
NASA
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AMES RESEARCH CENTER

Ocean solutions research at Ames

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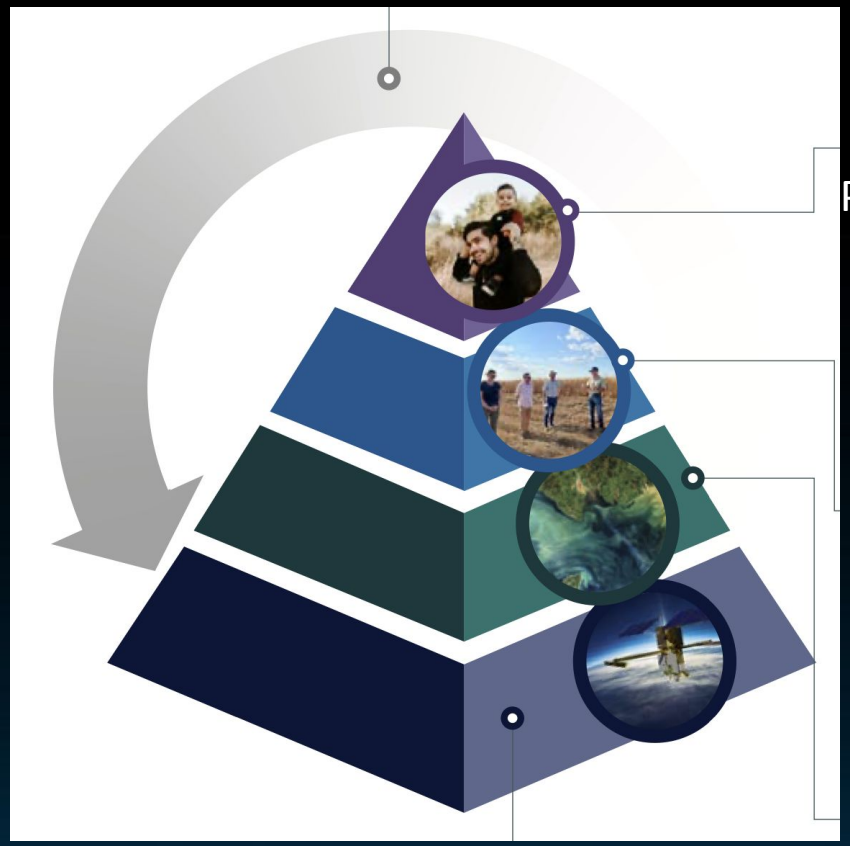
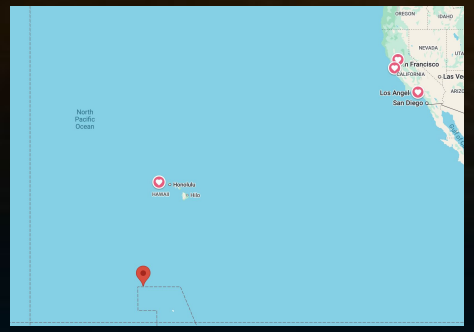
Ocean science for the nation & society

- Weather & climate prediction
  - Sea-level change
  - Building resilience
- Food
  - Fishing and aquaculture
- Culture & recreation
  - Biodiversity and ecological conservation
  - Indigenous people
- Trade & economy
- National security
- Energy & decarbonization
  - Offshore wind
  - Marine carbon dioxide removal



NASA Earth Science to Action Strategy

FATE: The drifting Fish Aggregating device (dFAD) TrajEctory modeling tool for marine protected area management



With support from the NASA Ecological Conservation Program

With cosponsorship by The Nature Conservancy & partnership with the USFWS

https://www.fws.gov/story/2023-06/diving-starfish-protect-palmyras-coral-reef

The problem:

dFADs attract fish but can destroy protected coral reefs & habitat

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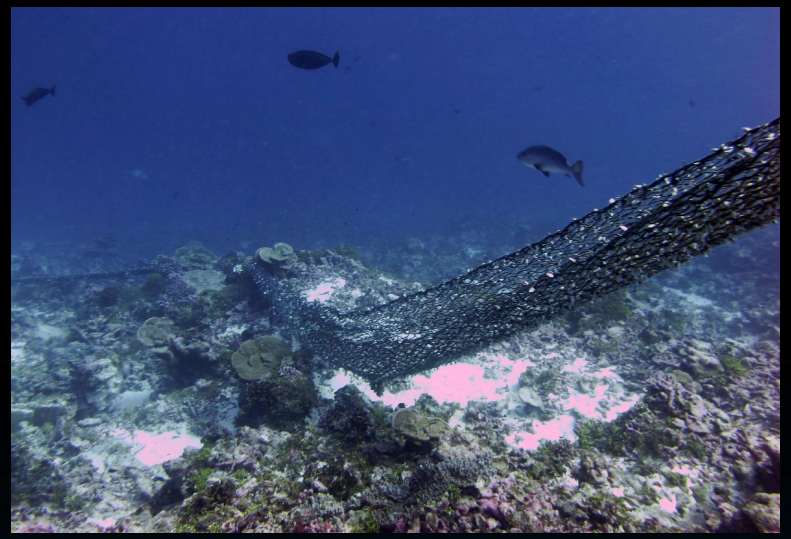


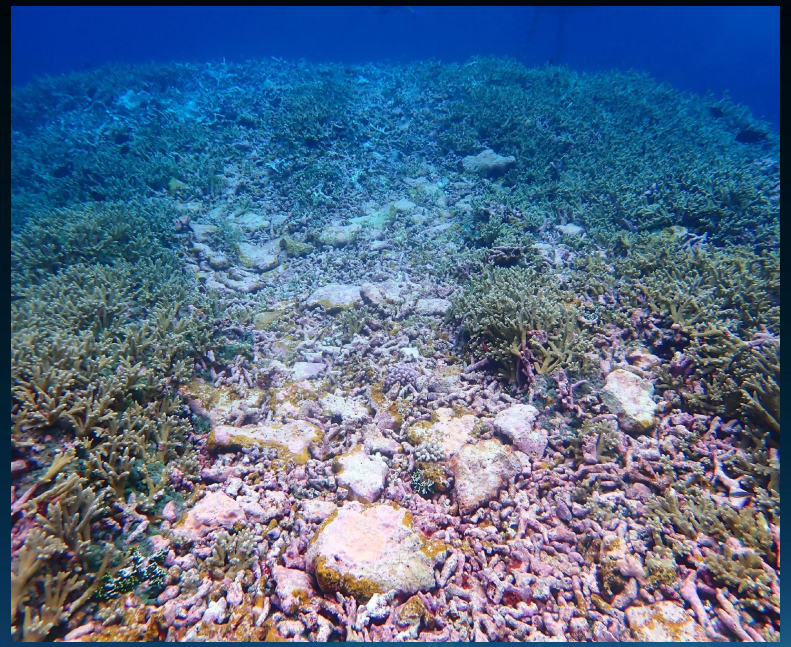
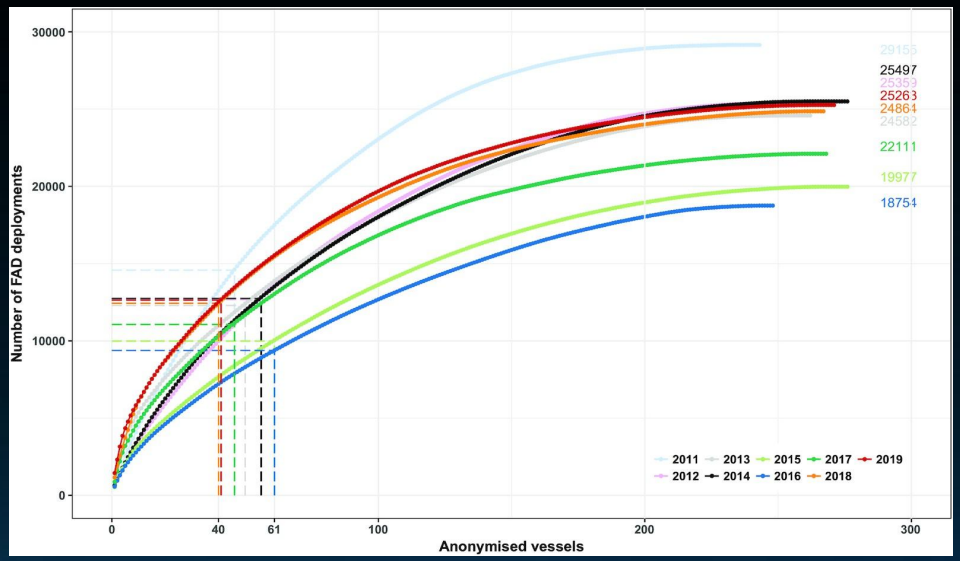


