

Interreg

Caraïbes

Fonds européen de développement régional



UNION
EUROPÉENNE

SARG'COOP

Programme caribéen de coopération de
lutte contre les algues sargasses



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des sargasses*



Plausible scenarios of sargassum
(*Sargassum spp.*) population based on
satellite-detection and beaching indices.



SEMA
SECRETARÍA DE ECOLOGÍA
Y MEDIO AMBIENTE


INAPESCA
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Y ACUICULTURA


CICIMAR-IPN

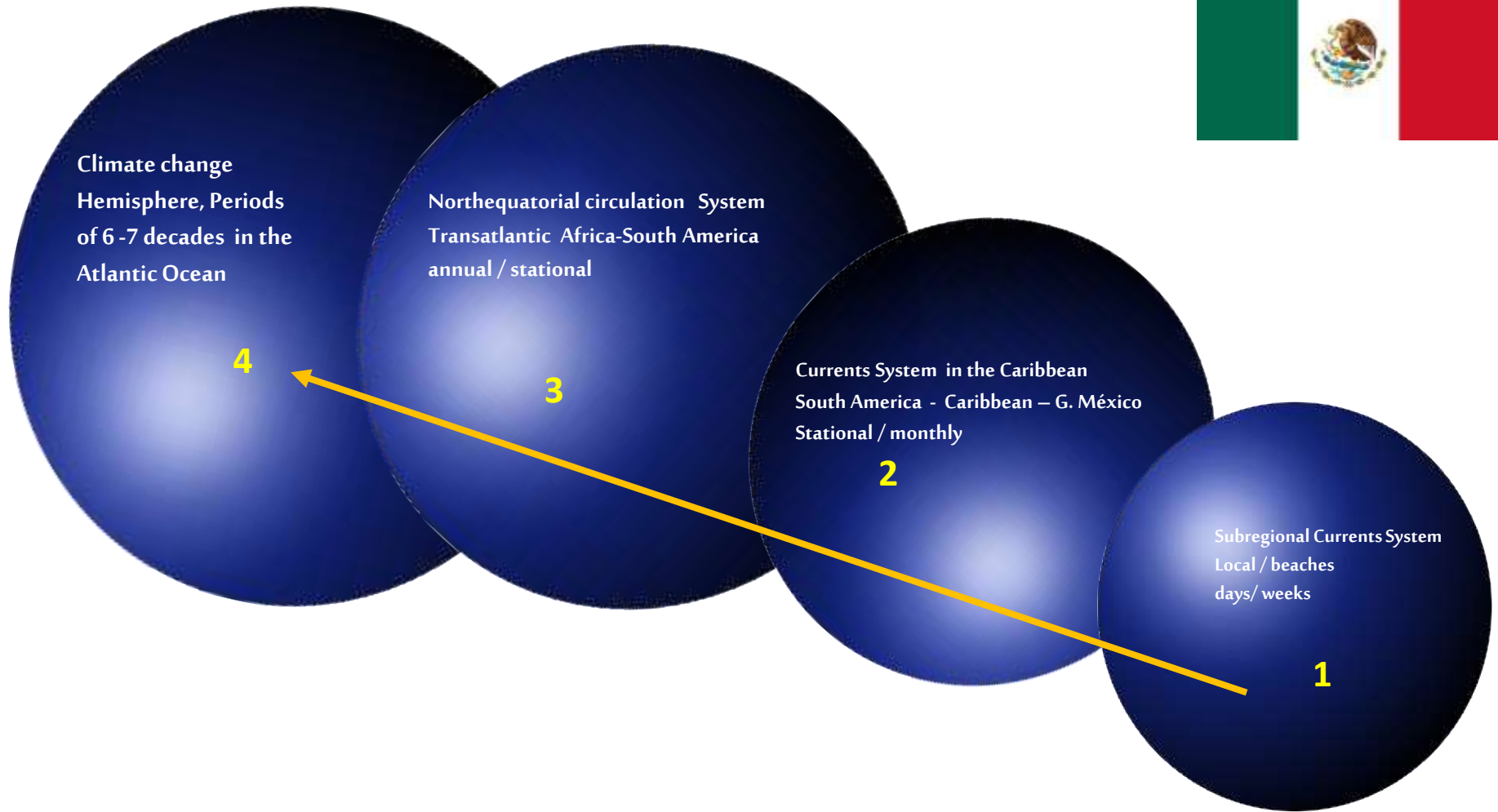
OIOS – Canada


MOON PALACE®
CANCUN

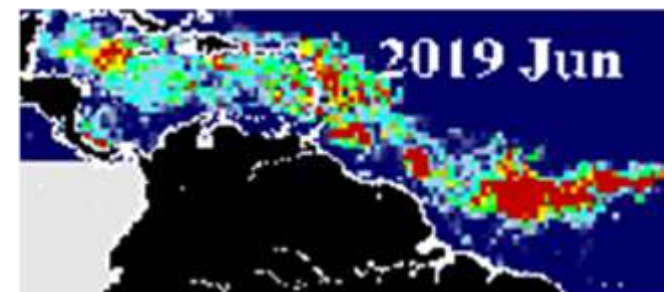
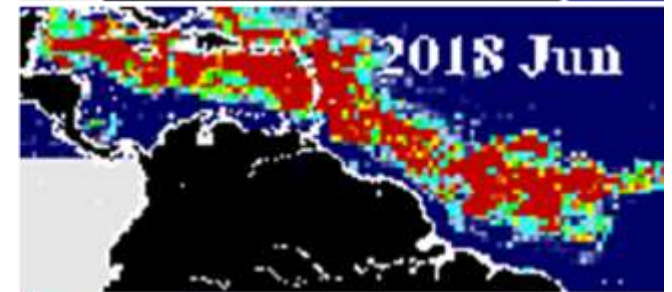
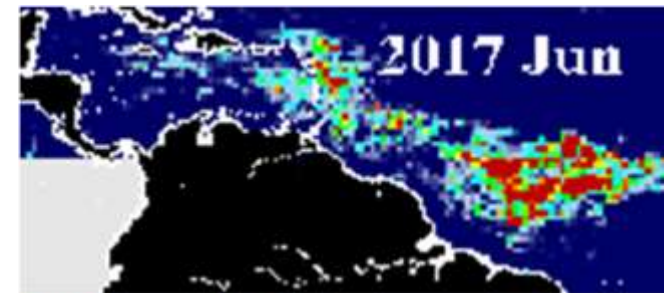
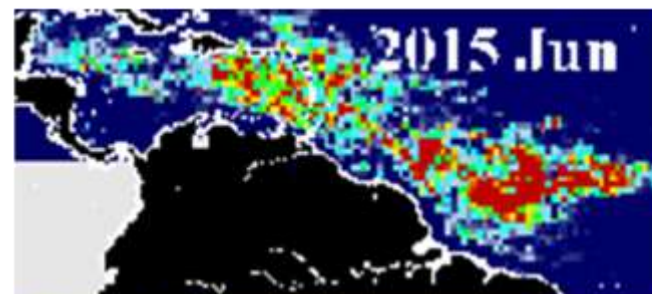
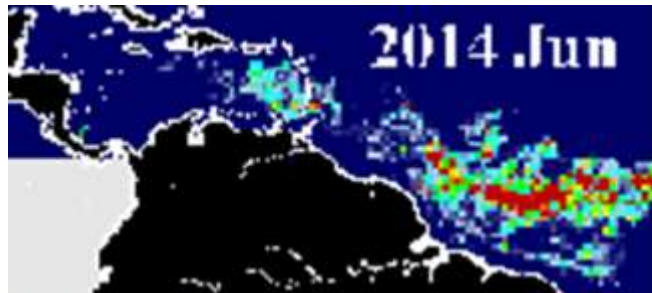


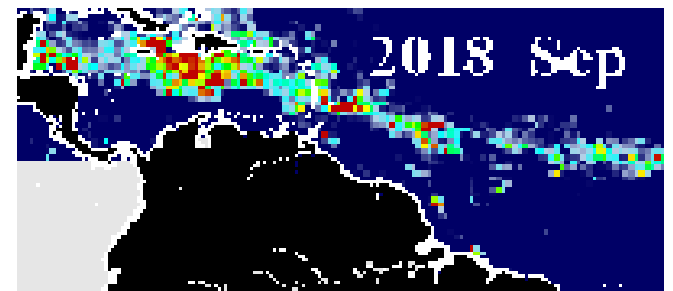
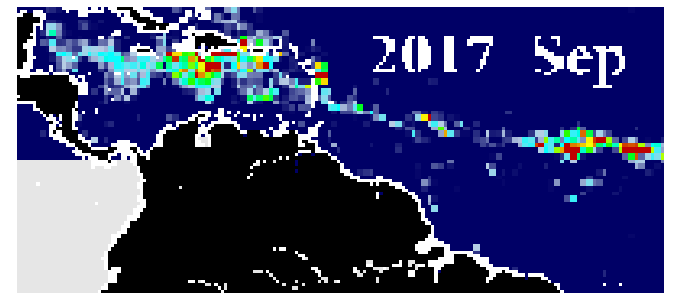
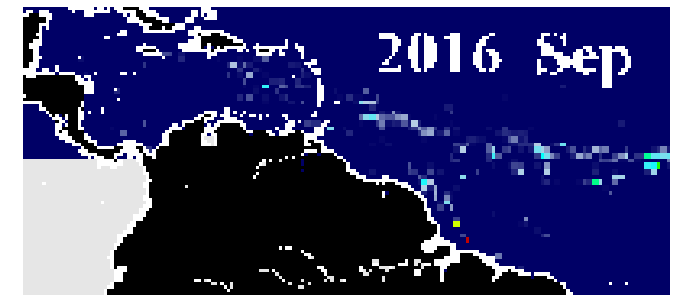
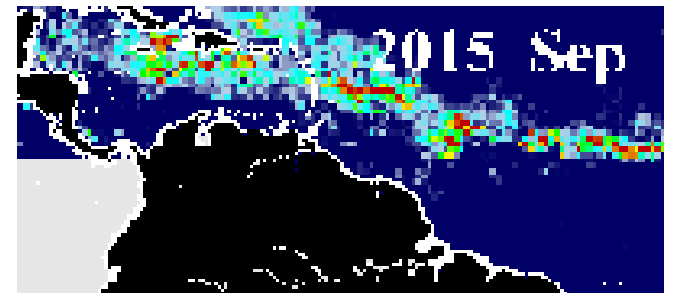
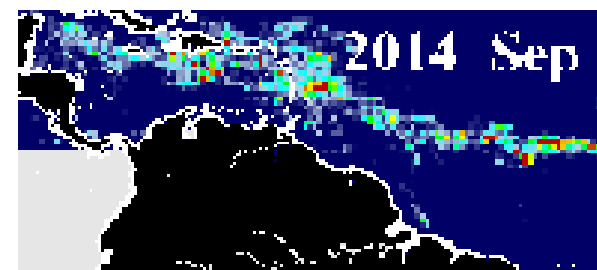
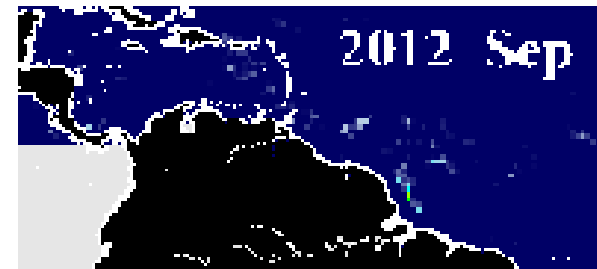
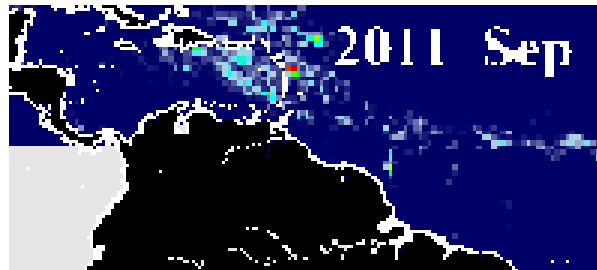
The sargassum phenomenon is considered a Wicked problem - problème enchevêtré.





