

Coral Reef Condition Across the Hawaiian Archipelago and Relationship to Environmental Forcing

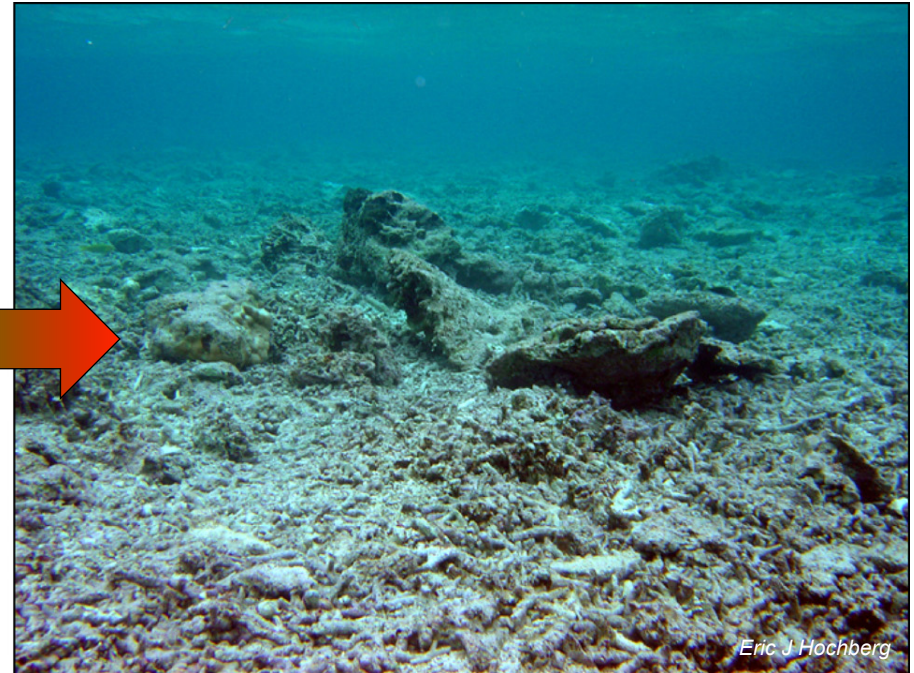
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The Coral Reef Problem:

Climate change may exacerbate existing local impacts, leading to reef degradation worldwide

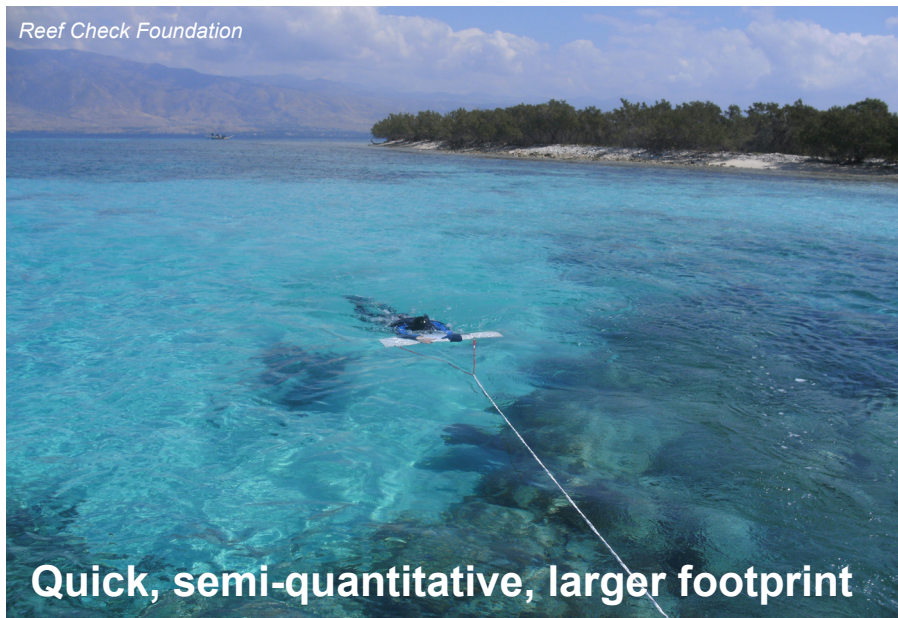


- Rough
- High Productivity/Calcification
- “Healthy”

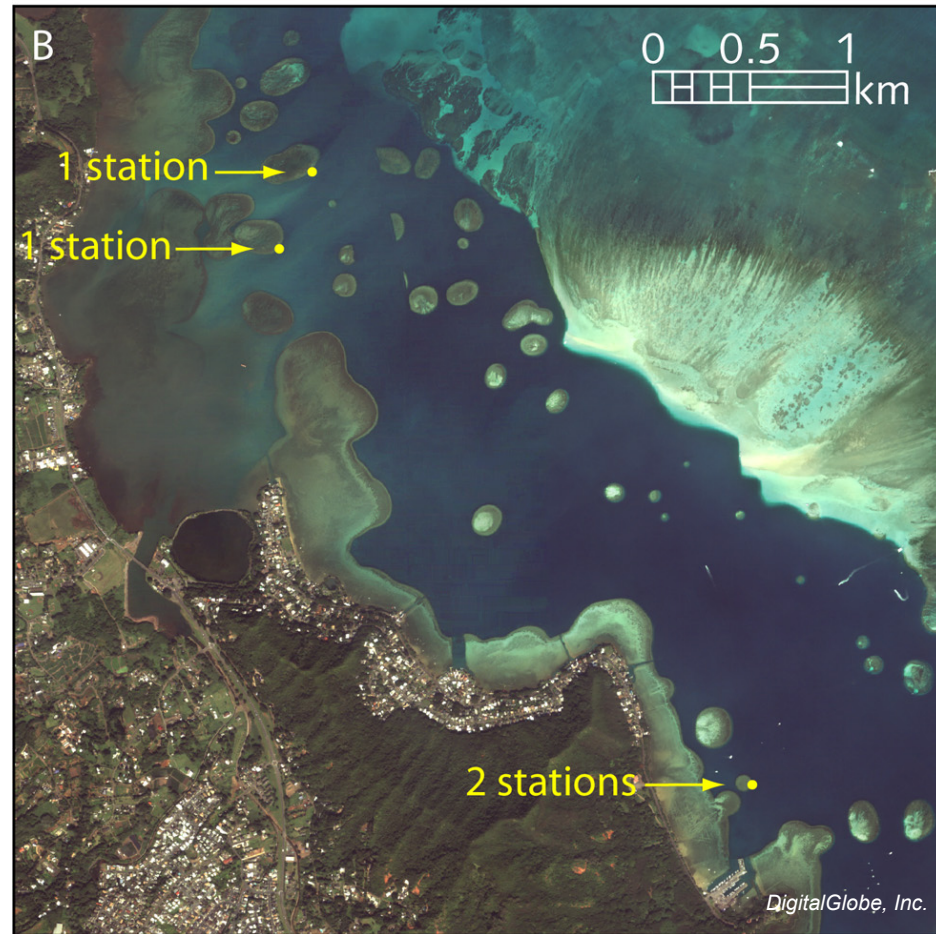
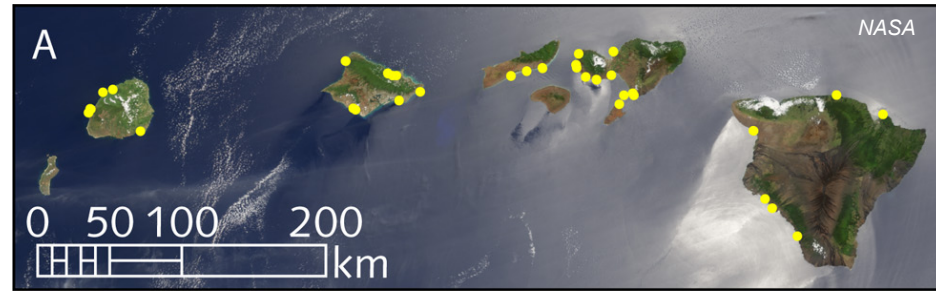


