

PELAGIC SARGASSUM

Retention and growth of pelagic sargassum in the North Equatorial Convergence Region of the Atlantic Ocean: hypothesis for examining recent mass strandings of sargassum along Caribbean and West Africa coastlines

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Pelagic Brown Alga: Class Phaeophyceae Family Sargassaceae



Sargassum natans

Sargassum fluitans

Caribbean Pelagic Sargassum 'Event' 2011

Northern Brazil...and West Africa





Sierra Leone

Per: Andrew Huckbody
Huckbody Environmental Ltd.

West African coastlines impacted by sargassum in 2011
(Sierra Leone and Benin); first documented account.

Pelagic Sargassum Event 2011 con't.

Gulf Coast Research Laboratory (GCRL) developed a web site to accommodate the reporting of large sargassum strandings along Caribbean shorelines & in adjacent waters.

<http://www.usm.edu/gcrl/sargassum/sargassum.observation.form.php>

Reporting Site: Pelagic Sargassum in the Caribbean

[Sargassum Reports Home](#)
[Report an Observation](#)
[Identification Guide](#)
[Resources](#)


During 2011, massive quantities of pelagic sargassum occurred throughout the Caribbean, impacting aquatic resources, fisheries, shorelines, waterways, and tourism. There are indications that such an event may occur this year, 2014.

In the effort to better understand critical aspects of this phenomenon, this website serves as a data collection center to accommodate reports of large quantities of pelagic sargassum observed within the region during 2014. The website provides easy access for data entry and represents a service to those interested in contributing to the information database. Data provided to this site will be used by Gulf Coast Research Laboratory (GCRL) scientists and colleagues throughout the region to identify the source and examine the movements and causes of this extraordinary event.

Your participation is essential to this work. Please use [this form](#) to report your observations. Thank you.


Area of Interest

Click [here](#) to view the study area in a larger map.




Examples of Sargassum Observations

Click any image to see a larger version.



Sargassum line offshore
photo by GCRL



Sargassum washed up on shore
photo by Hazel Oxenford



THE UNIVERSITY OF
SOUTHERN MISSISSIPPI
GULF COAST RESEARCH LABORATORY

Report Caribbean Sargassum



Reporting Site: Pelagic Sargassum in the Caribbean - 2014

[Sargassum Reports Home](#)
[Report an Observation](#)
[Identification Guide](#)
[Resources](#)

Please use this form to report details of your observations of sargassum during 2014. All inputs are not required.

Please report each observation separately. You may use this form to make multiple reports, both for multiple observations of the same sargassum mass and for observations of new sargassum masses.

We will not share your email address and contact information without your permission.

(Spam Check - This helps prevent robot software from using this form to submit spam.)
Please enter the number 7.

Date of observation (mm/dd/yyyy)

Country

Latitude (if available)

Longitude (if available)




Photo by GCRL

Description of location (Be as specific as possible. A distance and bearing to a well-known location are helpful.)

2014

Barbados - East Coast

20 Sept. 2014

Hazel Oxenford - Georgina Trew



Puerto Rico
Sept. 2014

Mustique Island, St Vincent & Grenadines

July 2014

Emma Doyle/Dianne Wilson



San Andrés, Colombia

Oct. 2014

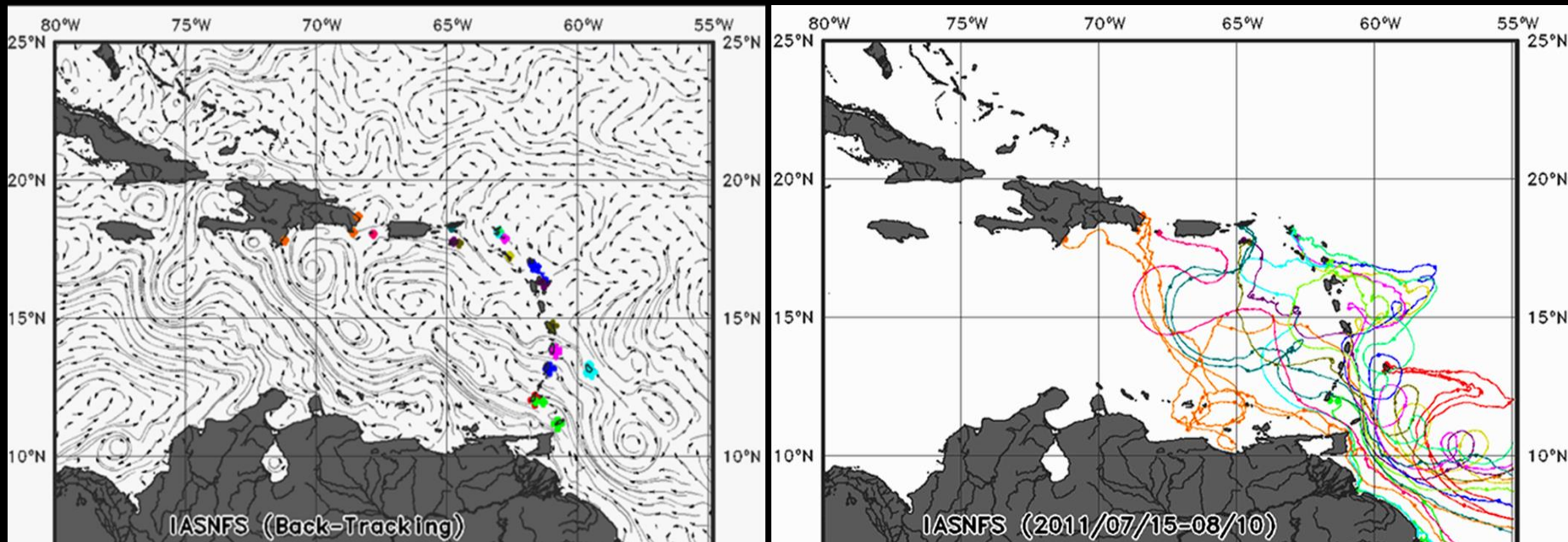
Erick Castro



Pelagic Sargassum Event 2011 con't.

