Are coastal barriers at risk?
implications for coastal communities

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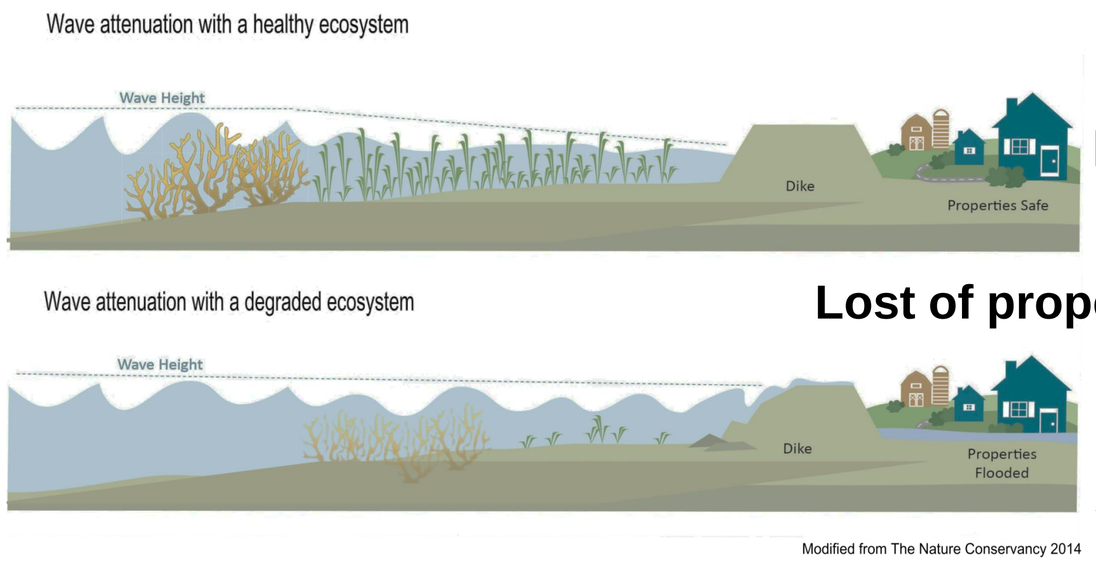
Coastal protection at risk

What if we lose corals and natural barriers?



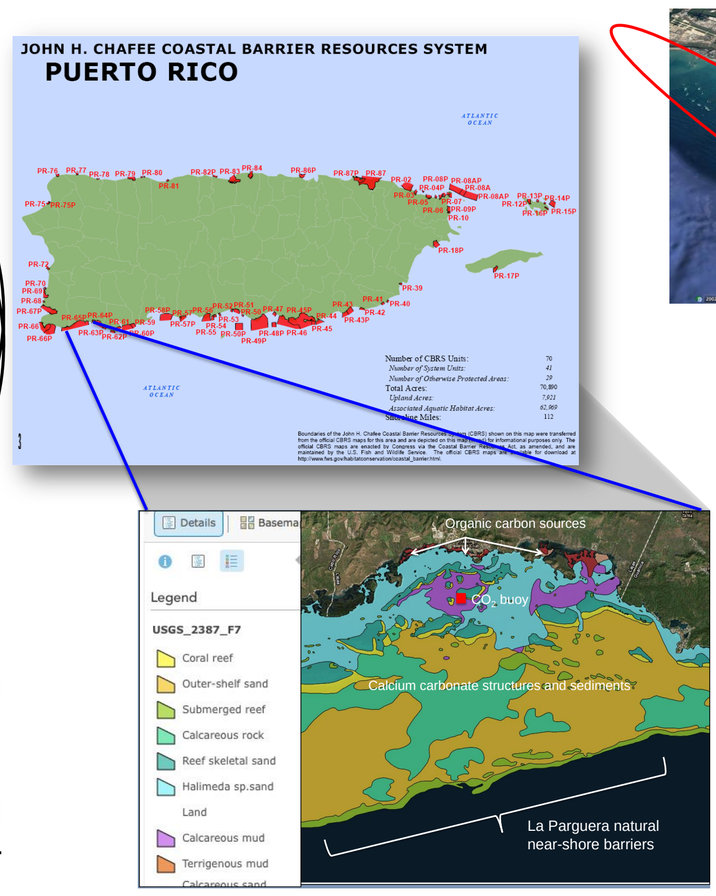
Modified from The Nature Conservancy 2014

Lost of property

Future Scenarios

- Critical atmospheric CO_2 threshold of 480 – 500 ppm will be surpassed within the next 40 - 60 years (IPCC, 2014, (RCP 2.6 scenario)).
- Vertical accretion of reef-building corals unable to keep pace with erosional processes (e.g. dissolution and bio-erosion) due to high surface seawater temperatures and ocean acidification (OA).
- Events of net dissolution in coral reef and carbonate barriers such as fossil sand dunes will likely increase.