Photo credits: K. Pollock/TNC

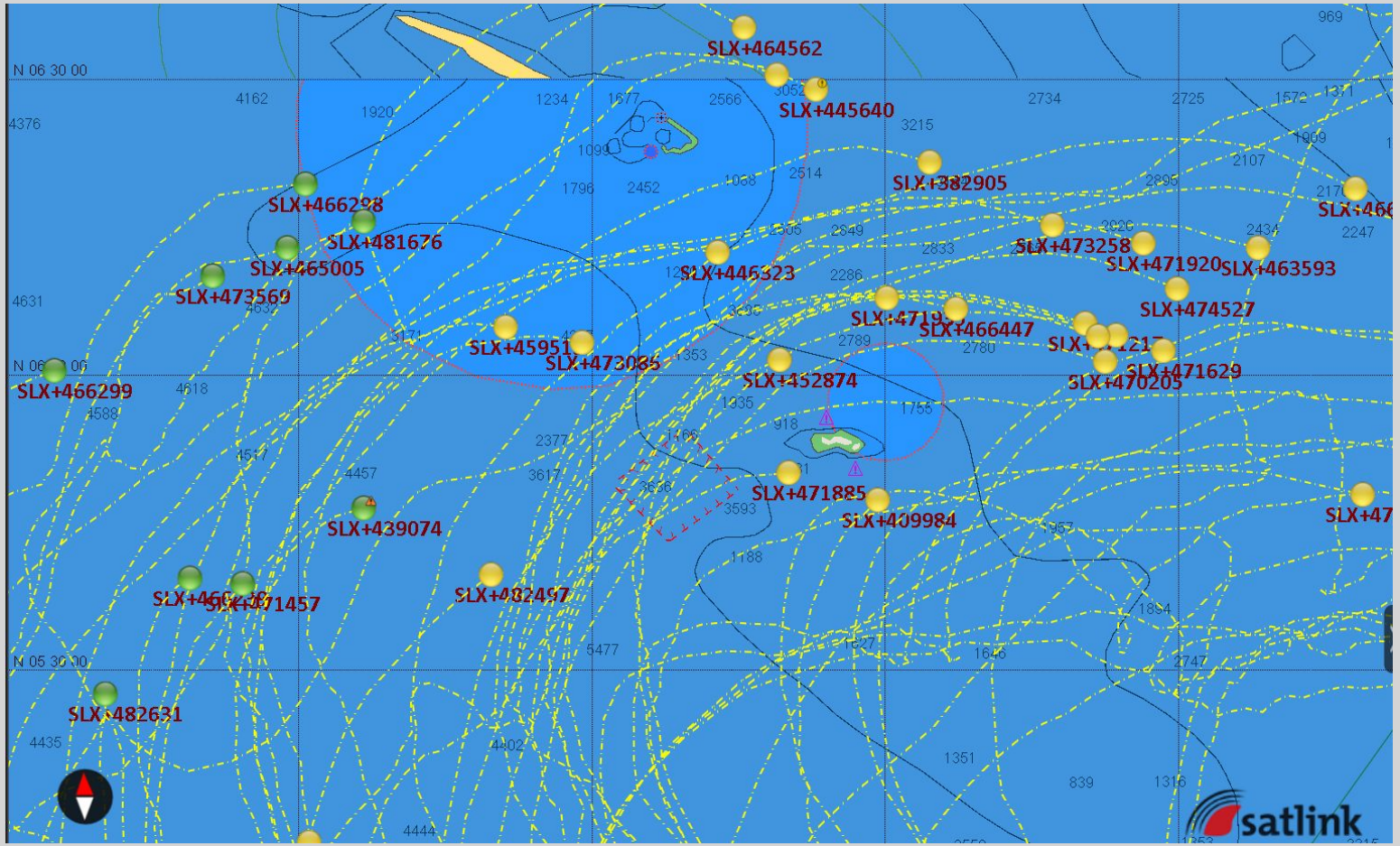
- **40,000 – 65,000 dFADs deployed in Pacific Ocean annually**
- **~100,000 in global oceans annually**

