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There have been recurrent, massive blooms of the pelagic brown alga Sargassum in the tropical central North Atlantic since 2011, with seasonal and interannual variations in the intensity and extent of the bloom. The blooms have led to chronic, seasonal impacts on the health and economies of tropical coastal nations in the region. The Sargassum population that now occupies this habitat was transported from the Sargasso Sea during an anomalously strong negative North Atlantic Oscillation (NAO) (Johns et al., 2020). Time series of satellite-based observations show that large Sargassum patches aggregate from March to September in a band that eventually stretches from Africa to the Americas. The geographic position of this band follows the seasonal south-north migration of the Inter-Tropical Convergence Zone (ITCZ). The massive cross-basin windrows follow the location of the ITCZ in its seasonal northward migration. Typically, since 2011, patches of Sargassum that are left over from the previous year’s bloom converge by action of the winds that form the ITCZ early in the year just north of the Equator. We propose that the strong winds associated with the ITCZ cause strong vertical mixing and Ekman pumping along a broad (~200 km north-south) band that stretches across the basin and migrates northward with the ITCZ. This band in the tropical central Atlantic has become a beneficial habitat for the growth of Sargassum. Vertical mixing, and eddy and Ekman upwelling, provide an open-ocean upward flux of nutrients under high

sunlight conditions in the central tropical Atlantic. During years when the winds that form the ITCZ are stronger, mixing is more effective, and the blooms are stronger. During years of weaker winds, the accumulations are less (such as in 2016) or can be minimal (2013). Our findings suggest that riverine inputs and coastal upwelling near Africa or the Americas are not spatially or temporally congruent with the seasonal aggregation and blooming of the Sargassum in the central tropical North Atlantic. Forecasting the recurrence and intensity of the blooms will require characterizing, understanding, and monitoring these mechanisms of open-ocean aggregation and nutrient supply.

This presentation builds on the paper by E. M. Johns, R. Lumpkin, N. F. Putman, R. H. Smith, F. E. Muller-Karger, D. Rueda-Roa, M. T. Brooks, C. Hu, M. Wang, L. J. Gramer, and F. E. Werner (2020). The establishment of a Sargassum population in the tropical Atlantic: biological consequences of a basin-scale long distance dispersal event. Progress in Oceanography, vol. 182; https://doi.org/10.1016/j.pocean.2020.102269.
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