Back-traced sargassum from reported sighting locations & dates to determine transport pathways (Franks et al. 2011); examined connectivity across the tropical Atlantic., particularly the NERR (Johnson et al. 2012)

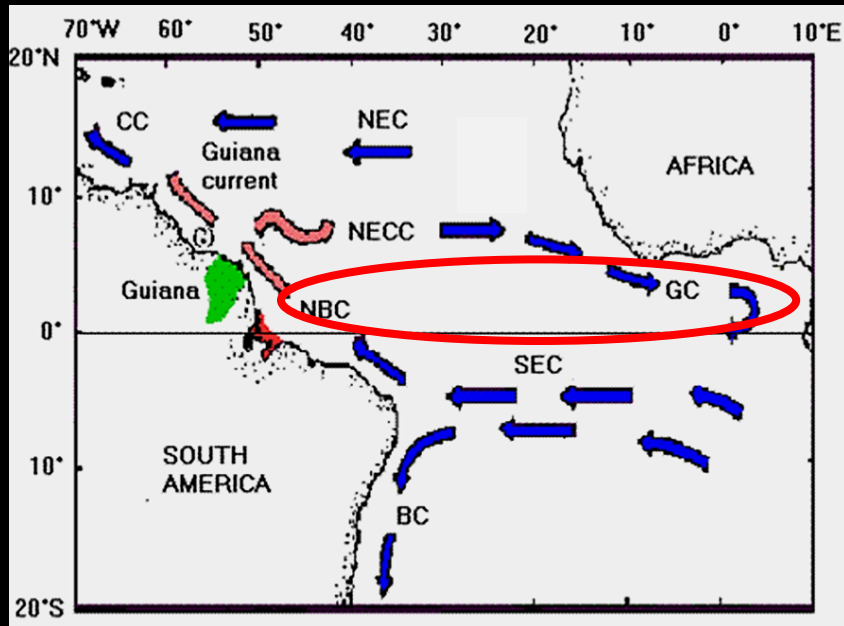
NRL: Intra-Americas Sea Nowcast-Forecast System (IASNFS)



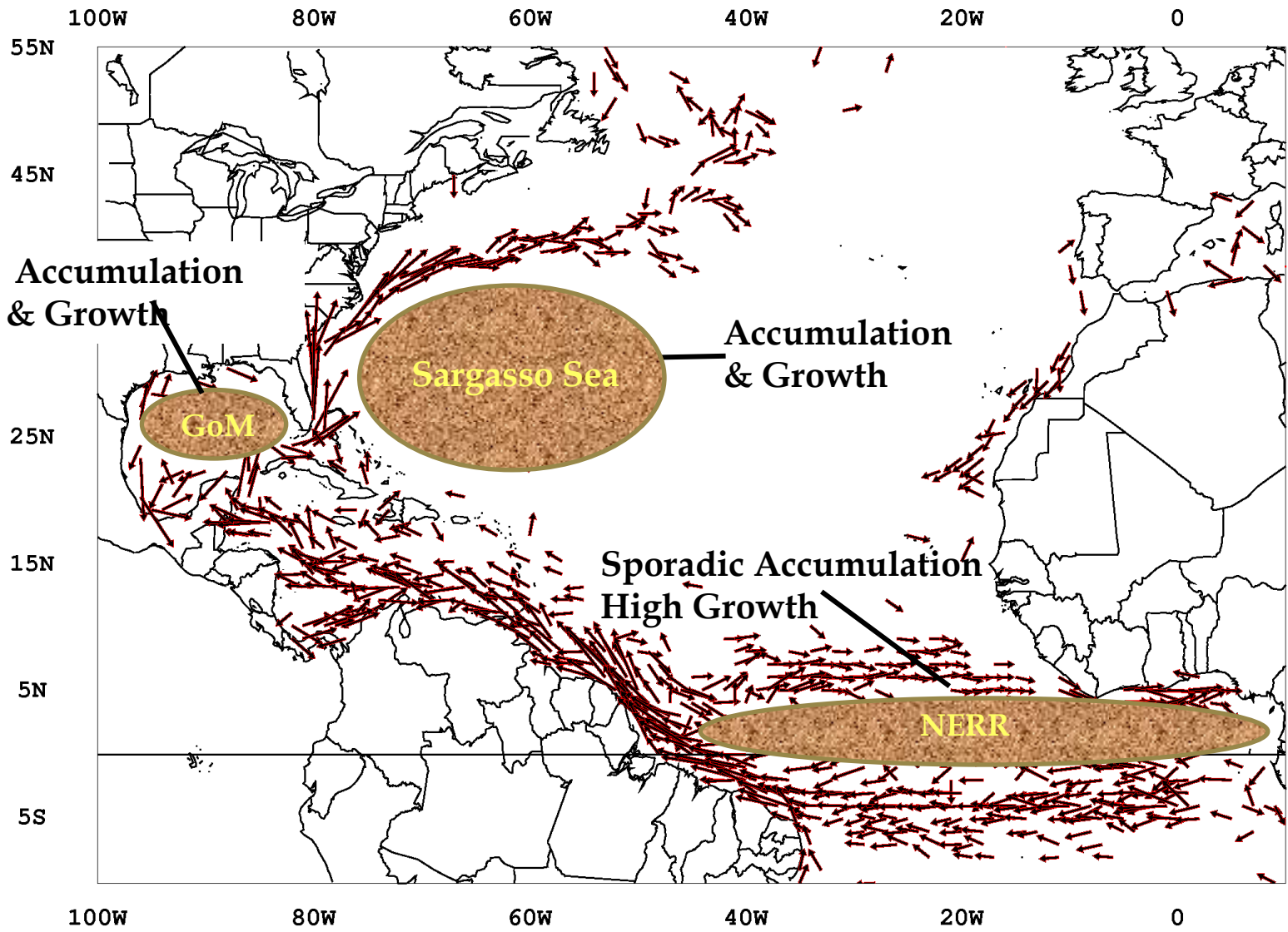
May - September 2011

Hypothesis:

Sargassum growth (bloom) occurred in the North Equatorial Recirculation Region (NERR) of the North Atlantic between the North Equatorial Counter Current and the equator.



NEC – North Equatorial Current
NECC – North Equatorial Counter Current
GC – Guinea Current
SEC – South Equatorial Current
NBC – North Brazil Current
CC – Caribbean Current
○ NERR

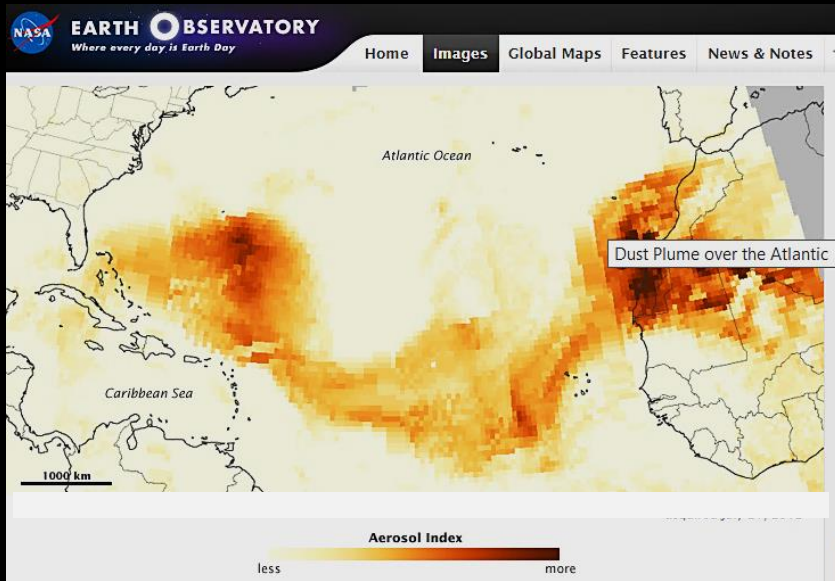


Hypothesis:

