

Climate change will fragment Florida stone crab communities

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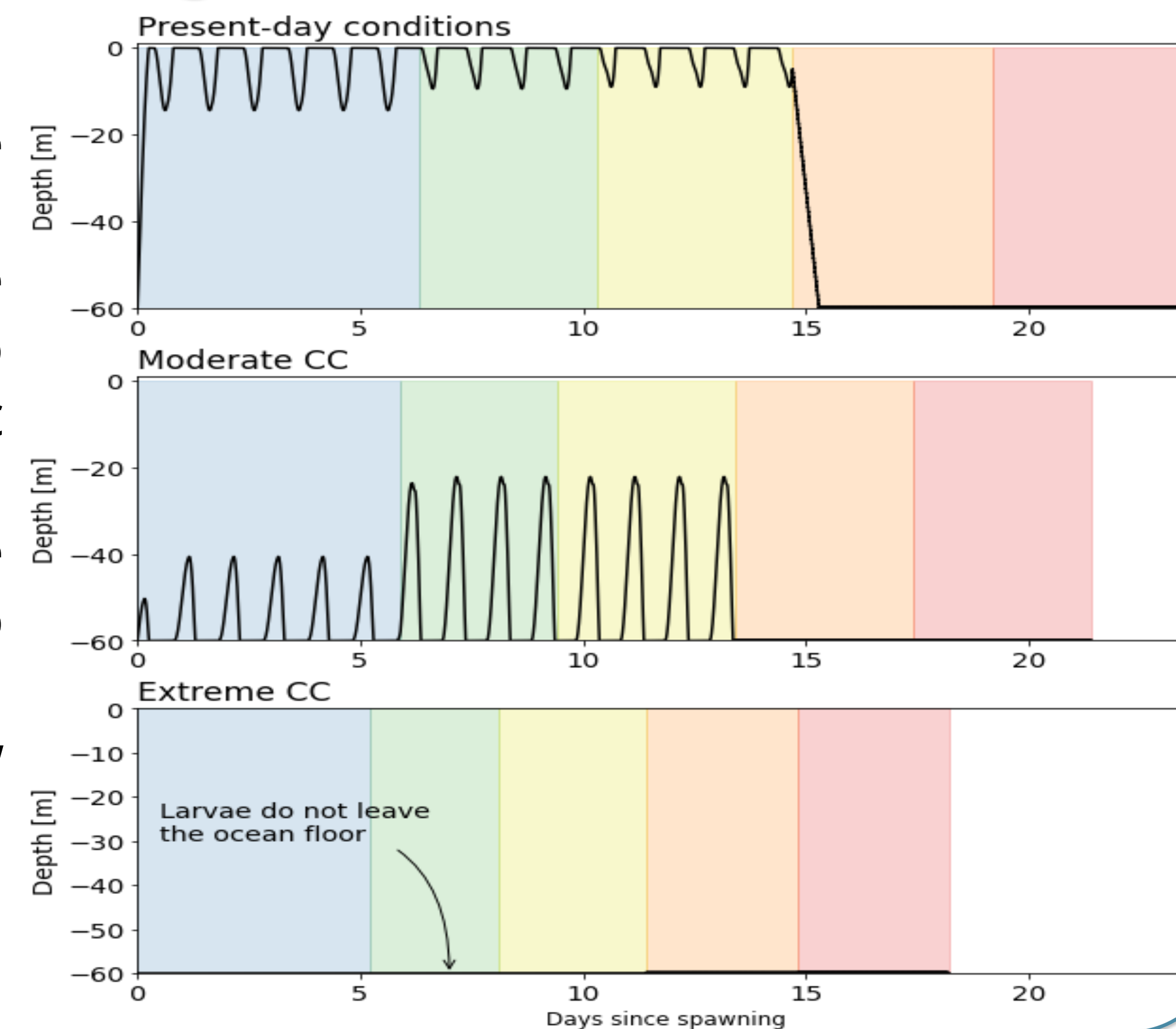
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Temperature and pH impact stone crabs' larvae swimming behavior