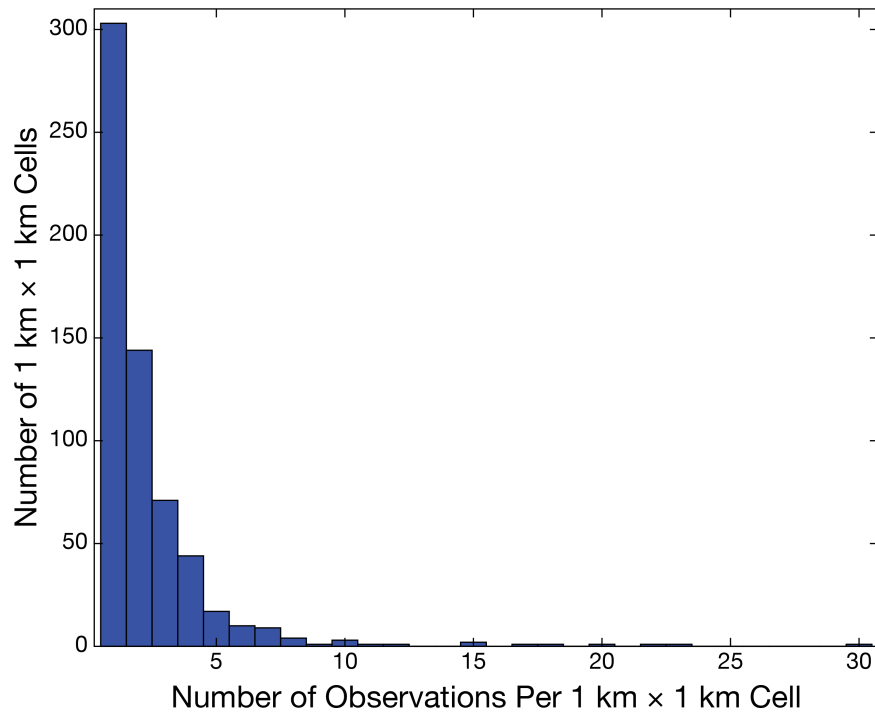
- Smooth
- Low Productivity/Calcification
- Not “Healthy”

