

Causes and Solutions of the Great Atlantic *Sargassum* Belt

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Pixalytics



Outline

1. Background

- i. What is the Sargassum Belt?
- ii. Why is it an issue?
- iii. What are the fundamental knowledge gaps?

2. Research Questions

- i. Hypotheses
- ii. Methods and expected outcomes

3. Summary and Further Work



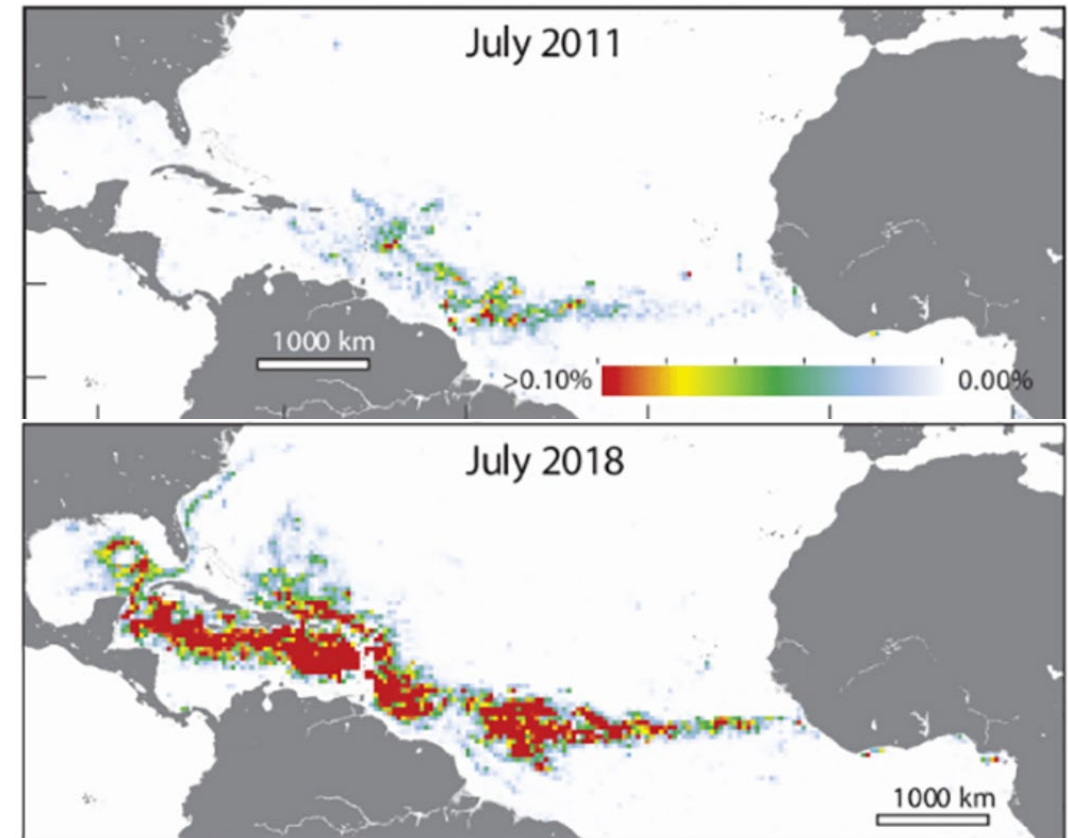
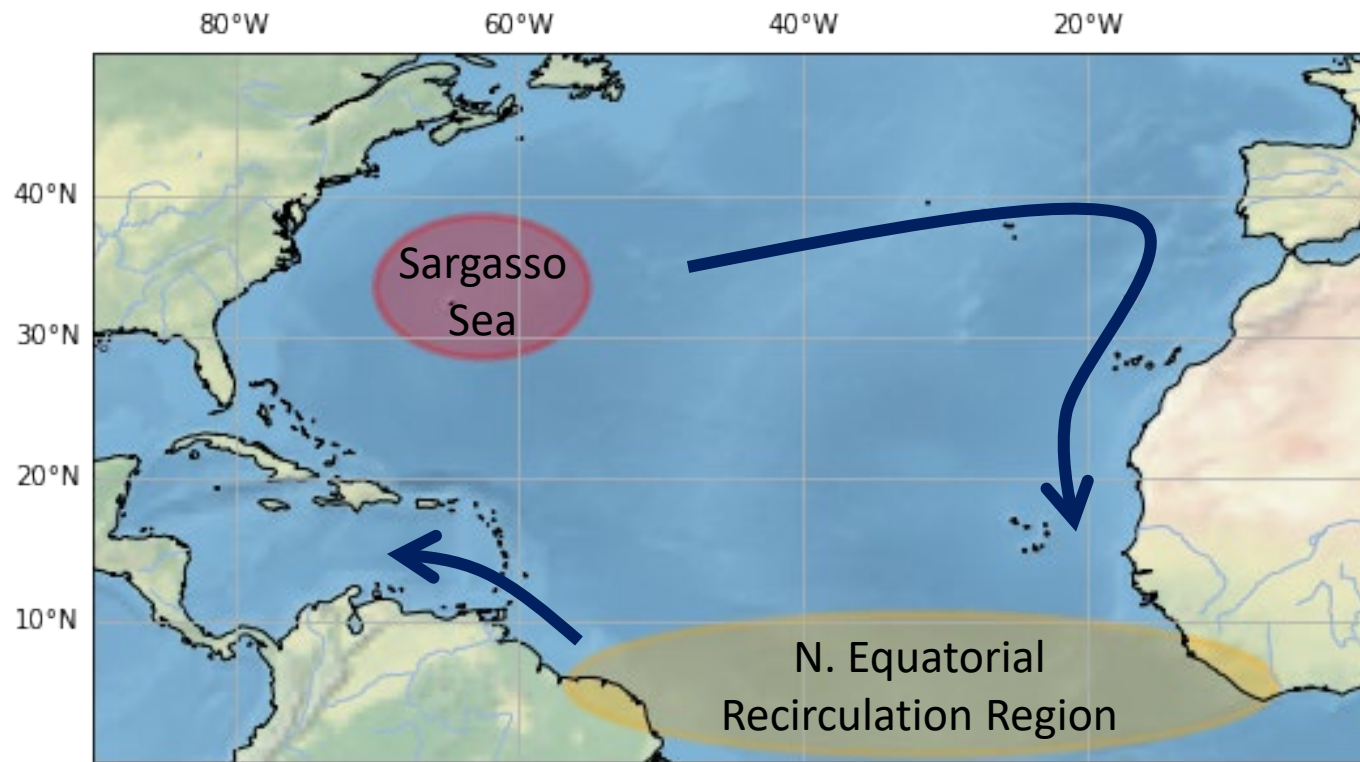
What is *Sargassum*?