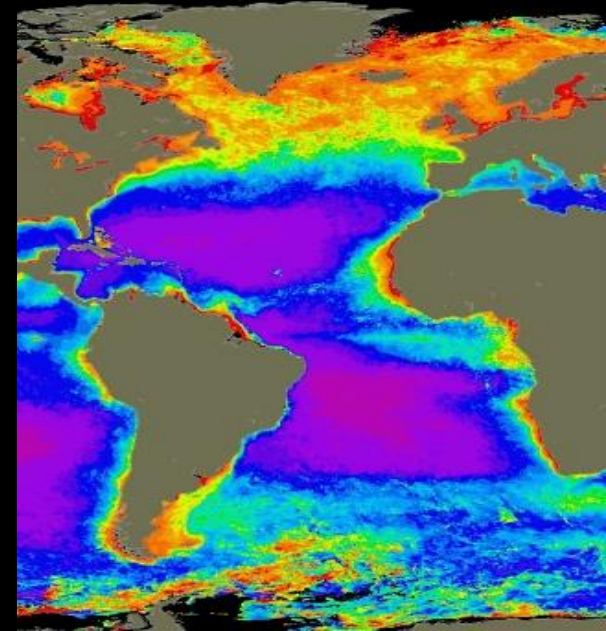
Sargassum bloom occurred in the North Equatorial Recirculation Region (NERR) of the North Atlantic between the North Equatorial Counter Current and the equator.

- Smaller quantities of sargassum commonly found in the NERR bloomed through high nutrient input.

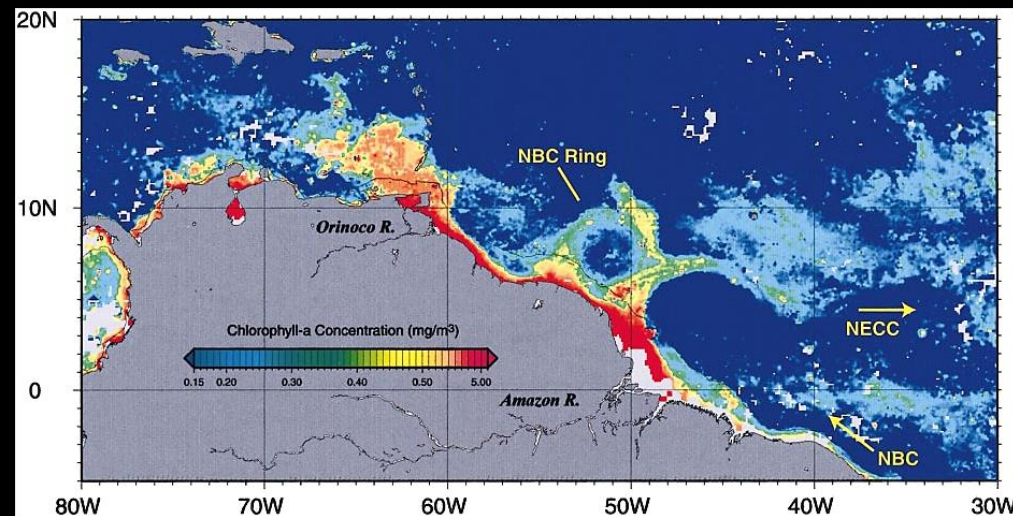
Nutrient Sources



African atmospheric mineral dust
(iron, nitrogen, phosphorus)



Upwelling: coastal West Africa,
Equatorial, Western Tropical Atlantic

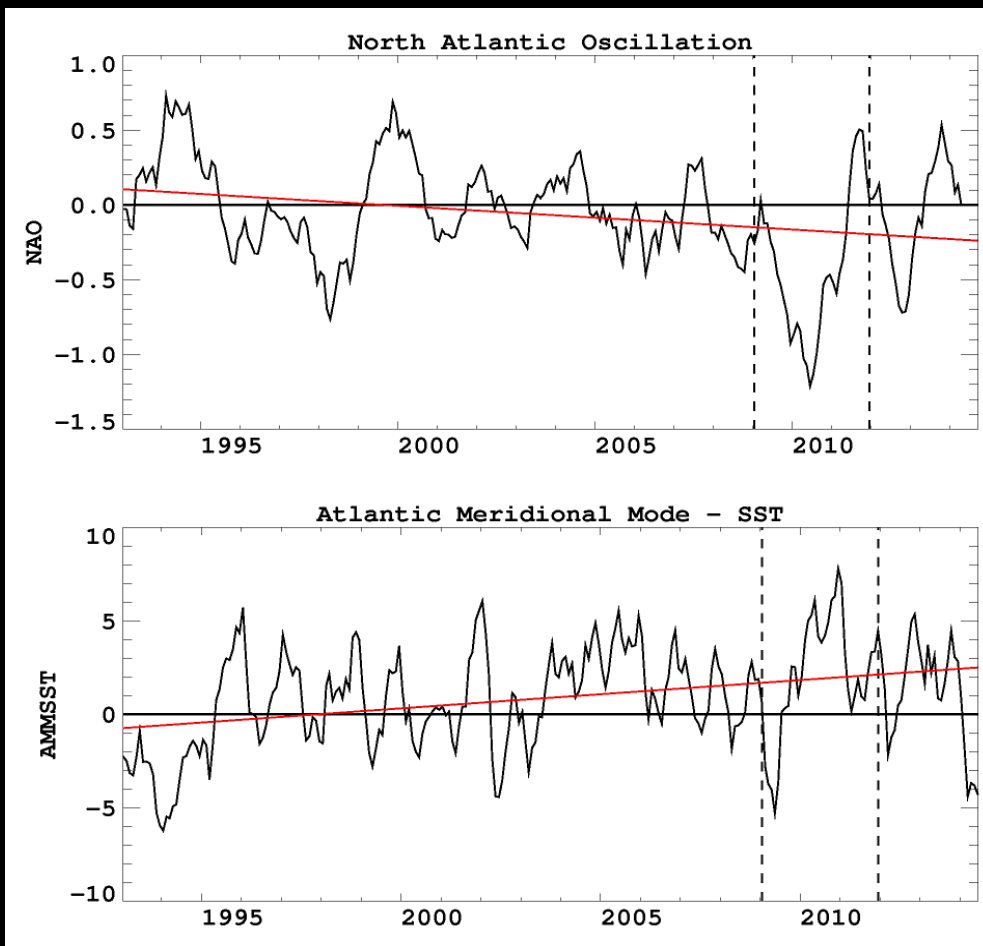


Amazon and Orinoco Rivers - Discharge

Hypothesis:

Sargassum bloom occurred in the North Equatorial Recirculation Region (NERR) of the North Atlantic between the North Equatorial Counter Current and the equator.

