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Rocky tidal pools: carbonate chemistry, diurnal variability and calcifying organisms in future high-CO₂ conditions

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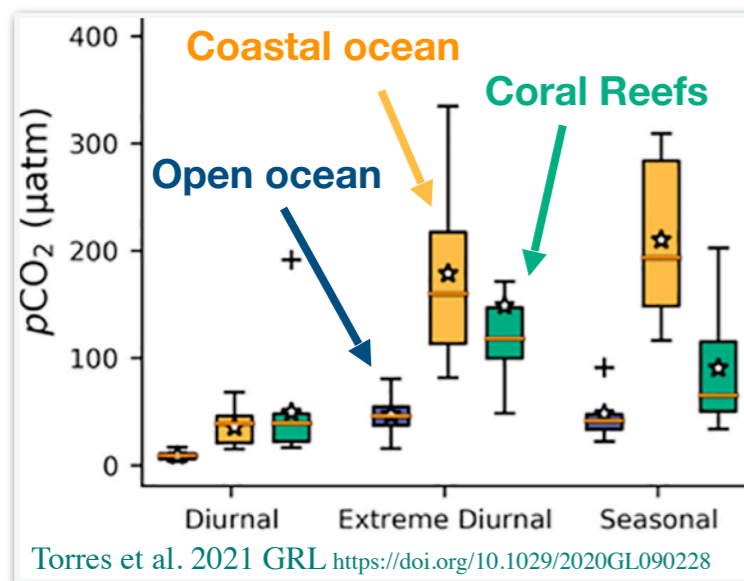
Rocky Tidal Pools

Carbonate chemistry, diurnal variability and calcifying organisms in future CO₂ conditions

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Coastal variability

Lack of observation & understanding = **variation** is seldom integrated to predictive climate models



Shallow coastal waters: High local contribution of the **biological activity**
-> **strong seasonal and diurnal variability**

How big is diurnal biology-driven (changes in calcification/photoS) carbonate variability?

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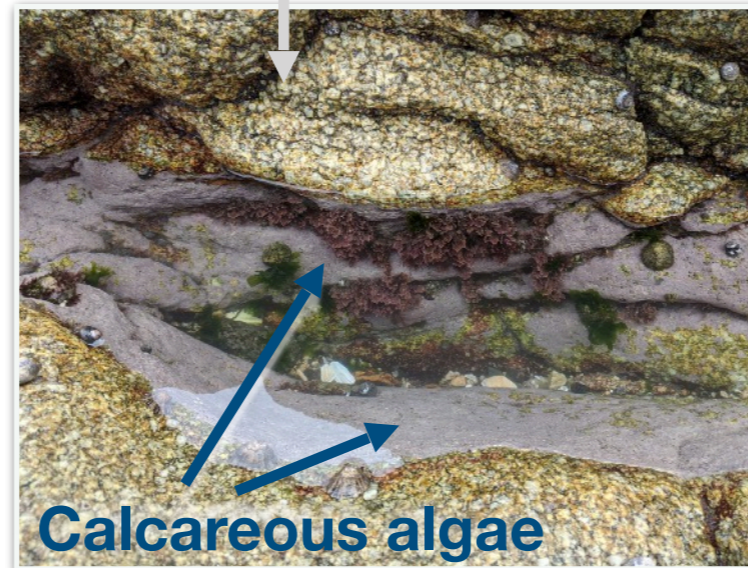
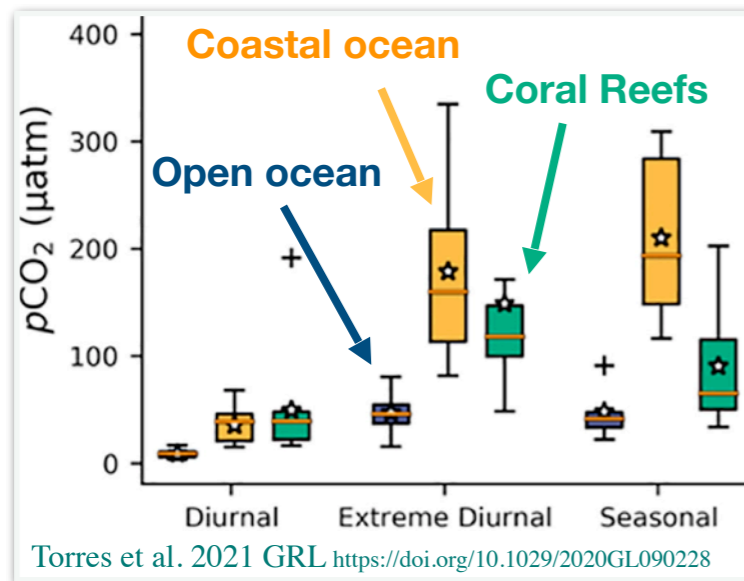
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Coastal variability

