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Understanding & predicting changes in the tropical Atlantic

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CSaP Annual Conference 2019, The Royal Society

Emerging technologies for public policy

Seminar 3: Impact of climate change on marine systems

26 June 2019

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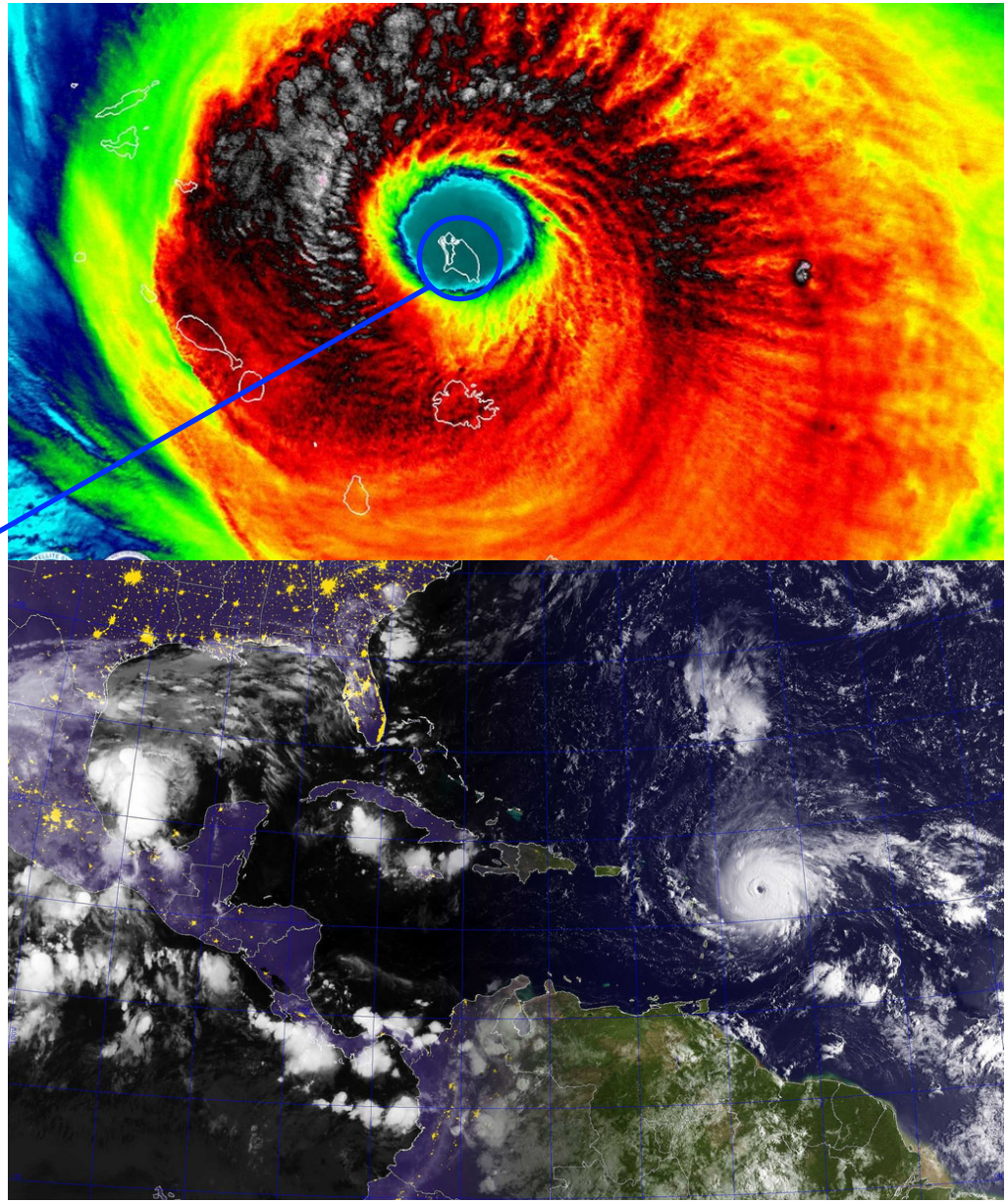
Selected themes:

- **Hurricanes** & ecosystem damage
- Climate change/variability & **Sargassum**
- Ocean currents & **Connectivity**
- **Predicting** change
- Focus on the tropics

