The Sargassum Invasion of the Eastern Caribbean and Dynamics of the Equatorial North Atlantic

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Backtracked sargassum movements from landfall locations to region off Brazil using IASNFS circulation model. Presented at 64th GCFI 2011, Franks et al.
Ingredients For Pelagic Sargassum ‘Bloom’ and Invasion

• Seeded area (asexual reproduction)
• High nutrients
• Time to grow
• Dynamic environment to accumulate
Currents from satellite tracked drifters 1979-2011

Jan-May

>20cm/s
Sporadic accumulation
High growth

Accumulation
Growth

Jun-Oct
Amazon/Orinoco/Congo outflow
Equatorial Upwelling
West Africa Upwelling

Warmest waters in Atlantic

MODIS Chlorophyll Summer 2011
African dust: Nitrogen, Phosphorus, Iron
Satellite tracked current drifters that entered black box in 2010-2011. Green squares are starting points.

40% of drifters spent > 6 months in box.

Between 500-20,000 times the biomass.
Northward displacement of ITCZ

High pressure Azores

Sea surface temperature

http://www.esrl.noaa.gov/psd/data/climateindices/list/
Summary

- North Equatorial Recirculation Region (NERR) most likely ‘bloom’ location.
  - North Atlantic Equatorial Counter Current
  - North Brazil Current Retroflection

- Contains ingredients needed for bloom:
  - Seeded area – pelagic sargassum all over N. Atlantic
  - High nutrient input – River inflow, upwelling, African dust
  - Time to grow – Recirculation region with multi-year time scale
  - Accumulation – eddy formation of mats and lines

- NERR affected by Hadley Cell ocean/atmospheric interaction
  - ITCZ latitude and intensity
  - North Atlantic air pressure
  - Sea surface heating

- Year 2011 unusual in climate indices – likely from wild swings in climate due to global temperature increase.