"mini-coastal seas"

Pools diurnal variability

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Monitoring: pH, Temperature, Light...

Sampling: Alkalinity

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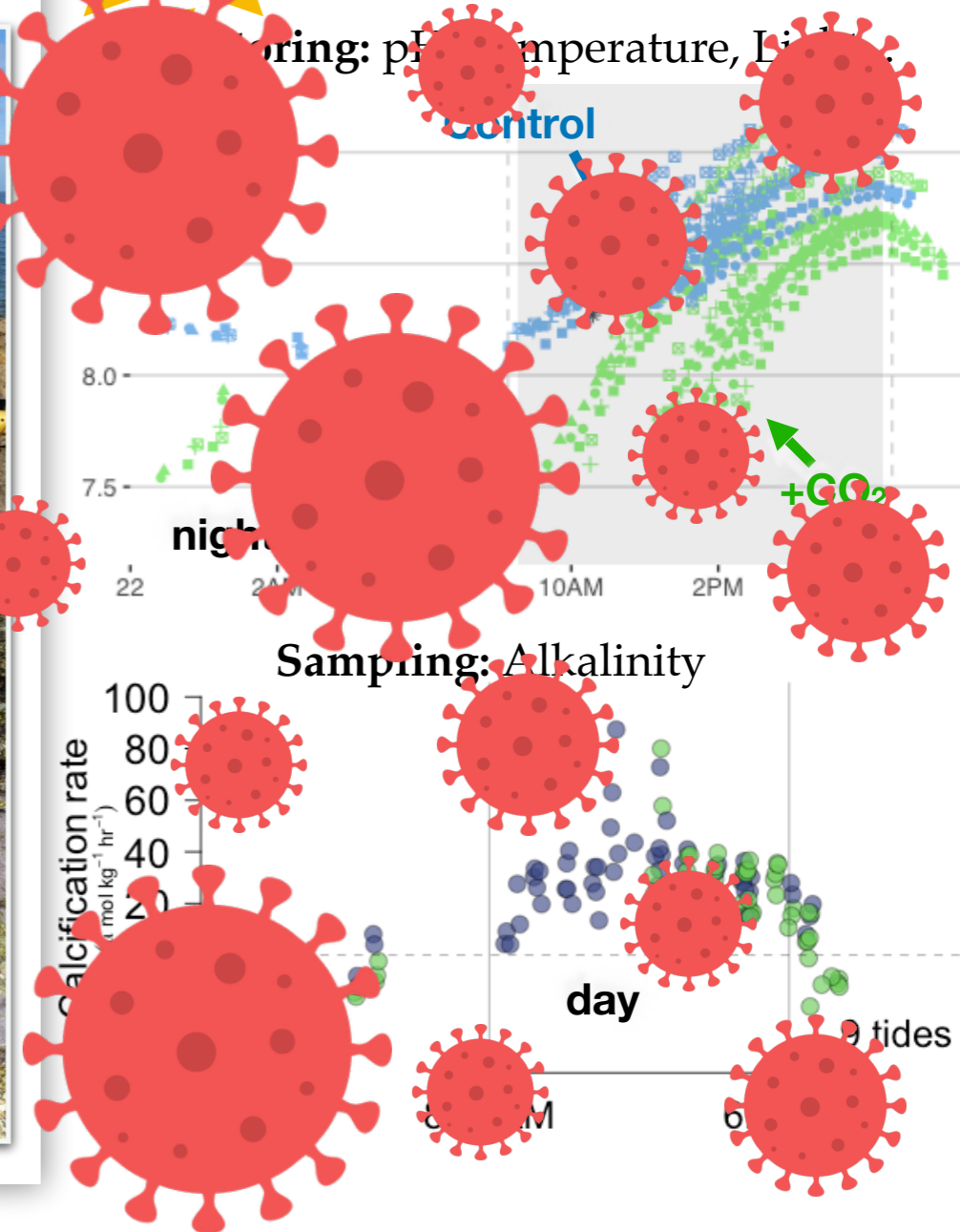