Dynamic processes inter-connected at different geographic Scales and times



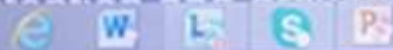


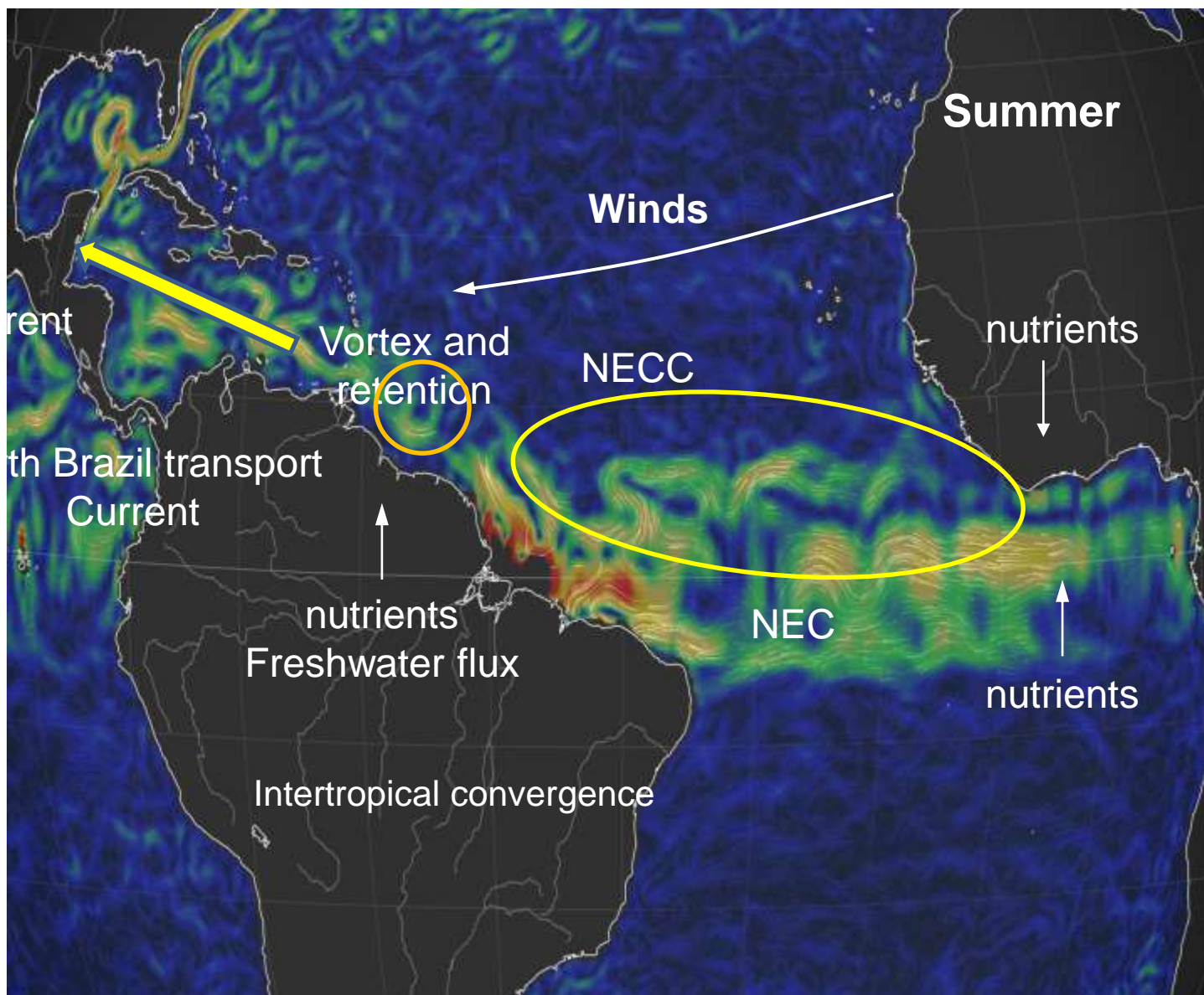


- Brazil is pass-through region....not a source region.



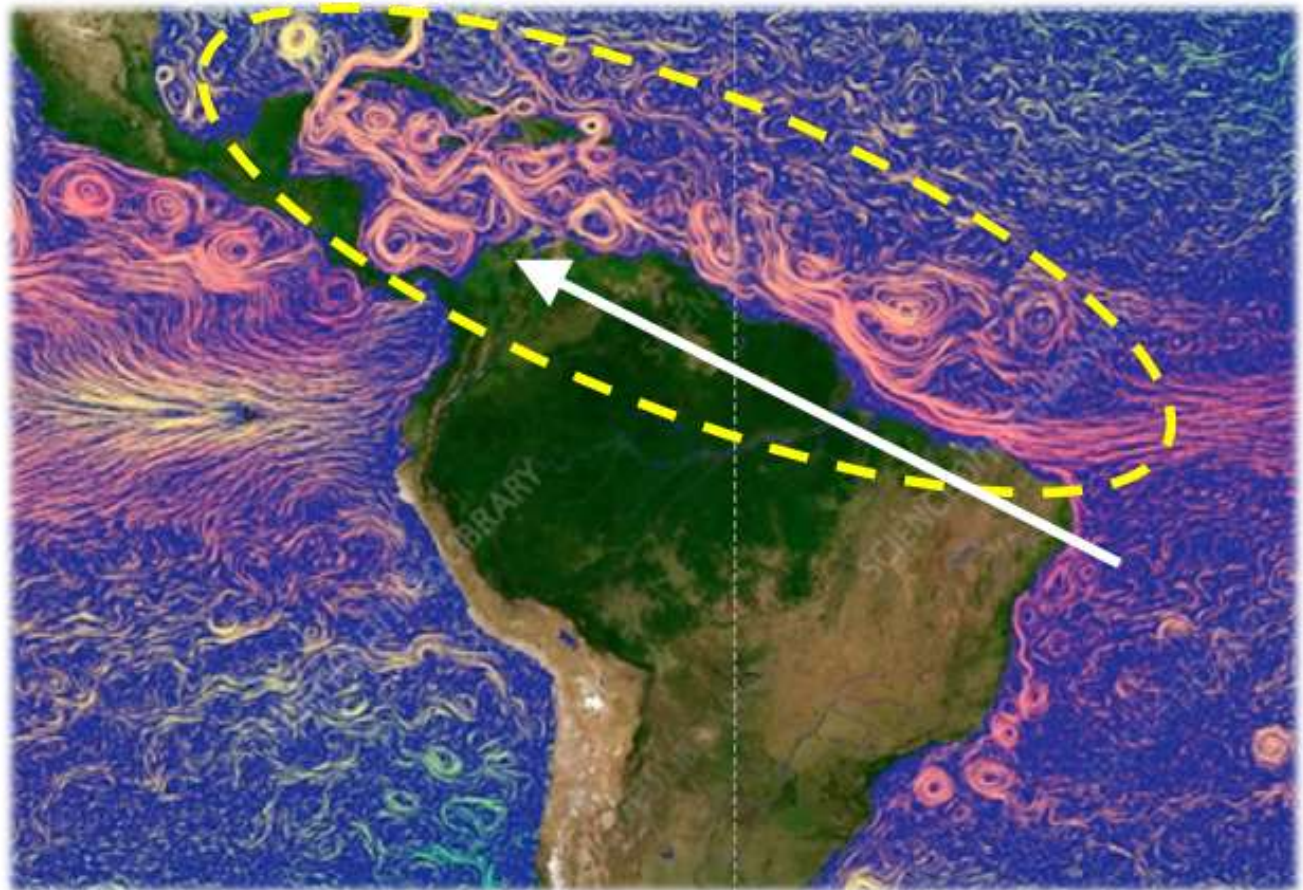
Proposed: Consolidation Regions are regions of Sargassum retention and growth