State-of-the-Art Reef Assessment Methods



Sparse Surveys Undersample Reefs

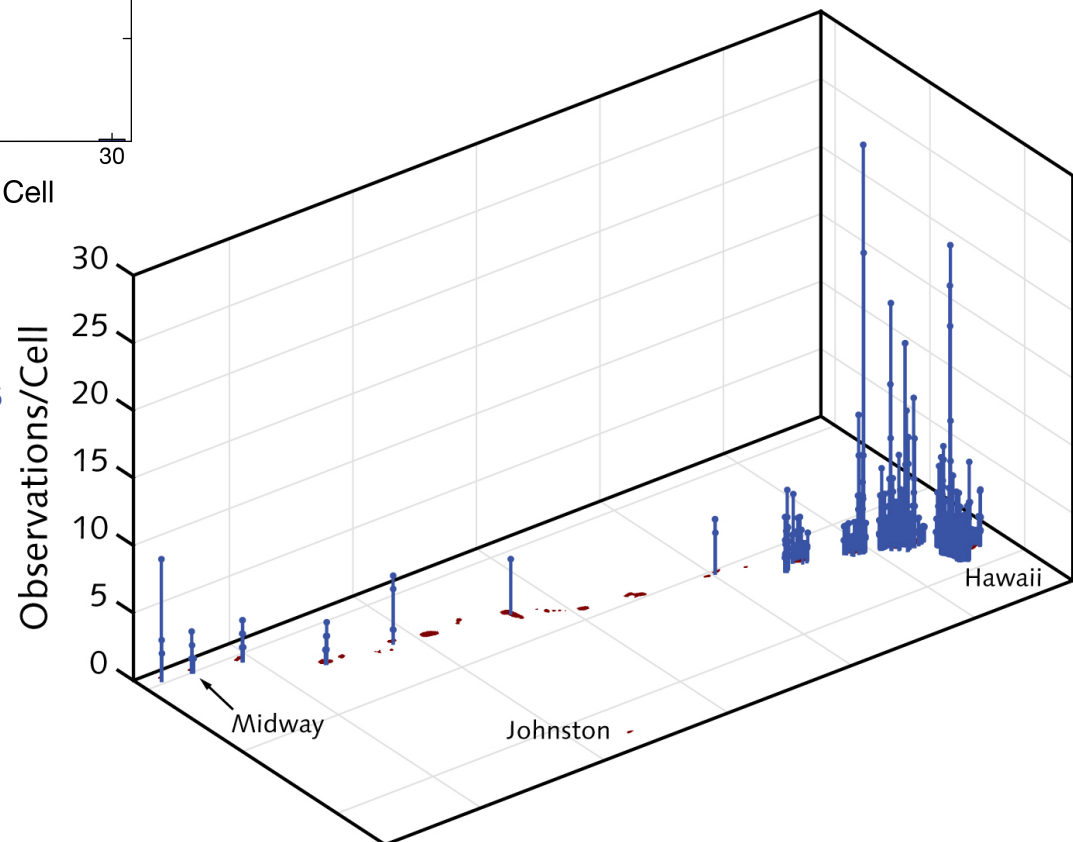




Hawaii — Readily Available Data on Benthic Cover 2005–2013

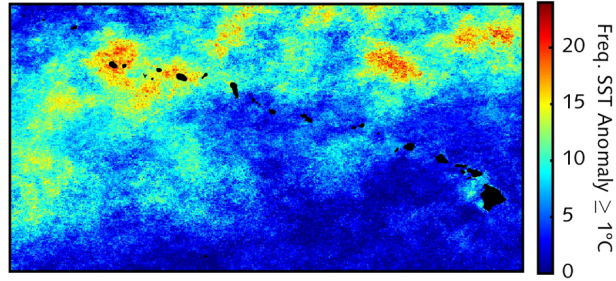
- Hawaii Coral Reef Assessment and Monitoring Program
- NOAA National Centers for Coastal Ocean Science Biogeography Branch

- Binned to 1 km \times 1 km grid cells
- 12,084 total cells
- 616 cells with ≥ 1 observation
- 303 cells with 1 observation
- 144 cells with 2 observations
- Effort focused — by far — on Main Eight Islands

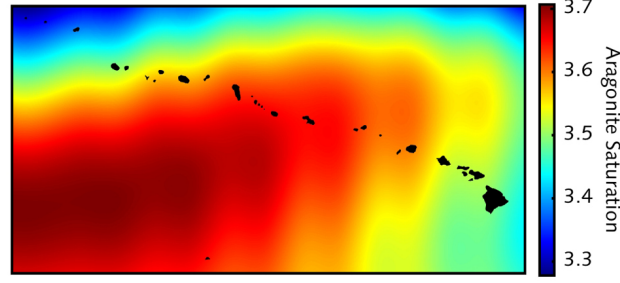


Biogeophysical parameters thought to be primarily responsible for driving reef condition

