa.gov
Hurricane OceanViewer	https://cwcgom.aoml.noaa.gov/index_HOV.html
Sargassum Inundation Reports	https://www.aoml.noaa.gov/phod/sargassum_inundation_report/
Survey123	https://cwcgom.aoml.noaa.gov/survey123_sargassum.html
TDS	https://cwcgom.aoml.noaa.gov/thredds/
	https://oceanwatch.aoml.noaa.gov/thredds/
ERDDAPs	https://cwcgom.aoml.noaa.gov/erddap/
	https://oceanwatch.aoml.noaa.gov/erddap/