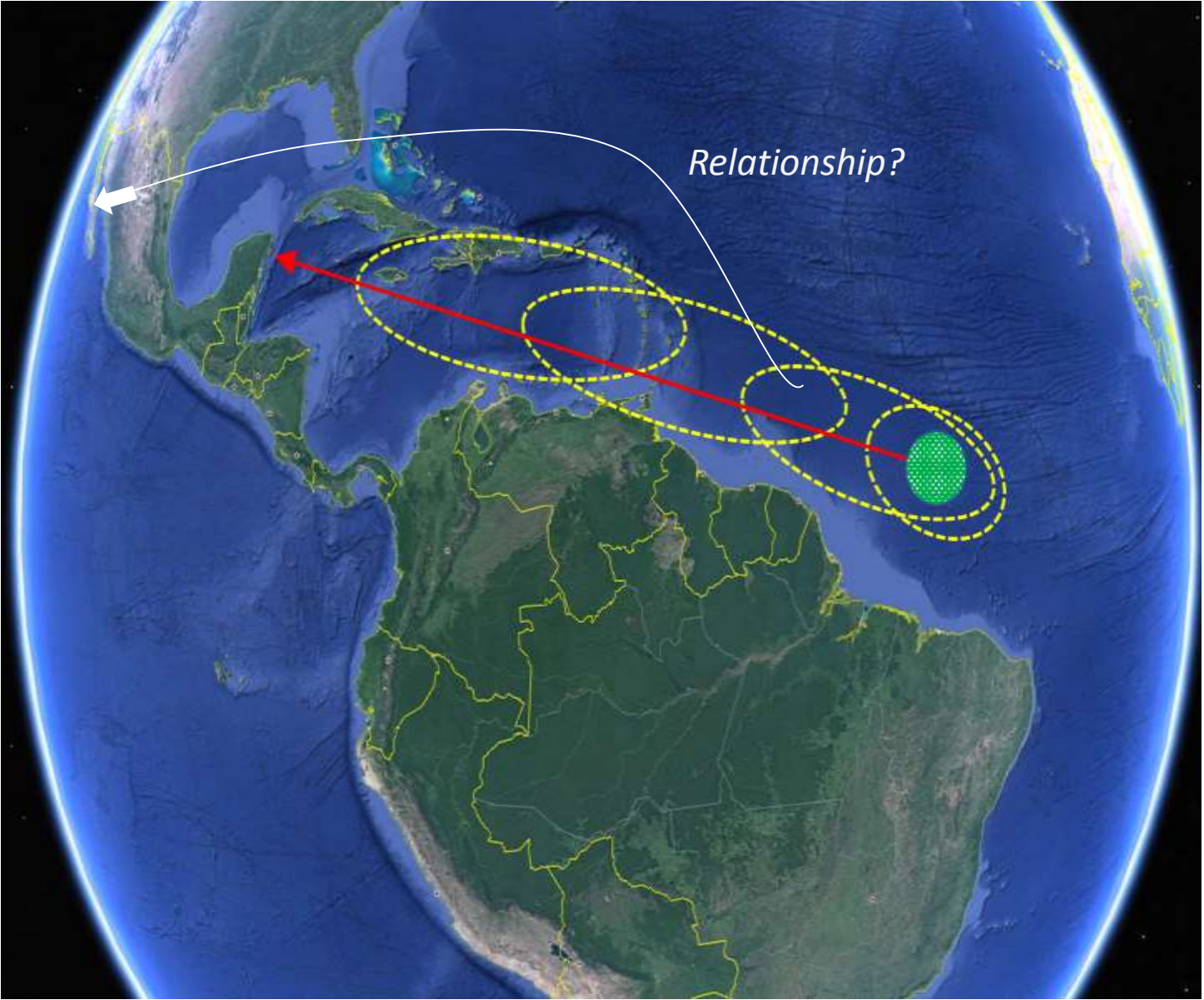


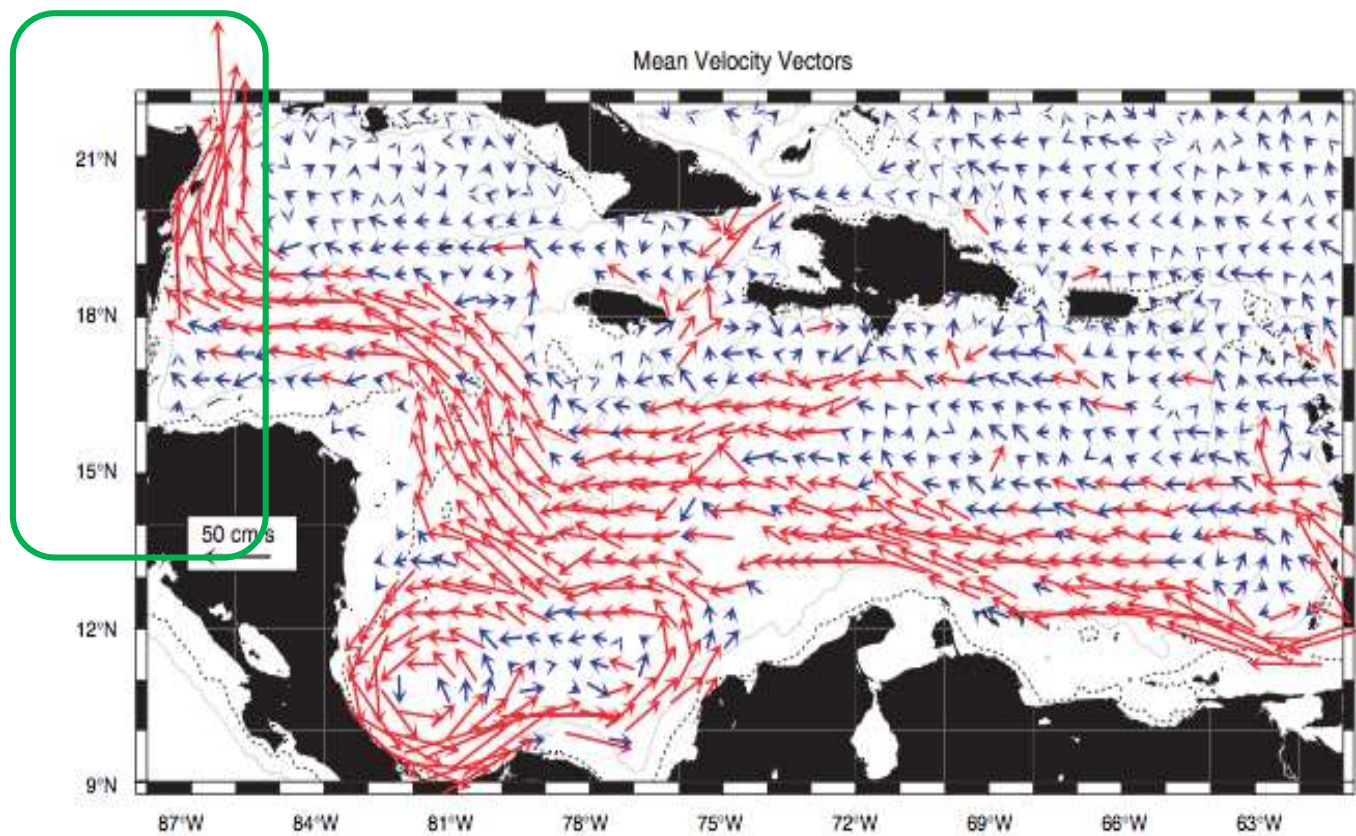




Transportation to the Great Caribbean







Caribbean current general pattern



Collection of sargassum in front of the Moon Palace Hotel



Reporte Meteorológico Playa Moon Palace											
Día	Cantidad de pastos (Semáforo)	Condiciones Climatológicas	Dirección del Viento	Rachas de Viento	Especie de sargazo o pasto	Fase de mayor afectación	Volumen extraído m3	Volumen procesado m3	Fenomeno Meteorológico Reportado	Observaciones	
1	1	PN	E	11-15	SF	Sunrise	140			MB	
2	2	DLL	SE	10-16	SF,TT	Sunrise	378	7		MB	
3	2	CD	SE	17-22	SF,TT	Sunrise	63			MB	
4	3	CD	SE	8-12	SF,TT	Sunrise	147	7		MB	
5	3	CD	SE	7-11	SF,TT,SA	Sunrise	105			MB	
6	2	CD	SE	8-10	SF,TT,SA	Sunrise	77	7		MB	
7	2	CD	NE	4-8	SF,SA	Sunrise	21			MB	
8	1	CD	ESE	11-13	SF	Sunrise	21			MB	
9	2	CD	ESE	8-10	SF,TT,SA	Sunrise	133			MB	
10	3	PN	NE	9-15	SF,TT,SA	Sunrise	308	7		MB	
11	2	CD	NE	15-20	TT,SA	Sunrise	189			MA	
12	2	CD	NE	11-18	SF,TT,SA	Sunrise	70			MB	
13	2	DLL	NE	20-15	TT,SA	Sunrise	63	14		MB	
14	1	CD	NE	11-22	SF,TT	Sunrise	35			MB	
15	1	CD	O	14-18	SF	Sunrise	35			MB	
16	3	CD	SE	5-14	TT,SF,SA	Sunrise	245	21		MB	
17	3	CD	SE	12-15	SA,SF	Sunrise	259			MB	
18	3	CD	SE	15-20	TT,SF,SA		119			MB	
19	2	CD	SE	10-20	SF,SA		154			MA	
20	2	CD	NE	10-22	SF,SA		91			MB	
21	2	CD	NE	15-18	SF,TT		70			MA	
22	3	CD	SE	12-16	SA,SF		112			MA	
23	2	CD	NE	6-14	SF,TT		56			MA	
24	3	PN	E	7-10	SF,SA		126			MA	
25	3	CN	E	12-15	SF,SA		175			MB	
26	3	CD	O	4-12	SF,SA		186			MB	
27	3	CD	O	10-14	SF,TT		126			MA	
28	3	PN	NO	12-17	SA,SF		98				
29	3	CD	SE	16-21	SA,SF		364				
30	3	CD	SE	10-20	SA,SF		378				
31											
Volumen total mensual							4344	63			
Promedio mensual							144.8				
Máximo diario							378				
Mínimo diario							21				



Thalassia testudinum



Syringodium filiforme

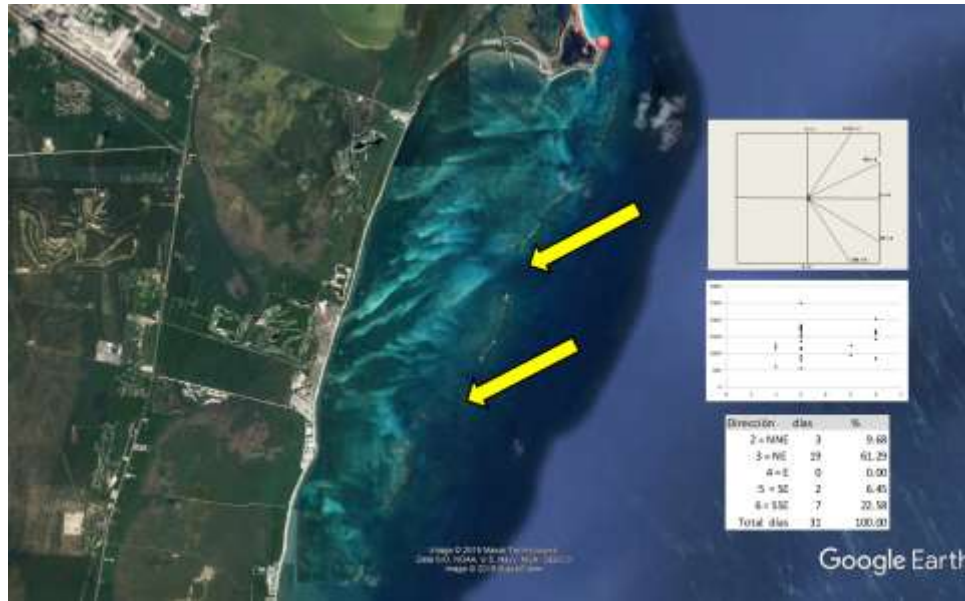
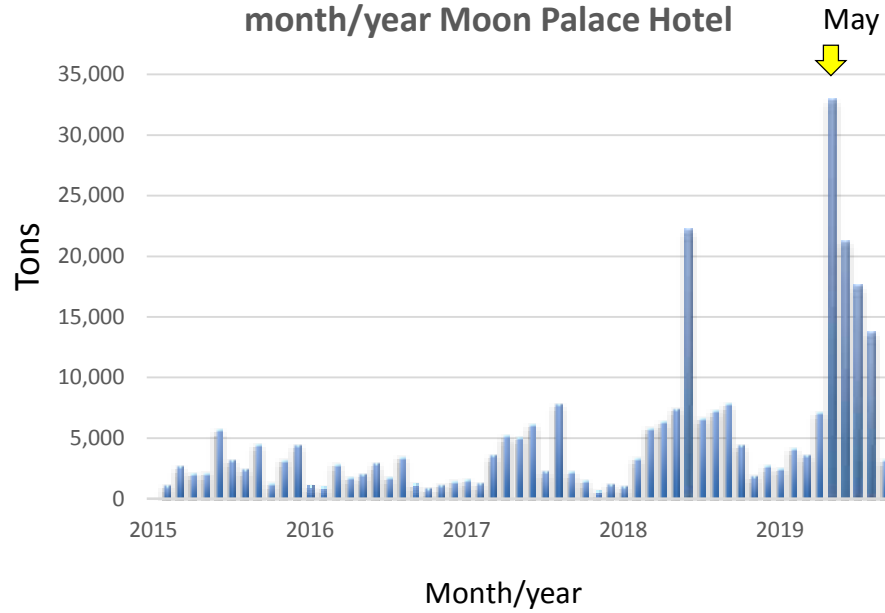