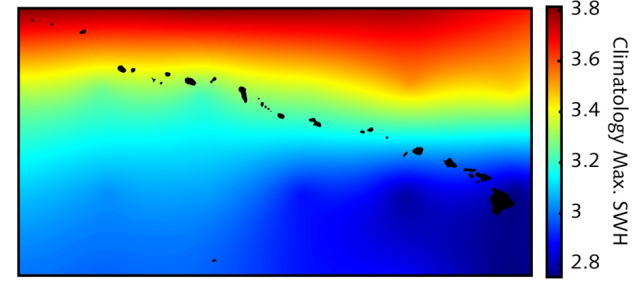
Thermal Stress



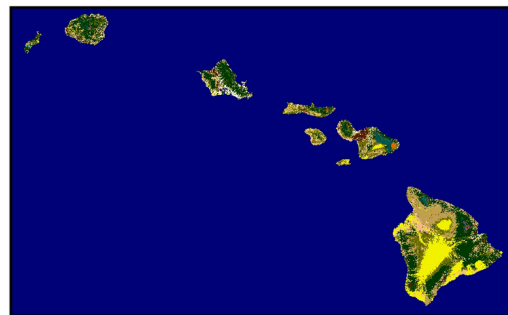
Ocean Acidification



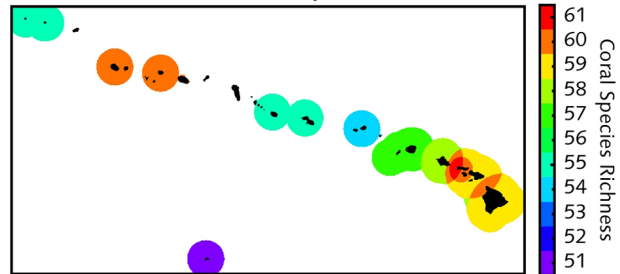
Waves



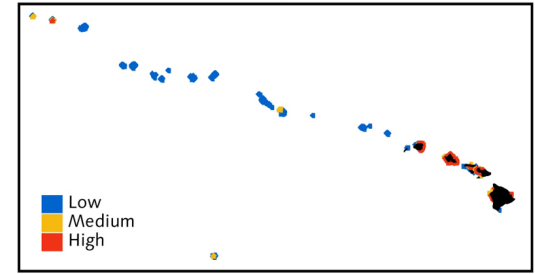
Land Use



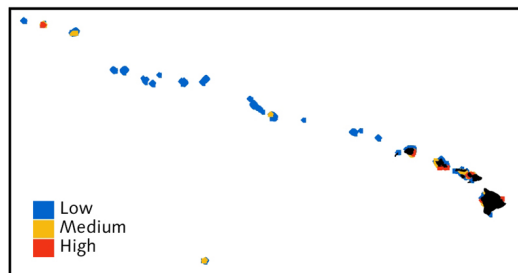
Biodiversity



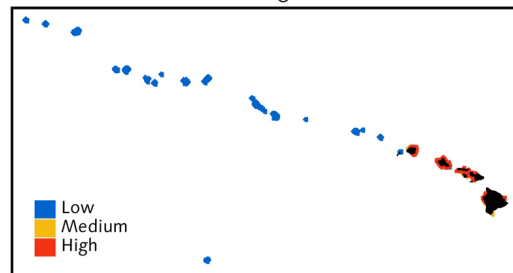
Coastal Development Threat



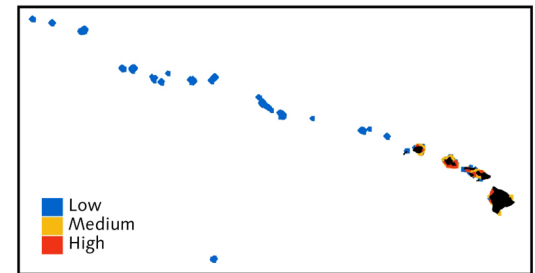
Marine Pollution Threat



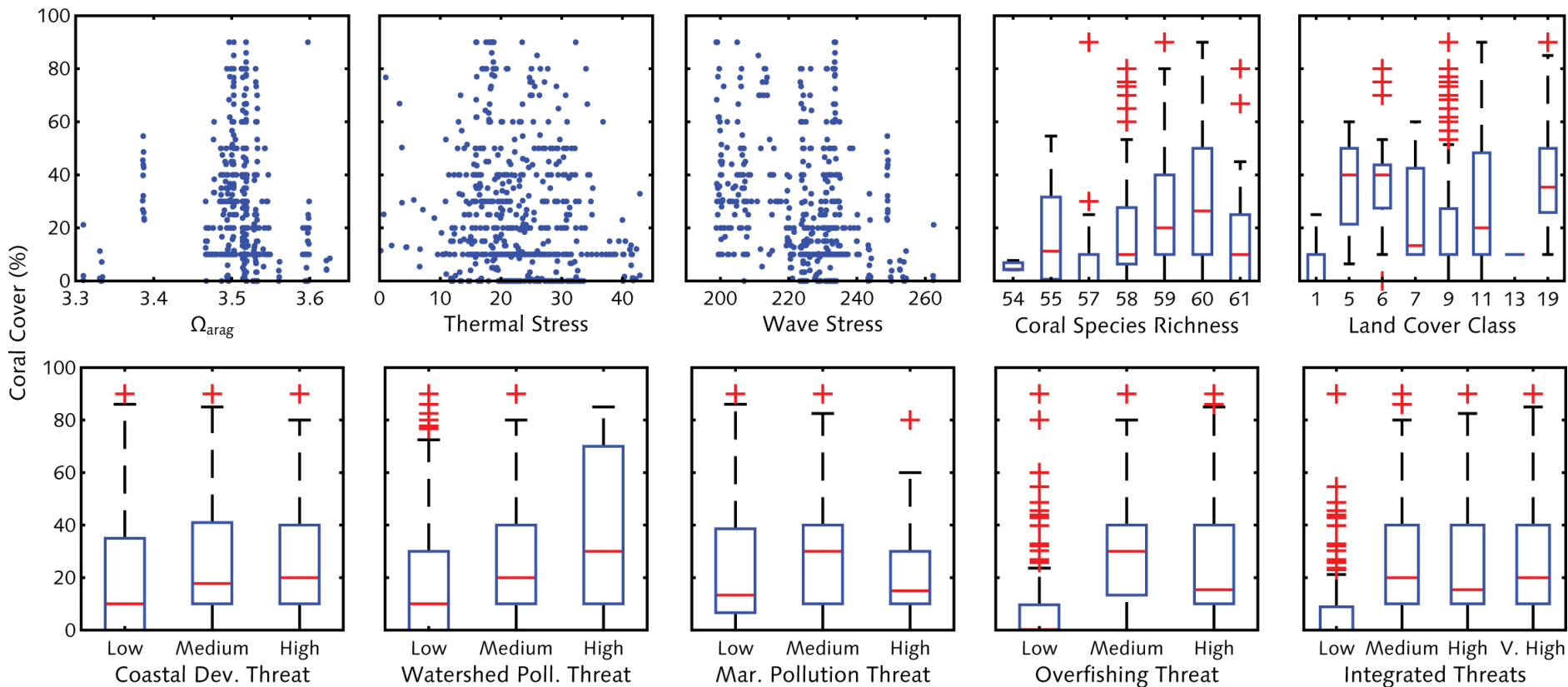
Overfishing Threat



Watershed Pollution Threat



Relationships between coral cover in Hawaii and biogeophysical forcing parameters



- **Patterns do not support prevailing understanding of how reefs relate to their environment**
- **In truth, available data are not actually representative of the ecosystem scale**

This project: Use AVIRIS 2017 coverage...

Northwestern Hawai'ian Islands:

- Laysan Island
- Maro Reef
- Gardner Pinnacles
- French Frigate Shoals
- Necker Island
- Nihoa Island