Puerto Rico coral barrier systems

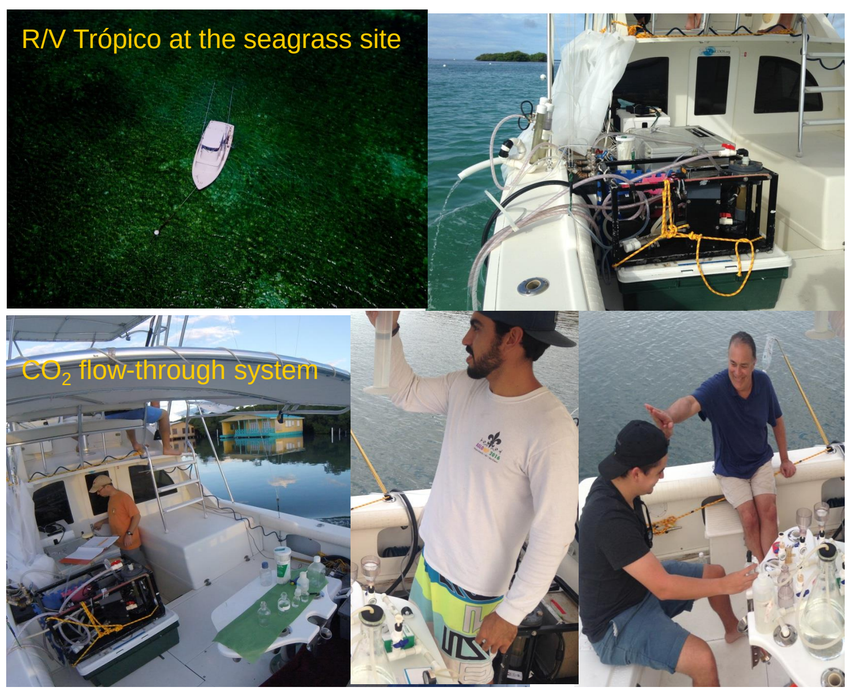


In Puerto Rico 84.31 km^2 of coastal barriers protect 884 km of coastline, 419,000 people and critical infrastructure from erosion and severe coastal storm damage through dissipation of wave energy.

CARICOOS and PR SeaGrant intend to develop the first biogeochemical and physical assessment for La Parguera barrier system in order to identify areas of vulnerability to dissolution.

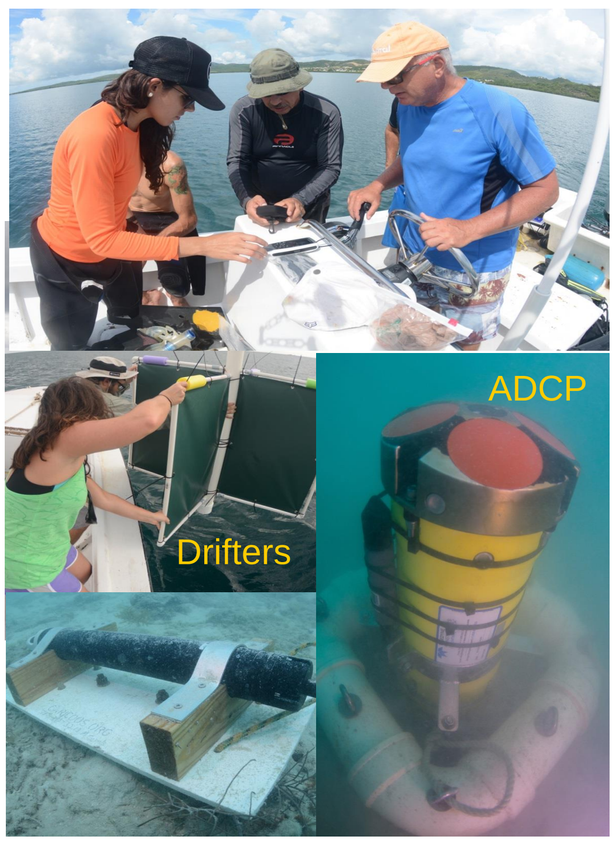
Assessing Chemistry and Hydrodynamics

Chemistry team



Underway measurements to characterize the chemical and optical properties of surface seawater. Students, volunteers and professors from UNH and UPRM participated during the 18 hr. long sampling at the bioluminescent Bay and seagrass sites.

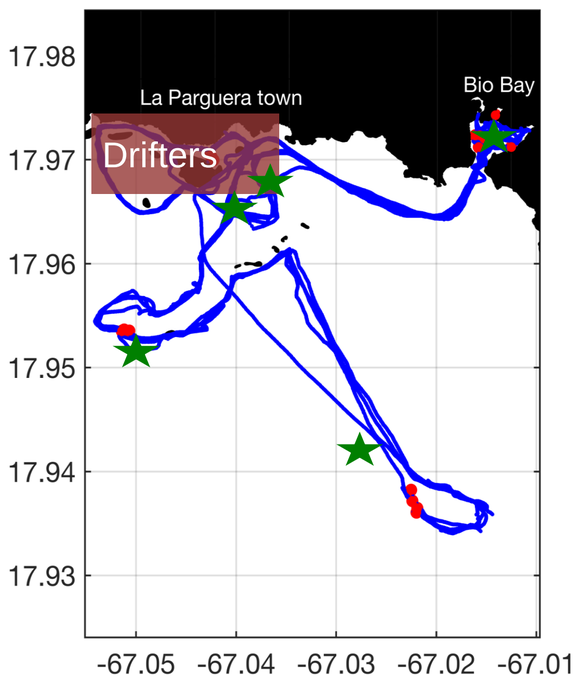
Hydrodynamics team



Getting ready to deploy a set of ADCPs and drifters to characterize the surface currents in the study area.