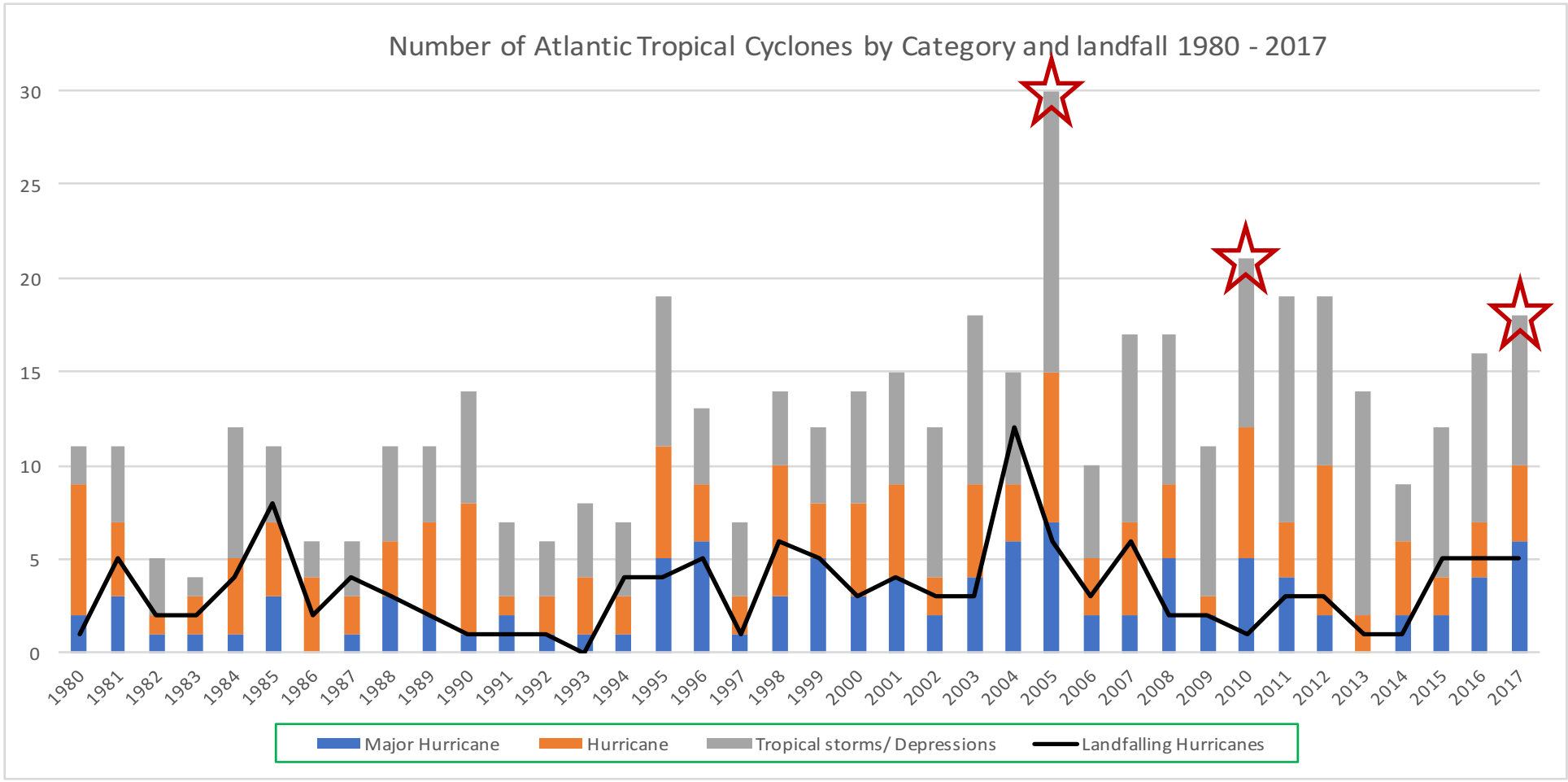
(although marine systems are changing worldwide)

Research Story 1 - The 2017 Atlantic hurricane season

- Hurricane Irma - Category 5 hurricane
- Landfall from Caribbean to the US
- First impact in Barbuda, 6 Sept 2017



Atlantic Hurricanes since 1980 (data from http://www.aoml.noaa.gov/hrd/hurdat/Data_Storm.html)

