Facing the threat of Sargassum seaweed

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Center for Fisheries Research & Development
Gulf Coast Research Laboratory

Symposium: Challenges, dialogue & cooperation towards Sustainability of the Caribbean Sea

Association of Caribbean States (ACS)
The Caribbean Sea Commission (CSC)
Port of Spain, Trinidad and Tobago
23-24 November 2015

Sargassum influx

- What is the current state?
- Will it continue?
- How are we coping?
- The way forward

Current state:
what is sargassum?

- Free-floating brown seaweed (2 species)
- Can form large floating mats or long windrows of weed
- Can accumulate over huge areas where ocean currents form loops or rotating gyres

Current state:
what is sargassum?

- Free-floating brown seaweed (2 species)
- Can form large floating mats or long windrows of weed
- Can accumulate over huge areas where ocean currents form loops or rotating gyres
- High ecological significance in nutrient poor open ocean
- Temporally variable biomass (depends on nutrients, water temperature and recirculating currents)

Current state:
what is sargassum?

- On shore it also has value:
  - Foraging ground for shore birds
  - Binds sand and dunes
  - Fertilizes shore plants

Current state:
Negative impacts

- Inundating shorelines
  - Covering beaches
  - Discoloring nearshore water
  - Pungent odor /corrosive (H_2S)
- Threatening coastal ecosystem
  - Smothering coral reefs, seagrass beds, mangroves
  - Using up O_2
  - Nutrient overload

Current state:
Negative impacts

- Threatening endangered species
  - Turtles trapped and drowned
  - Nesting beaches unsuitable
  - Hatchlings trapped
- Challenges for fisheries
  - Difficult access
  - Clogged propellers and intakes
  - Fishing gear becomes ineffective
  - Increased vulnerability of juveniles


Barbados Sea Turtle Project

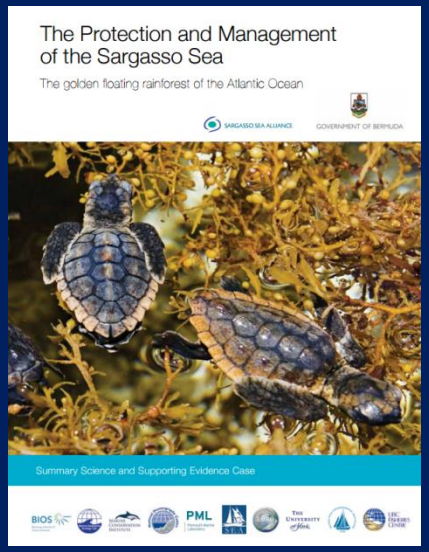

Farley Augustine

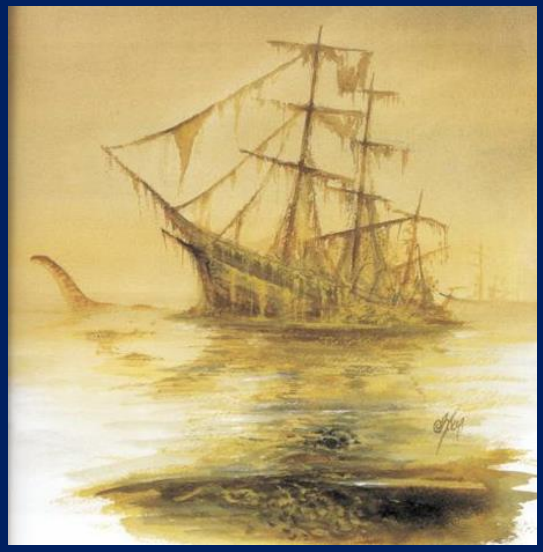

Amy Cox


Kyle Harris

Current state:
where is it found?

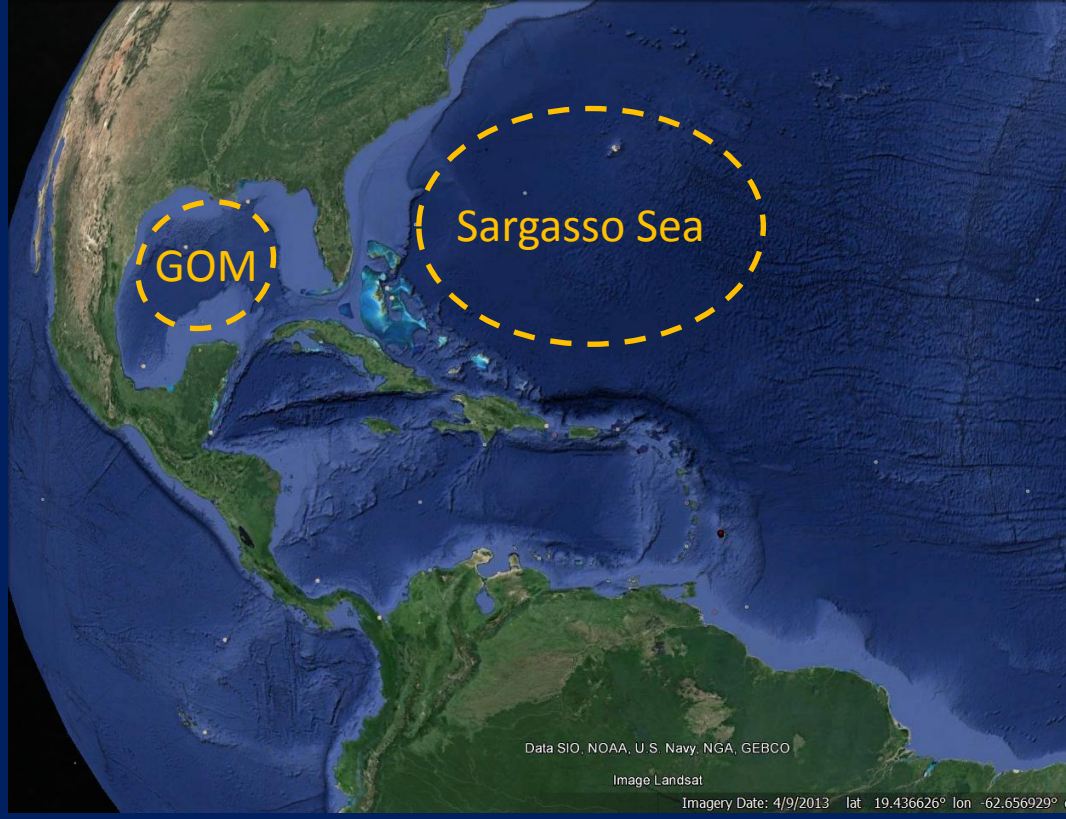
- Best known from the Sargasso Sea





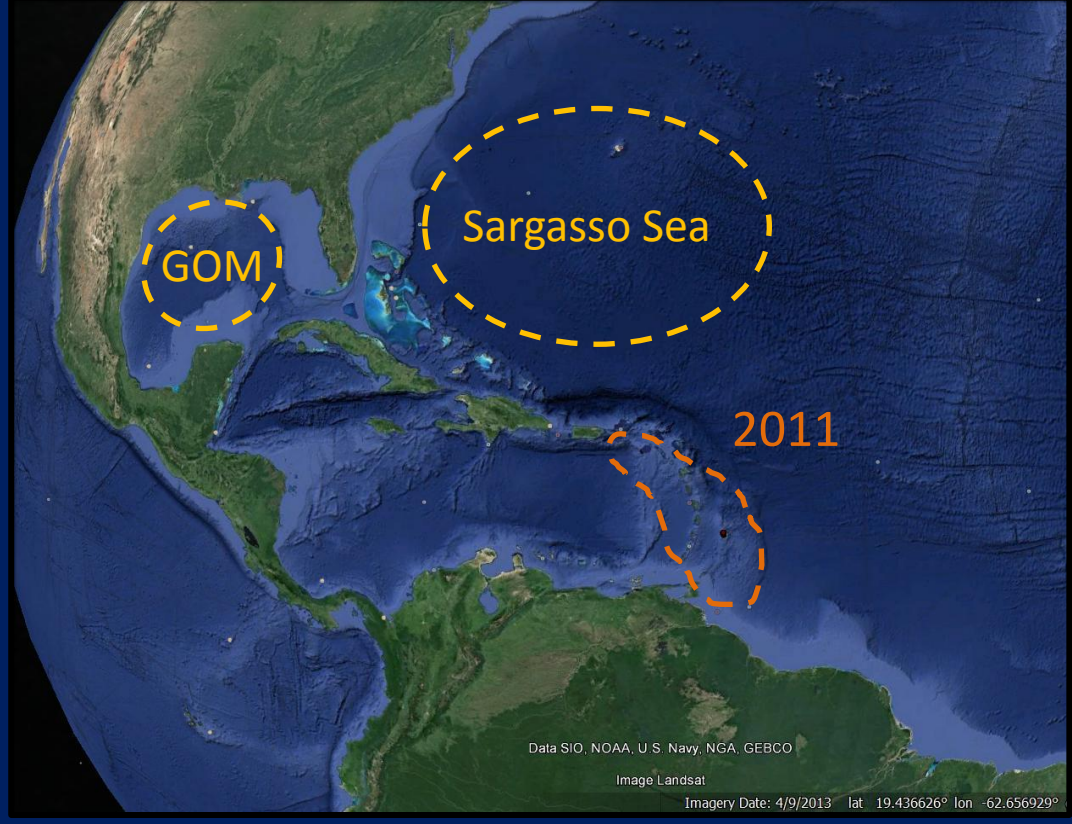
Current state:
where is it found?