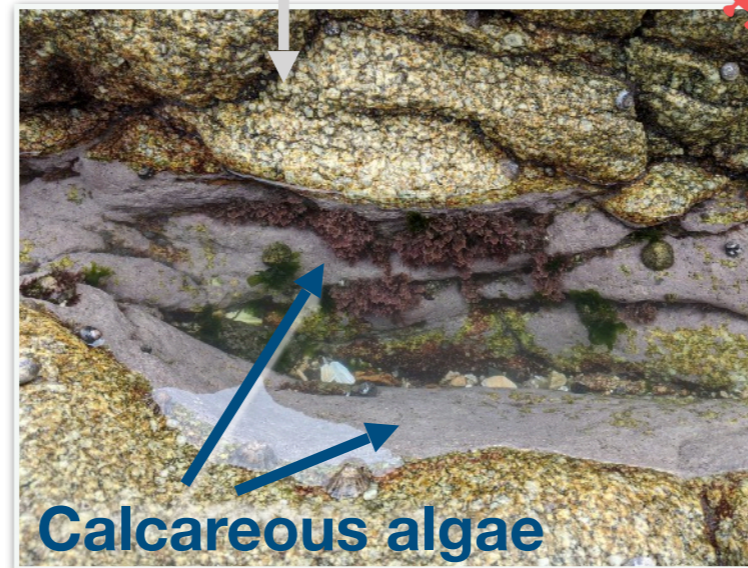
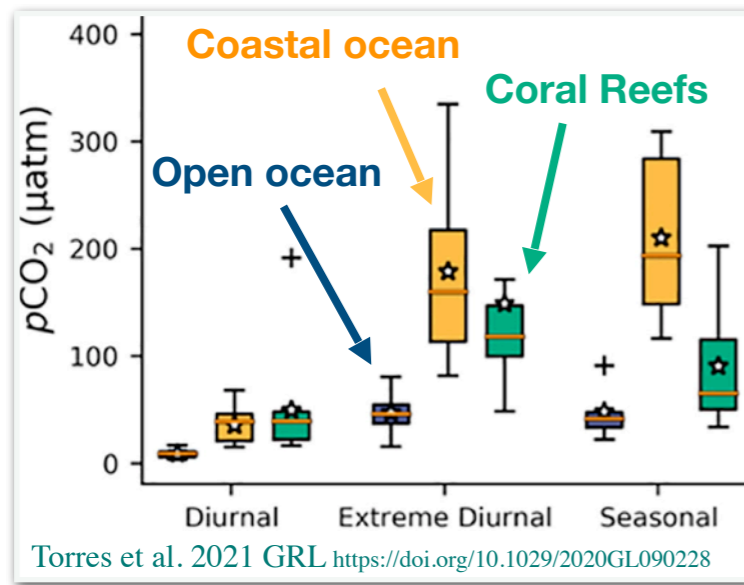
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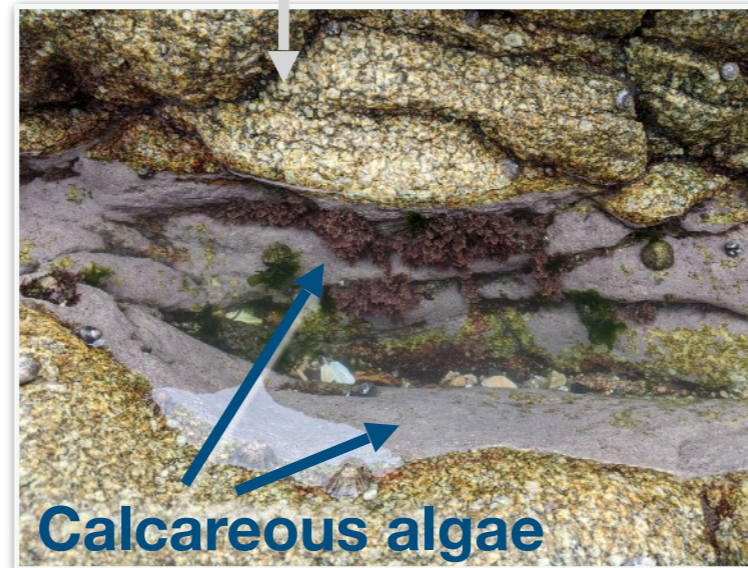
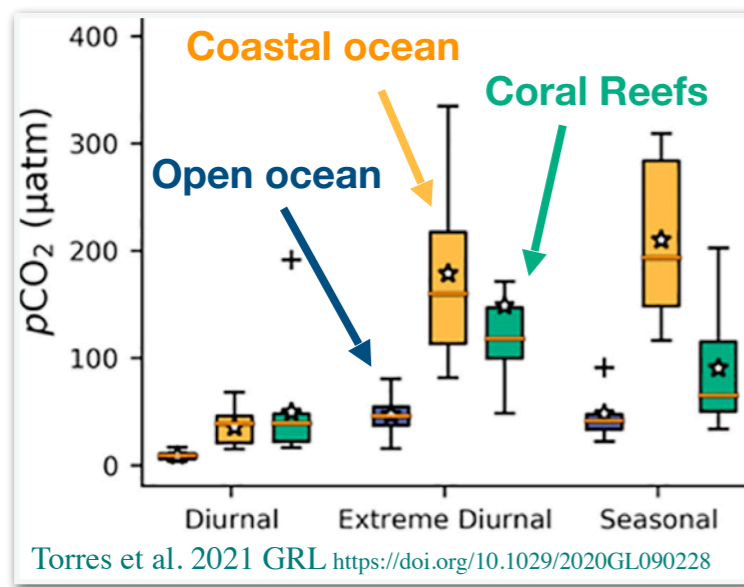