Sargassum alga

Etapas del sargazo basadas en la cantidad de Sargazo o Pastos marinos en playa: 1 (0-20%), 2 (20-40%), 3 (40-60%), 4 (60-80%) y 5 (80,100%)

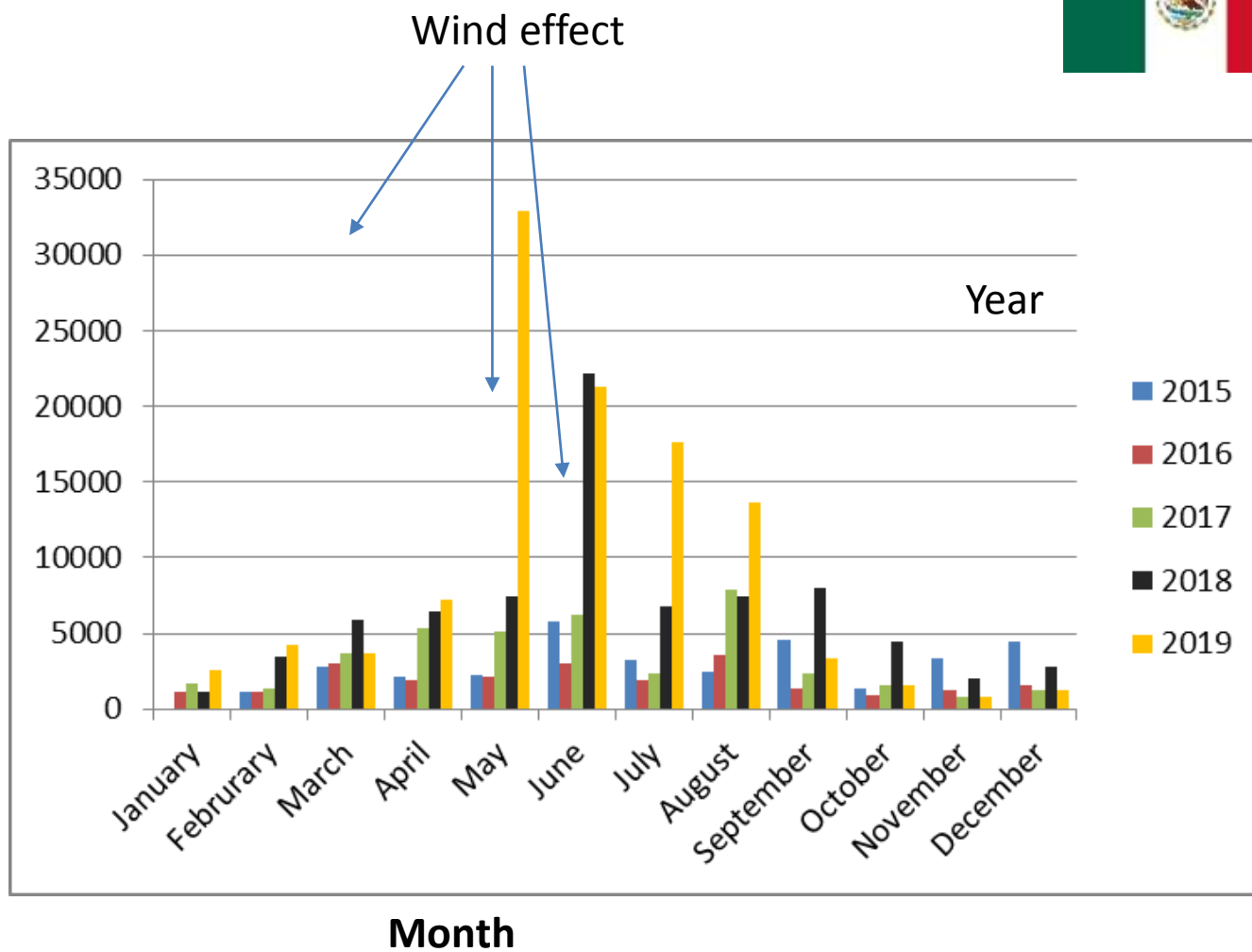
Condiciones climatológicas: Se refiere a cielo despejado (CD), Cielo parcialmente nublado (PN), cielo nublado (CN), Lluvias parciales
Fenómenos meteorológicos reportados: Ciclón tropical (CT), depresión trópic (DT), tormenta tropical (TT), huracán (H)
Fase hotelera de mayor afectación: S (Sunrise); N (Nizuc); MG (Moon Grand)
Especies de algas o pastos marinos: S: Sargassum; Sf: Syringodium filiforme; Th: Thalasia testudinum

