Forecasts of Pelagic *Sargassum* Blooms and Transports in the Intra-Americas Sea and Tropical Atlantic: Improving a Prototype Decision-making Tool

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2799 Richmond Highway, Arlington, VA
What Sargassum?

*Sargassum* blooms in the Caribbean Sea

**An important habitat**

- Food and shade to many animals (fish, young turtles, shrimp, crab, etc.), and it also supports sand dunes and shoreline stabilization
- “Golden floating rainforest of the Atlantic Ocean” (The Sargasso Sea Alliance)
What Sargassum?

Sargassum blooms in the Caribbean Sea

A beach nuisance

- Smells bad, attracts insects,
- Smother turtle nesting sites, causing turtle and fish mortality
- Negative impact on tourism and economy
A regime shift?

No other properties show such dramatic changes

*Ulva* in the Yellow Sea

*Sargassum* in the East China Sea

*Sargassum* in the Atlantic
What caused *Sargassum* blooms in the Atlantic?

Some hypotheses, but picture not clear

The vast ocean is connected through ocean currents

![Ocean Currents Diagram](image-url)
Project goals: Improve SaWS and its operational use

Sensors and models: MODIS, VIIRS, OLI, HYCOM

Products: AFI, FAI, FAP, FAD, FAB, SSC, others

SaWS

Interactions
Email alerts

Short-term forecast (hours, days, weeks)

Long-term forecast (months)

Time-series, model development

End users: NMFS, SAFMC, FWC, SSC, Jetblue, Exxon-Mobil, CariCOOS, local agencies and groups, general public
**Achievements to date: remote sensing of biomass**

Landsat-8 OLI image

<table>
<thead>
<tr>
<th>Sensor</th>
<th>SNR</th>
<th>Detection Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODIS 1-km:</td>
<td>1000:1</td>
<td>0.2% = 2000 m²</td>
</tr>
<tr>
<td>MODIS 250m:</td>
<td>200:1</td>
<td>1% = 625 m²</td>
</tr>
<tr>
<td>L8 OLI 30m:</td>
<td>50:1</td>
<td>4% = 36 m²</td>
</tr>
</tbody>
</table>
Achievements to date: remote sensing of biomass

Field measurement, algorithm tuning, and validation

Wang et al. (2018, GRL)
Achievements to date: Publications

On the continuity of quantifying floating algae of the Central West Atlantic between MODIS and VIIRS
Mengqiu Wang & Chuanmin Hu

Remote Sensing Applications: Society and Environment
journal homepage: www.elsevier.com/locate/rsase

A simple, fast, and reliable method to predict Sargassum washing ashore in the Lesser Antilles
Jean-Philippe Maréchal, Claire Héliot, Chuanmin Hu

Geophysical Research Letters

RESEARCH LETTER
10.1002/2017GL072932

Predicting Sargassum blooms in the Caribbean Sea from MODIS observations
Mengqiu Wang and Chuanmin Hu

Geophysical Research Letters

RESEARCH LETTER
10.1029/2018GL078858

Remote Sensing of Sargassum Biomass, Nutrients, and Pigments
Mengqiu Wang, Chuanmin Hu, Jennifer Cannizzaro, David English, Xingxing Han, David Naar, Brian Lapointe, Rachel Brewton, and Frank Hernandez
Achievements to date: Publications

Wang and Hu (2017, GRL)
Achievements to date: improved online tools

1. Coverage expanded to South America and West Africa
2. Added VIIRS data products
3. Added new Floating Algae Density (FAD) product

Week of May 14 – 20, 2019
Achievements to date: user group interactions

1. Workshops: French – American Workshop on *Sargassum*, Texas, Jan 2018
   Blue growth and risk management workshop, St. Lucia, Jan 2018
2. Partnership with Sargasso Sea Commission, CariCOOS…
3. Webinars and online presentations: Feb 2019, Mar 2019
4. User group communications and interviews
5. *Sargassum* monthly bulletins – updated by end of the month since Feb 2018

Outlook of 2019 *Sargassum* blooms in the Caribbean Sea*

April 30th, 2019, by University of South Florida Optical Oceanography Lab
(mengqiu@mail.usf.edu)

Looking ahead, because the amount of *Sargassum* in the CWA in April 2019 is considerably lower than in April 2018, the amount of *Sargassum* transported from the CWA to the CS (i.e., “new” *Sargassum* to the CS) during May – June 2019 may be lower than in May - June 2018. However, this transport will still be higher than most of the previous “*Sargassum* years” during the same months. Furthermore, because
Achievements to date: user group interactions
Achievements to date: user group interactions

“Over the last six months, the National Meteorological Service has used the images as a guide in providing a weekly sargassum statement to assist in the management, clean up and awareness of the sargassum mats along the coast of Belize.”
- National Meteorological Service of Belize, April 30, 2019

“I am the developer of the sailing apps called SailGrib WR, we exchanged emails a year ago. I have been publishing a daily sargassum report for the Easter Caribbeans for the past year. As of Dec 21st, no more sat images are available either for both satellites: https://optics.marine.usf.edu/subscription/modis/C_ATLANTIC/2018/daily/
Can you confirm this is due to the US government shutdown and that the service will be back when it ends?”
- Henri Sailgrib <henri@sailgrib.com> January 3, 2019

“Greetings from CANADA! We appreciate the great work you are doing. My wife and I recently went to Punta Cana from April 9-16, 2019 & we did come across the ‘Beach Killer Algae!’ YUCK!
In planning for next winters (cold/icy/snowy/miserable up north here in Montreal, Quebec, CANADA) ‘getaway,’ what places would you recommend that do NOT receive this ‘Sea-Weed’ on its beaches? During research on this subject, I see that it travels in a pattern in the Caribbean Sea. Thanks again for your great work-research. Yours truly”
- Ian & Diane (Stewart), May 7, 2019
So what?
Biogeochemistry, ecology, environment, economy

House made of *Sargassum* bricks

So what?
Biogeochemistry, ecology, environment, economy

Eco-shoes made with *Sargassum* and plastic bottles

Summary

• A prototype SaWS has been improved, based on research and in response to user needs
• Coverage extended, VIIRS added
• New product of Floating Algae Density added
• User groups expanded (governmental agencies, environmental groups, private industry, citizens…)

What’s next?
• Incorporation of high-resolution sensors
• Seek sustainable funding support through partnerships