Credit: aoml.noaa.gov

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What is the Great Atlantic *Sargassum* Belt (GASB)?



Wang et al., Science, 2019



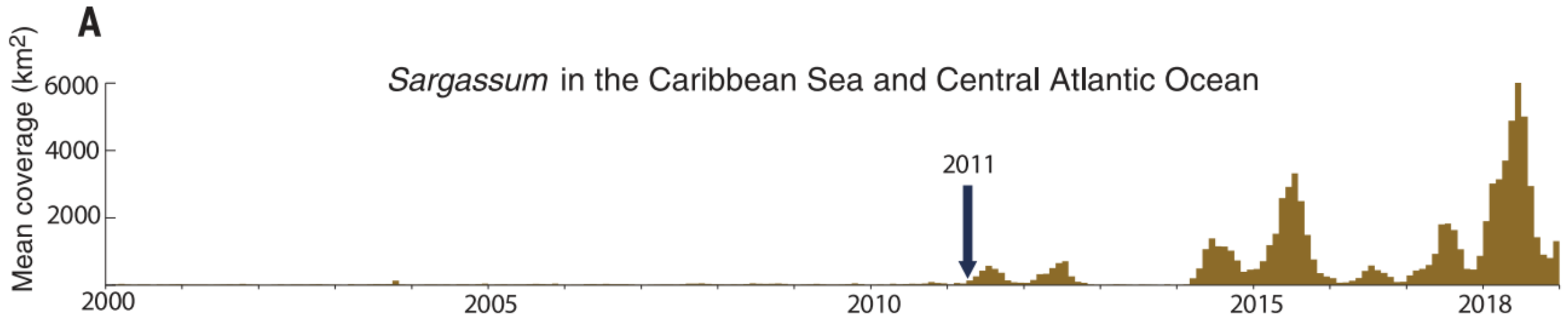
Why is this an issue?