- Best known from the Sargasso Sea
- Also well known from the Gulf of Mexico



Current state:
where is it found?

- Since 2011 have been massive influxes into the Caribbean Sea



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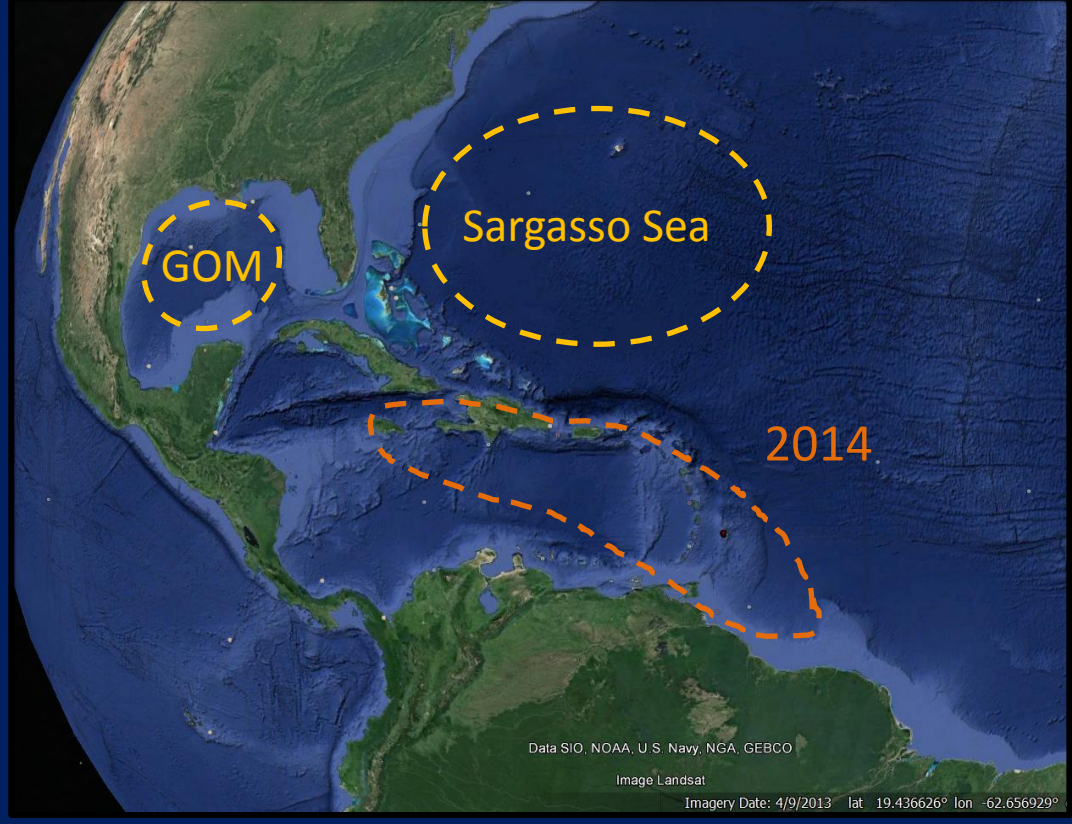

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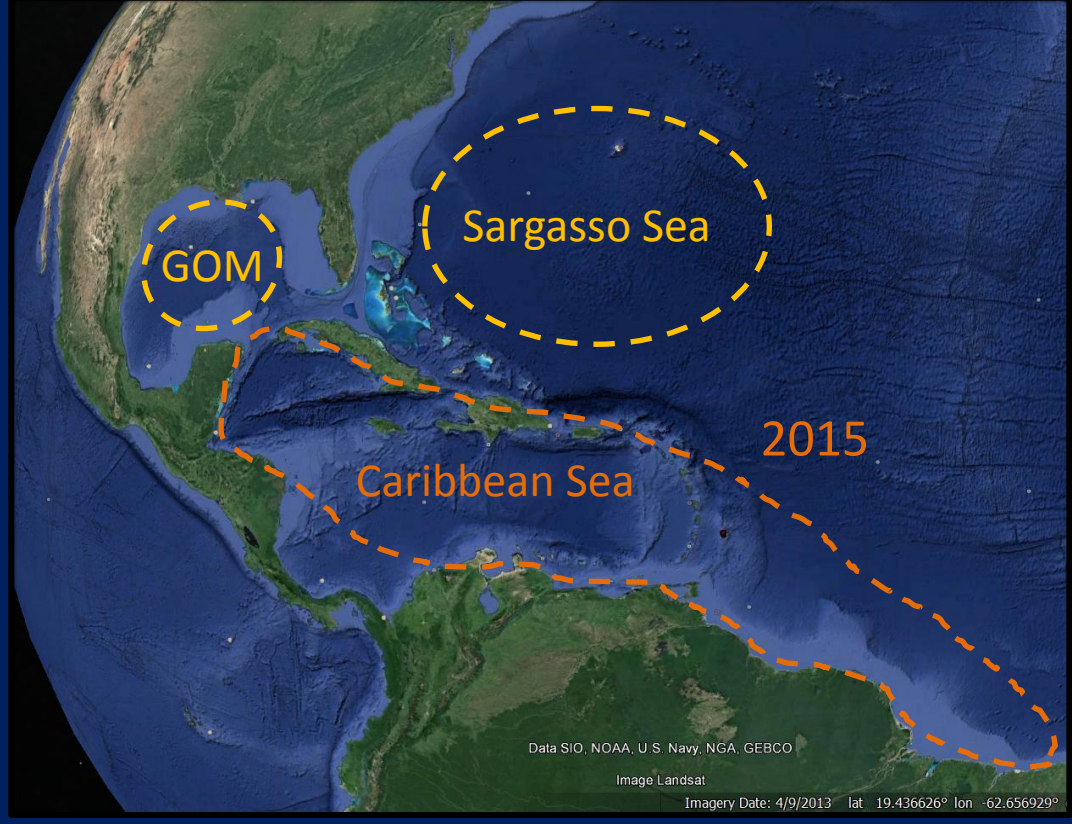
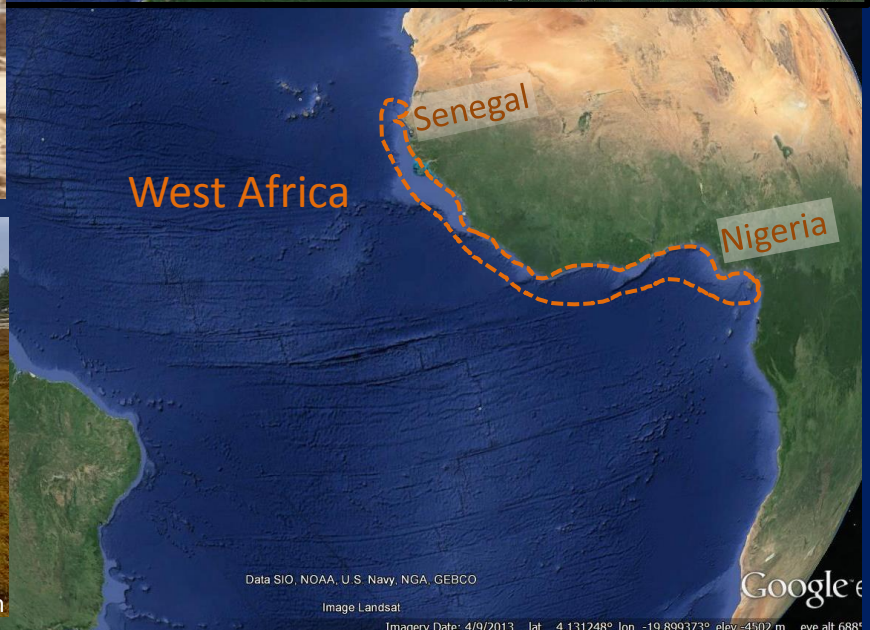


