Sargassum Invasion of the Eastern Caribbean and West Africa 2011: Hypothesis

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In the spring of 2011 unprecedented quantities of pelagic *Sargassum* washed up on beaches of the Lesser Antilles Islands of the Eastern Caribbean. It was subsequently reported along the coasts of Sierra Leone and Benin, West Africa, and spotted in large mats and long lines offshore Northern Brazil.

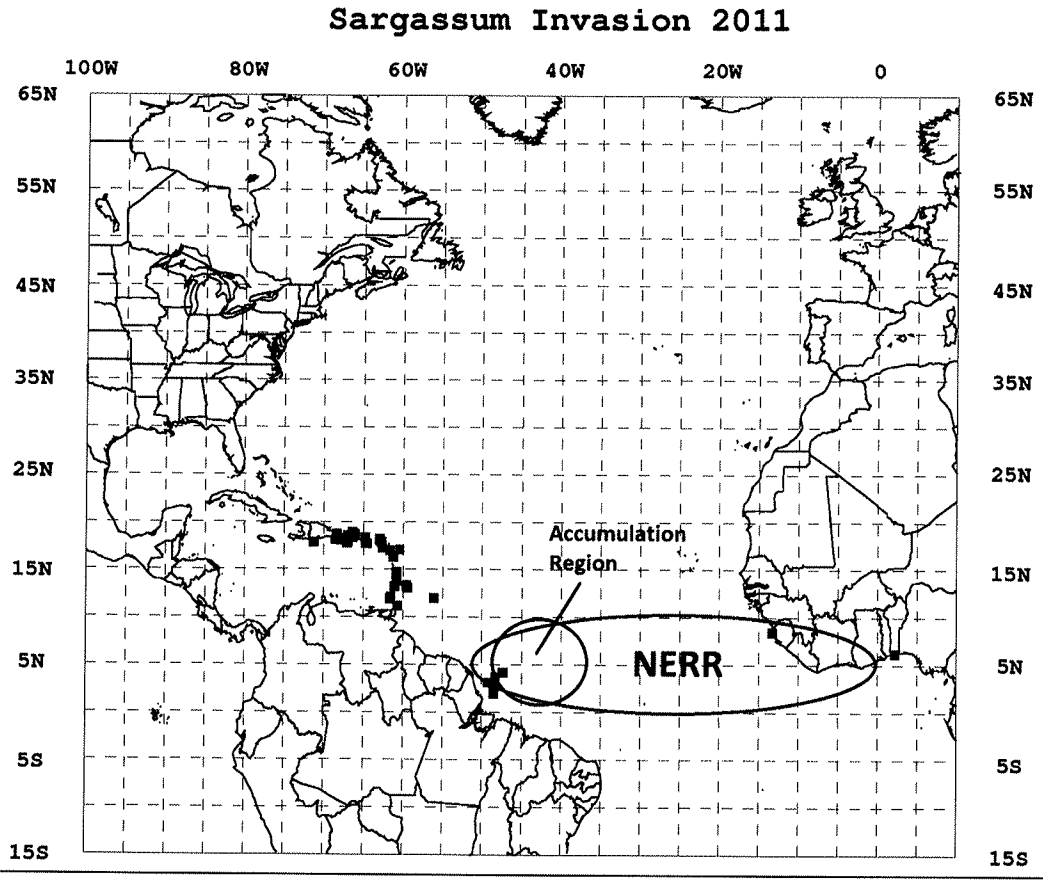

Figure 1. **Black Squares**: Locations of reported sightings of large quantities of *Sargassum*. (Note the two locations in West Africa)
NERR: North Equatorial Recirculation Region.
Accumulation Region: North Brazil Current retroflection and large eddies.

Using ocean current data from a high resolution numerical model, back traces were done from the sargassum sighting locations for a period of about 18 months prior to landings. The traces all went to the NERR (Fig. 1) where they spent considerable time in eddy-like motions. The traces eventually backtracked to the equator and then to the South Atlantic. Since the presence of the two species of pelagic *Sargassum* (*Sargassum natans* and *S. fluitans*) has not been verified in the South Atlantic and no connections could be found to the Sargasso Sea, the following hypothesis was formed: It is suggested that the *Sargassum* bloomed in the NERR, consolidated in the Accumulation Region and was 'flushed

out' in the spring of 2011 when the North Equatorial Counter Current broke down. This counter current forms seasonally in boreal winter and dissipates in boreal summer. After growth in the NERR, consolidation into large mats and long lines was made in the Accumulation Region (Fig. 1) where the North Brazil Current retroflects into the North Equatorial Counter Current and into large eddies, which subsequently move into the eastern Caribbean. Satellite tracked mixed-layer drifters tend to confirm this general pattern.

Surface waters of the NERR are warm and relatively nutrient rich, capable of supporting enhanced growth of *Sargassum*. Nutrients are supplied by the Congo River, equatorial upwelling, coastal upwelling off West Africa, the Amazon River and iron-rich dust from northwest Africa. Sea surface temperature maps show that the NERR and the Accumulation Region are the warmest regions in the North Atlantic. The species of pelagic *Sargassum* involved in the invasion do not propagate sexually, but simply fragment and new growth occurs. Blooms can appear when pelagic *Sargassum*, which may already be spread throughout a region, has the possibility of high growth through nutrient input, and consolidation into lines and mats by circulation features.

The association of the bloom with Equatorial Atlantic circulation dynamics is reinforced by the peaking of major North and Equatorial Atlantic climate indices in 2010. The Atlantic Meridional Mode (AMM), the North Atlantic Oscillation (NAO) and the Tropical North Atlantic (TNA) indices all reached unprecedented peaks (positive or negative) in 2010, subsequent to the bloom of 2011. However, these indices have not reached similar peaks since 2010 and, hence, cannot be directly correlated with the present apparent bloom near the Lesser Antilles (spring/summer 2014). Timing of *Sargassum* bloom events, hence, remains unclear.