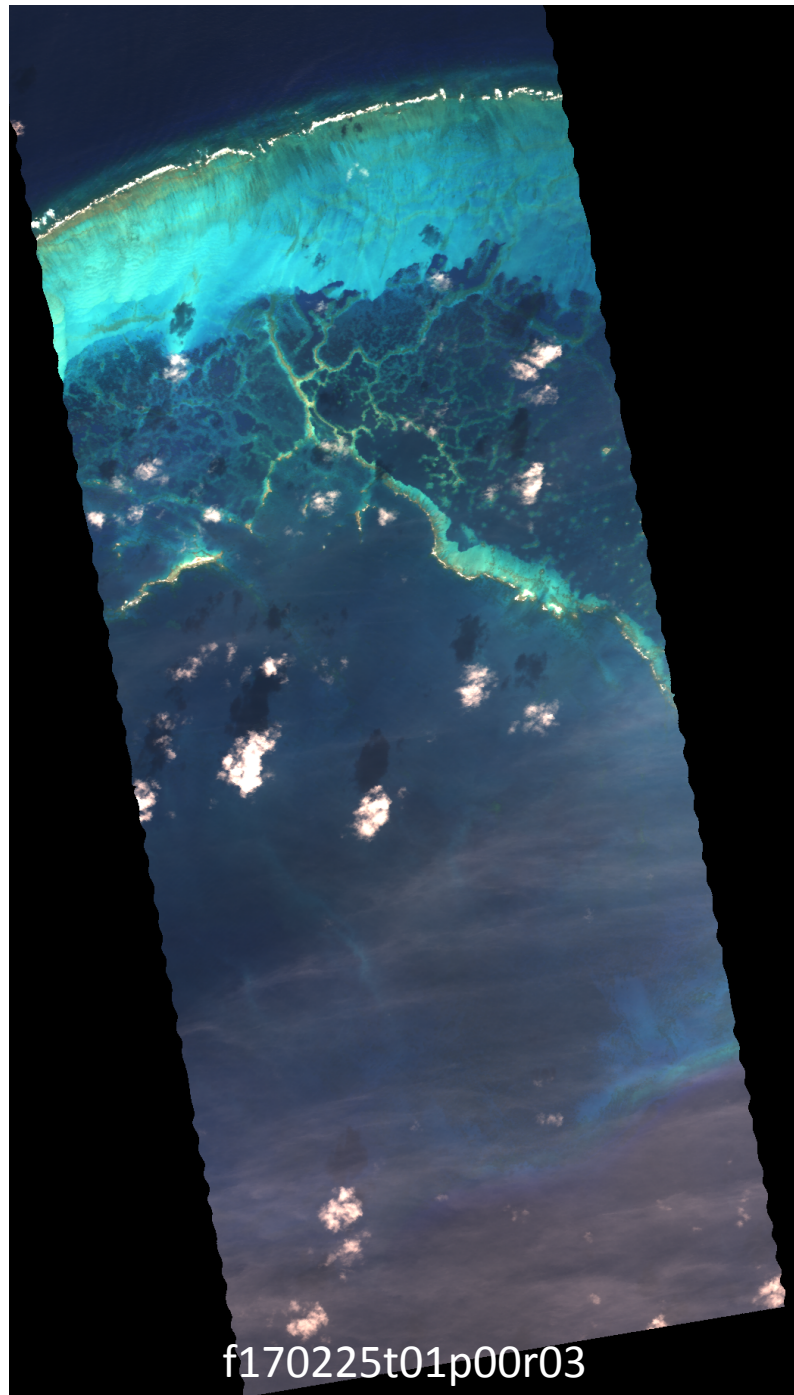
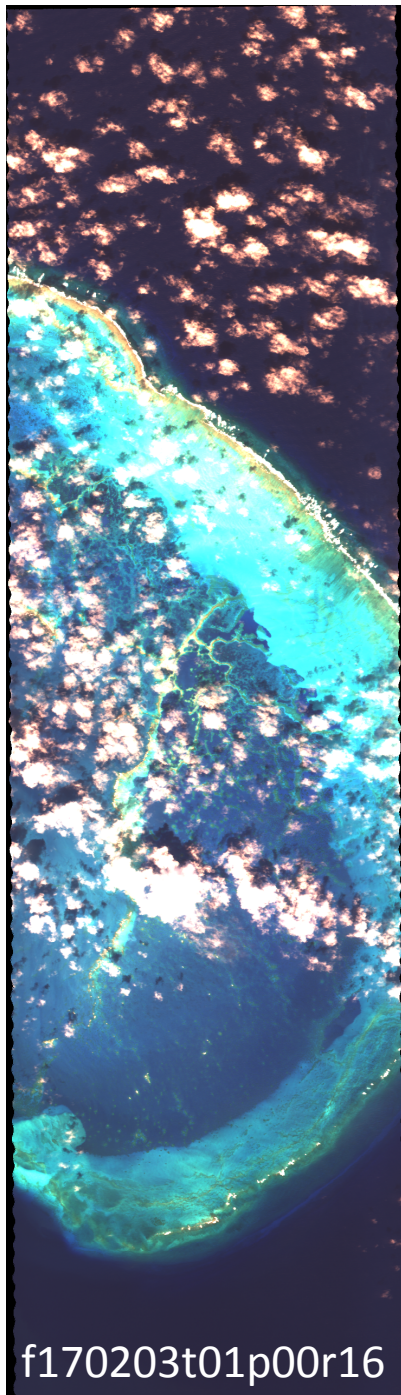
300 km

Main Eight Hawai'ian Islands:

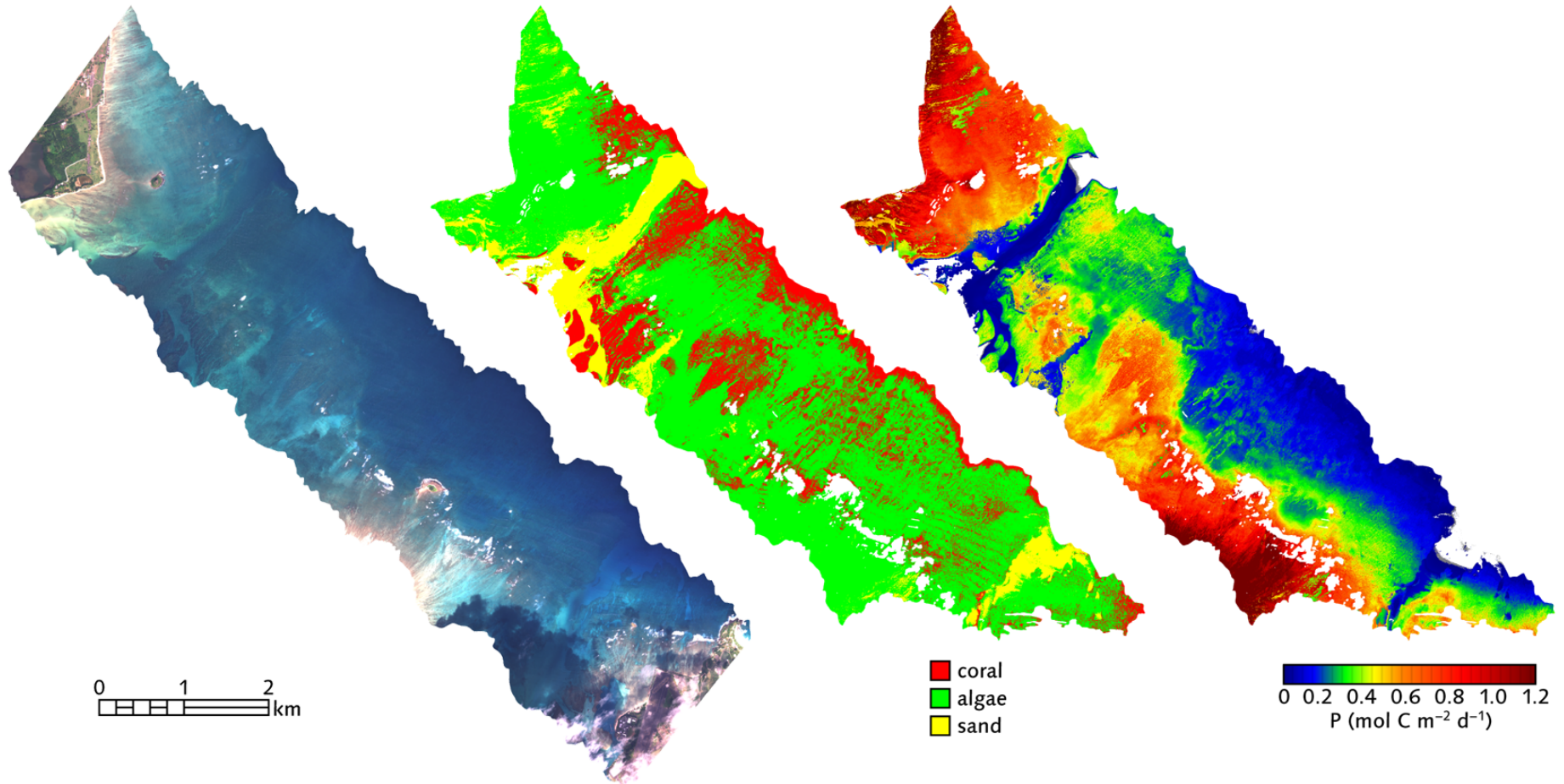
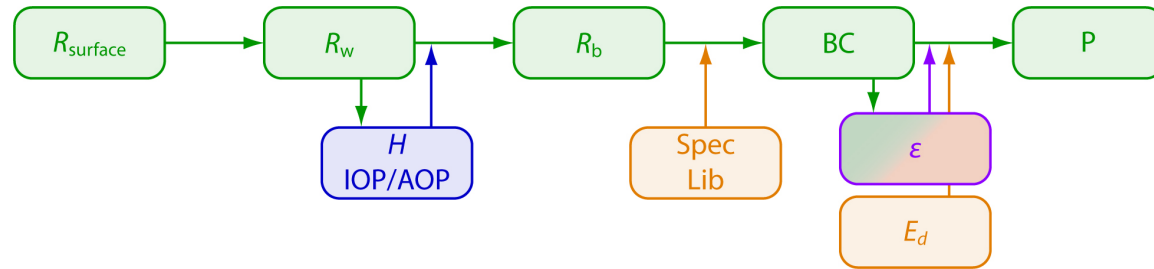
- Ni'ihau (northern tip)
- Kaua'i (north and west)
- O'ahu (windward)
- Moloka'i (south)
- Lana'i (portions of north, east, south, west)
- Maui (west, southwest, north)
- Kaho'olawe (north)
- Hawai'i (west, southeast)