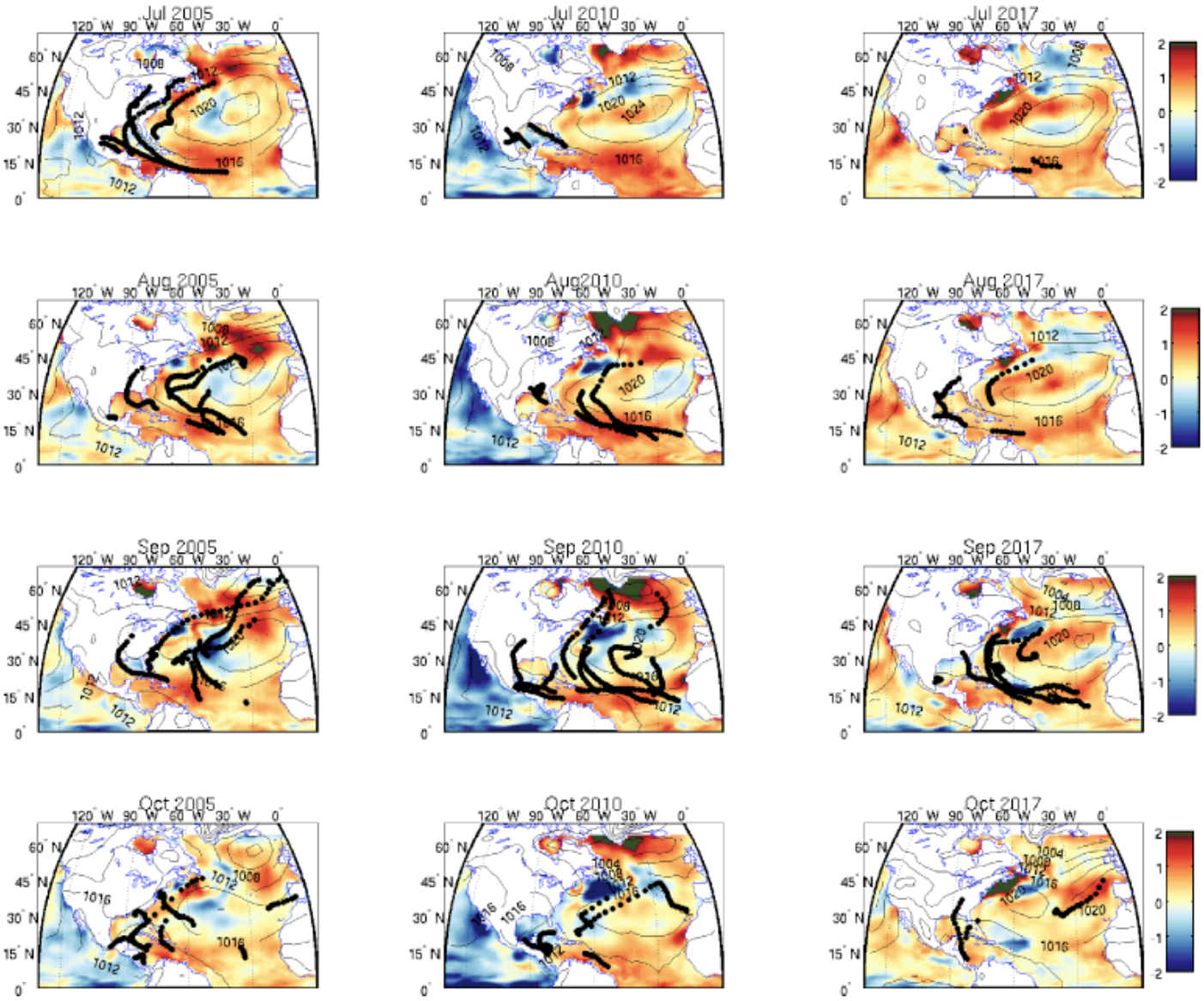


We examined the oceanic circumstances around Atlantic Hurricanes in 2005, 2010 & 2017

Note the coincidence of hurricane tracks and anomalous surface warmth

Ocean warming of 2017 involved unusual ocean conditions over the eastern tropics during April, quite different from 2005 & 2010