- Smaller quantities of sargassum commonly found in the NERR bloomed through high nutrient input.
- Climate change in the North Atlantic created conditions in the NERR during 2009-10 that allowed for sargassum growth, accumulation and consolidation.



Low air pressure - Azores

Sea surface heating

Exceptional alignment of 'unprecedented peaks' (+and-) in major North & Equatorial Atlantic climate indices 2009–2010 (likely due to global temperature increase) that affected ocean-atmospheric interaction in the NERR.

To 'bloom', pelagic sargassum required:

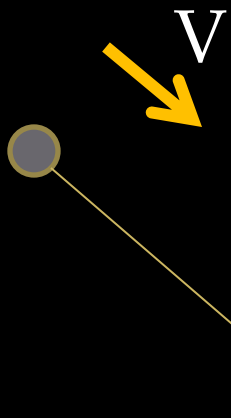
- A recirculation region (NERR) where nutrients were available over an extended period of time
- Consolidation regions which enabled formation of large sargassum features

Present work:

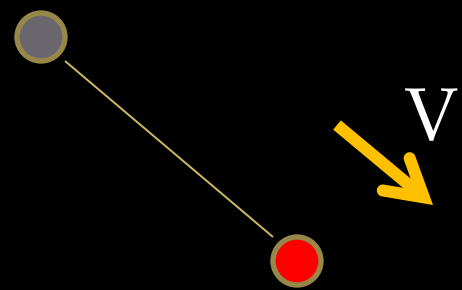
- Use satellite-tracked drifters and forward / backward tracking in oceanographic models to test hypothesis
- Examine interannual changes in NERR advective dynamics between 2009-2013

Where did the sargassum originate?

1. **Back tracking:** from sargassum landings using model currents
2. **Forward tracking:** from possible source regions using same currents
3. Validation of sargassum **transport patterns** using satellite-tracked drifters