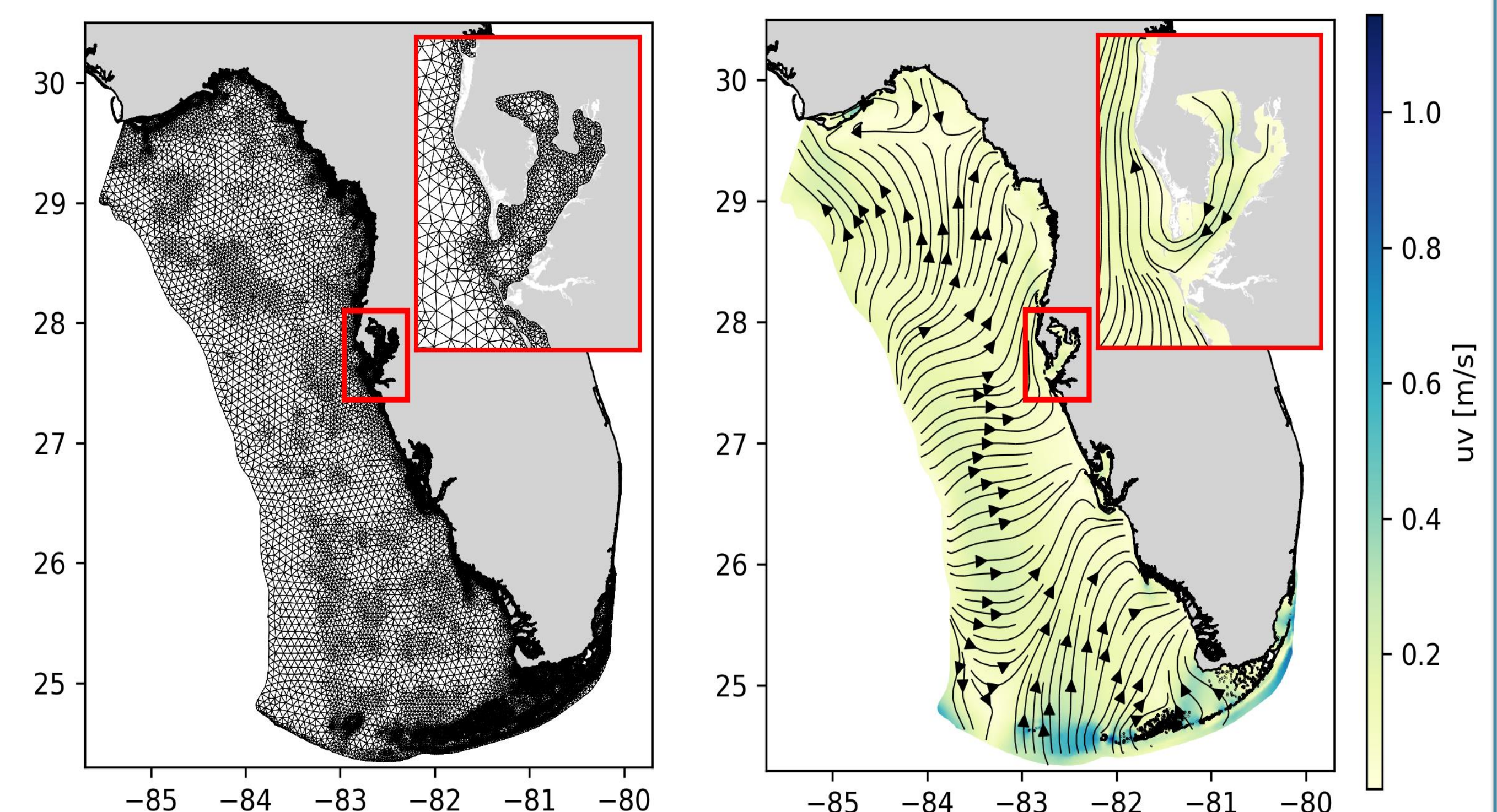
The commercially important Florida stone crab, *Menippe mercenaria*, is one specie that is affected by changes in seawater pH and temperature. Elevated CO₂, which leads to **lower water pH**, and **higher water temperature** have been shown to **reduce larval survivorship**, particularly when those two factors are combined. **Lower pH** also results in a reduced rate of embryonic development (therefore **increasing the time to hatching**), **reduced hatching success** and a **lower position in the water column** of some larval stages, which can reduce their dispersion potential. **Temperature** also **determines the duration of the larval stages**. While climate change will modify the dispersion pattern of stone crab larvae, it remains unclear how those changes will be spatially distributed and what implication they will have for the fisheries



A 3D biophysical dispersal model to understand the impacts of climate change

To understand the dispersal of stone crabs' larvae and the impact of climate change, we developed a **3D biophysical model**:

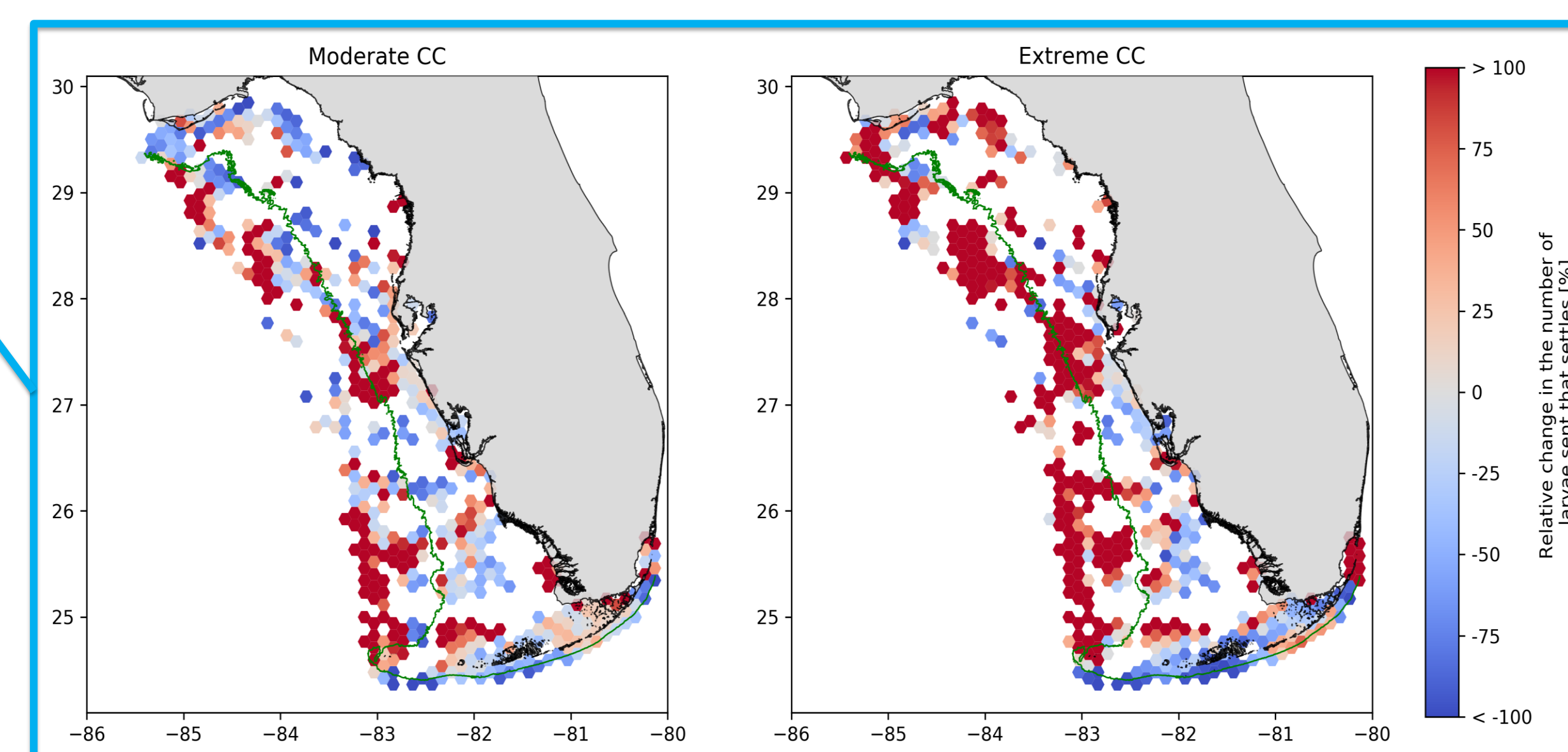
- We simulated the **three-dimensional ocean circulation** over the West Florida Shelf with the **multi-scale ocean model SLIM**.
- The **dispersion of the larvae** was then modeled by using SLIM's **Lagrangian particles tracker**.
- A **connectivity study** was performed to understand the dispersion patterns and community structure
- **The impacts of climate change (CC)** were evaluated by running **three different scenarios**: present-day, moderate CC (RCP 2.6) and extreme CC (RCP 8.5).



Future stone crabs' communities will be more fragmented

Our results show that in the years to come, we can expect :

- A **shift in the spatial distribution** of the crab, with an increase in the number of larvae settling in **deeper** and **northerner waters**
- An **increase** in the **total amount of larvae that settle**
- An **important decrease** in the **size of the communities** present in the West Florida Shelf, leading to a population that will be **less resilient to disturbances**
- That the **non-fishing zone** (NF - more than 30 meters depth) will **not serve** as a **source** of larvae for the **fishing zone** (F - less than 30 meters depth)



	Percentage of sent larvae involved				
	F to F	NF to F	F to NF	NF to NF	Total
Present-day	0.52	0.02	0.01	0.12	0.67
Moderate CC	0.6	0.05	0.01	0.17	0.83
Extreme CC	0.57	0.05	0.01	0.34	0.97