Date Range: 19 Jan to 03 Mar 2017
83 flight lines with usable reef area

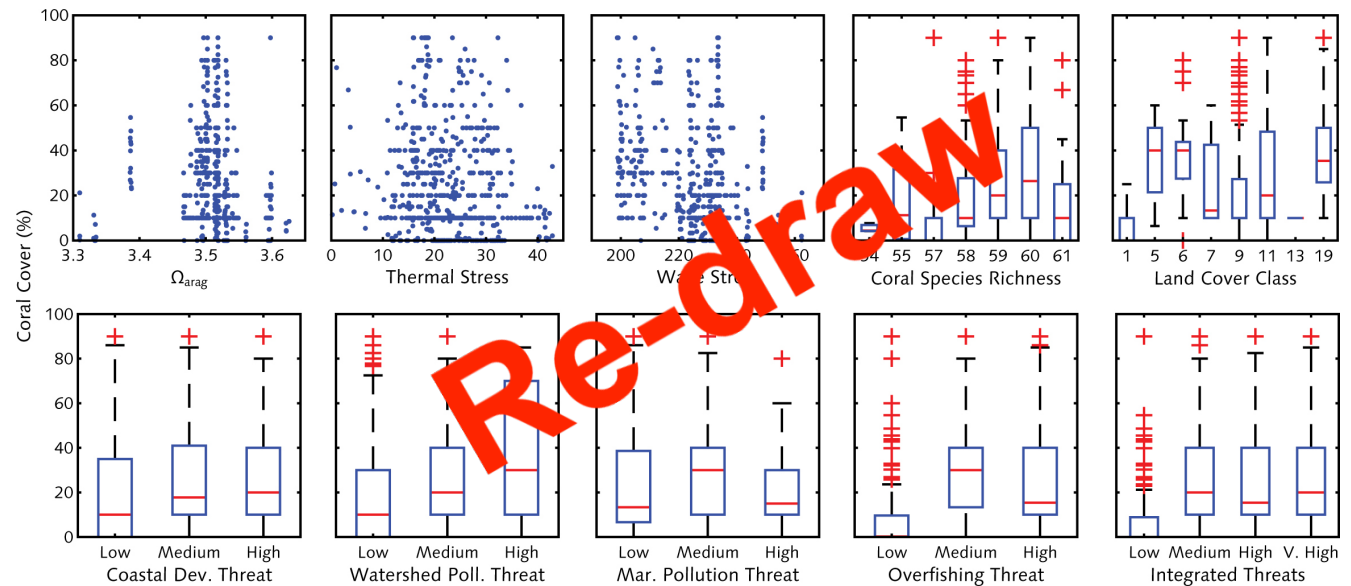
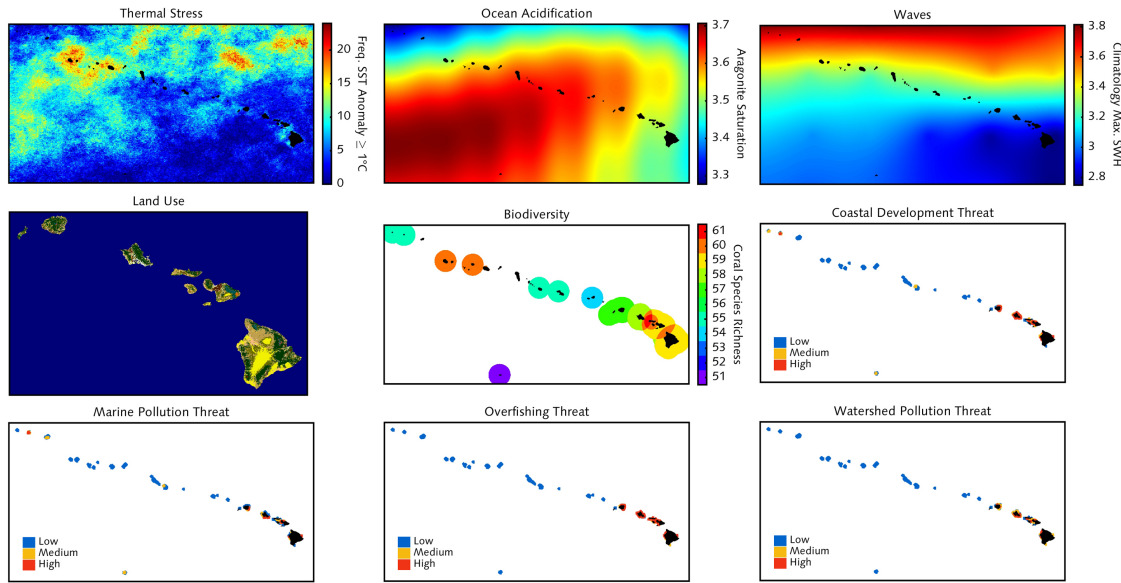
(Usable
reef
area)