Credit: sciencemag.org

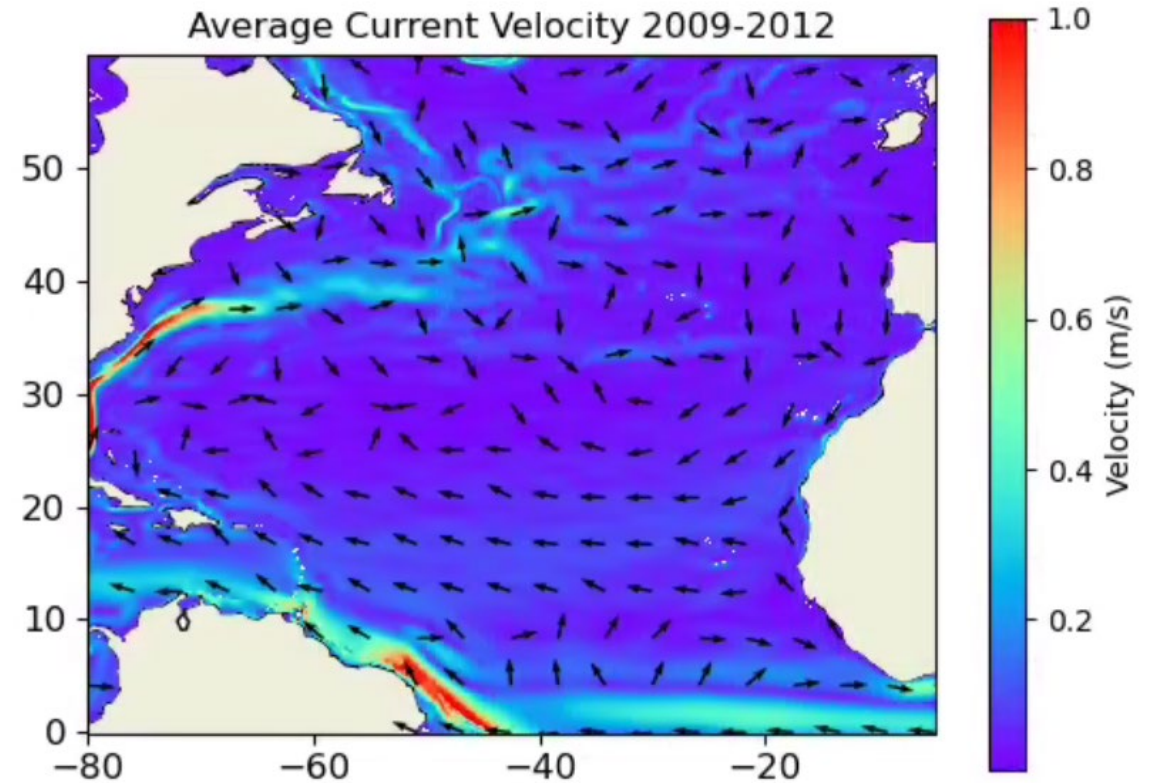
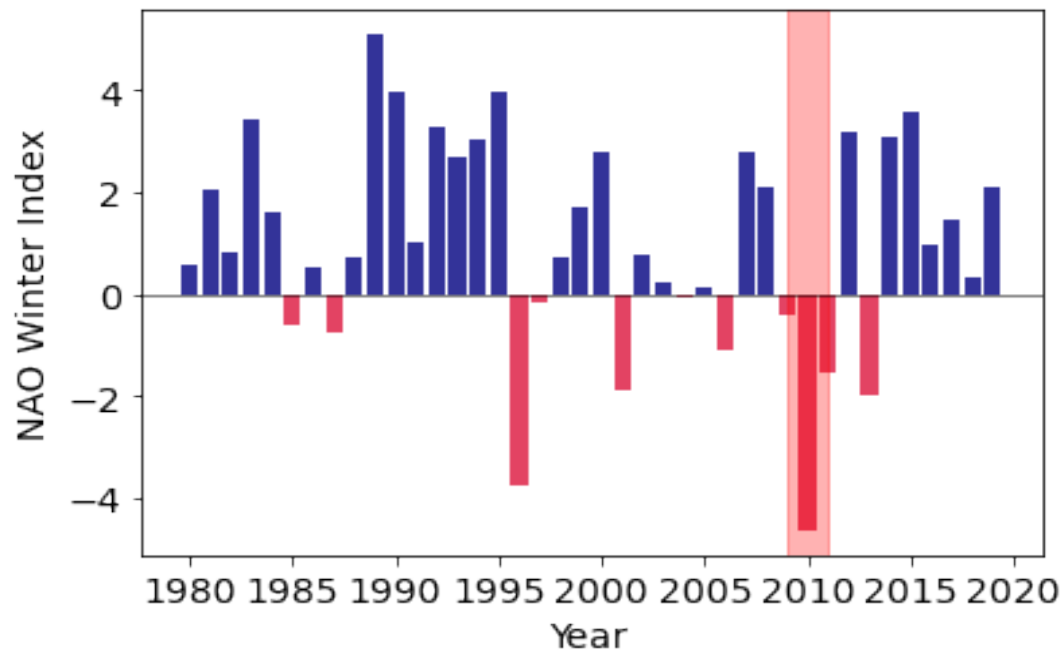
What are the fundamental knowledge gaps?

1. What caused the first large GASB event in 2011?
2. What drives the observed annual variability?
3. Can numerical models reliably predict trajectories and beaching?