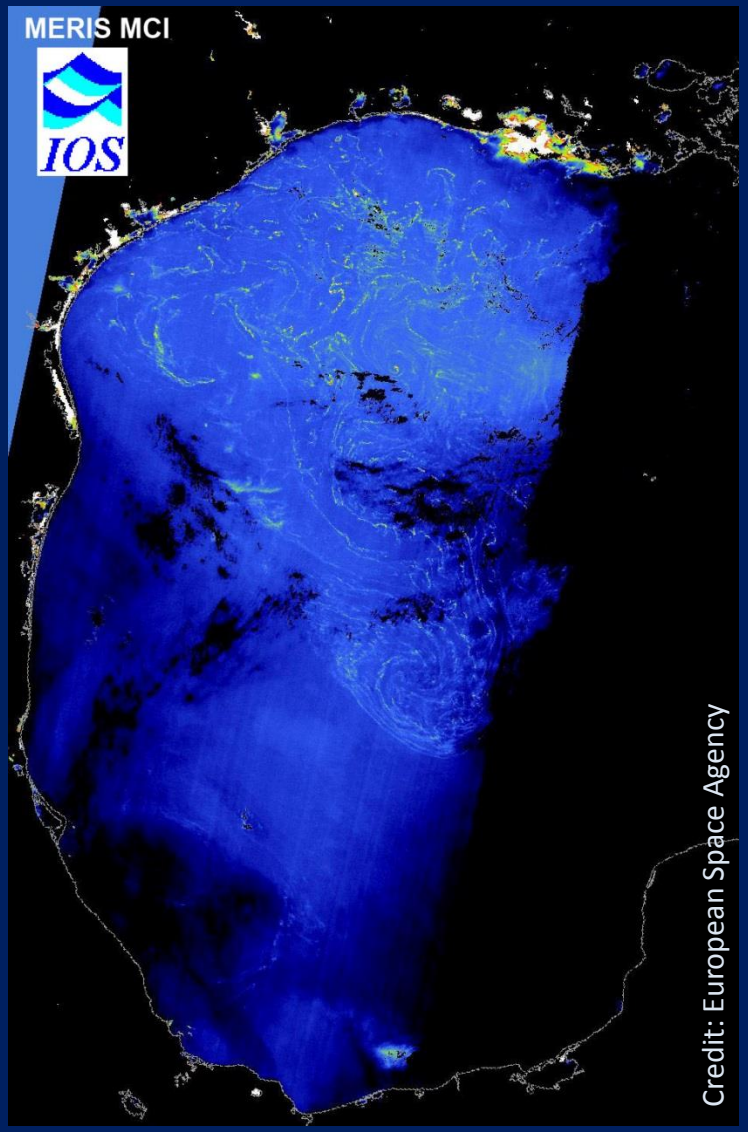
Current state:
where is it found?

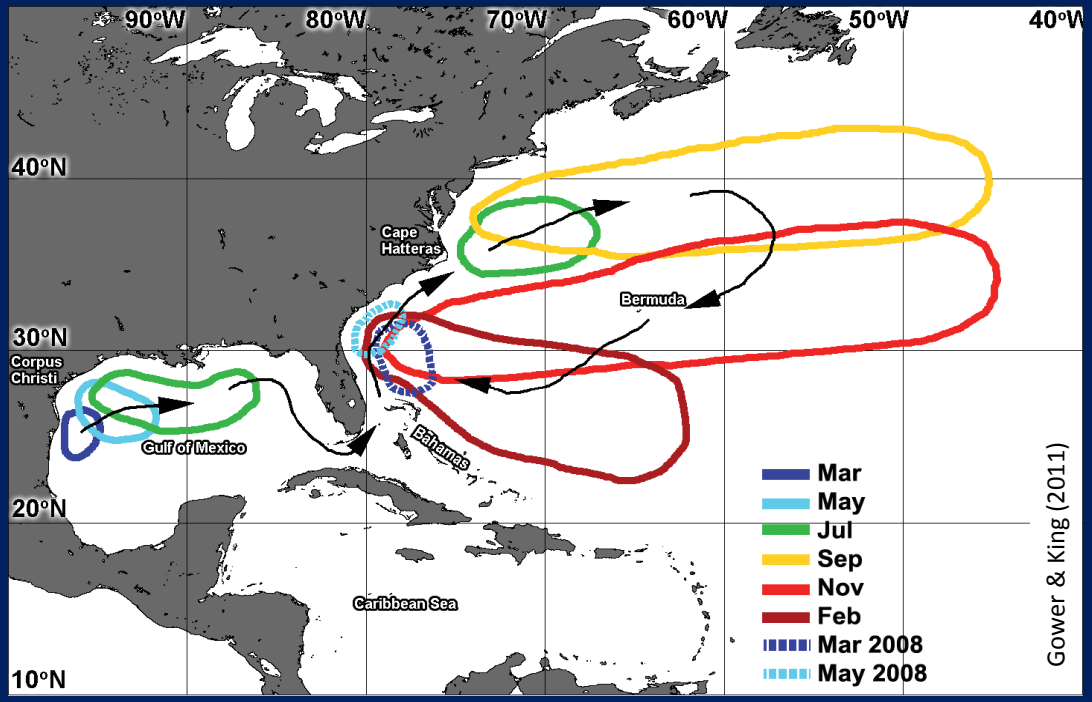
- Since 2011 have been massive influxes into the Caribbean Sea
- … and along the coast of West Africa



Solarin et al. 2014

Current state: are these populations connected?

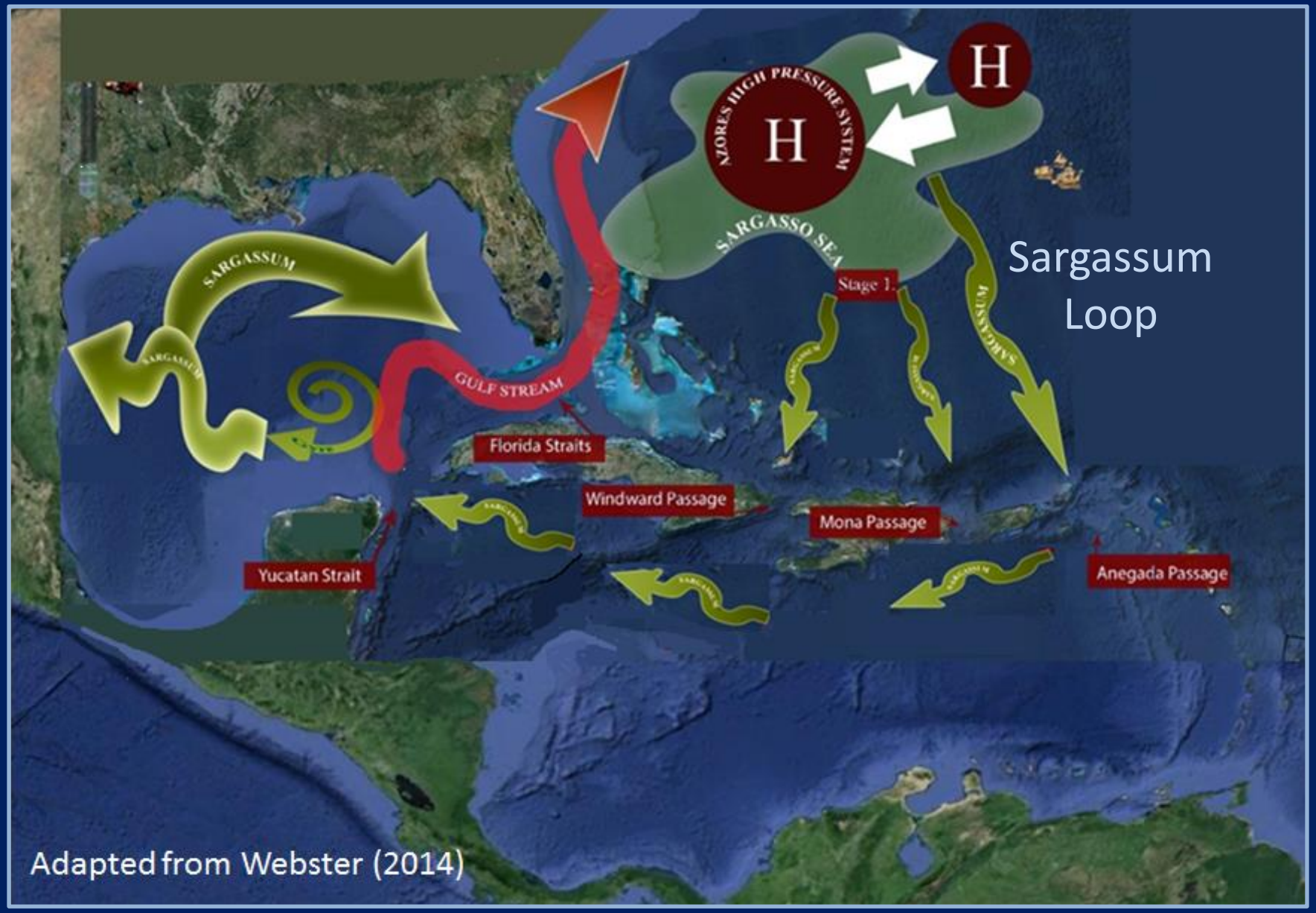




Monthly sargassum distribution derived from MERIS satellite imagery (2002-2008)

MERIS satellite imagery showing sargassum ‘swirls’ in northern GOM

Current state: are these populations connected?