(Williams & Ruaia 2022 WCPFC-SC18-2022/GN IP-1)



Escalle et *al.* 2021 *ICES J*

Partial solution: **Intercept dFADs when possible via monitoring (FAD Watch)**



Improved solution:

Predictive model to assist decision to deploy resources

□ FATE

Photo & image credits: K. Pollock/TNC

FATE

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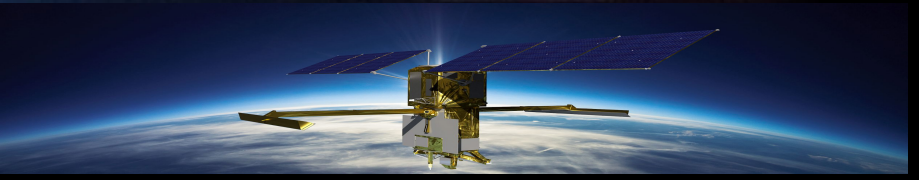
Operational tool to predict and visualize dFAD trajectories, grounding risk, and guide TNC decisions to retrieve dFADs.

Based on NASA remote sensing and modeling technology



Satellite remote sensing

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SWOT Sea Level Anomaly (SLA) gradient

Credit:
Chris Henze
Nina McCurdy
David Elsworth

Supercomputing and models

https://www.nas.nasa.gov/pubs/stories/2015/feature_Pleiades_Thigpen.html

Supercomputing and models

Viz Credit: Ames Viz Group Chris Henze Nina McCurdy …
Simulation: ECCO group, Dimitris Menemenlis, …

https://data.nas.nasa.gov/geoseccoviz/geoseccovizdata/c1440_llc2160/MITgcm/mp4/HD_latlon_SSSPEED.mp4

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Marine Carbon Dioxide Removal Research

Overarching motivation: The ocean holds roughly 50x the carbon of the pre-industrial atmosphere, removes 25% of anthropogenic emissions already, and we could potentially develop solutions to store atmospheric carbon in the ocean at gigaton scale.

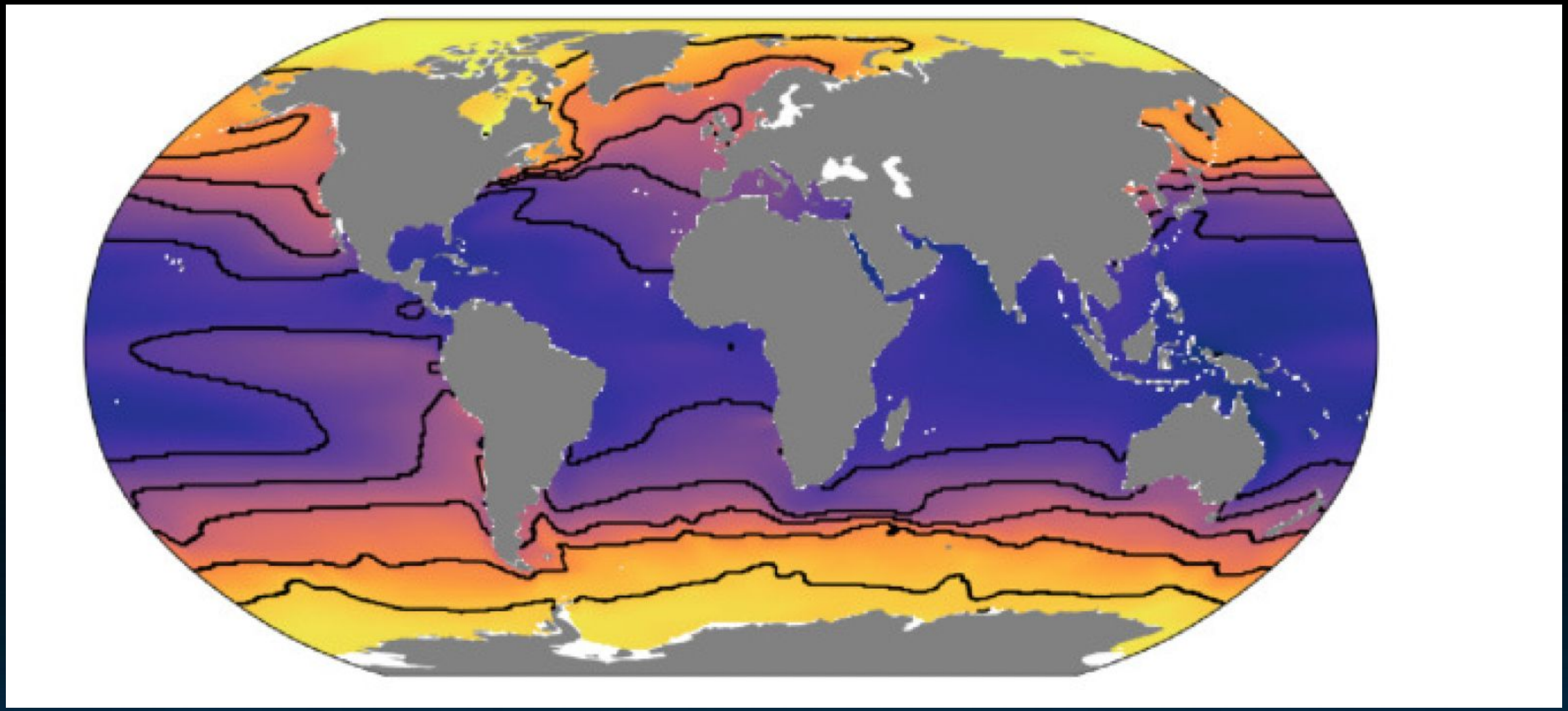
Need to understand and quantify risks and benefits.