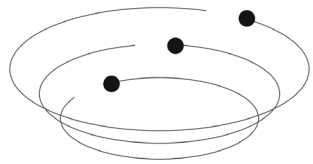
Wang et al., Science, 2019

1. Why did the GASB form?



Current theory by *Johns et al., Prog. In Oceanography, 2020* → An extreme NAO event

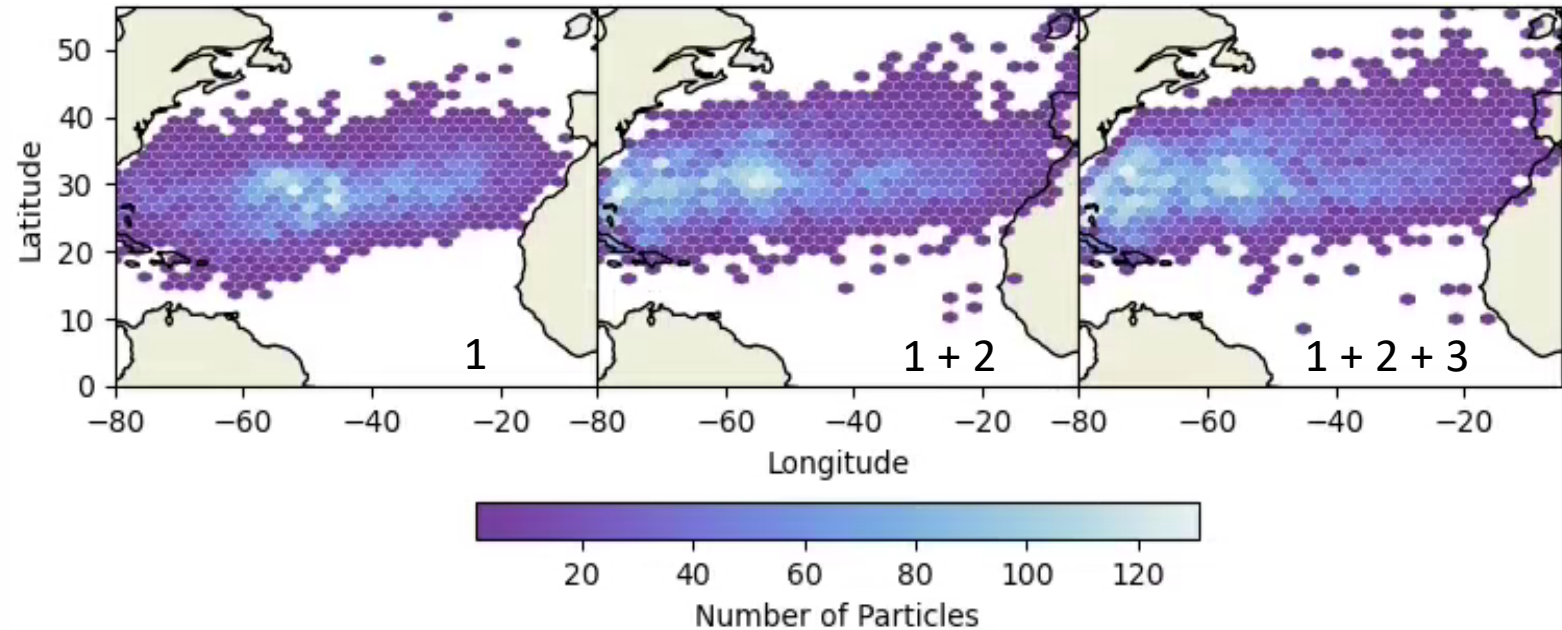
1. Why did the GASB form?



Method:

Ocean **Parcels** Particle Tracking

- 1) Surface Currents: Global Reanalysis 1/12°, CMEMS
- 2) Stokes Drift: Global Wave Reanalysis, CMEMS
- 3) Wind: ERA5



Particle Density after 4-year run (2009-2012)

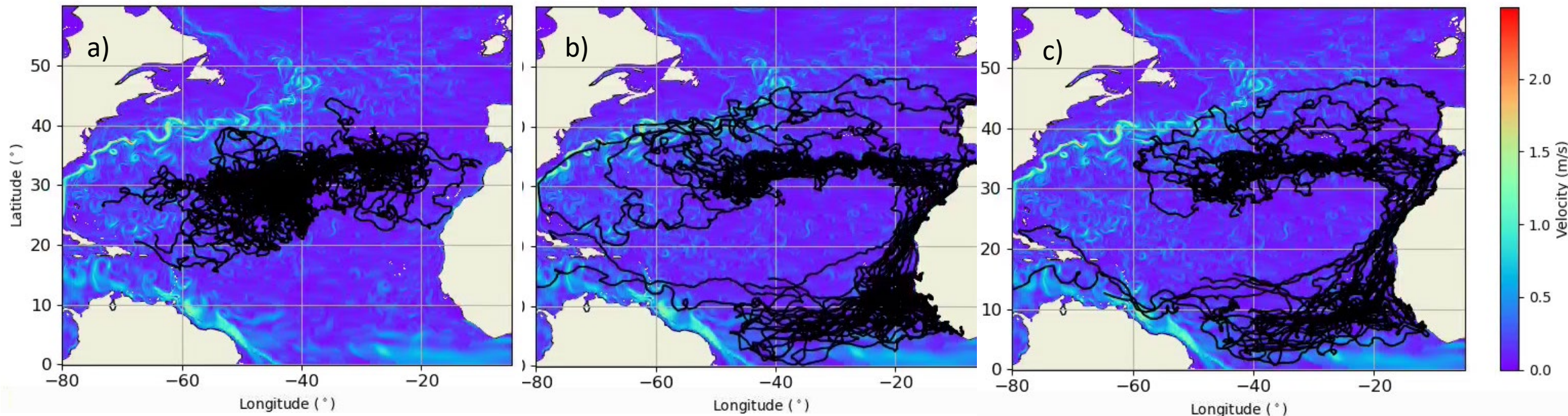
1. Why did the GASB form?