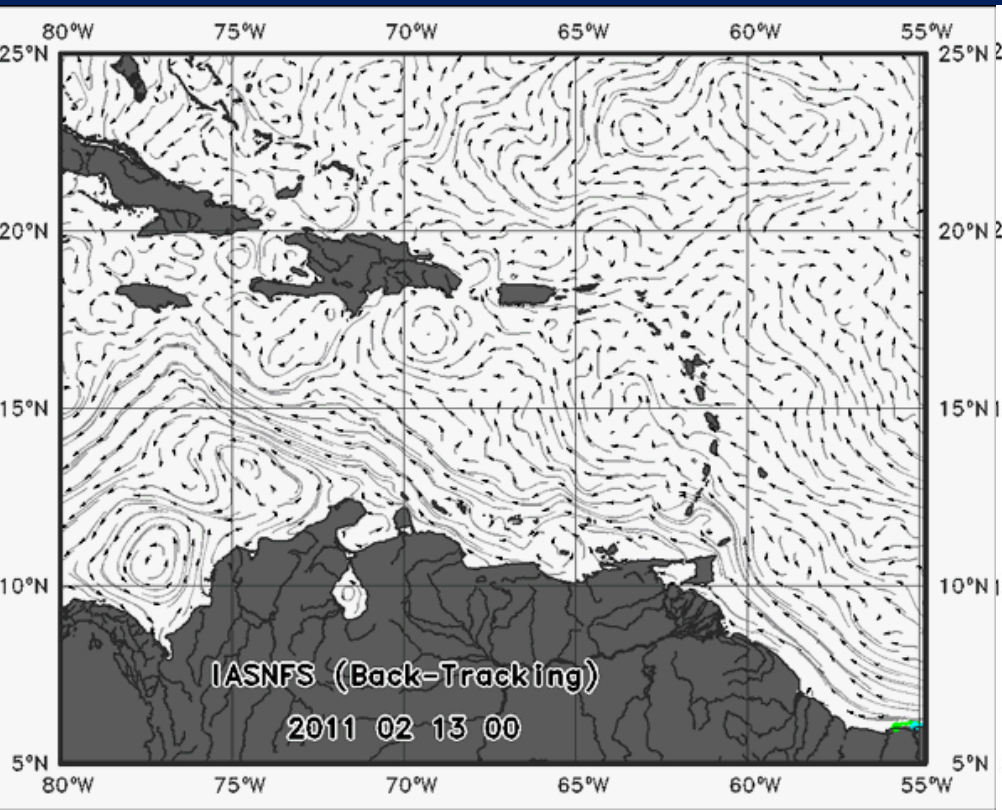


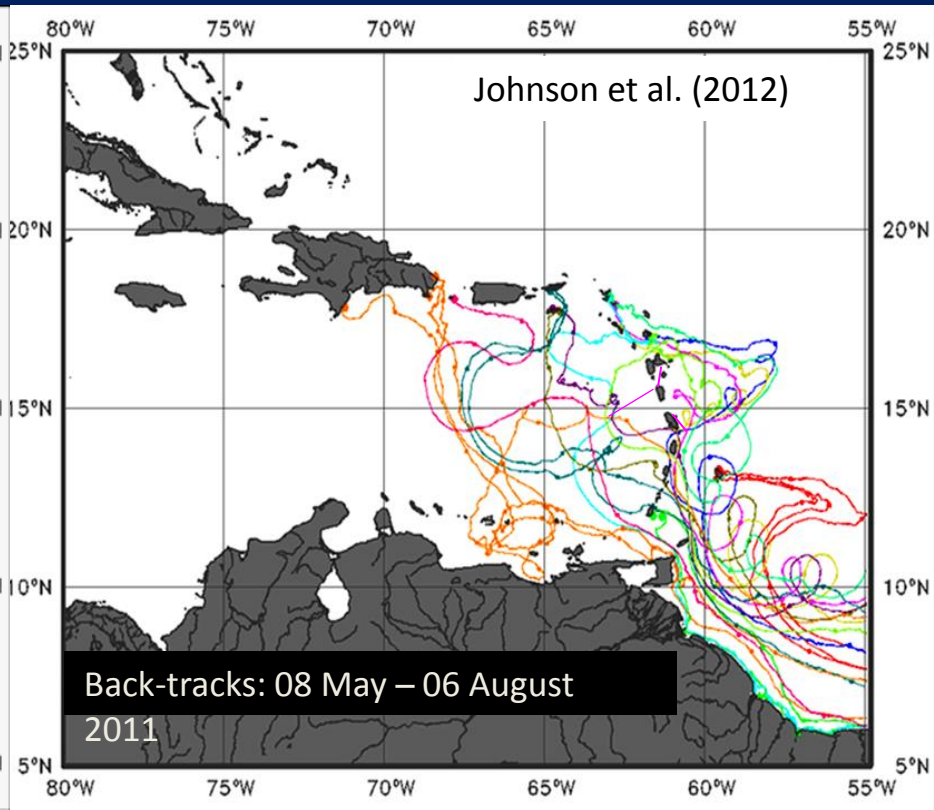
Current state: are the populations connected?

GOM - Sargasso Sea - Caribbean?

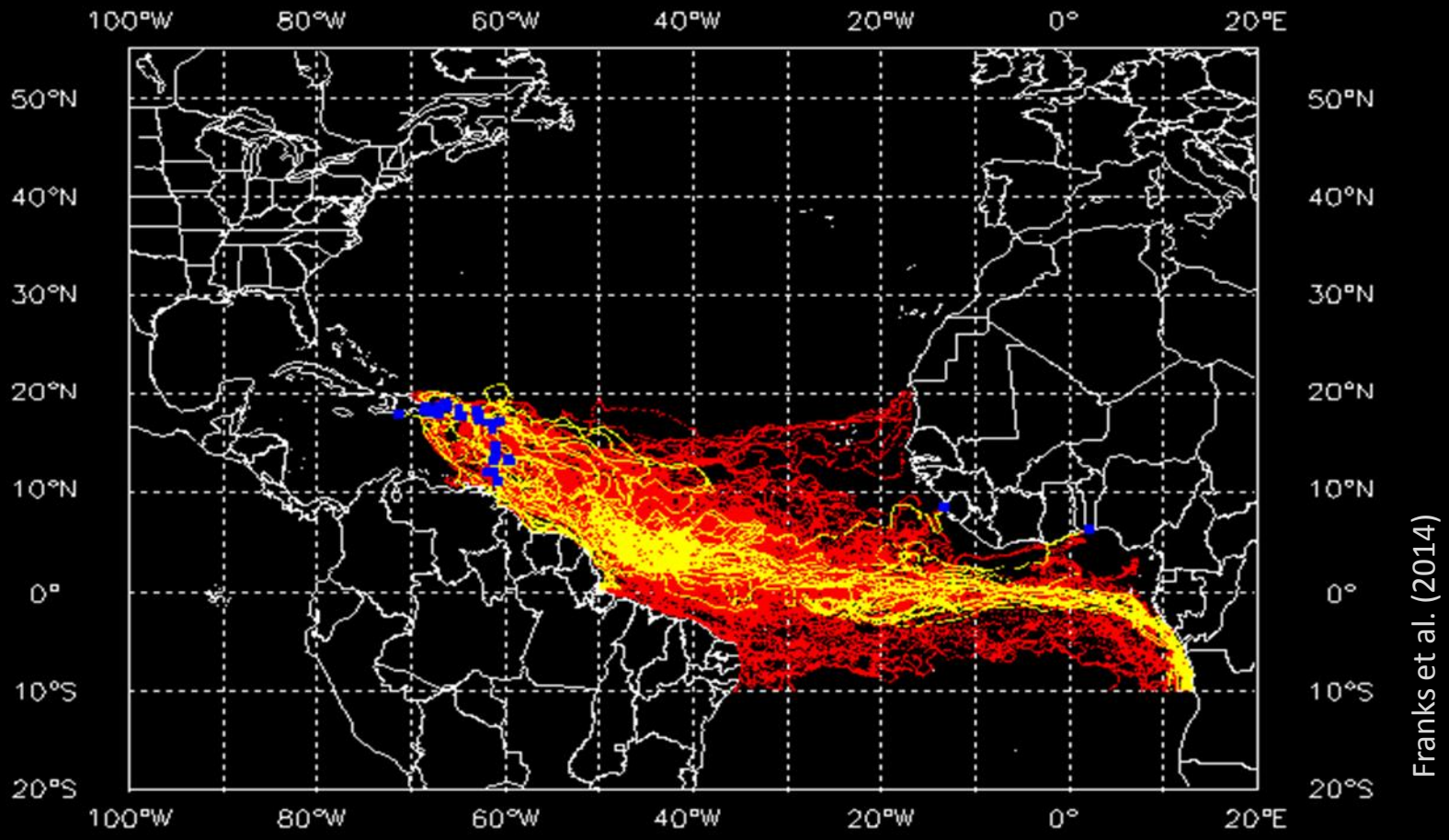
- Landing dates
- Archived surface currents
- Backtrack to source