Hallam et al. (2019) *Nature Communications*



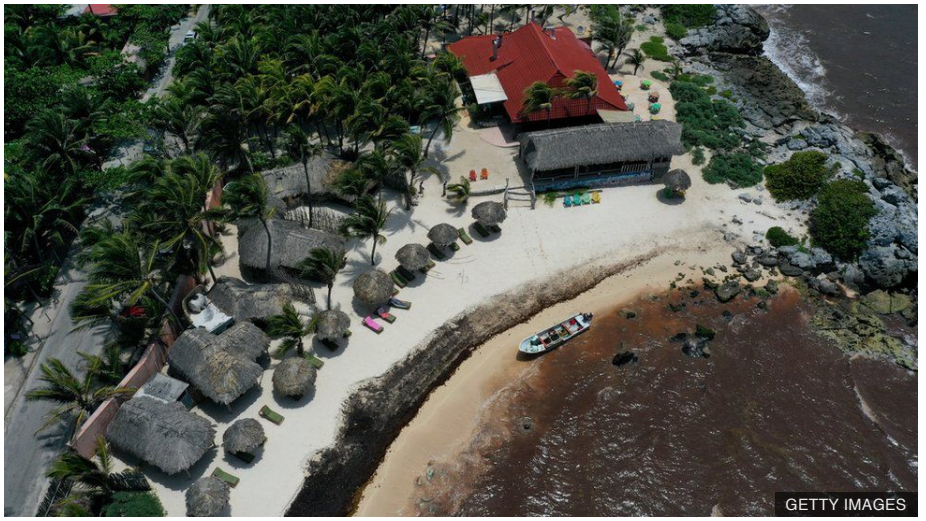
Research Story 2 - The Sargassum Crisis in the Carribean (and beyond)

Sargassum adrift in the Atlantic. Photo: Victoria J. Coles, U. Maryland

BBC NEWS

Mexico's top Caribbean beaches hit by seaweed infestation

2 hours ago

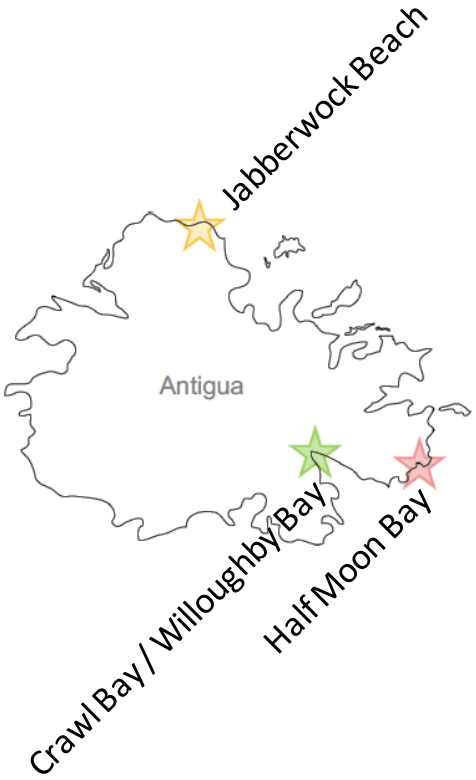


An infestation of a seaweed-like algae along some of Mexico's most visited Caribbean beaches has pitted the local community against the president, who has described the problem as a "minor issue".