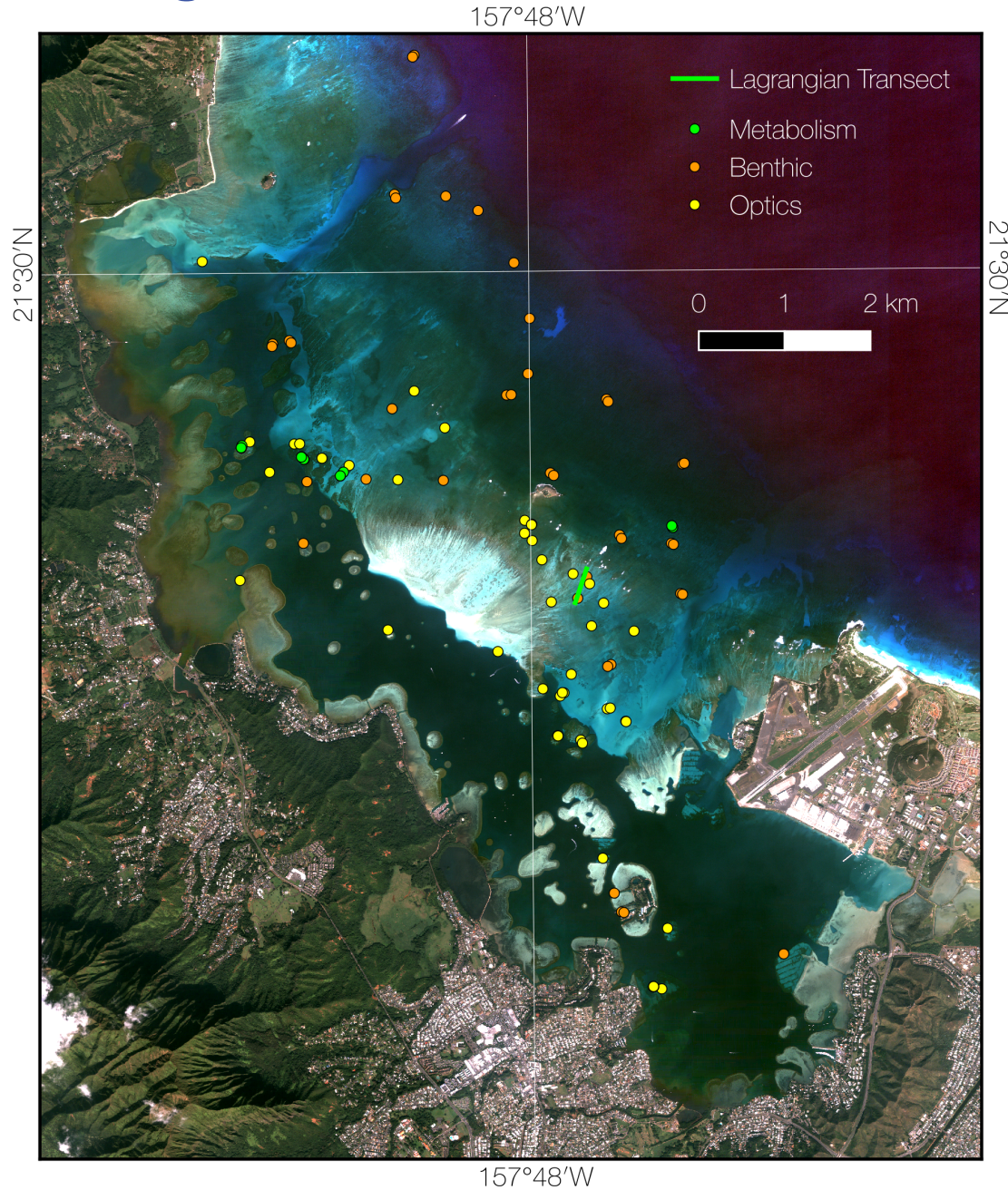
This project: ...to determine reef condition (BC + P)...