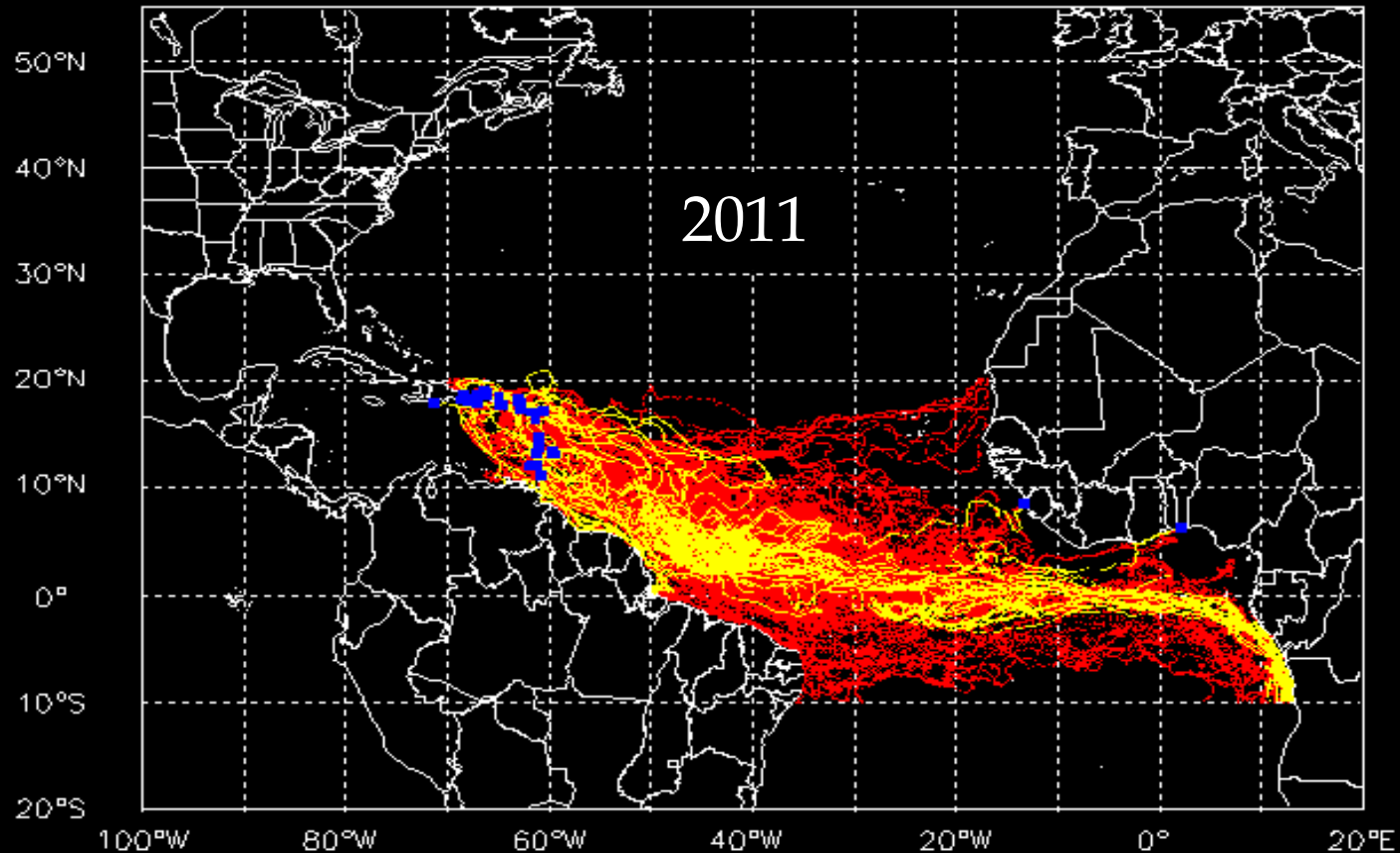


Forward track
 $\delta x = V * \delta t$



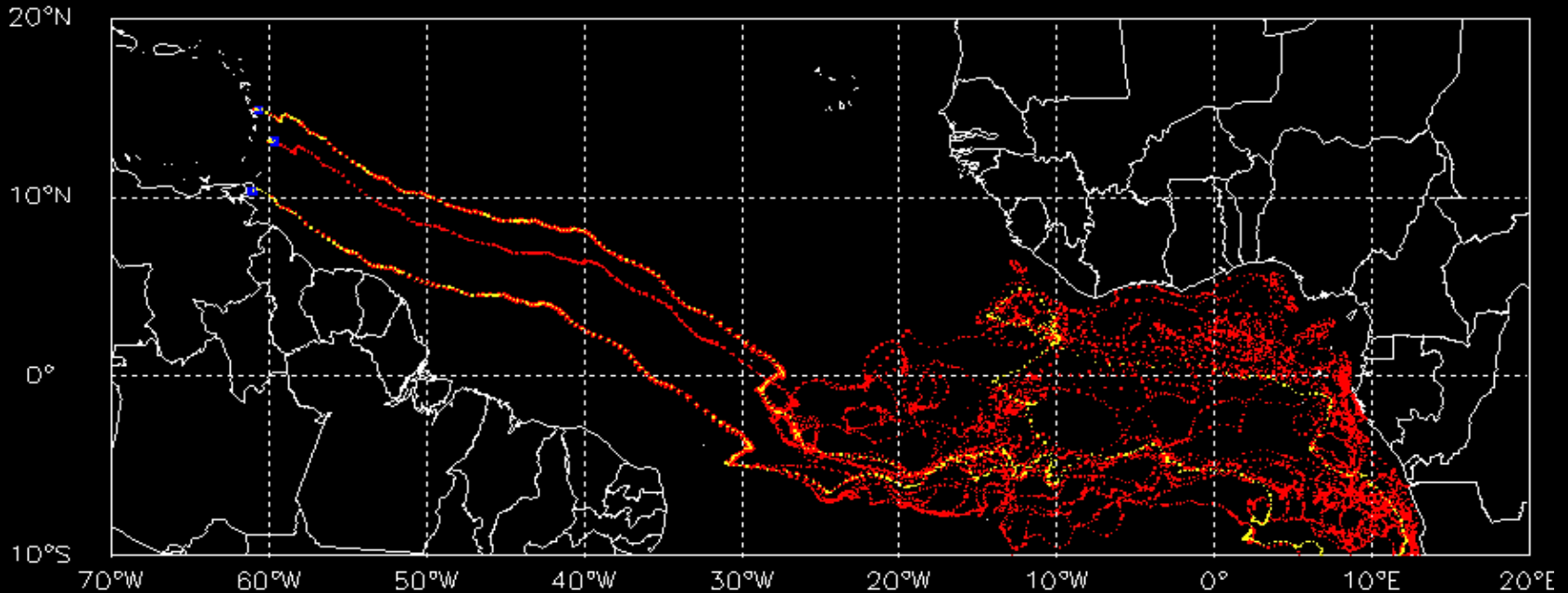
Back track
 $\delta x = V * (-\delta t)$

Recirculation/consolidation region in the western equatorial Atlantic with connection to the equator



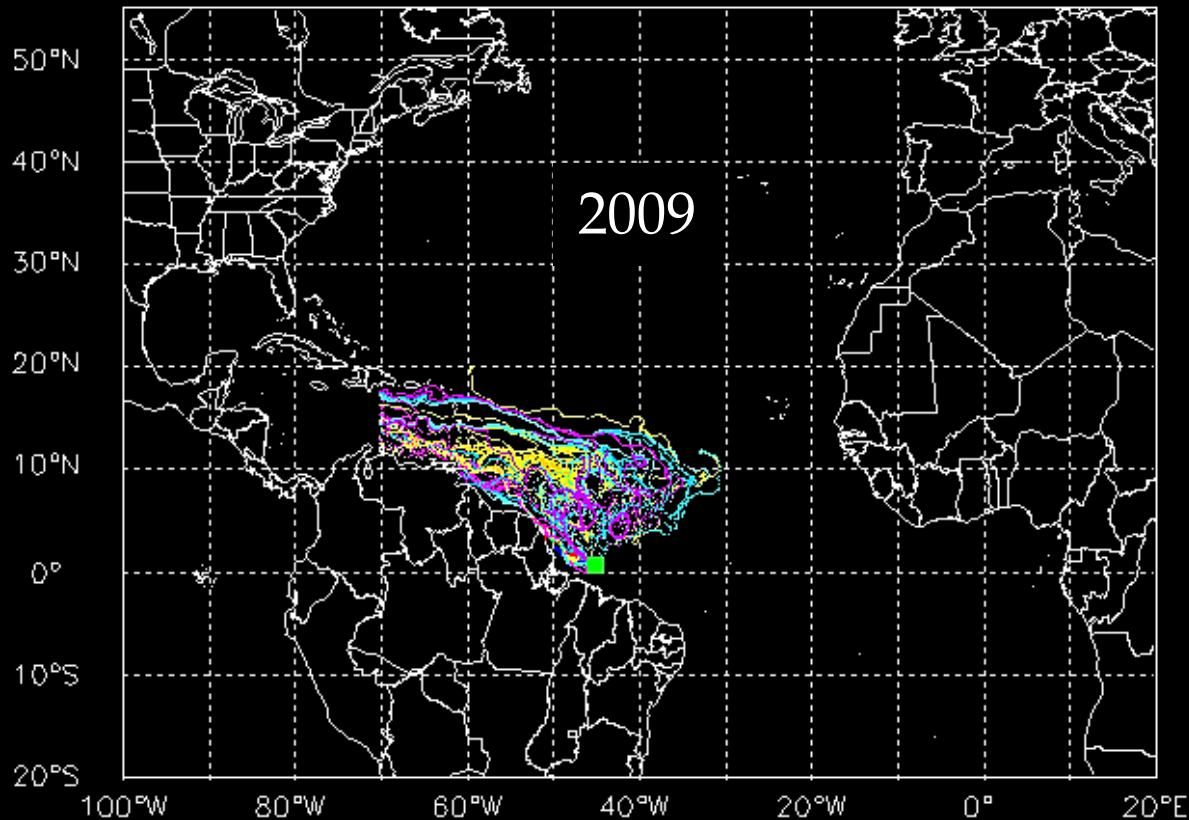
- Blue squares: stranding locations (note west Africa)
- Yellow lines: back trace without LSM to 1 January 2010
- Red lines: back trace with LSM