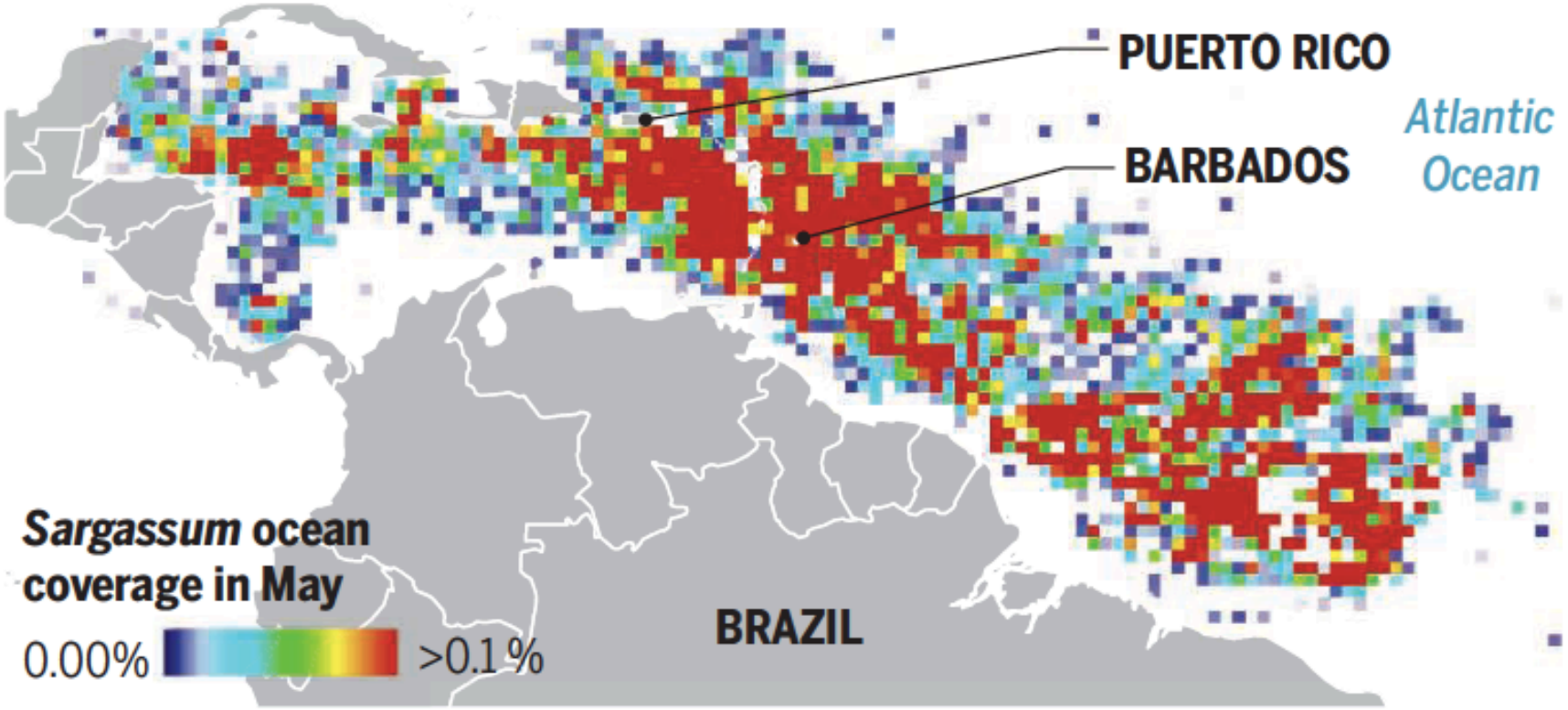
In a long-running issue attributed by many researchers to climate change, sargassum has covered the popular white sandbanks, turning the pristine waters brown and leaving a strong odour as it decomposes, alarming residents, businesses and, obviously, tourists.

https://www.bbc.co.uk/news/world-latin-america-48756500

	June, 2018	July, 2018	August, 2018	September, 2018
Jabberwock				
Half Moon Bay				
Crawl Bay				
Willoughby Bay				