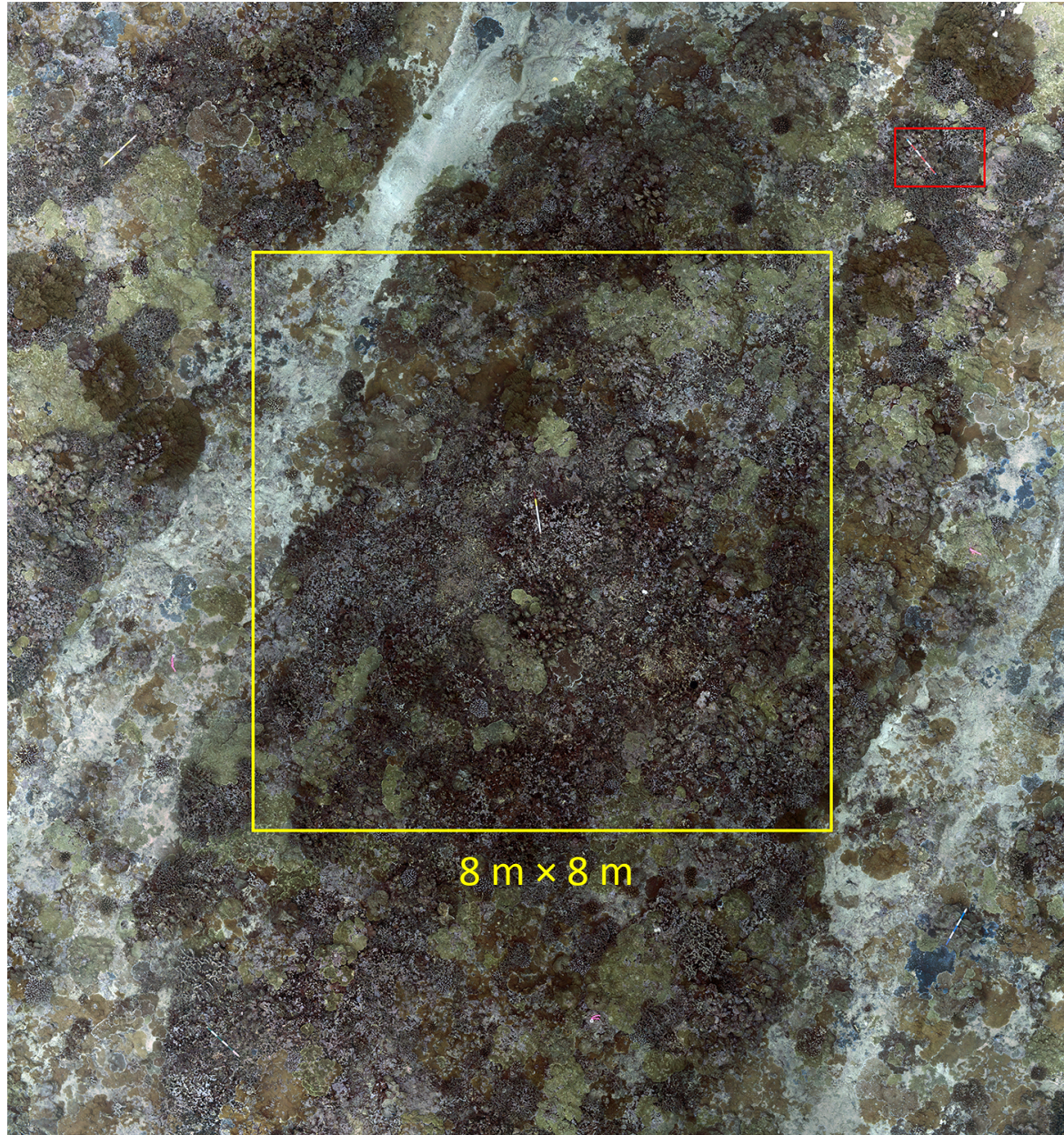
This project: ...and relate back to biogeophysical forcings.



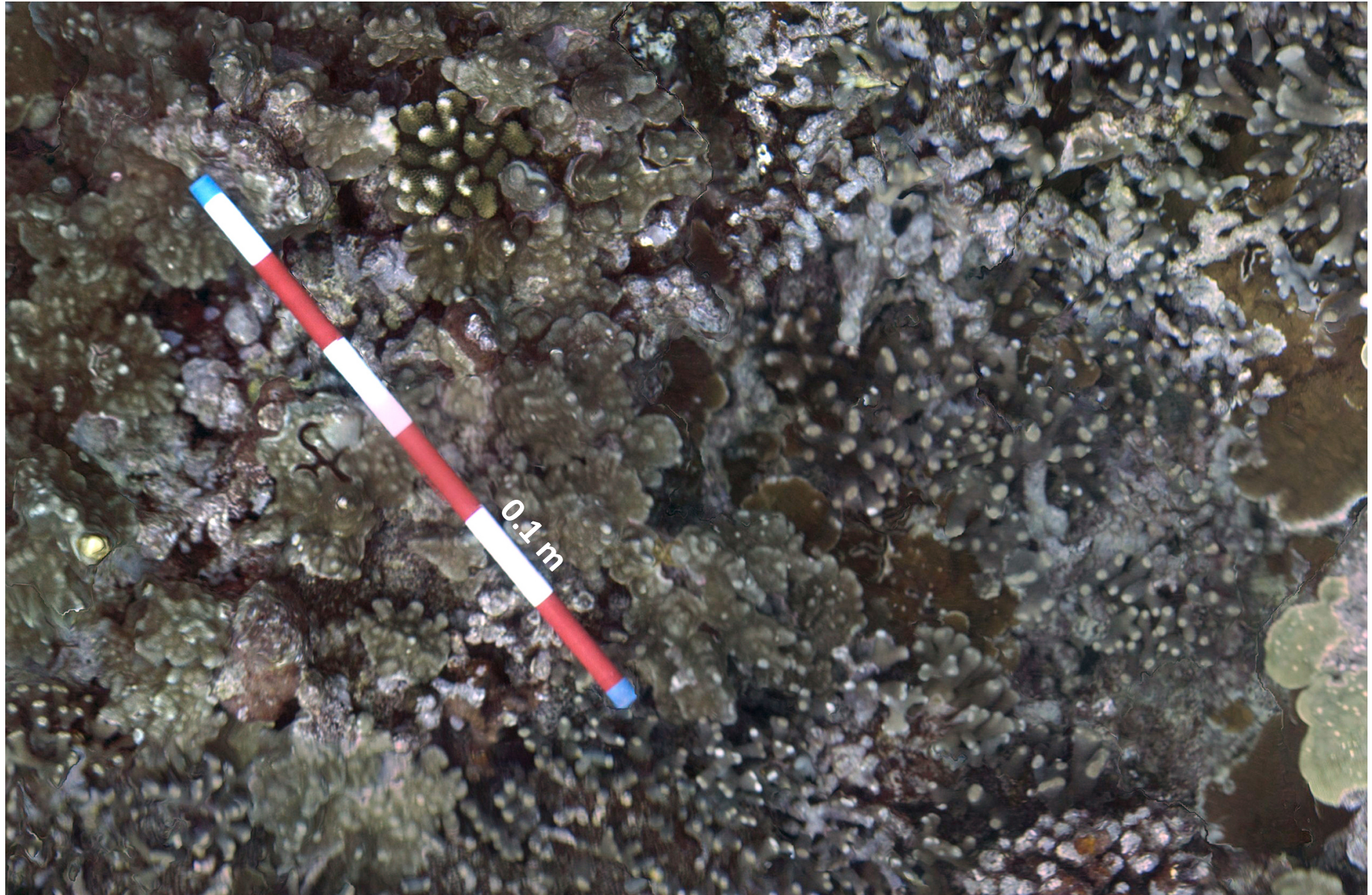
Leverage CORAL for in-water validation (Feb 2017)



Photomosaics for Validation of Benthic Cover



Photomosaics for Validation of Benthic Cover





ER-2
(HyspIRI)

Current Status

- **Data collection complete**
- **Validation data processed & on SeaBASS**
- **Refining algorithms**
- **Surface reflectance imagery**

G-IV (CORAL)

Thank you



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