- Coming into region from SE
- Not from Sargasso Sea or the GOM





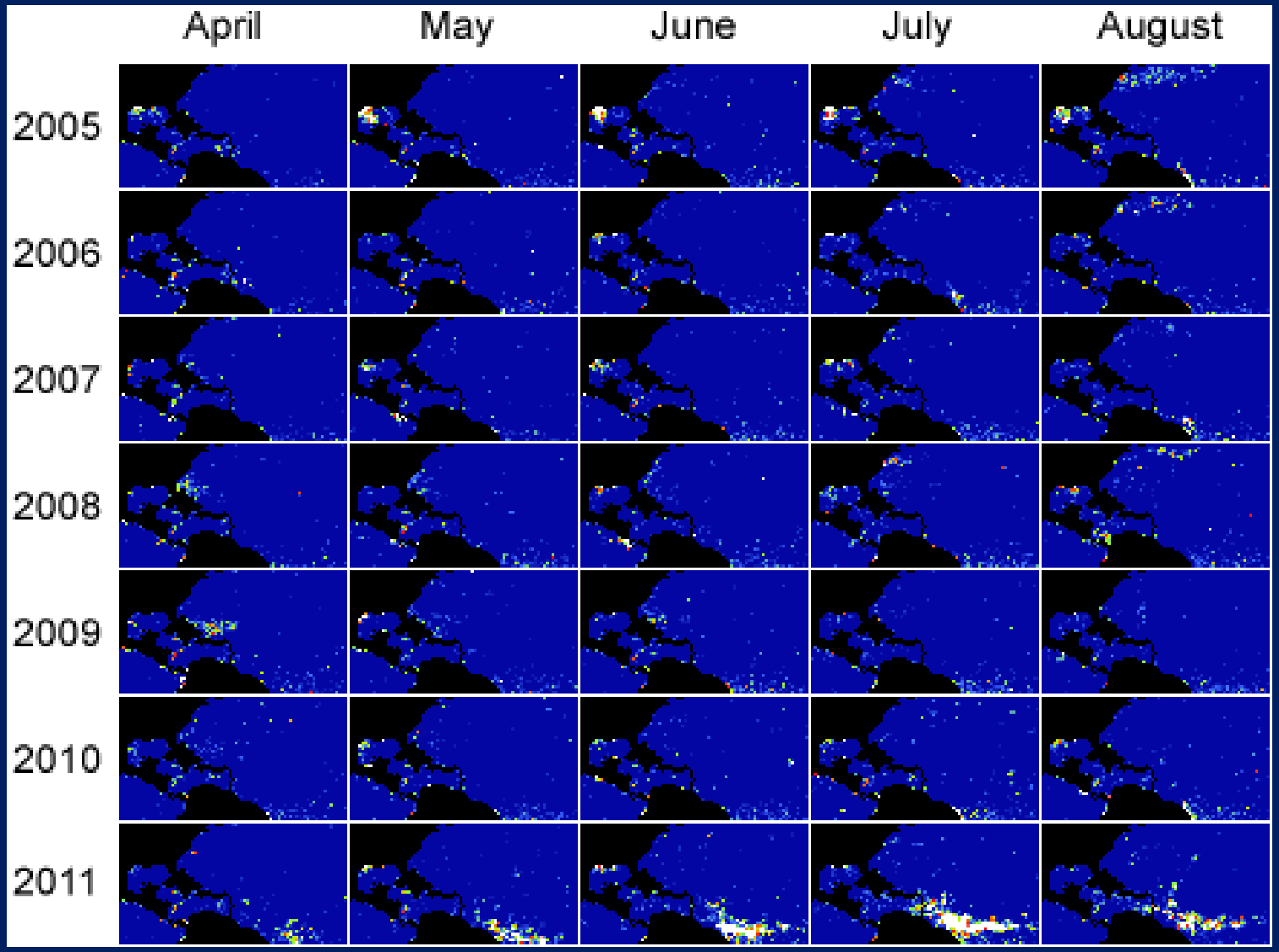
Current state: what is the source?



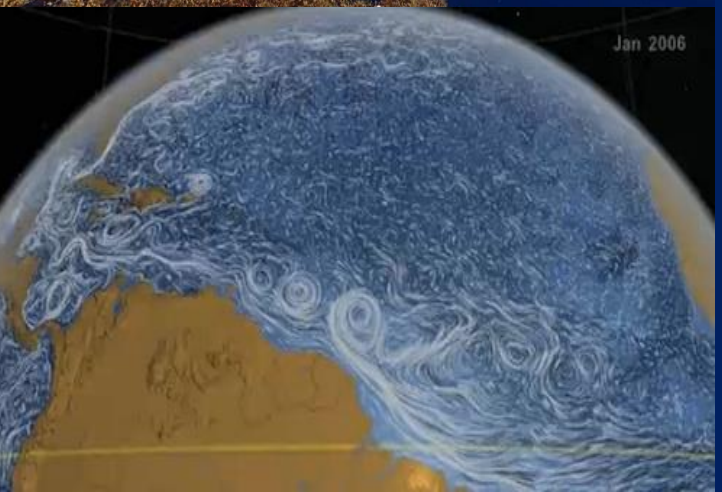
- Blue squares: stranding locations (note west Africa)
- Lines: back-trace to 1 January 2010

Equatorial region

Current state: confirming the source

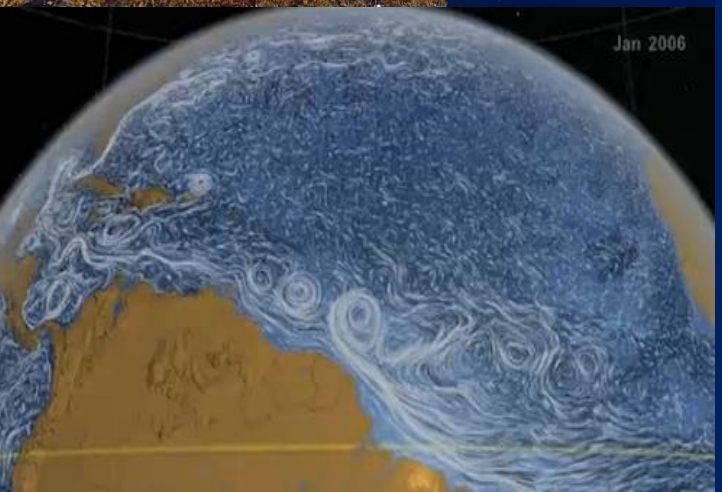


From: Gower et al (2013)



Will it continue?
What are the drivers?