Selected particle trajectories (with same release time and location) for each condition:

a) *Current velocity field*

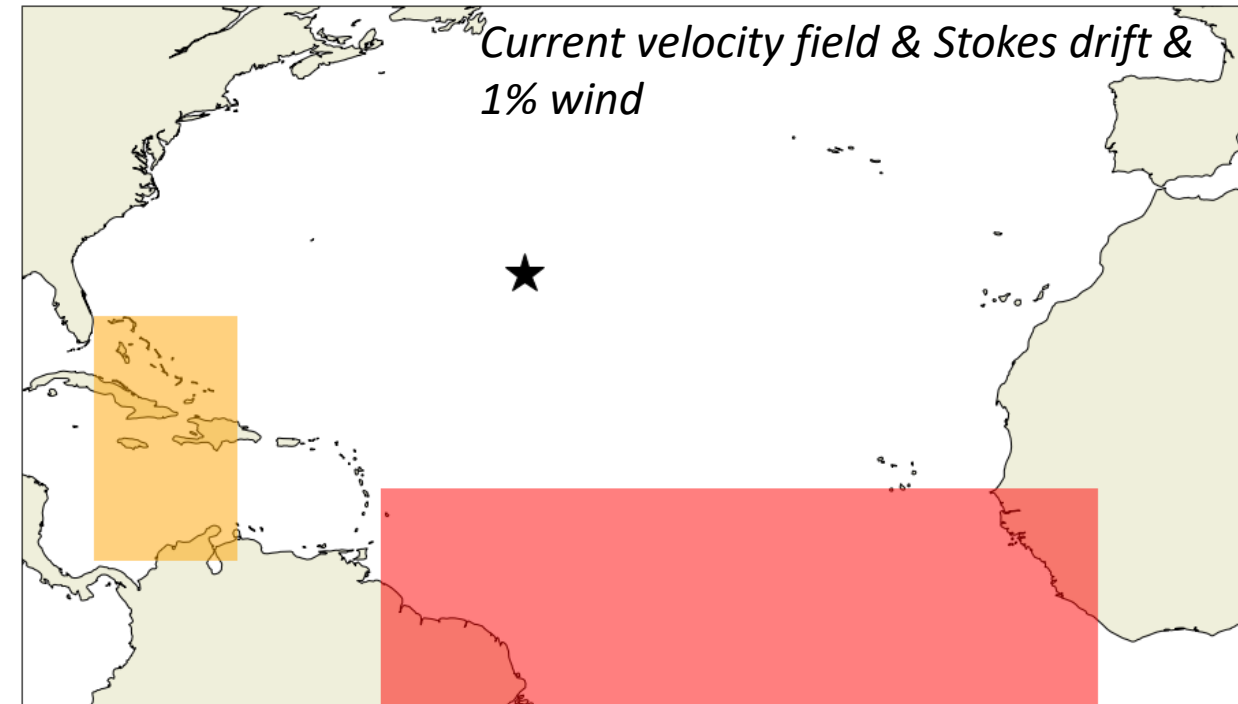
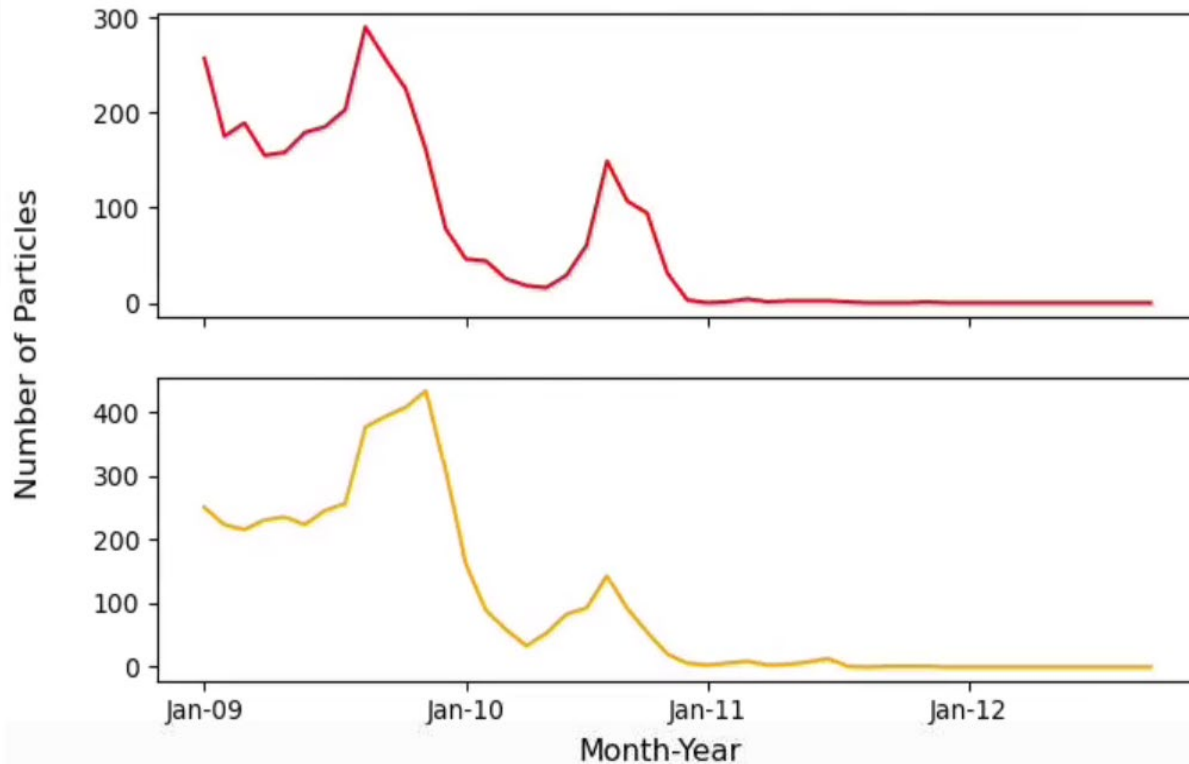
b) *Current velocity field + Stokes drift*