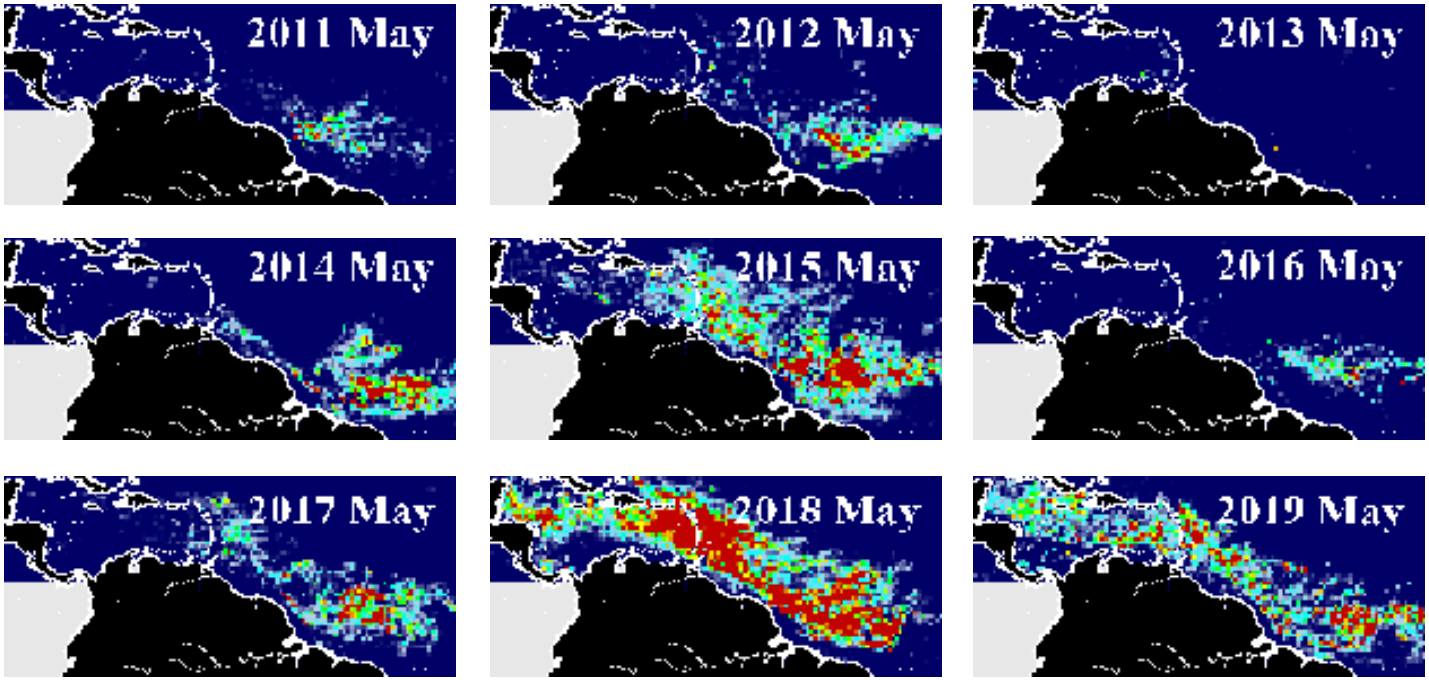


Photos courtesy of Greg Scott (1), Nicole George (2), Martha Gilkes (3), Mar Burbidge (4), Andy Scholl (5), Ellie Wyatt (6)



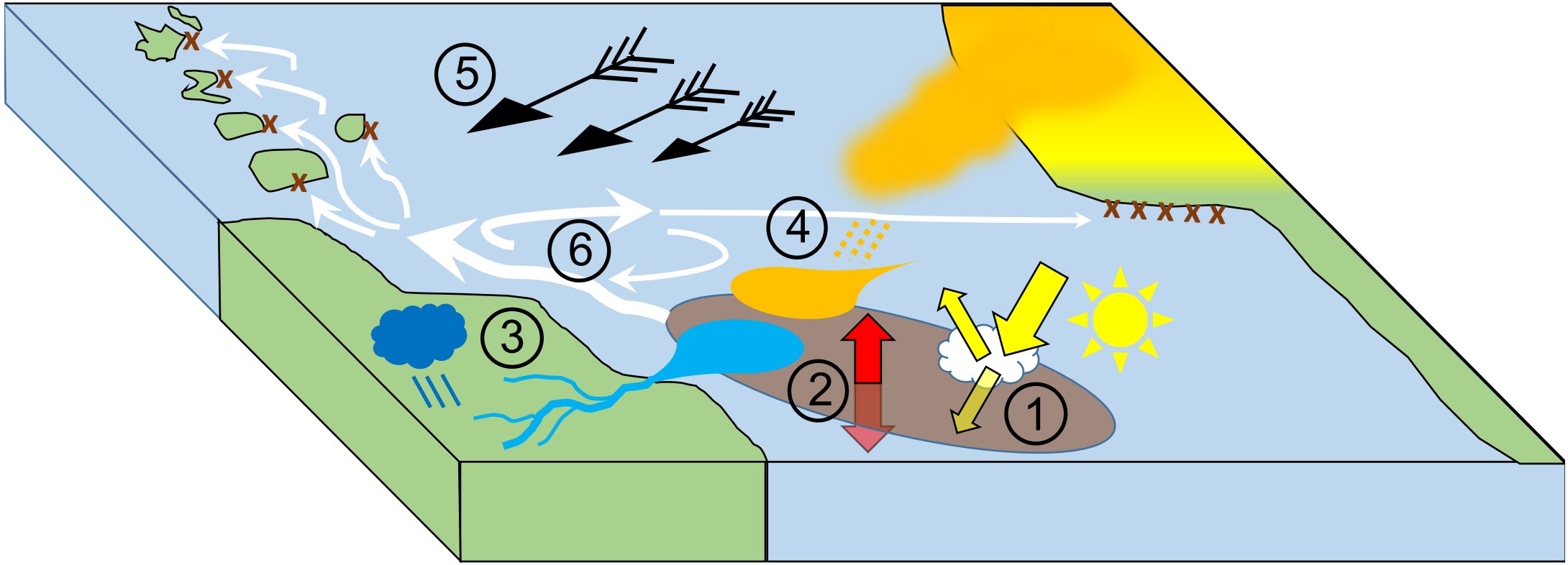
Langin, K. (2018) Seaweed masses assault Caribbean islands, *Science* 360 (6394), 1157-1158