Thanks to Milton Carlo, Erick García and all volunteers students from UPRM. Thanks to Chris Hunt, Marc Emond and Shawn Shellito from UNH.

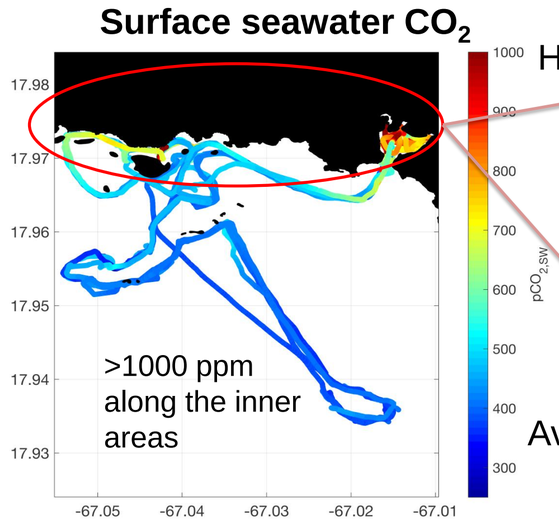
Cruise track



Aboard the "R/V" Trópico

Cruise track (blue line) and seawater sample stations (red circles) visited during the first cruise campaign from the 31st of October to the 3rd of Nov of 2016. The green stars are the hydrodynamic instruments positions. Red rectangle indicate the area were the drifters were deployed.

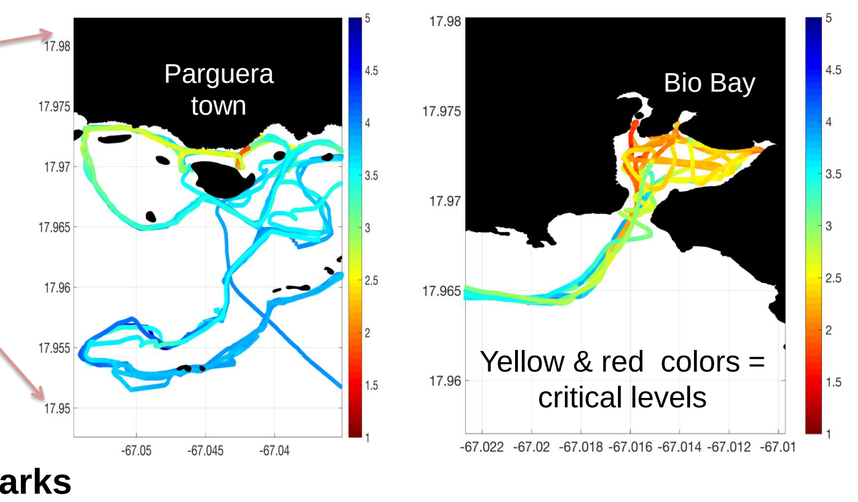
Surface seawater CO_2



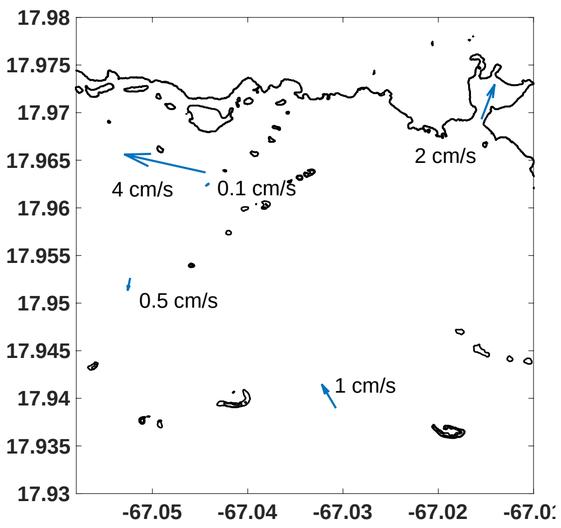
High

Average

Surface seawater aragonite saturation state (Ω_{arg})



Depth & time averaged currents



Remarks

- The CO_2 effect on seawater carbonate chemistry resulted in a decrease in pH and Ω_{ARG}. If Ω_{ARG} is less than 1 (some areas in the Bio Bay), the seawater is undersaturated and net dissolution will be favored.
- Inner areas are more sensitive to OA and dissolution: carbonate sediments, calcareous algae and inner shelf coral reefs.
- Depth and time averaged currents show mean flows directed westward, except at the Bio Bay where mean flows are directed inshore. For further info on the hydrodynamics at the site, please see Rodriguez-Abudo's poster.