2014

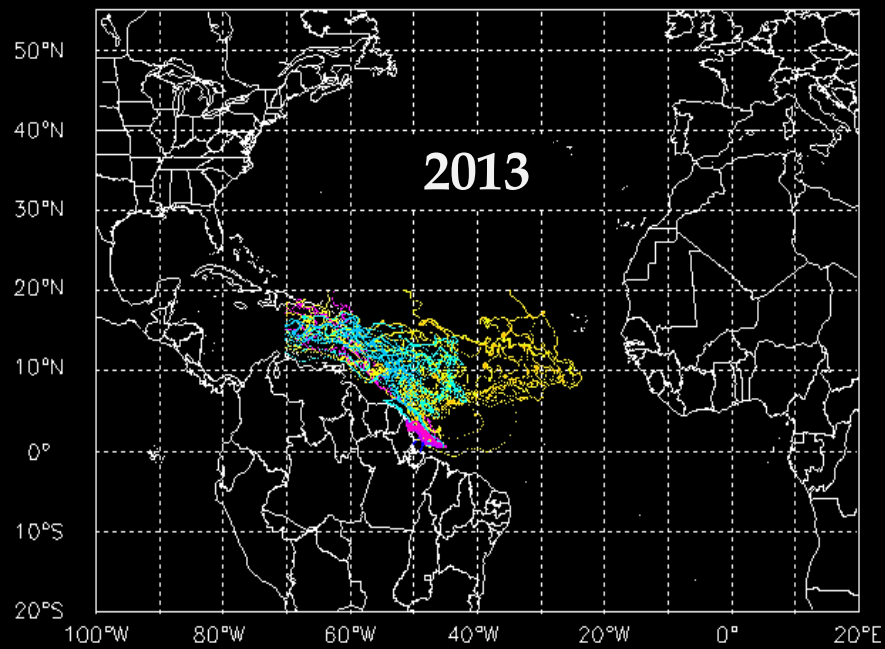
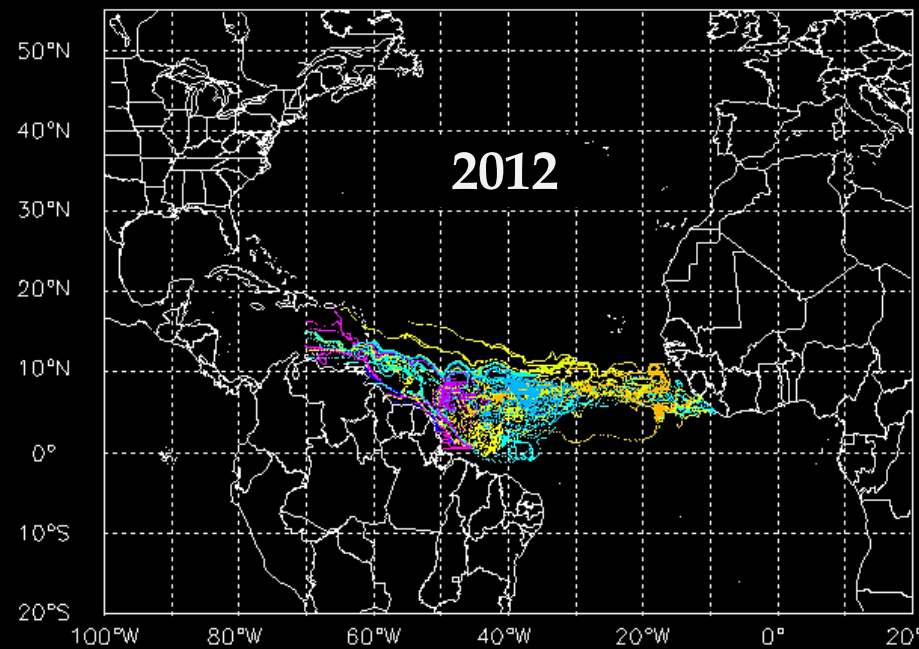
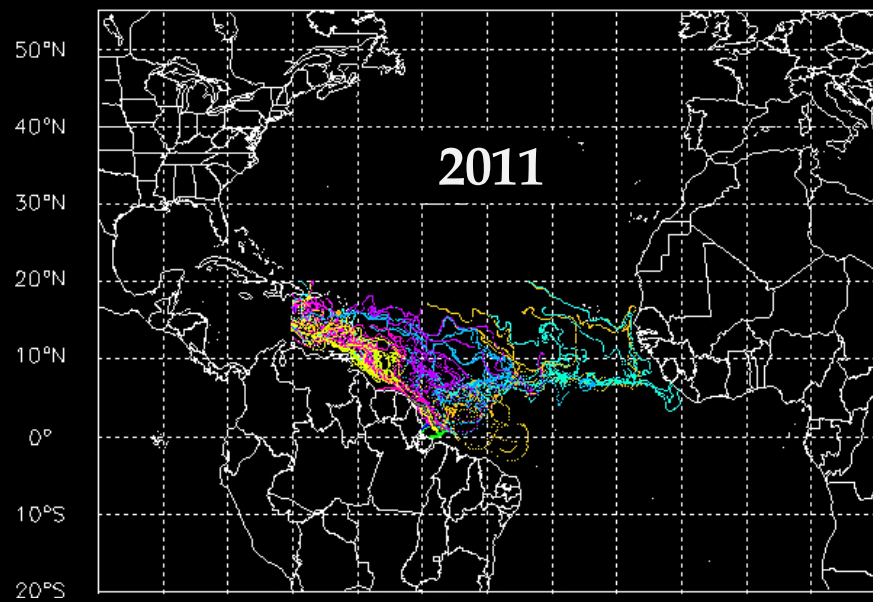
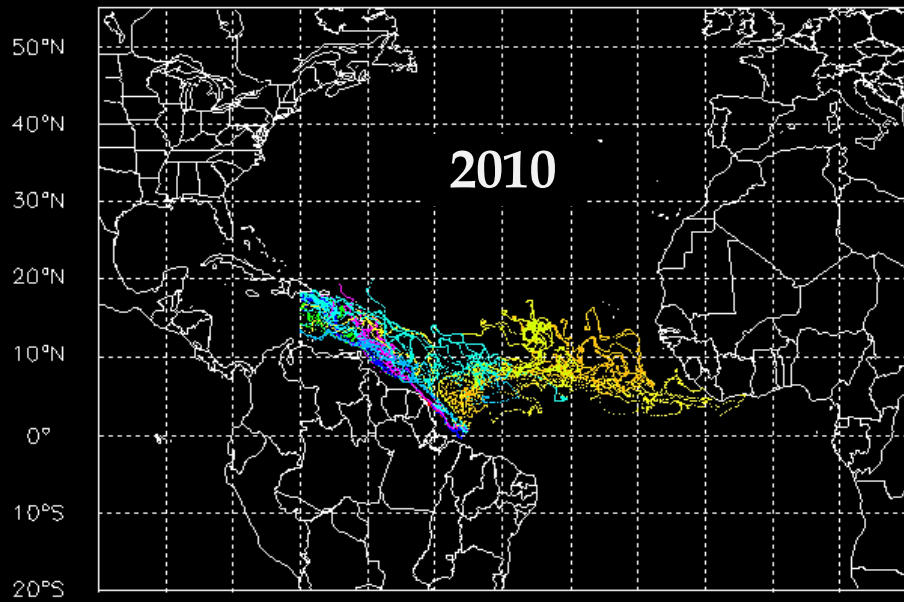