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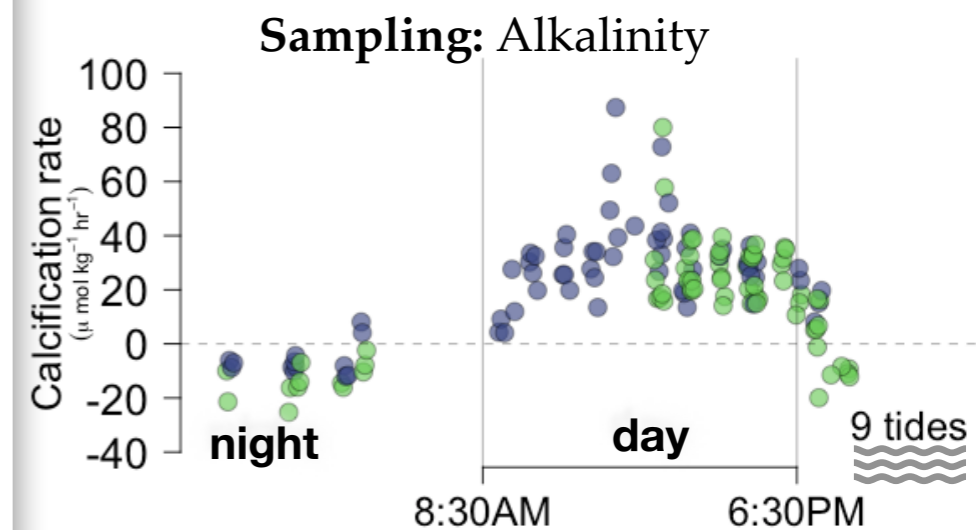
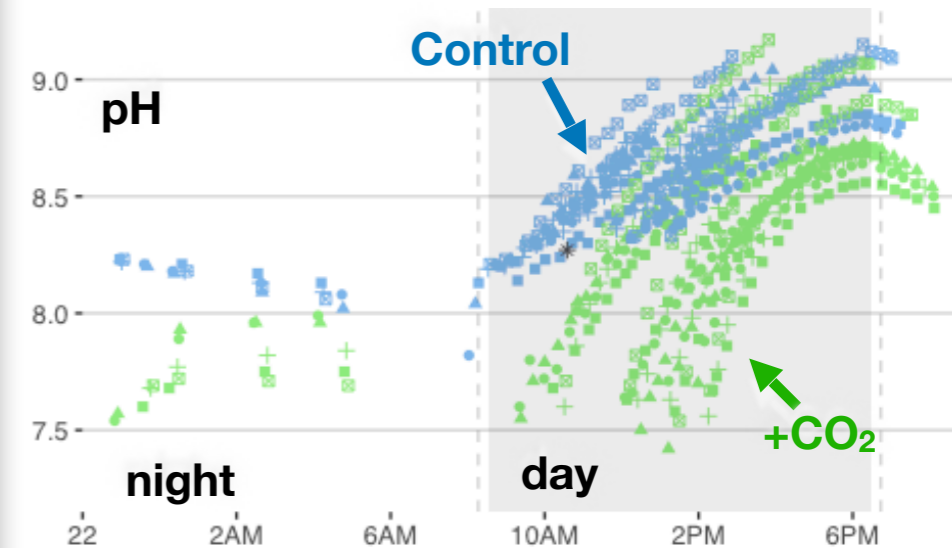
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Monitoring: pH, Temperature, Light...