Biomass (Tons) of Sargassum per month/year Moon Palace Hotel



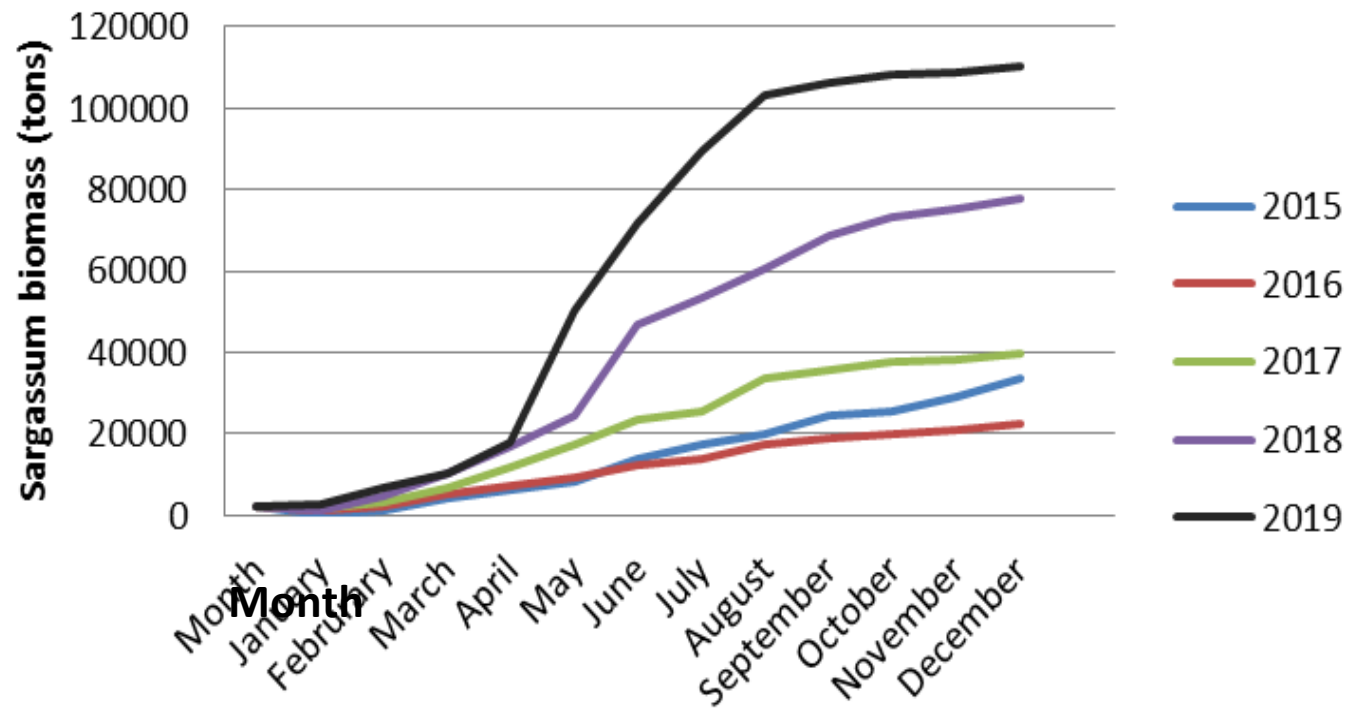


Tons of sargassum per month registered at Moon Palace Hotel



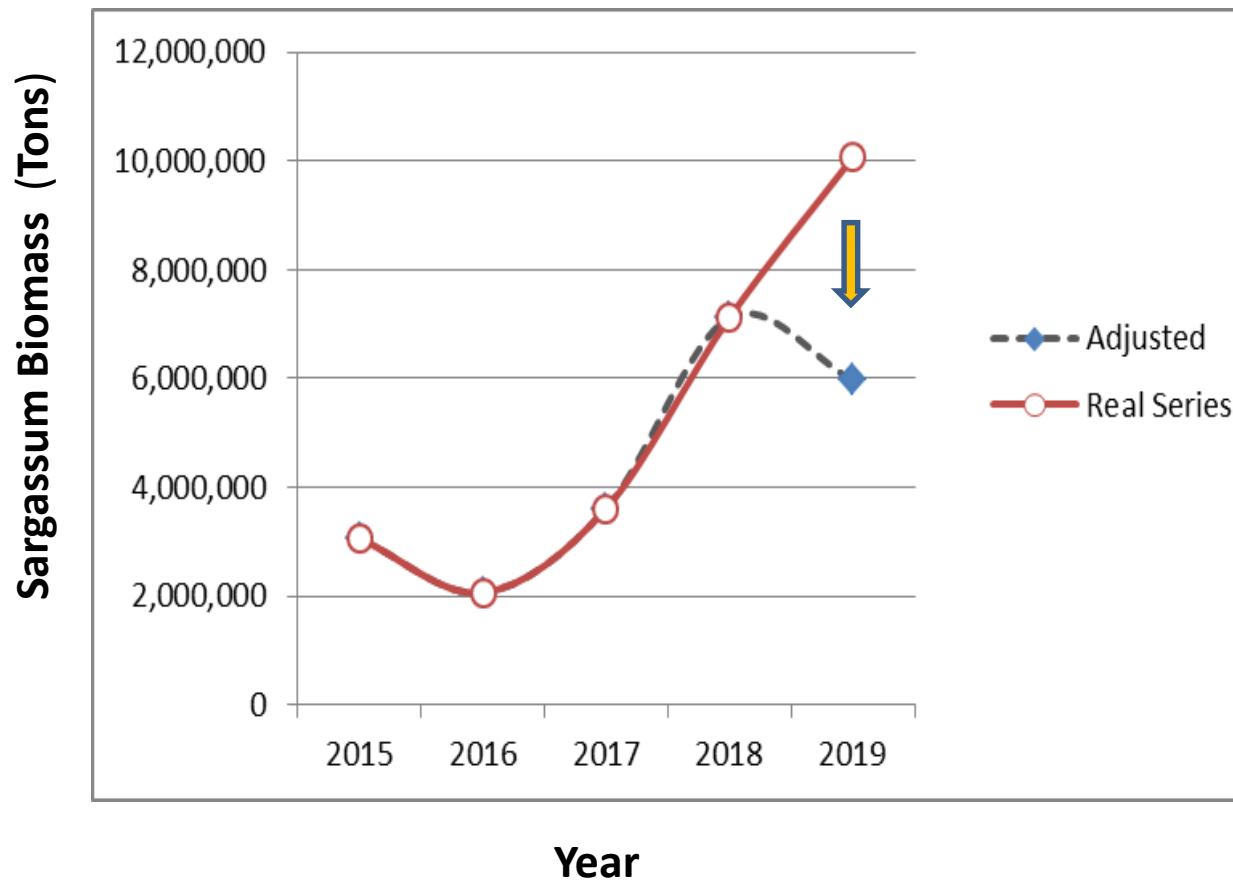


Total accumulated per year Moon Palace Hotel



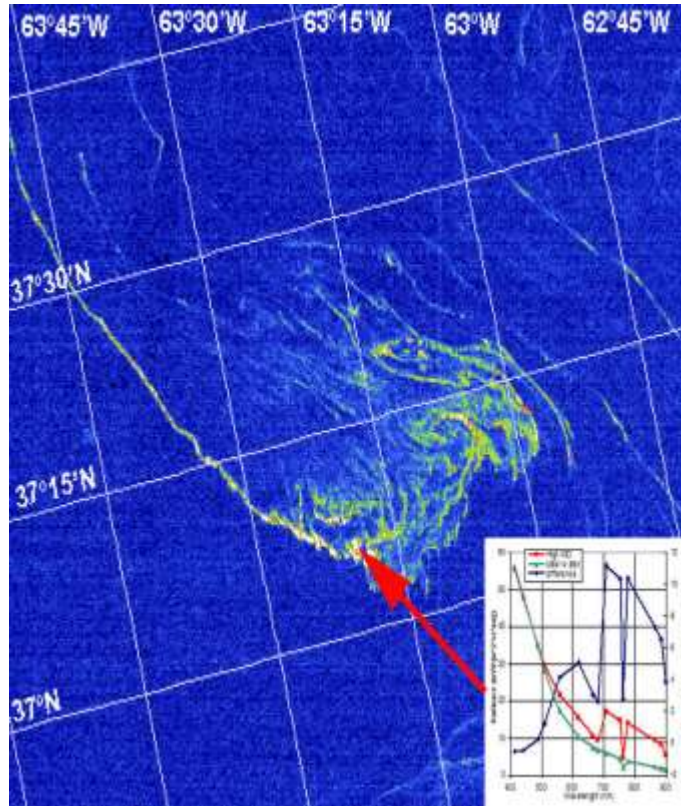


Whole coast of Quintana Roo, Mexico





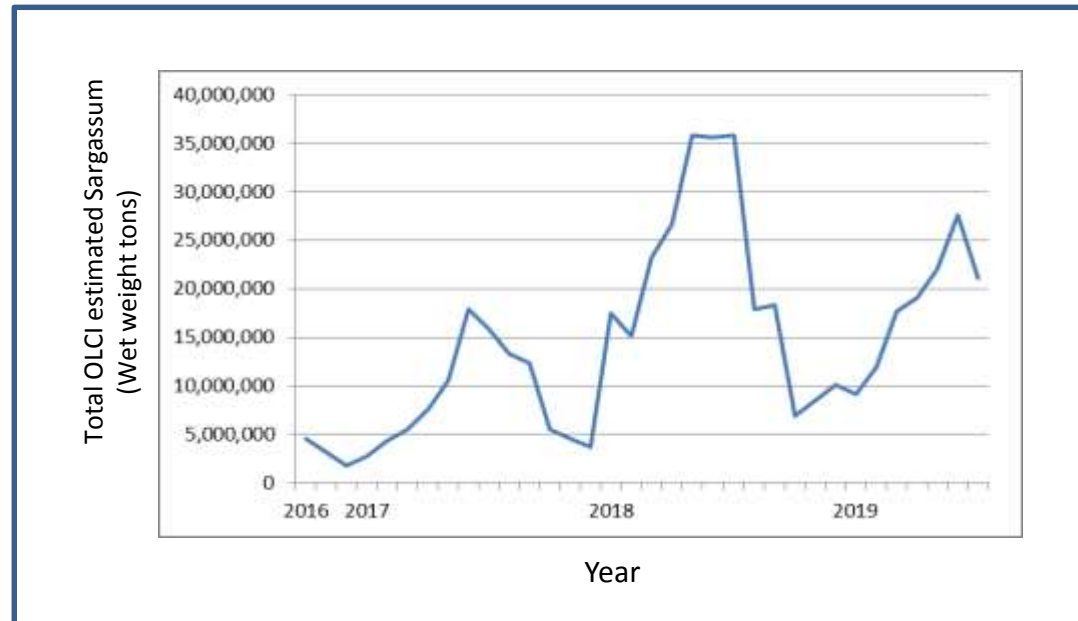
Sargassum spp. Total Biomass estimates



MCI values observed with MERIS and OLCI, forming monthly maximum values for period August To August 2019.

MERIS and OLCI
Medium Resolution Imaging Spectrometer optical sensor
It allows to rectify for definitive Signal when clouds, haze and sunlight

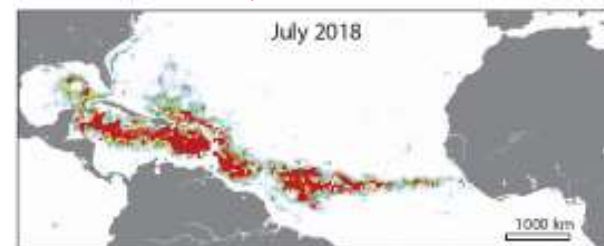
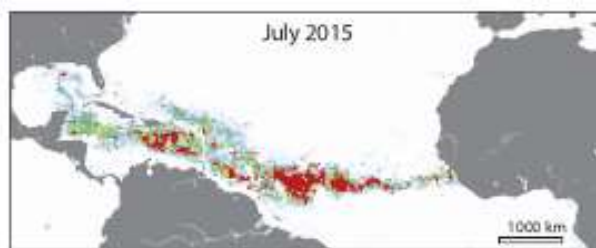
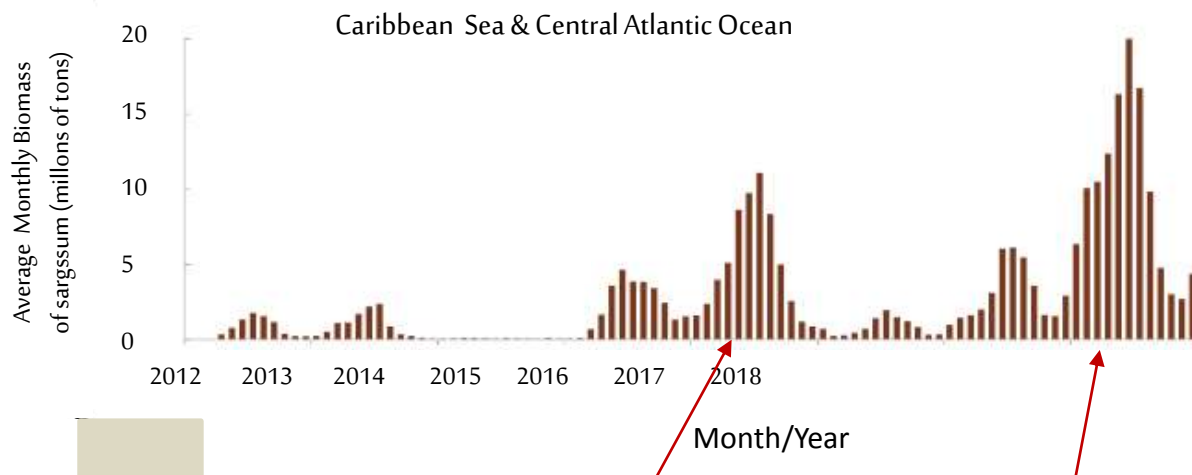
OLCI



MCI values observed with MERIS and OLCI, forming monthly maximum values, adding over areas and scaling to historical ship-tow data in the Atlantic, as described in Gower and King, Int JRS, 32, 1917-1929, 2011.

Period (end of 2016 – 2019)