- Blue squares: stranding locations (note west Africa)
- Yellow lines: back trace without LSM to 1 January 2013
- Red lines: back trace with LSM

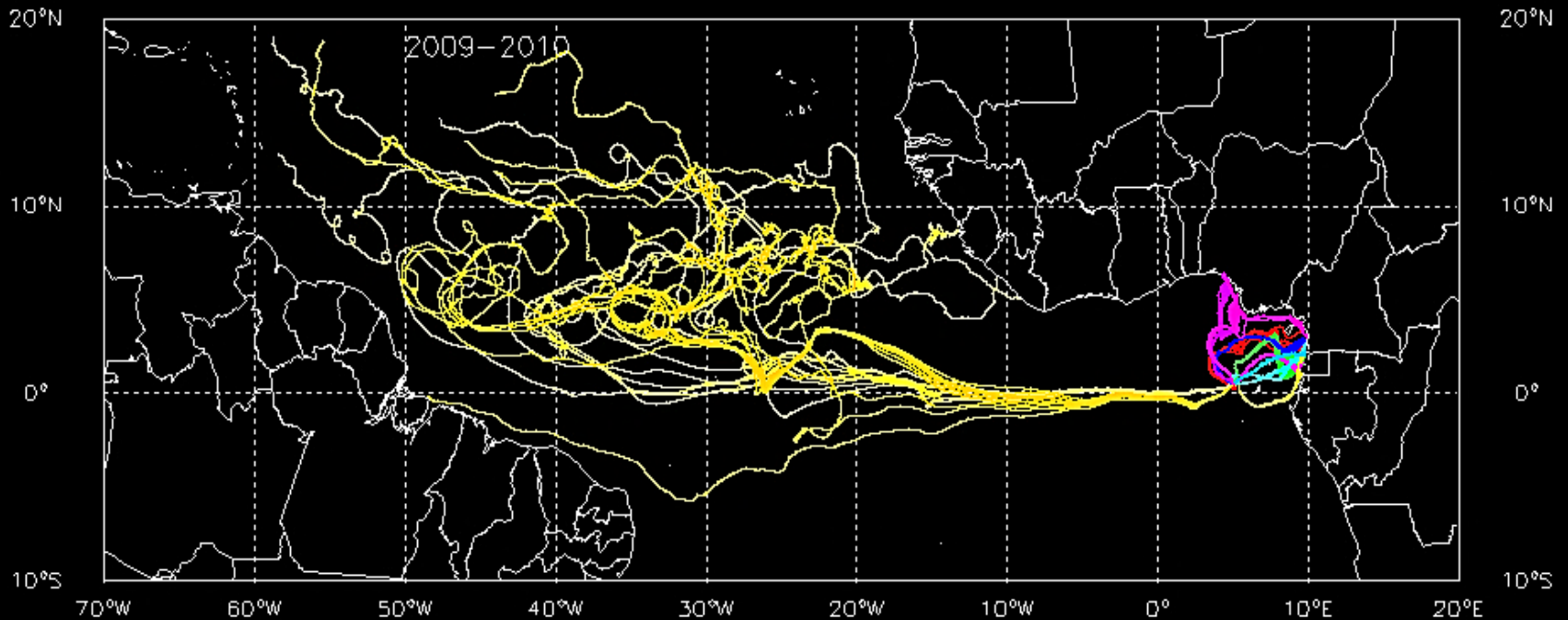
Note: no western consolidation region, but connection to Gulf of Guinea and equatorial consolidation region. Connection to far south Atlantic is suspect.



Test of forward tracking using model currents from equatorial location (green square). 10 parcels launched every month for full year & allowed to run for 1 year. In winter (Dec-Mar), groundings on coast of Brazil. In spring (Apr-Jun), flows directly to Caribbean. In summer & fall turns into central NERR

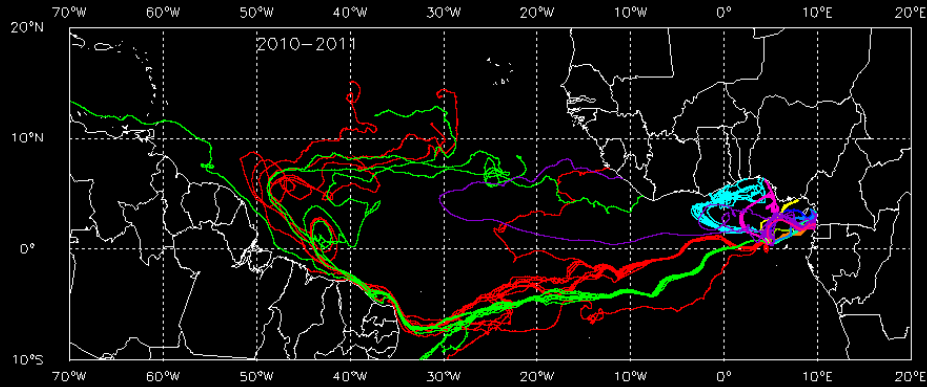


2009-2010

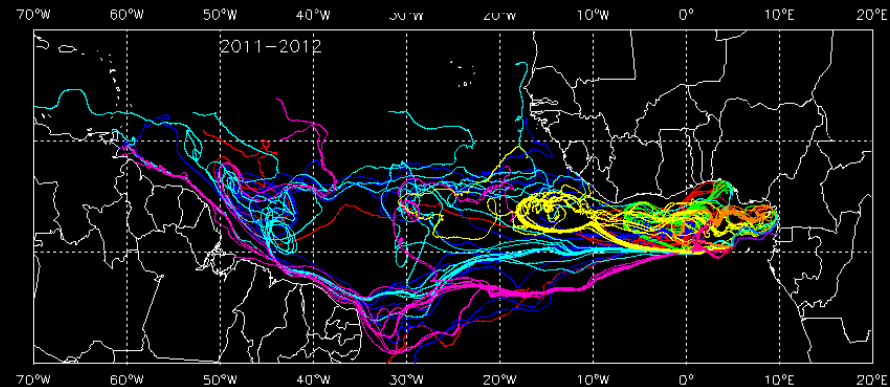


Test of forward tracing from the Gulf of Guinea (green square). 10 parcels launched at monthly intervals. June - July move to west.