c) *Current velocity field + Stokes drift + 1% Wind*

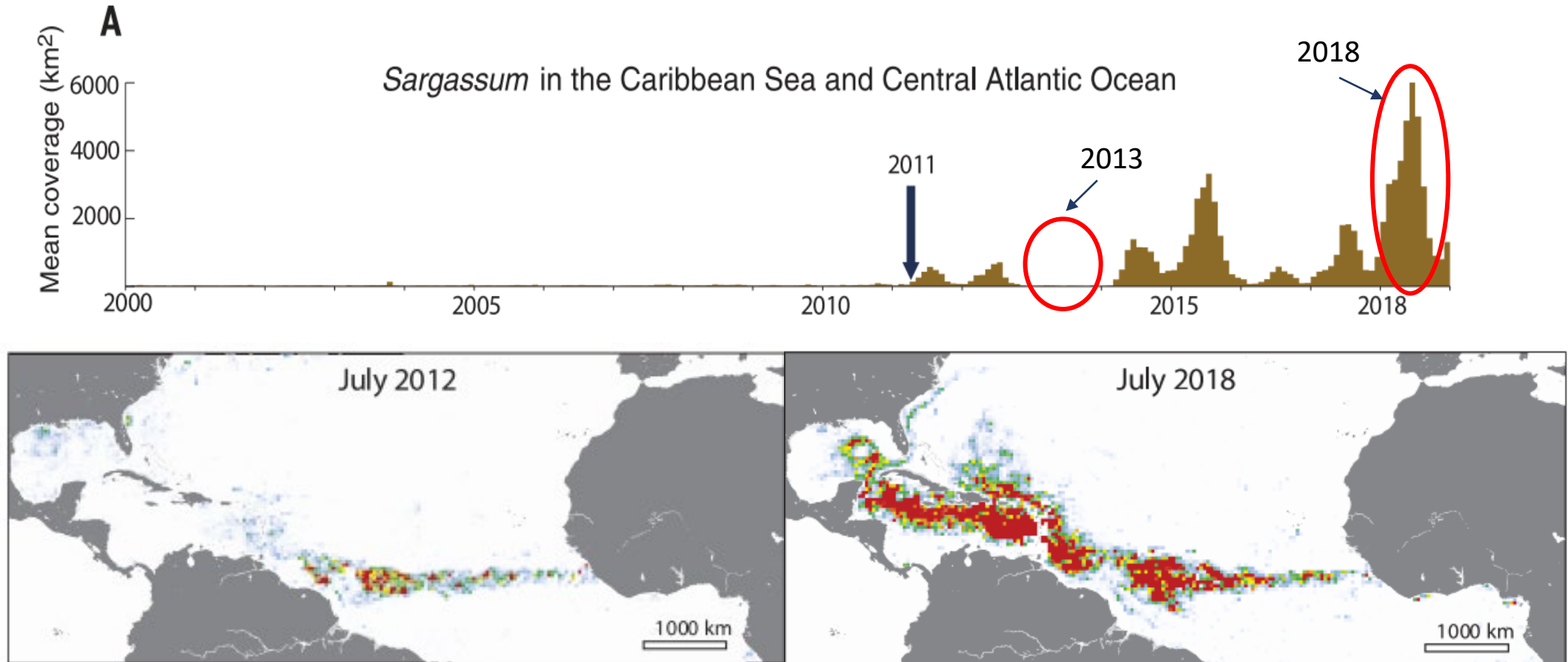


1. Why did the GASB form?

Number of particles of *each monthly release* that travel through the Equatorial Atlantic and the Caribbean Sea