- Nutrients
- Warm water
- Consolidation region
- Release & transport mechanism

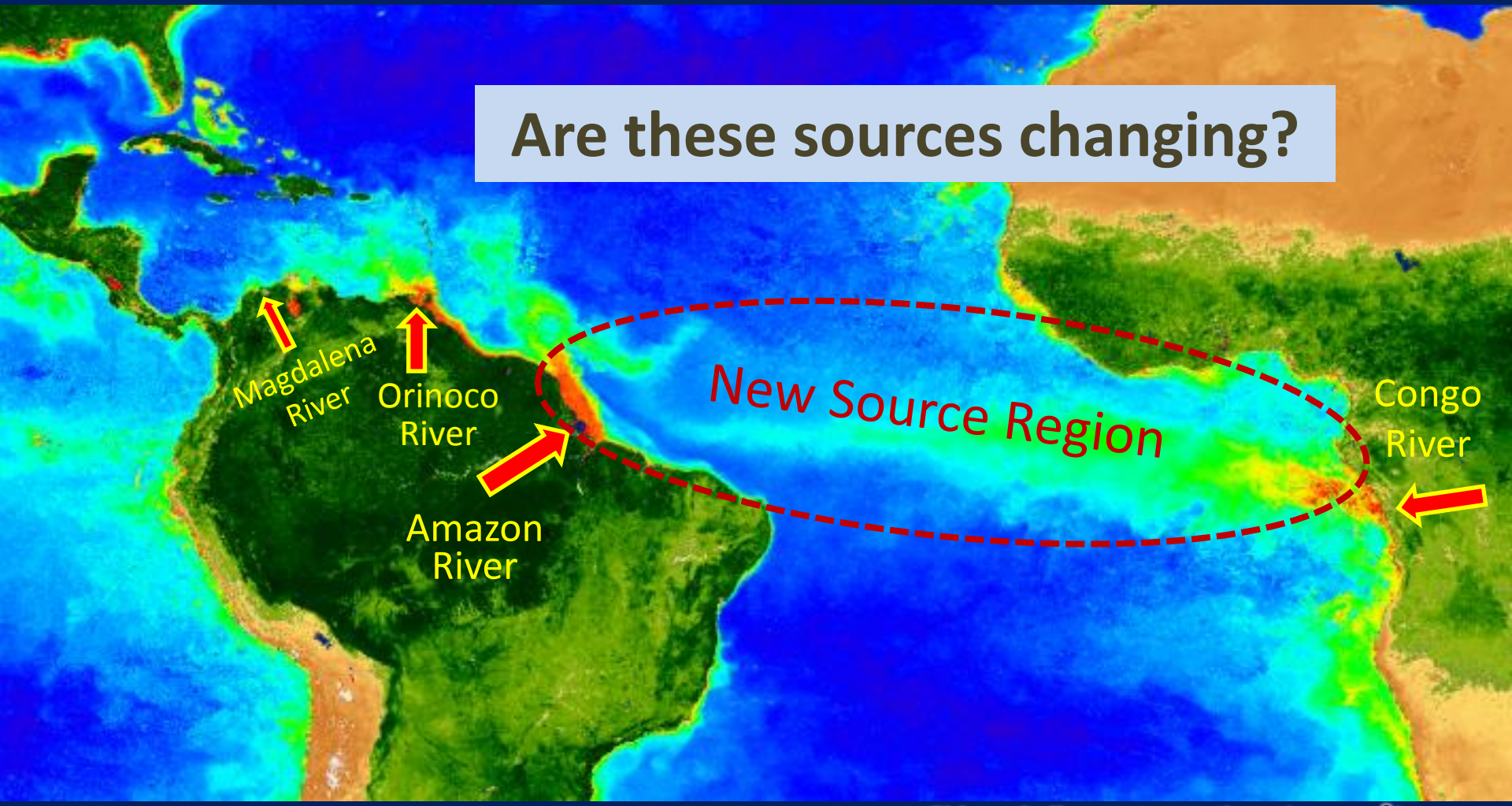


Will it continue? What are the drivers?

- Where are nutrients coming from?
- What affects water temperature?
- What affects recirculating currents?
- How and where do currents ‘break away’?
- Is there a long-term cyclical pattern?
- What is the role of climate change?

Sources of nutrients

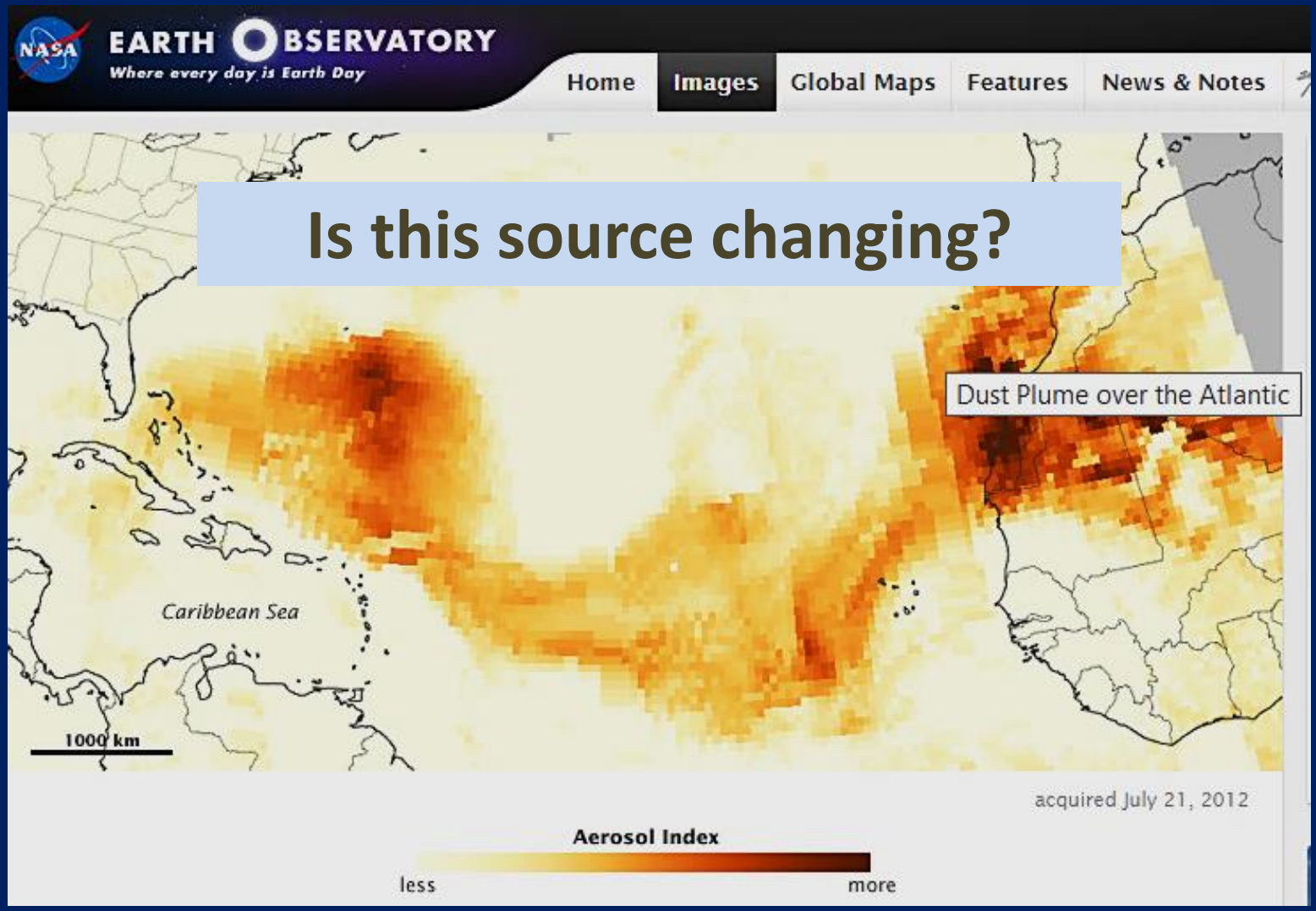
Some of the world's largest rivers drain into this equatorial region



Bring: nitrates and phosphates

Sources of nutrients

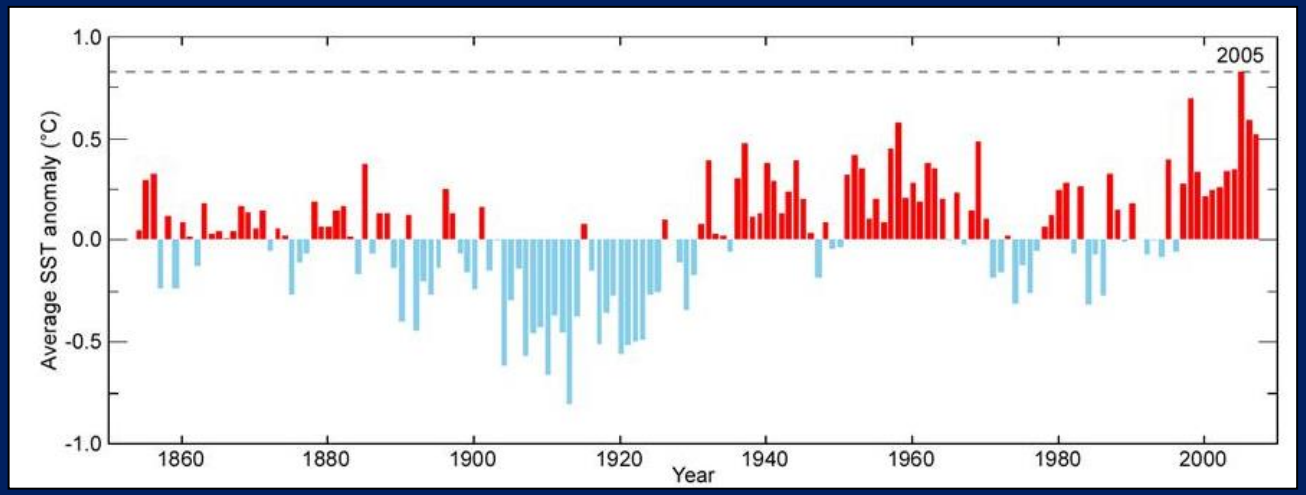
African dust plume a possible key nutrient source?