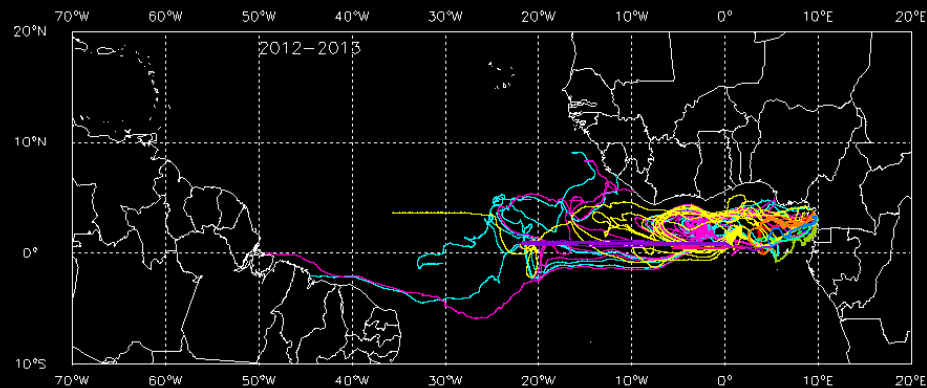
2010



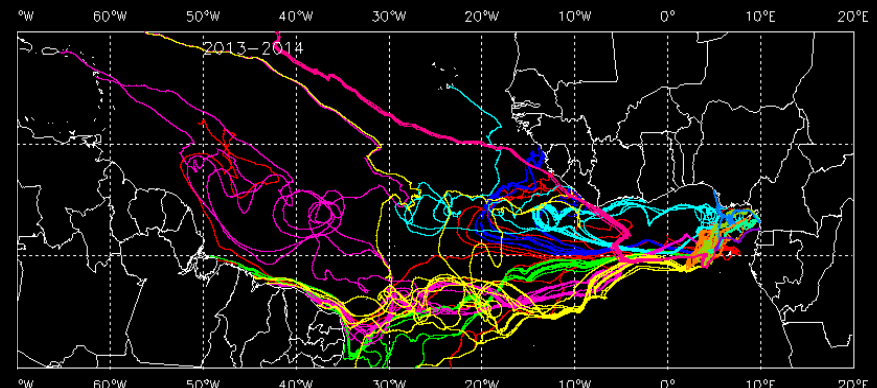
2011



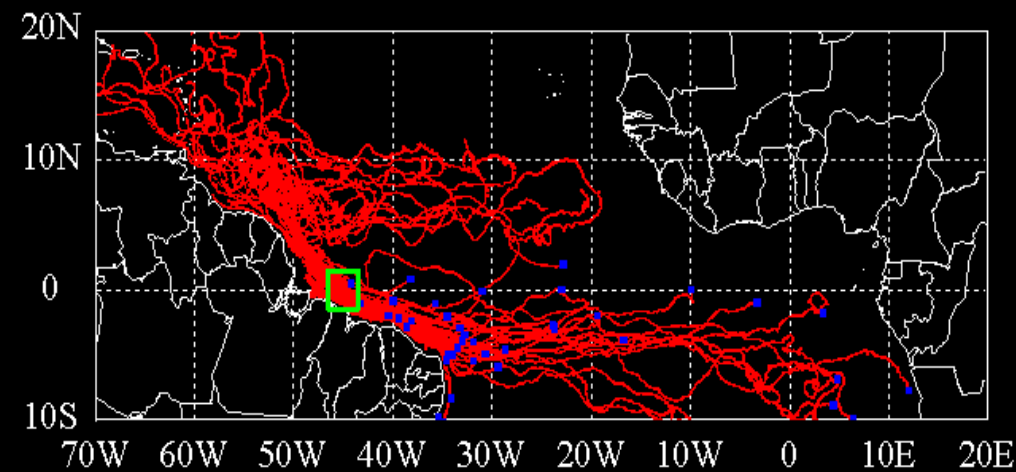
2012



2013

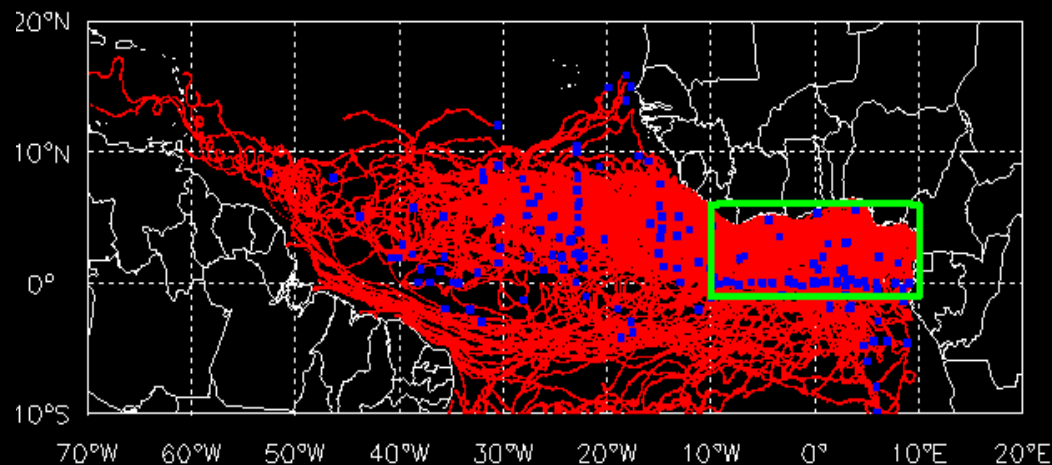


Forward tracing from the Gulf of Guinea to end of the following year



Satellite tracked drifters that passed through green box off Brazil. Note connection to central NERR. Blue squares are positions of first report.

Satellite tracked drifters that passed through green box in the Gulf of Guinea. Note connection to central NERR and to Caribbean through coastal Brazil.



SUMMARY

- ❖ The sargassum 'bloom' impacting the tropical Atlantic did not occur in the Sargasso Sea or the Gulf of Mexico.
- ❖ The North Equatorial Recirculation Region (NERR) between Brazil and Africa is favorable for accumulation and consolidation of pelagic sargassum, as well as growth from nutrient and iron availability.
- ❖ Atlantic climate indices reached historical maxima/minima in the period 2009-2011. It is suggested that conditions during this period favored recirculation, consolidation and growth of sargassum.
- ❖ Although it appears that we are entering a period of higher winter 'flushing' of the NERR, it is unclear if it is sufficient to clear the region of sargassum bloom conditions.

ACKNOWLEDGMENTS

- ❑ gcfinet@listserv.gcfi.org
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- ❑ Jean-Philippe Maréchal, Hazel Oxenford, Emma Doyle, Capt. Marcos Hanke, Rosemarie Kishore, Susan Singh-Renton Rosa Rodríguez, Capt. Anderson Kinch, Michelle Scharer, Fadilah Ali, Martha Prada, Jeanette Mateo, Dianne Wilson, Don Abrams, Wilma Lingle, Pieter Van Baren, Jennifer Hayes, Andy Maldonado