Satellite-based Sargassum Watch System (SaWS)



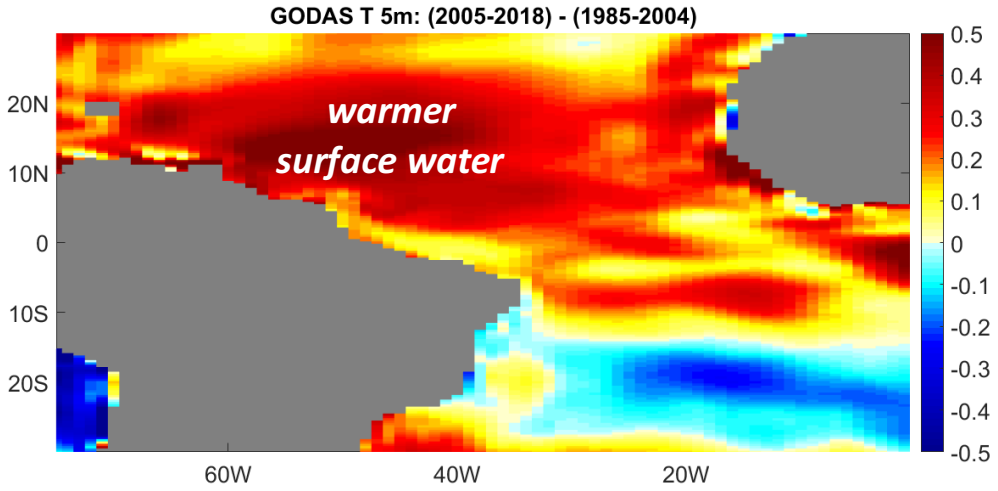
https://optics.marine.usf.edu/projects/saws.html

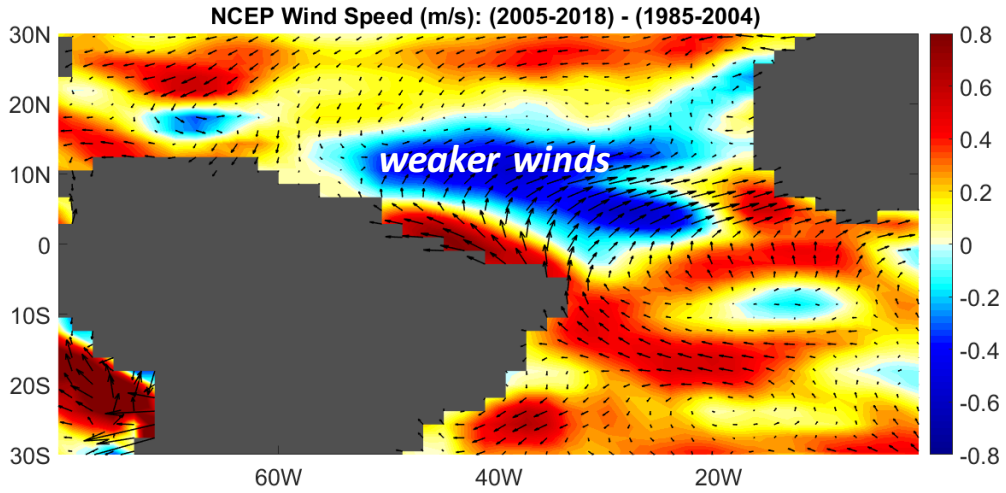
Why has *Sargassum* proliferated across the tropical Atlantic since 2011?