With support from the NASA Ocean Biology and Biogeochemistry Program

And collaboration with Running Tide (now defunct!)

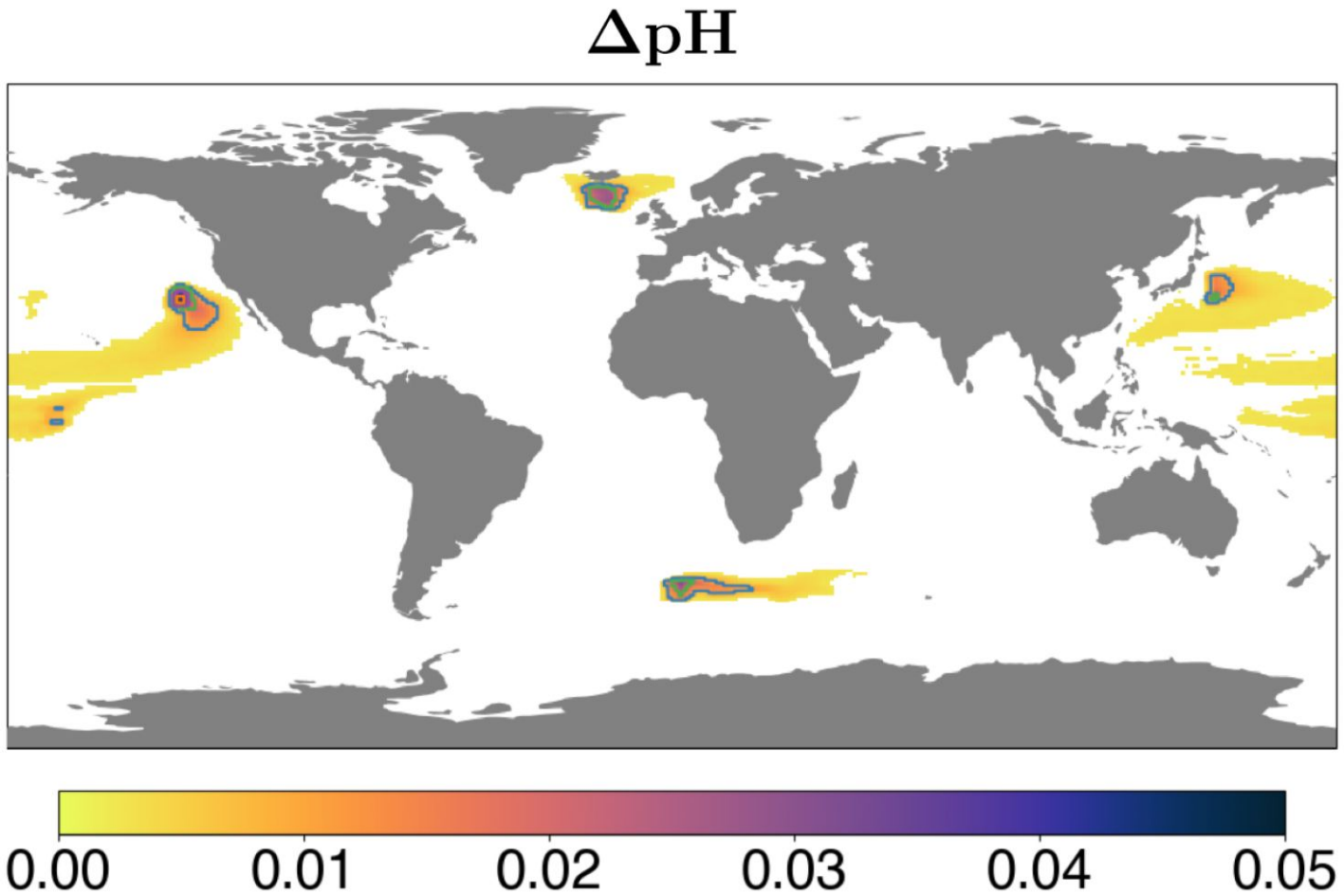
See 2022 NAS report: A RESEARCH STRATEGY FOR OCEAN-BASED CARBON DIOXIDE REMOVAL AND SEQUESTRATION