Brings terrestrial nutrients particularly iron

Water temperature

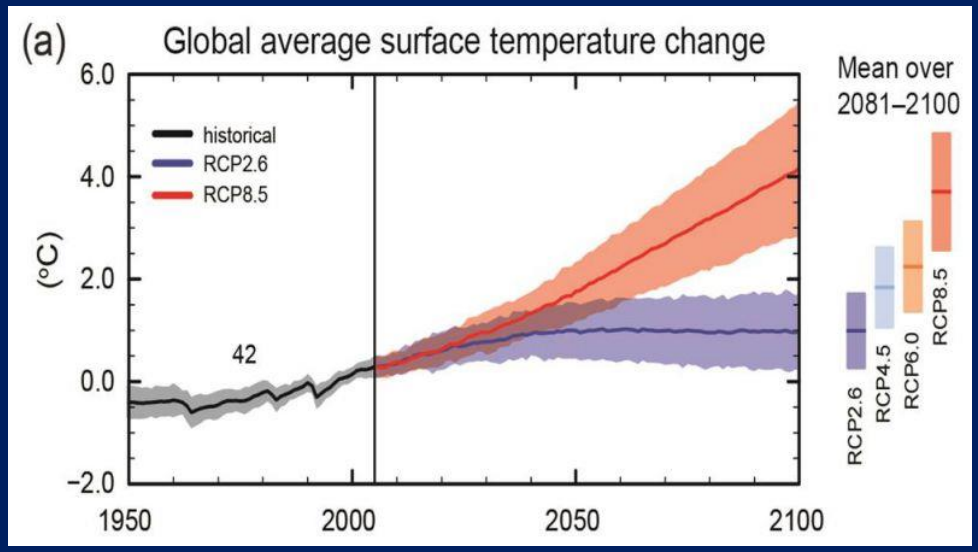
Increasing with global warming



Eakin et al. (2010)

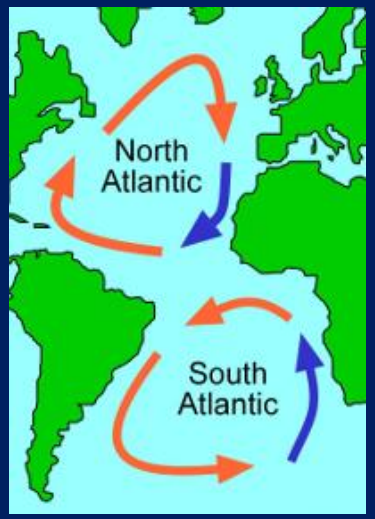
Caribbean Sea Surface Temperature (SST)

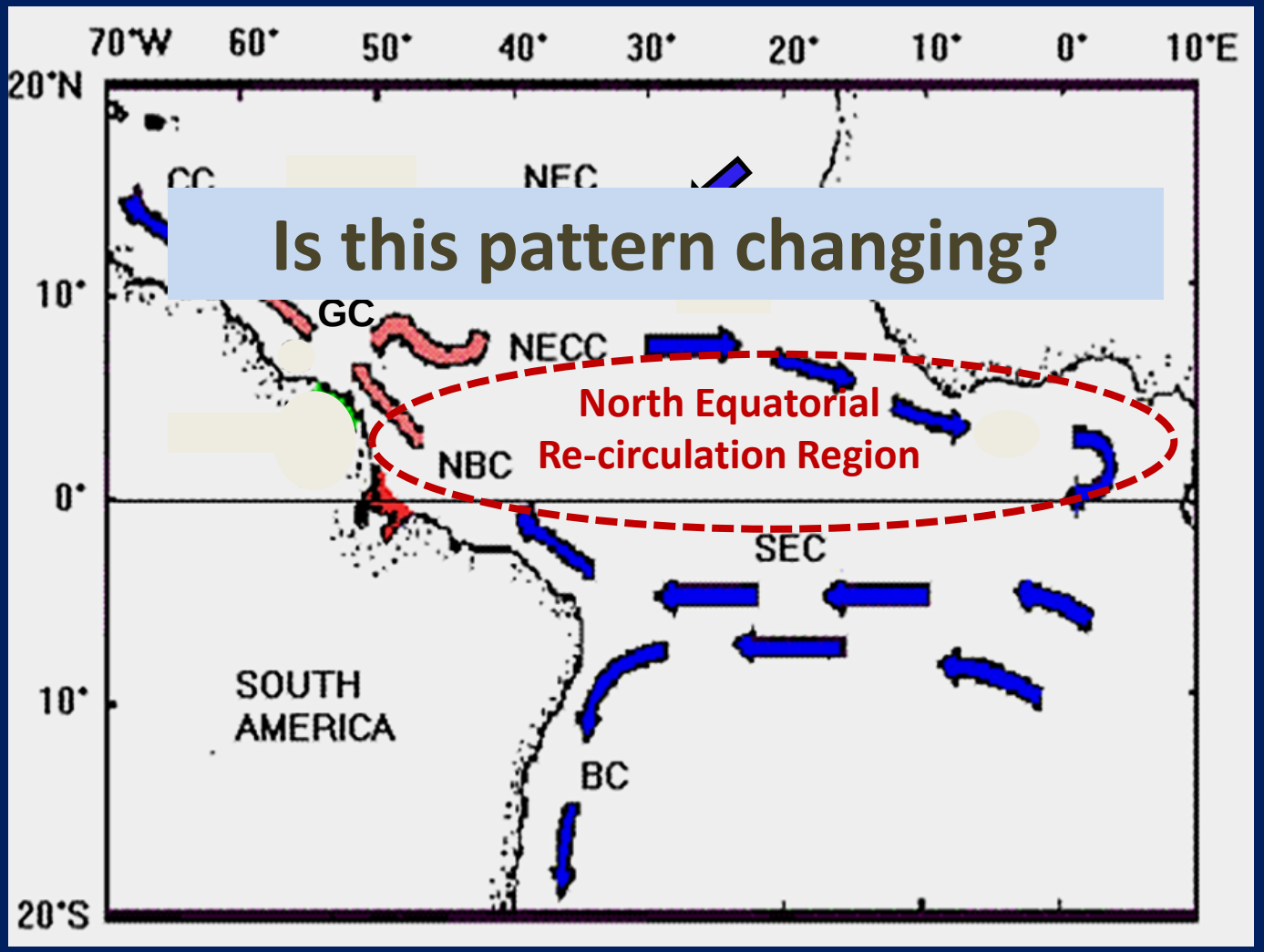
Latest temperature predictions



Consolidation, release & transport

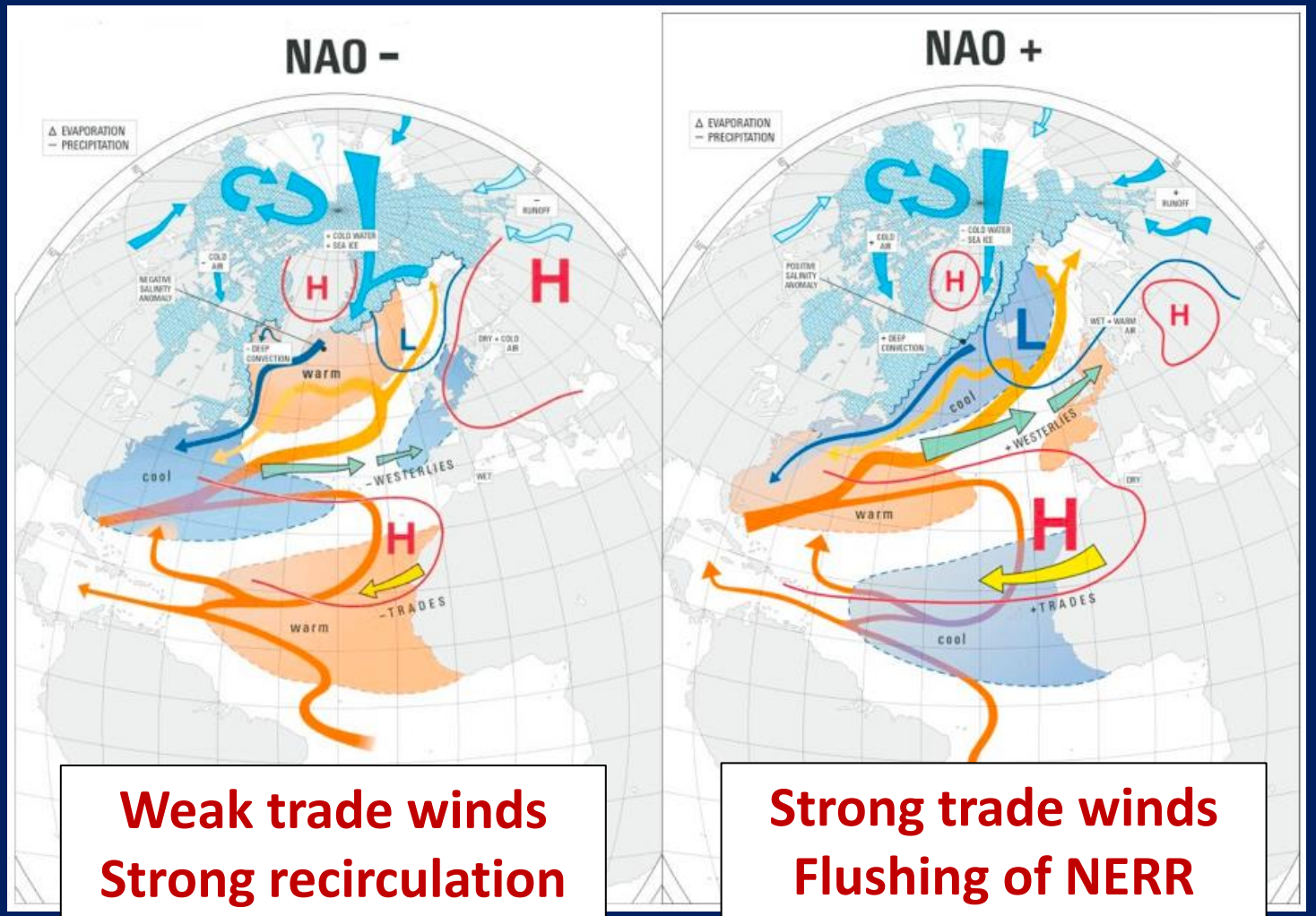
Equator is an area of complex circulating currents called the North Equatorial Re-circulation Region (NERR)