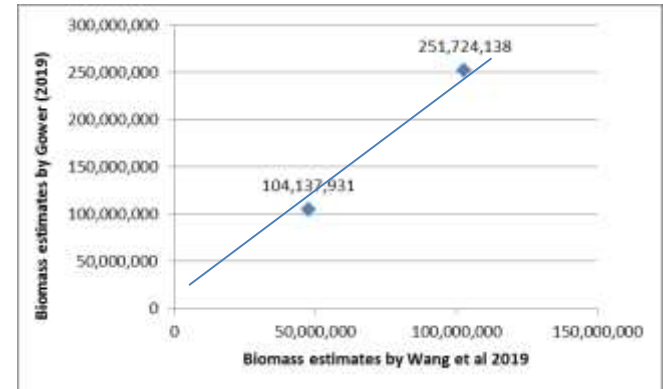
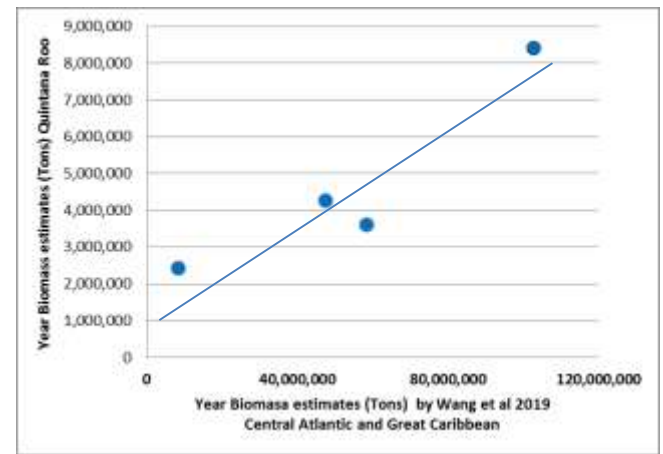
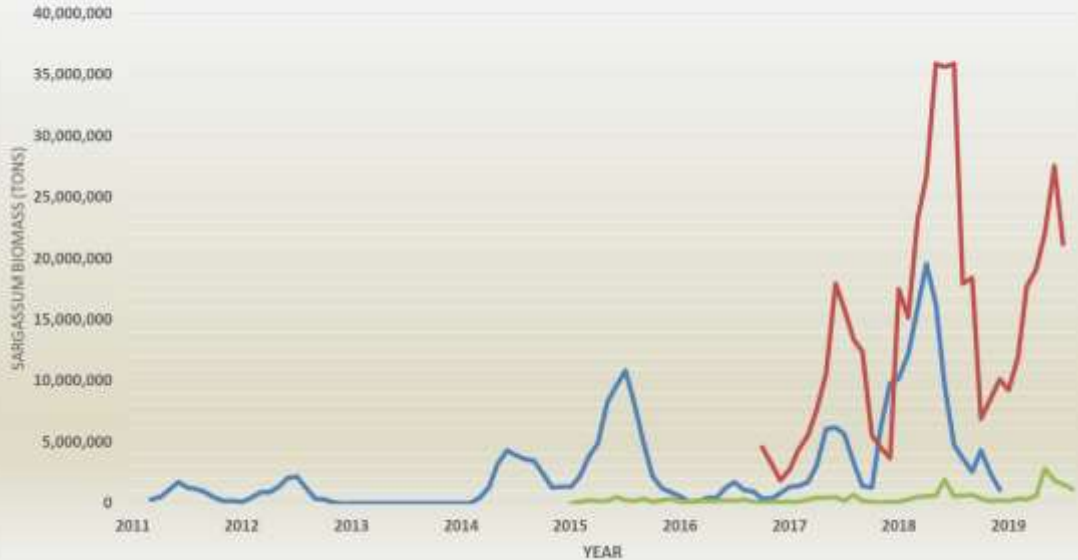
MERIS and OLCI: Medium Resolution Imaging Spectrometer optical sensor. It allows to rectify for definitive Signal when clouds, haze and sunlight



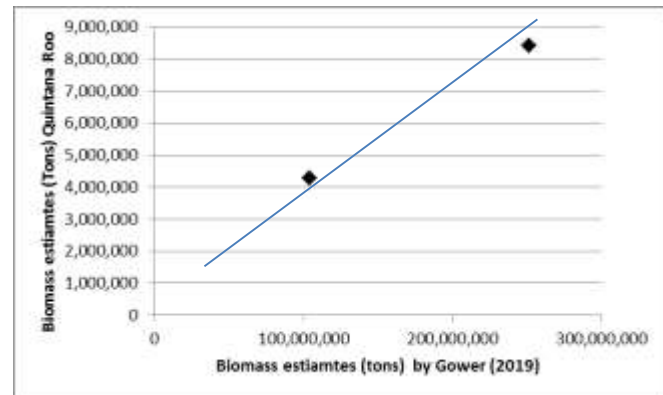
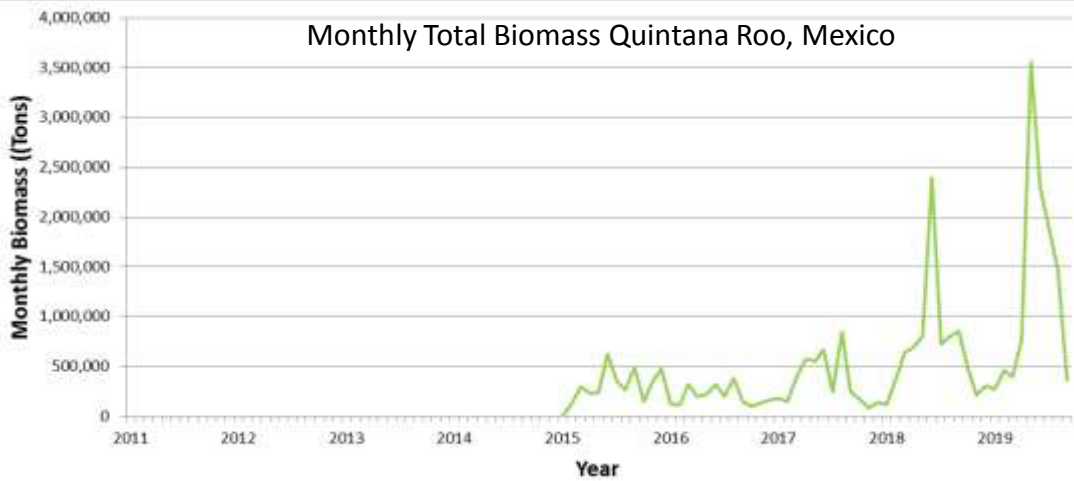
By: Wang et al. (2019)

Time series of Biomass (tons) at three scales & methods

— Wang et al 2019 — Gower — Quintana Roo

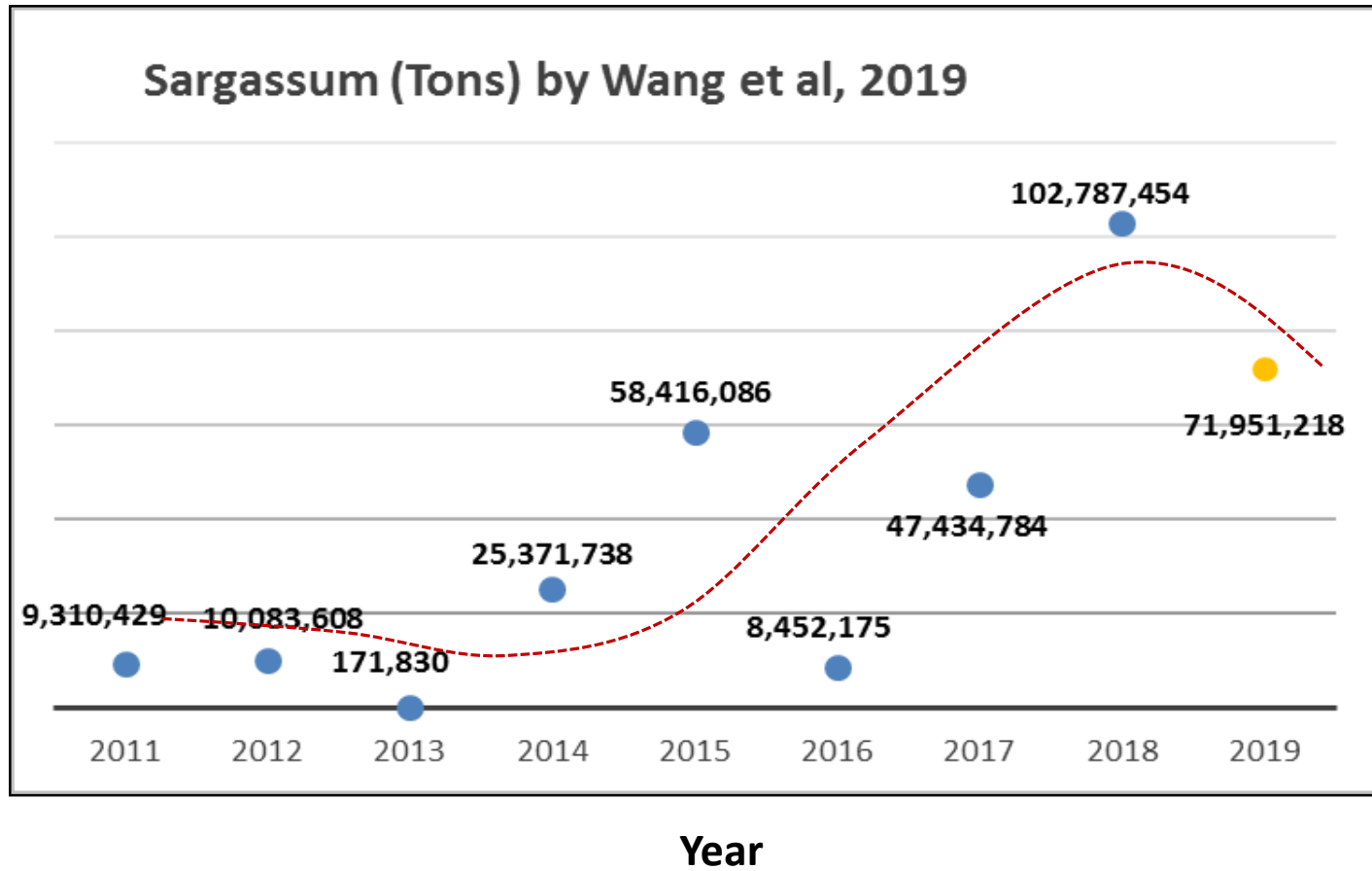


Monthly Total Biomass Quintana Roo, Mexico



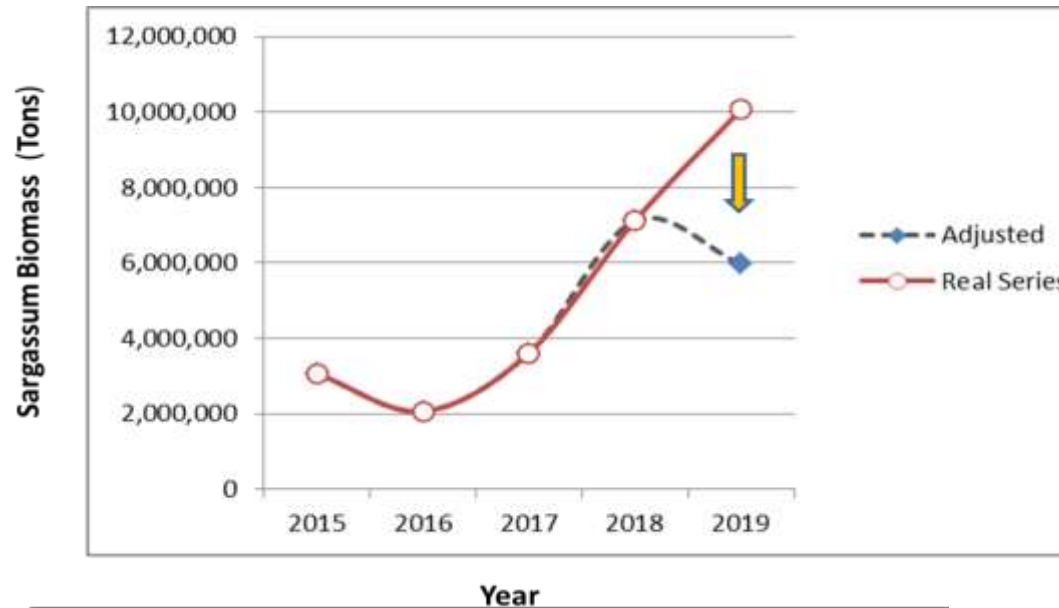


Year average biomass (Millions of Tons)