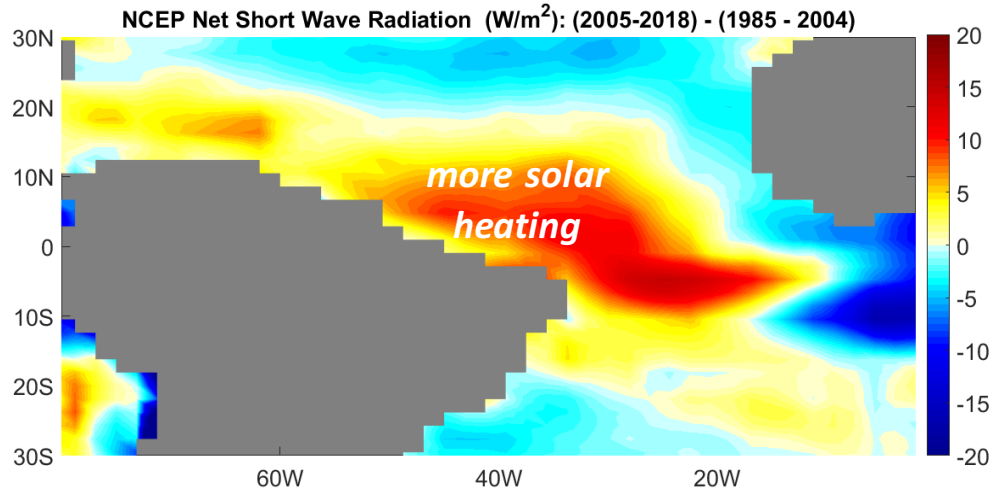


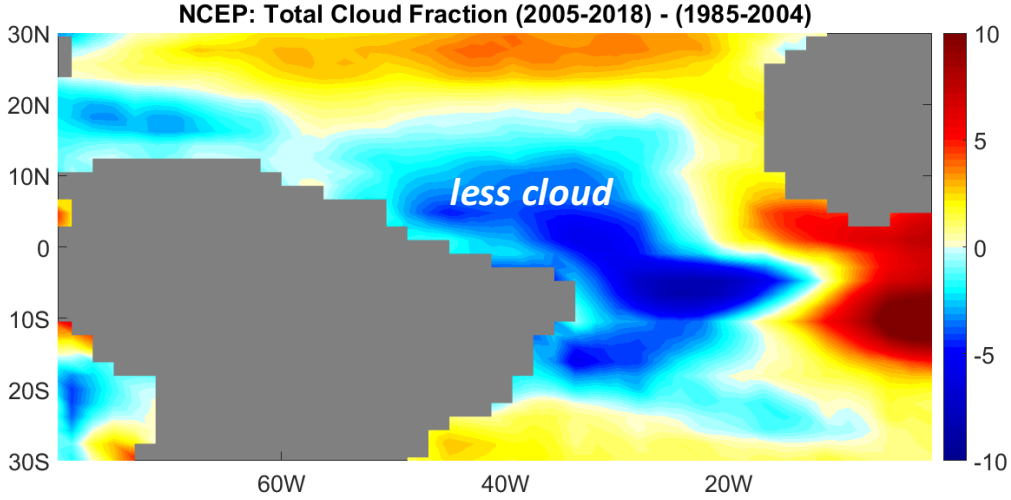
(1) changing light conditions (clouds)
(2) changing stratification (heat exchange)
(3) changes in runoff (macronutrients)
(4) changes in dust fluxes (micronutrients)
(5) changing winds and surface drift
(6) changes in large-scale ocean currents

Recent climate change (variability) in the equatorial North Atlantic 2005-2018 minus 1985-2004









Marsh & Skliris, in prep.

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Points for Discussion?

- **Hurricane seasons** are changing in intensity & character
- Ecosystems suddenly change basin-wide - e.g. **Sargassum**
- We are not sure why!
- Ocean currents **connect** coastal environments separated by an ocean, on timescales of months-years
- **Predicting** change and natural cycles on a range of timescales (seasons to decades) continues to improve
- The tropics are uniquely vulnerable to **extremes** of heat, storms and sea level rise (reefs, low-lying SIDs)