Mapping out the mCDR potential of OAE using data-assimilative NASA ocean-biogeochemical model



https://doi.org/10.22541/essoar.170957083.34212619/v1

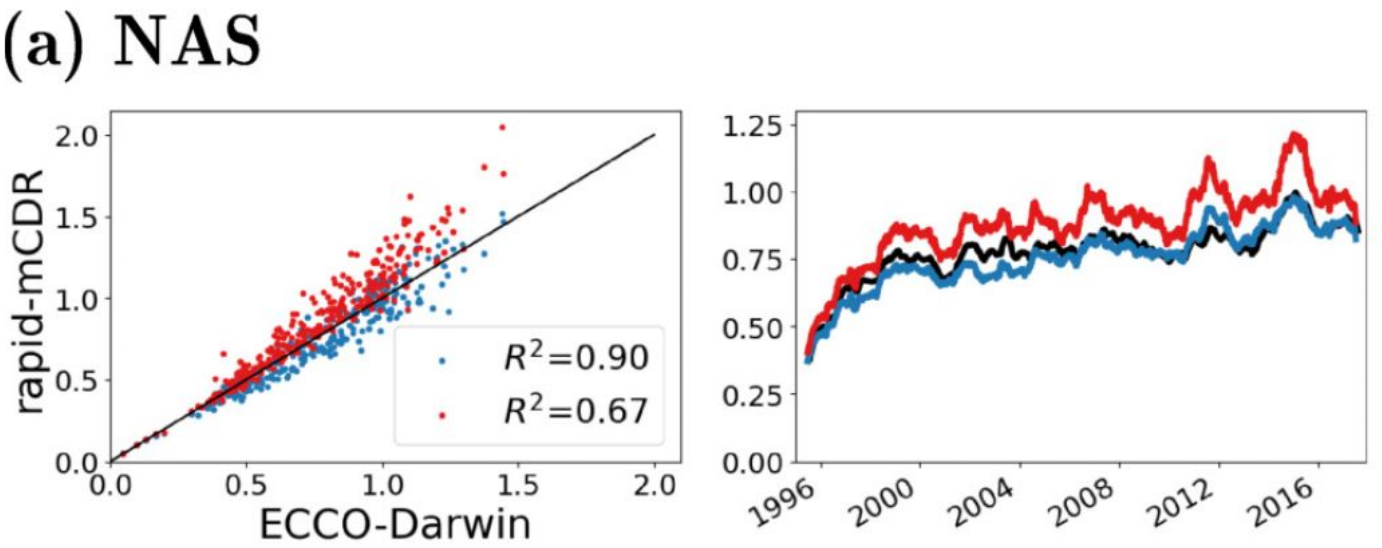
Quantifying the impact of circulation



https://doi.org/10.22541/essoar.170957083.34212619/v1

A simple tool that estimates OAE efficiency anywhere in minutes on a laptop

https://doi.org/10.22541/essoar.170957083.34212619/v1



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