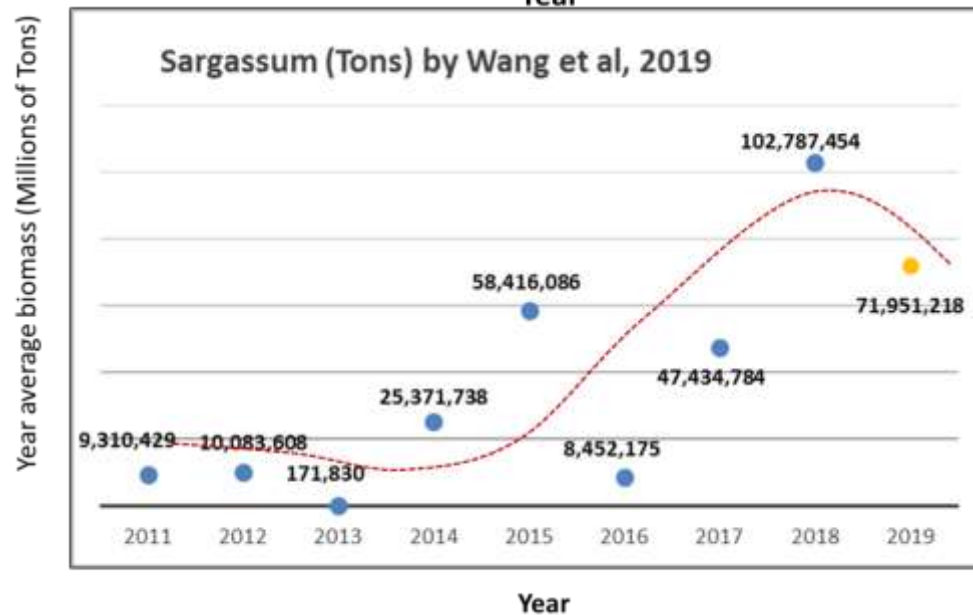


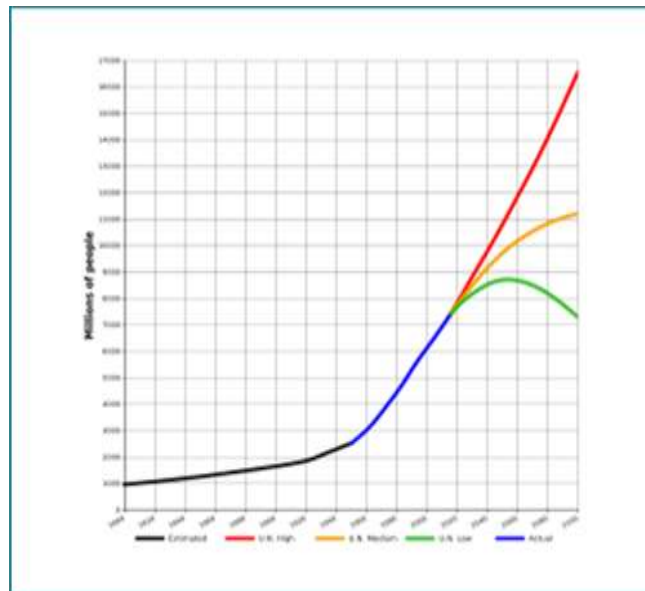
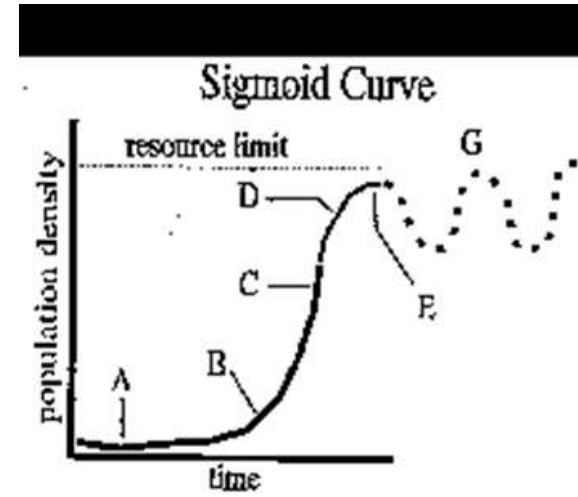
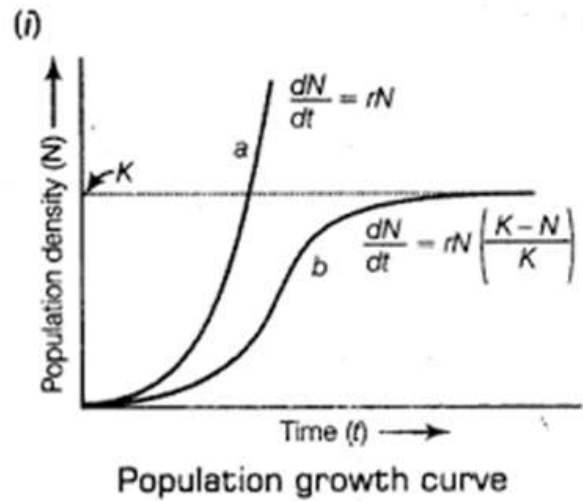
Coast of Quintana Roo, Mexico



Effect of
winds

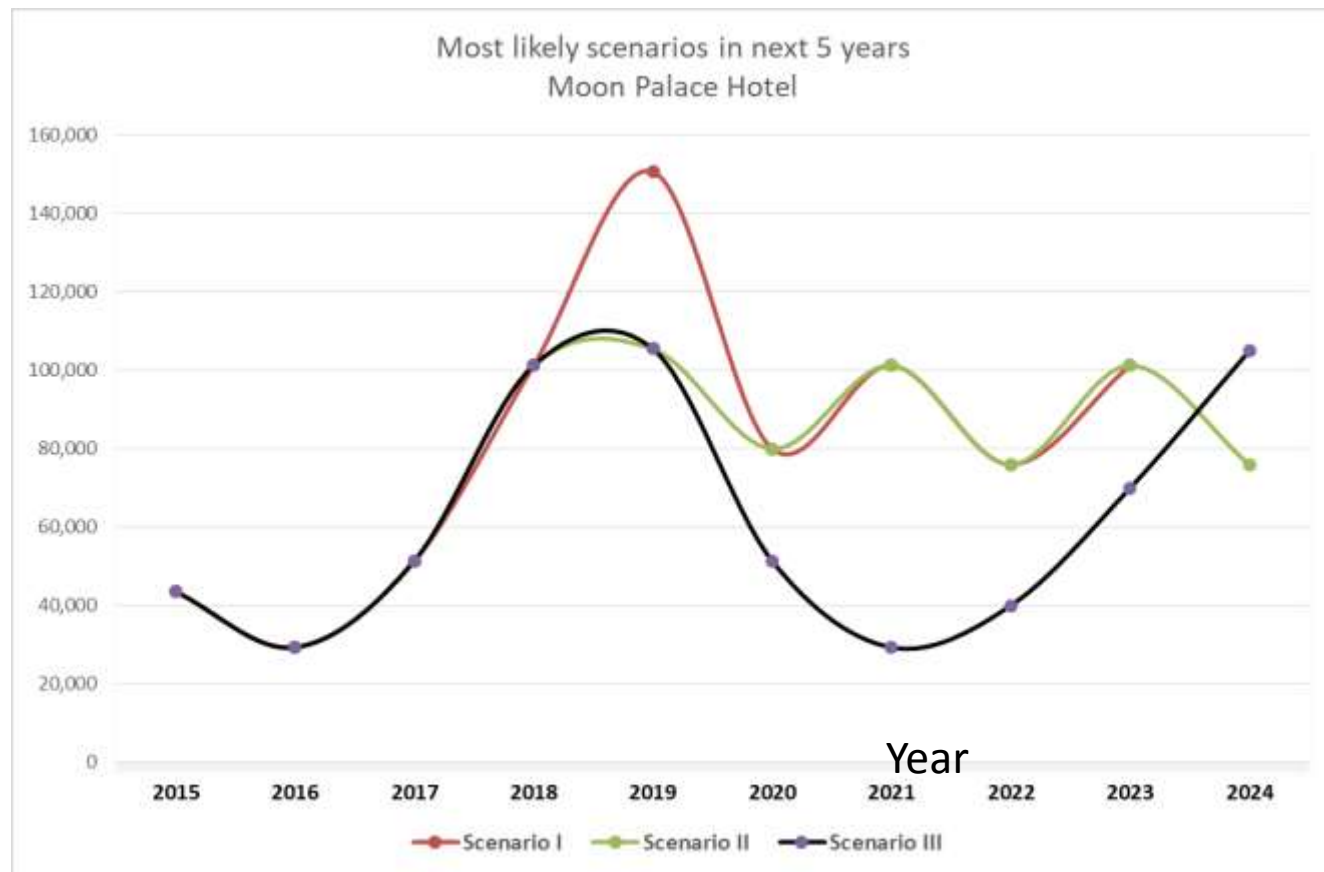
Caribbean Sea Central Atlantic Ocean







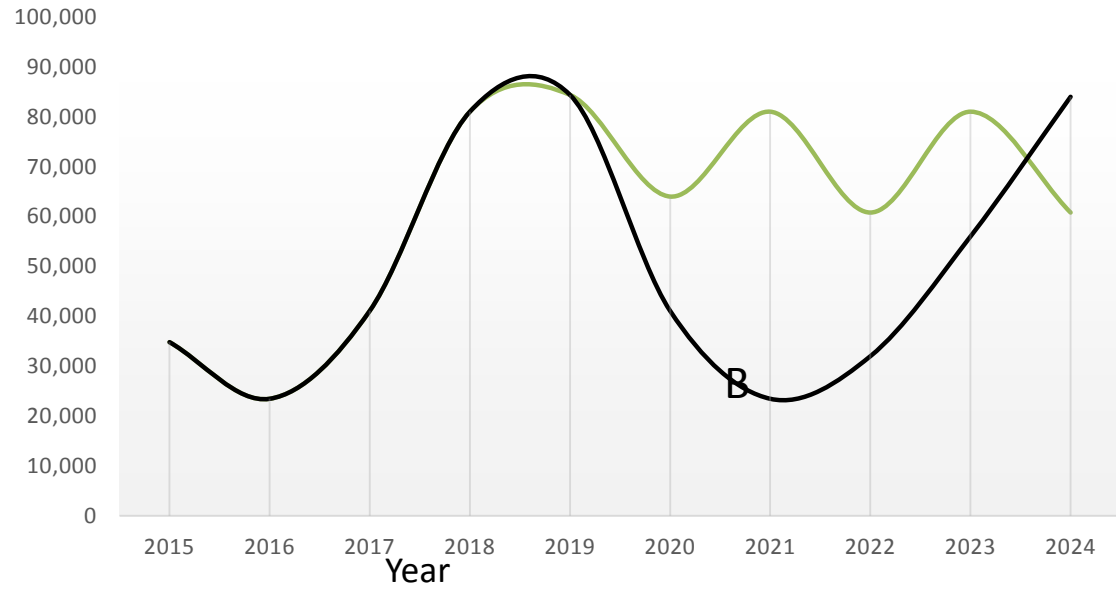
Yearly Accumulated Sargassum (M3)