2. What causes variability in the GASB?



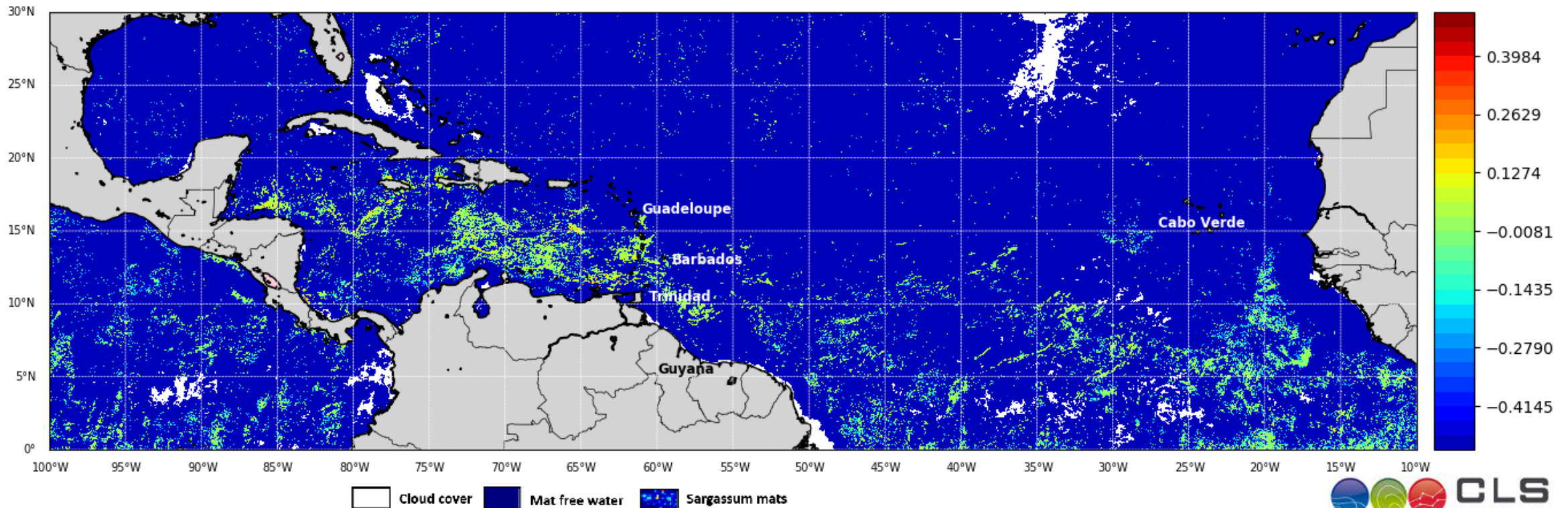
Wang et al., Science, 2019



2. What causes variability in the GASB?

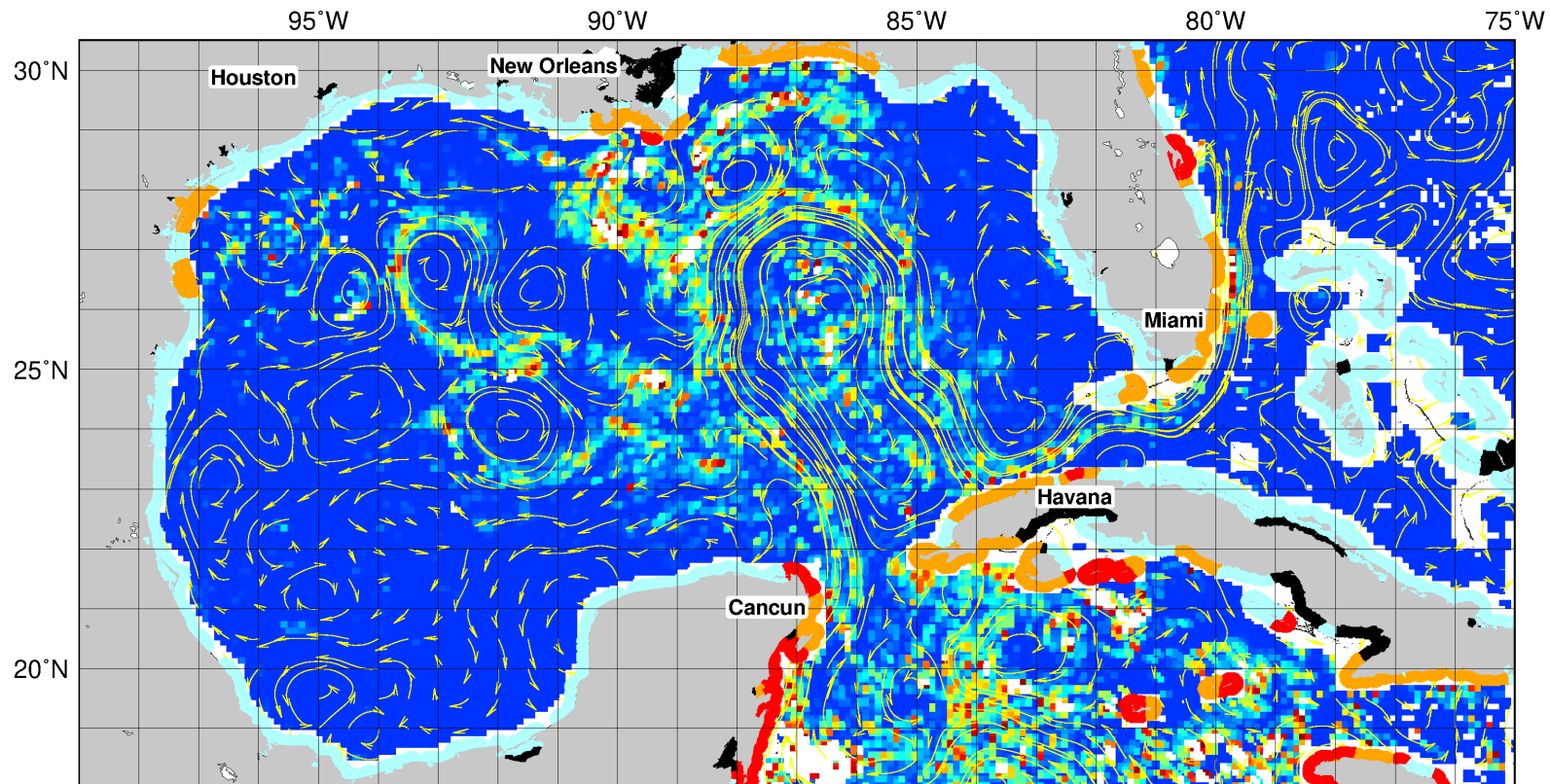
SAMtool: Sargassum Detection – CLS

OLCI / MODIS NFAI CLS 7 days Mean (2022-03-04 00:00:00 UTC)



2. What causes variability in the GASB?

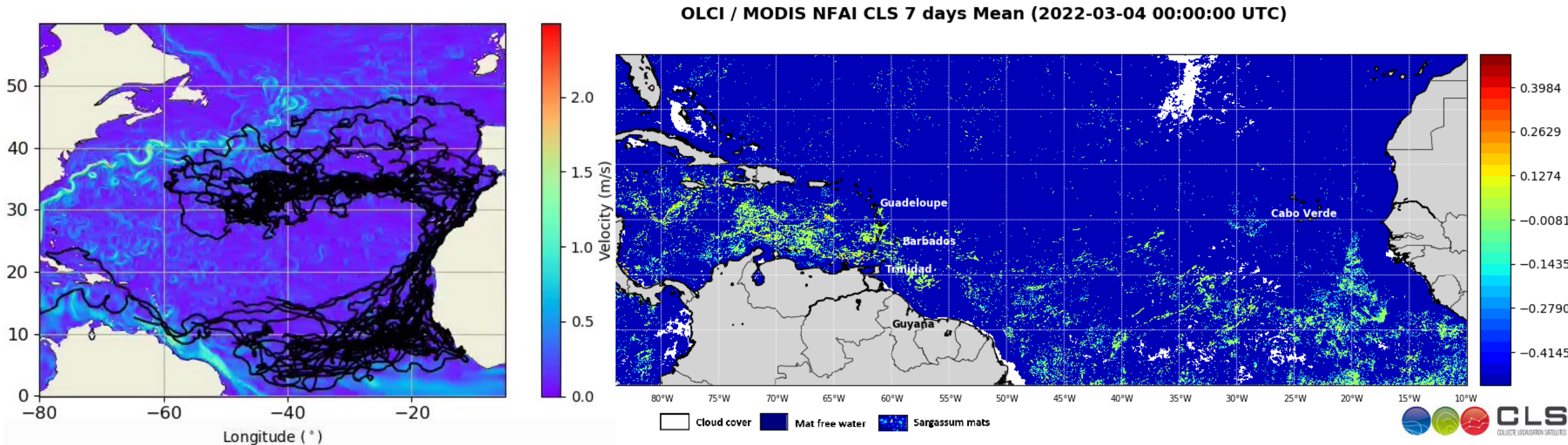
Sargassum Inundation Report – NOAA & USF



- How does the distribution and biomass change for:
 - Caribbean Sea
 - Equatorial Atlantic
 - Sargasso Sea

- What drives the changes?

Summary and Further Work



- Explore if particles can only escape the Sargasso Sea in 2009/2010; if so, then why?
- Determine drivers of interannual variability in *Sargassum* bloom size and distribution