Preliminary data from February 2021

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Carbonate chemistry, diurnal variability and calcifying organisms in future CO₂ conditions

Coastal variability

Hi,

My study stems from the assessment that we lack understanding and data on the variability of the carbonate chemistry in coastal waters.

This means that it is difficult to integrate natural coastal variation into predictive climate models.

Here, in a paper recently published by our team, you can see that even diurnal coastal variation is important. It is of course because the biological activity has a great contribution to this variability.

So we wanted to understand better how big this diurnal, and even seasonal, variation is in coastal waters and what processes drive it?

"mini-coastal seas"

To study this, we chose rocky tidal pools as mesocosms to study. They are extreme environments. They are closed-systems at low tide and contain calcifiers, in particular calcareous algae such as corallines and encrusting algae - that you can see here - that contribute greatly to changing the chemistry of the pools and are in turn affected by the chemistry. We monitored several parameters and sampled for total alkalinity.

As you're aware, it has been challenging to access the field and be able to go to the lab to analyze samples.

Pools diurnal variability

So here I am presenting some preliminary results: During the day, we have a big increase in pH due to photosynthesis and a community that calcifies. While as soon as the sun goes down, calcification rates are negative, meaning there is net dissolution.

I will analyze this dataset to understand the contribution of pH, temperature, light, species composition on calcification.

We also added CO₂ at the start of emersion (the points in green) to decrease pH and mimic future conditions. With this data, we are planning to explore the effect of ocean acidification on the calcification of these communities.