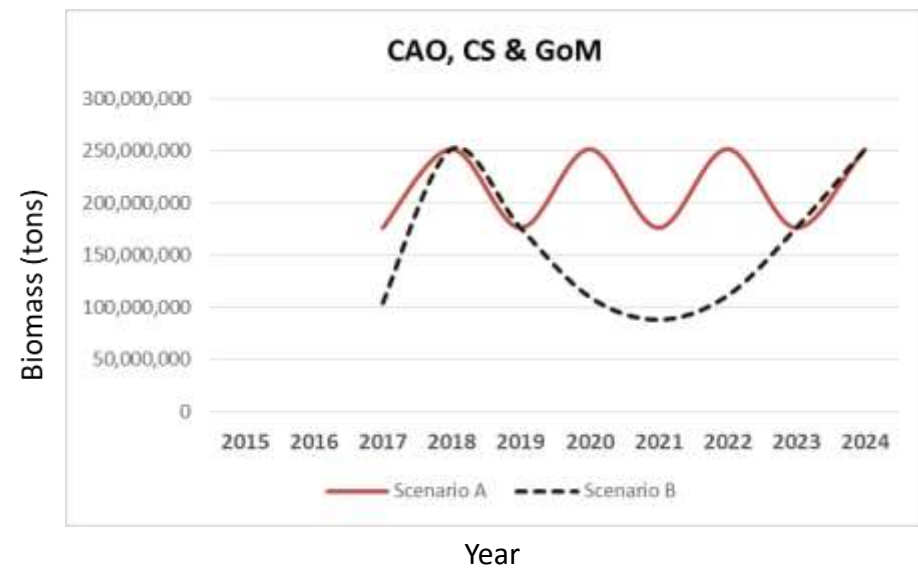
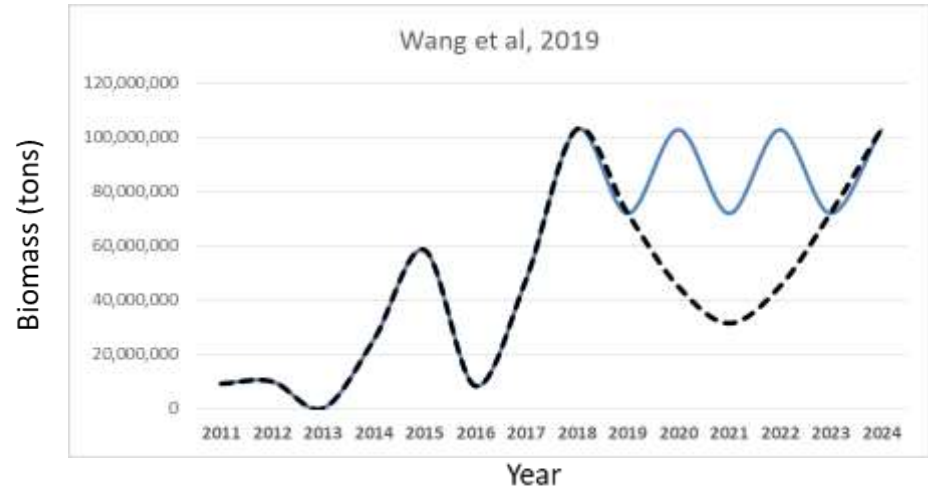
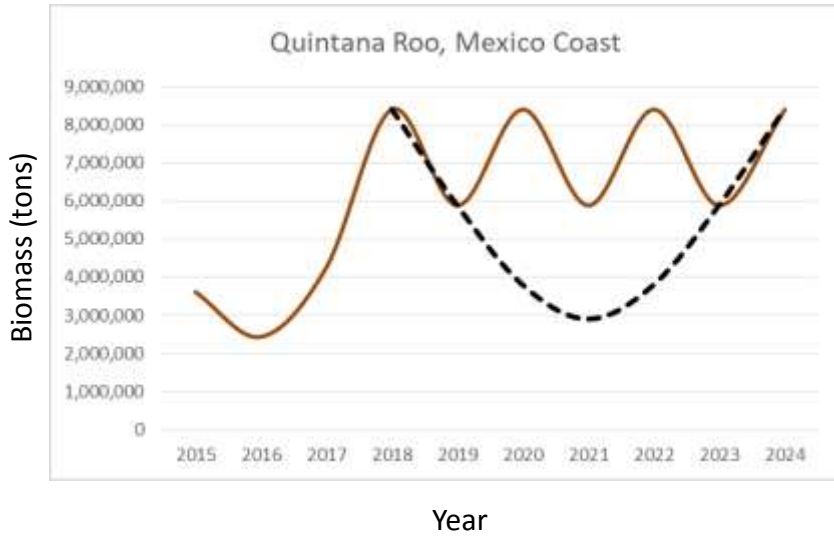


Most likely scenarios in next 5 years Moon Palace Hotel, Q.R. Mexico

Yearly Biomass (Tons)

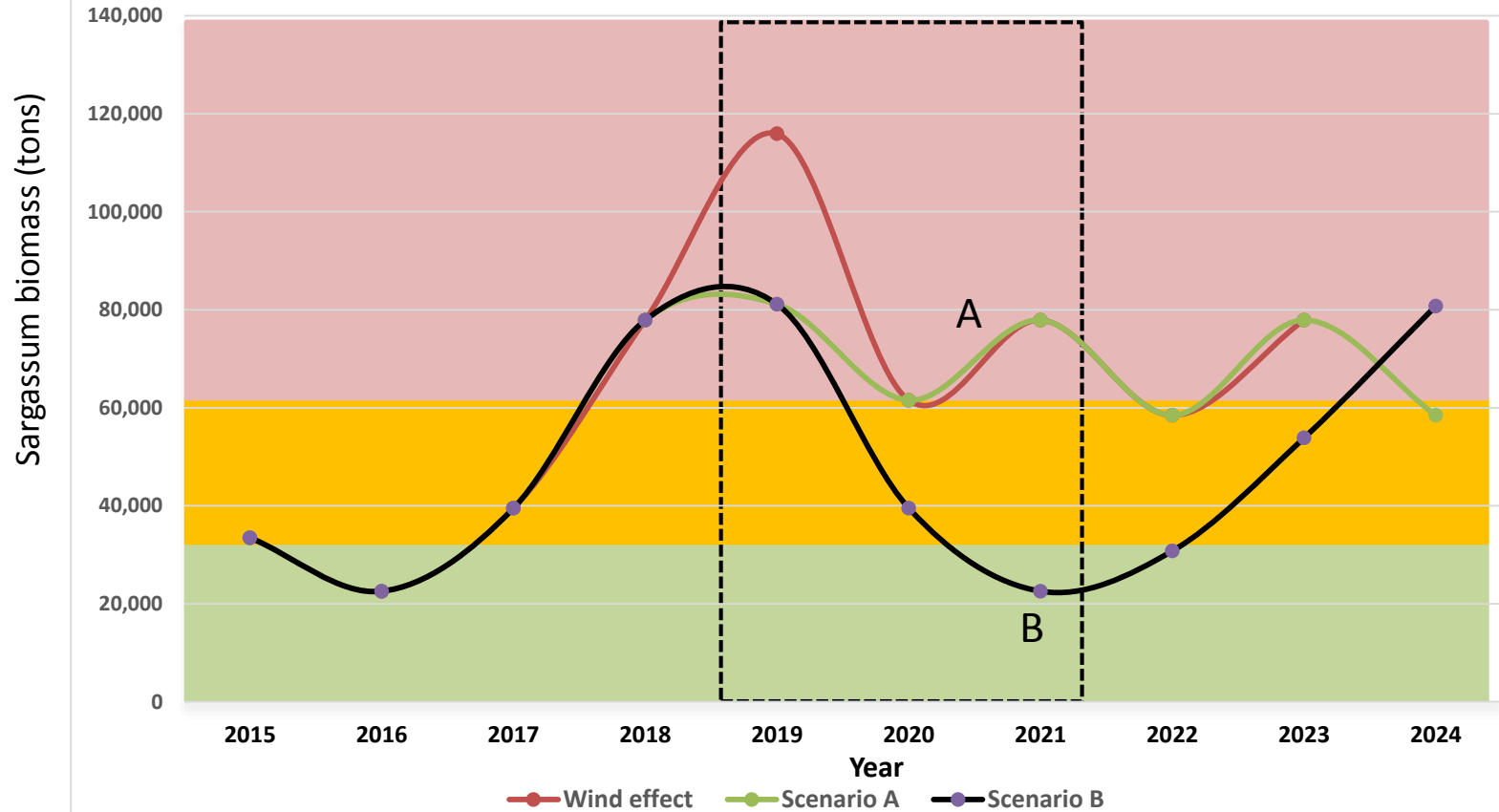


— Scenario A — Scenario B





Most likely scenarios in next 5 years Moon Palace Hotel





Conclusions:

- Records of beaching sargassum indices in Puerto Morelos, Quintana Roo were used to build a reliable index which accords with signal of Total biomass of sargassum in the Central Atlantic Ocean and the Great Caribbean.
- We found strong positive correlations between beaching index in Moon Palace Hotel Puerto Morelos and Total Biomass estimates based on Satellite observed values by Gower and his team and Wang et al, 2019.
- Sargassum population peaked and there is a downturn movement after 2018 .
- Decreasing of total sargassum population Biomass might follow one of the scenarios described as **A or B**.
Each one has completely different implications at all levels.
- Monitoring of beaching events at different sites within the Caribbean (Country level) are of much importance to compare the drifting of sargassum to coastal areas during advection movements of sargassum from the Atlantic Ocean to the Gulf of Mexico.



- It is of outmost importance to standarize a methodology to generate indices to estimate beaching biomass of sargassum at coastal level in different countries and sites.
- It is necessary to analyse and compare those indices to assess the impact of sargassum in each country and be able to alert, in advance, the strength of the sargassum population during usptream movements.
- It is important to recognize and study, in detail, wind direction and strength, to understand the accumulation of sargassum on the beaches.

Important remarks:

- Future sargassum Total Biomass estimates and beaching indices in next two years, will indicate in more detail, which factors and their levels are implicated in the population dynamics of *Sargassum spp.*
- If biomass estimates and beaching indices follow **Scenario A**: it will imply density-dependence behavior.
- If on the contrary, total Biomass estimates and beaching indices behave according to **Scenario B**, it would indicate the need to incorporate Global factors such as North Atlantic Oscilation (NAO), AMOC and to study their effect on Sargassum population dynamics in the area of distribution.

THANKS !
MERCI !
GRACIAS!



