HARNESSING PACE SATELLITE DATA TO PROTECT PUERTO RICO'S COASTS

A COMMUNITY-DRIVEN APPROACH TO SARGASSUM MONITORING

Jamon Jordan
College of Earth, Ocean, and Atmospheric Sciences Marine Resource Management Program

INTRODUCTION

My favorite part of my time in Puerto Rico was the beautiful coastline. I especially enjoyed our time at La Playuela Beach near Cabo Rojo. The white sandy beaches and turquoise waters attract tourists and locals alike. However, there is a major nuisance in the form of Sargassum spp., a brown seaweed. It has been accumulating in thick mats making it difficult to wade in the water, increasing turbidity, and results in an unpleasant odor. While the presence of Sargassum in the Caribbean is natural, the increase in frequency and volume on the coast in recent years has increased likely due to climate change. Current Sargassum removal is labor-intensive and costly, and alternative uses for this seaweed are still under development.

This project explores the potential of satellite remote sensing to improve Sargassum monitoring and forecasting in Puerto Rico. By leveraging data from Sentinel-2 and the newly launched PACE satellite, we can provide valuable information for beachgoers and resource managers, allowing them to anticipate Sargassum events and allocate cleanup efforts more effectively.

Figure 1. Picture of me at La Playuela Beach

IDEAS

Project 1: Collaboration with scientists from NOAA and University of Puerto Rico Mayaguez Geological and Environmental Remote Sensing Lab analyzing PACE data for Sargassum signatures.

Project 2: Working with oceanographers/meteorologists to incorporate Sargassum tracking data into existing forecasting models.

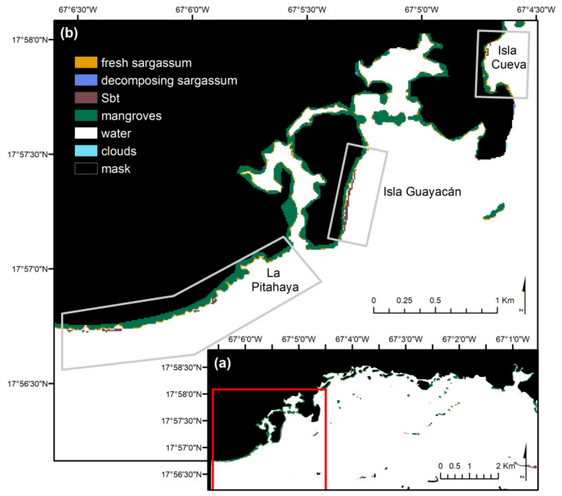

Figure 3. Map of classification of Sargassum spp, and other coastal habitat using satellite remote sensing data. This is from a study by León-Pérez et al., and it shows an example of how remote sensing is already being used in the region.

COMMUNITY INVOLVEMENT

Citizen Science Initiatives: Train volunteers to do beach surveys, ground-truth satellite data.

Workshops to educate the community on identifying Sargassum, reporting sightings, and accessing the information platform

Teach youth valuable skills in obtaining, processing, and analyzing data from PACE

Figure 4. Image of Sargassum spp. mats on beach. This is an example from a study by Putman et al. showing how citizen science can be used to gather location data for mats and condition of decay

CONCLUSIONS & REFLECTION

While the threat of the implications of climate change continue to be broad and encompassing, it also presents opportunities to foster values of resilience within communities. The newly launched PACE satellite presents opportunities for Puerto Rico's youth to engage in cutting-edge science that not only has a positive community impact, but also equips them with valuable transferable STEM skills in coding, data analysis, and statistics.

This project can further unite the community by fostering a deeper understanding of Sargassum patterns and the natural systems at play. Increased awareness of climate change's impact on our beaches can inspire a sense of environmental stewardship. Prior to this trip, I expected the coasts of Puerto Rico to be more degraded due to the tourism, but I was pleasantly surprised to see how pristine the coastlines are. It makes me excited to for the opportunity to bring community together and leverage the best tools available to foster a more intimate relationship between the people of Puerto Rico and the sea.

Figure 5. Cabo Rojo Lighthouse

PROJECT OBJECTIVES

Objective 1: Utilize PACE satellite's hyperspectral imaging to improve classification of mats and measure density.

Objective 2: Develop accurate Sargassum forecasting models integrating PACE data, ocean currents, and weather patterns.

Objective 3: Create a public-facing data platform/app to share real-time Sargassum information with coastal communities.

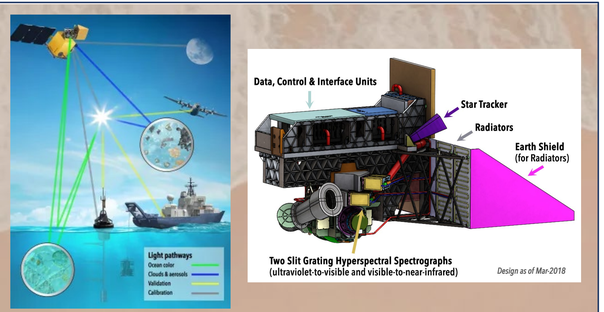

Figure 2. Courtesy of NASA Goddard Space and Flight Center

OUTLOOK

Education: Increased public understanding of HABs, ocean health.

Career: Potential for job growth in marine science, data analysis sectors in Puerto Rico.

Future Objectives: Expanding the project to other Caribbean islands.

SOURCES

León-Pérez, M. C., Reisinger, A. S., & Gibeaut, J. C. (2023). Spatial-temporal dynamics of decaying stages of pelagic Sargassum spp. along shorelines in Puerto Rico using Google Earth Engine. *Marine Pollution Bulletin*, 188, 114715. https://doi.org/10.1016/j.marpolbul.2023.114715

Putman, N. F., Beyea, R. T., Iporac, L. A. R., Triñanes, J., Ackerman, E. G., Olascoaga, M. J., Appendini, C. M., Arriaga, J., Collado-Vides, L., Lumpkin, R., Hu, C., & Goni, G. (2023). Improving satellite monitoring of coastal inundations of pelagic Sargassum algae with wind and citizen science data. Aquatic Botany, 188, 103672. https://doi.org/10.1016/j.aquabot.2023.103672

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to the CAS Global Experience Fund, USDA NIFA, PreCollege Programs, and Sea Grant for their generous support. I am also grateful to the Biological and Resource Research Center at Oregon State University for providing travel assistance to and from the airport, as well as for the Enterprise rental. I am deeply appreciative of the kindness and hospitality extended to me by Universidad Interamericana de Puerto Rico - Recinto de Barranquitas. Finally, I would like to thank MSI/Marine and Coastal Opportunities for providing financial support for my travel to Puerto Rico.

SACNAS USDA NIFA Sea Grant GLOBAL EXPERIENCE FUND Oregon State University