Consolidation, release & transport

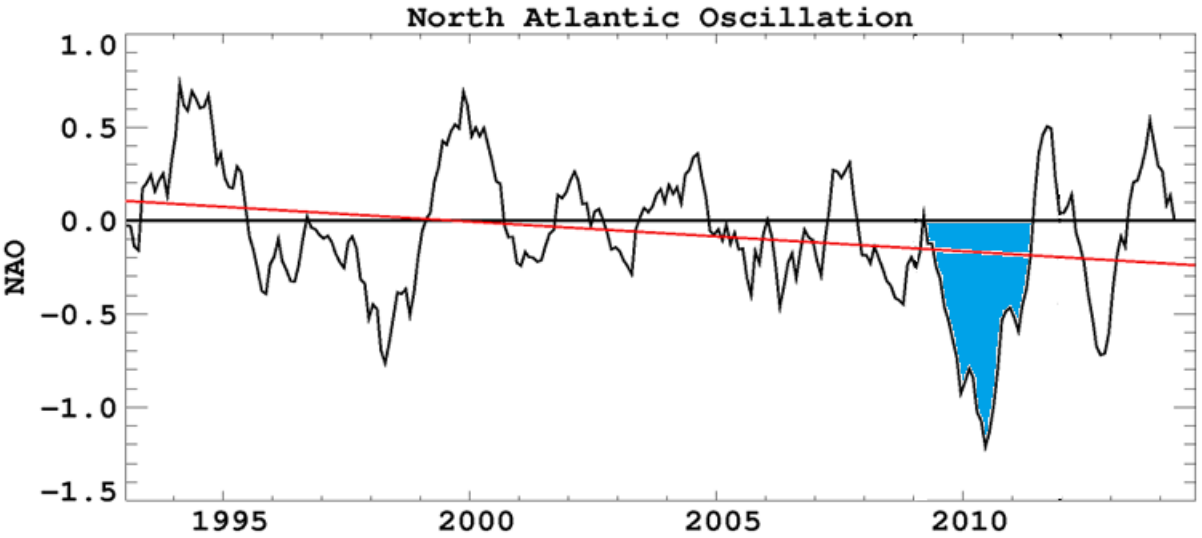
North Atlantic Oscillation (NAO) index

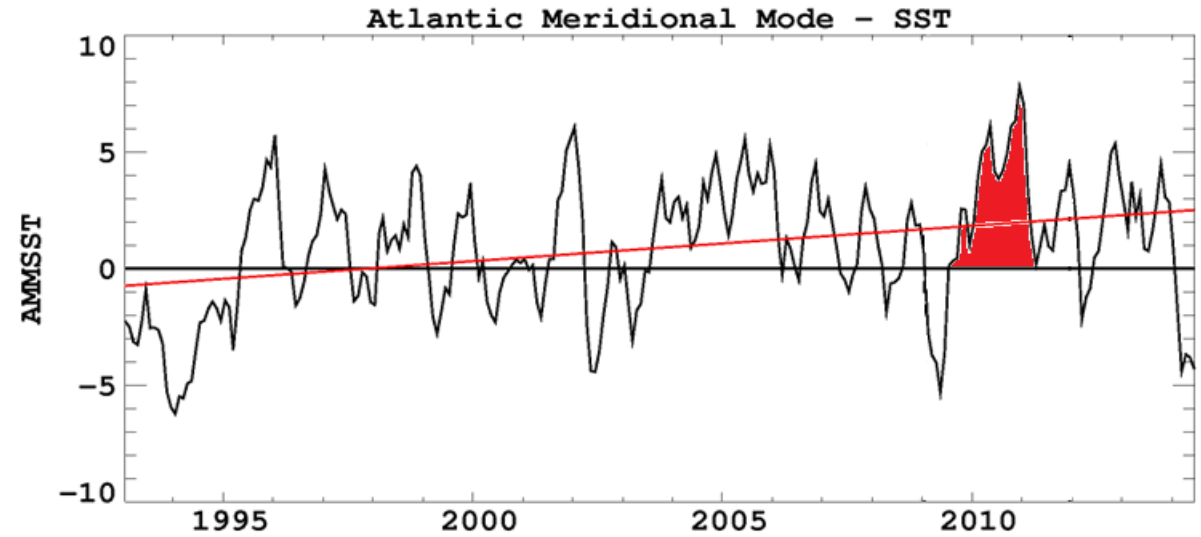


Weak trade winds
Strong recirculation
Warm water

Strong trade winds
Flushing of NERR
Cooler water

Consolidation, release & transport





Anomalously low NAO

Tipping point?

Anomalously high SST

The way forward

Regional issue needs regional response

Newsweek U.S.

TECH & SCIENCE

Sargassum Is Ruining Beaches From Texas to Tobago

BY MELISSA GASKILL / JUNE 28, 2015 1:45 PM EDT

INTERNATIONAL BUSINESS TIMES

WEDNESDAY, NOVEMBER 18, 2015 AS OF 1:33 PM EST

What Is Sargassum? Smelly Seaweed Invasion Declared An Emergency In The Caribbean

By Sarah Berger @sarahberger0408 s.berg… 2015 8:55 AM EDT

DAILY NEWS NEW YORK

Tourism officials can't hide the threat of Sargassum seaweed as it's taking over beaches from Florida to Texas and damaging the environment

BY LINDA STASI NEW YORK DAILY NEWS , Saturday, October 17, 2015

theguardian

Monday 10 August 2015 10.00 BST

Caribbean-bound tourists cancel holidays due to foul-smelling seaweed

Seaweed blankets the beach in Cancun, Mexico. The huge influx of sargassum has hit most of the Caribbean this year and prompted cancellations from tourists. Photograph: Israel Leal/AP

Negative press hurting tourism

The way forward: Regional response

1. Regional collaboration in research
2. Regional communication for response & learning

Research

- USM database for stranding reports
- USM determined new source via archived current data
- UVIC provided supporting satellite evidence
- TAMU-SEAS stranding forecasts for GOM and now expanded
- FAO-UWI-USM sargassum predictions and fishery impacts
- French Antilles - USM

Communication & sharing

Sub-regional symposia

- Galveston, UWI-CERMES, LAC Cancun, Sierra Leone
- Agendas of: CTO, GCFI, ACS

Web-based resources & fora

- UWI sargassum-at-cermes.com
- UNEP's SPAW-RAC sargassum basecamp (3 groups: management & impacts; research; tourism)
- Information guides - GCFI, CAST
- Documentaries

The way forward:
Regional collaboration in research

Prediction: How often and how much?

- Investment in clean-up technologies and management systems
- Investment in new business opportunities
- Vulnerability of coastal communities (employment, health)

Understanding: Impacts on tourism, fish, fisheries and coastal ecosystems

- Inform policy responses
- Coastal livelihood adaptation strategies
- Biodiversity conservation

The way forward:
Regional collaboration in research

Development: Equipment / methods

- Cost effective & environmentally sound solutions for prevention of stranding or removal

Development: Uses and products

- Business opportunities
- Storage and supply

Monitoring and learning:

- Determine best practices
- Measure success
- Guide adaptation

The way forward:

Regional communication for response & learning

Learn from each other:

- Best ideas and practices
- Avoid misconceptions
- Build knowledge

Coordinate response:

- Deal with bad press
- Share the cost burden

Efficient use of scarce resources:

- Share knowledge
- Avoid replication of efforts
- Improve response

Encourages partnerships:

- Public and private sector initiatives
- NGO/community engagement

Conclusion: some suggestions

Regional research fund

- Rapid response
- Regional relevance
- Co-ordination

Collaboration mechanism among research institutions

- Best use of facilities & knowledge
- Builds regional capacity

Continued support of communication/sharing

- Better integration of science and tourism sectors

New support

- Developing partnerships
- Encouraging entrepreneurship

Reference sources:

Franks et al 2011. Unprecedented influx of pelagic *Sargassum* along Caribbean Island coastlines during summer 2011. Proc. Gulf Carib. Fish. Inst., 64:6-8

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Lapointe et al 2014. Ryther revisited: nutrient excretions by fishes enhance productivity of pelagic Sargassum in the western North Atlantic Ocean. J. Exp. Mar. Bio. & Ecol. 458: 46-56

Thank you!