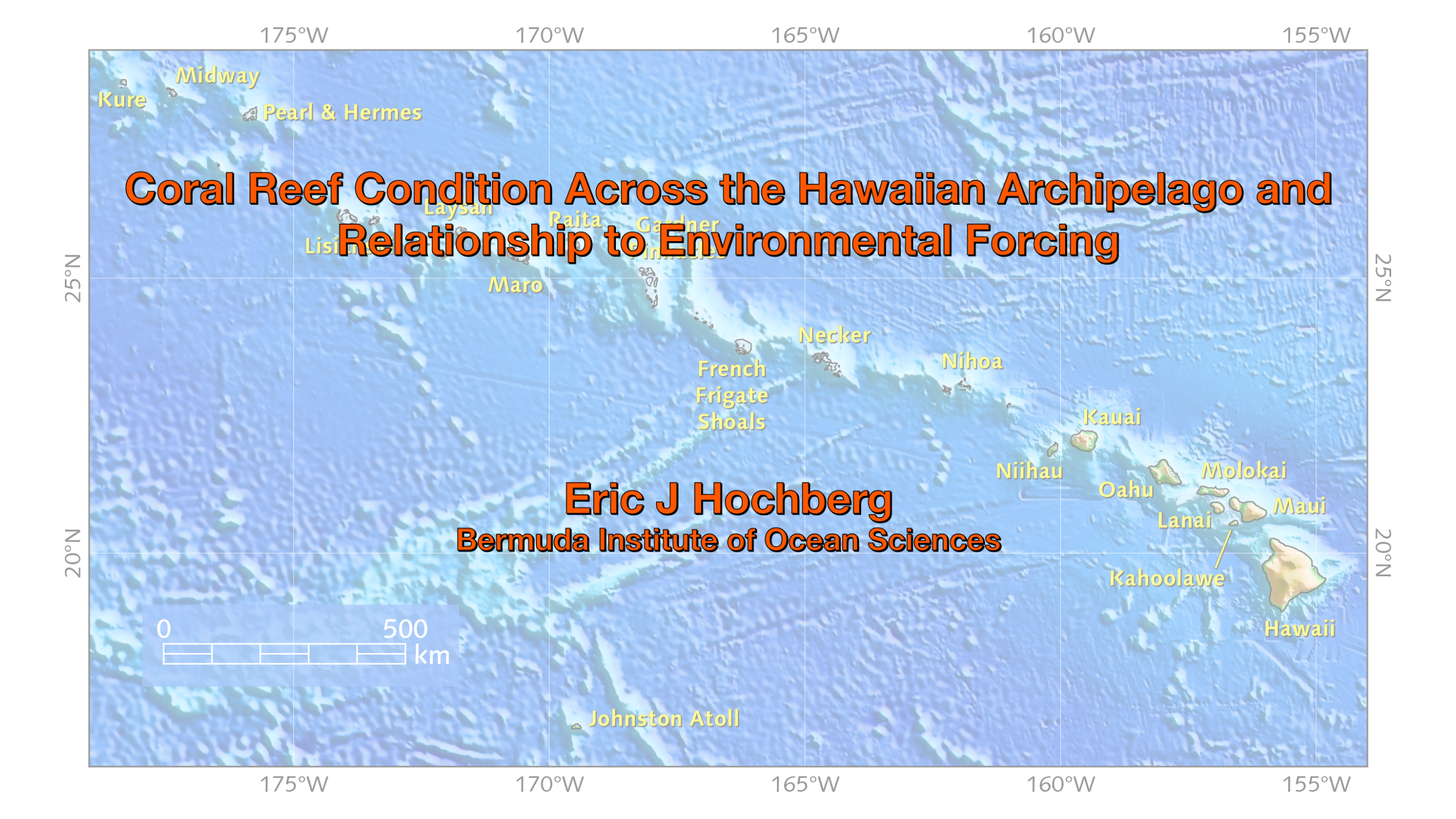


Coral Reef Condition Across the Hawaiian Archipelago and Relationship to Environmental Forcing

Eric J Hochberg

Bermuda Institute of Ocean Sciences

Trends in coral reef condition in Hawaii
- Coral cover is the universal metric

Hawai'i Coral Reef Assessment and Monitoring Program: Spatial Patterns and Temporal Dynamics in Reef Coral Communities[1]

Paul L. Jokiel,[2] Eric K. Brown,[2] Alan Friedlander,[3] S. Ku'ulei Rodgers,[2] and William R. Smith[2]

Pacific Science (2004), vol. 58, no. 2:159–174

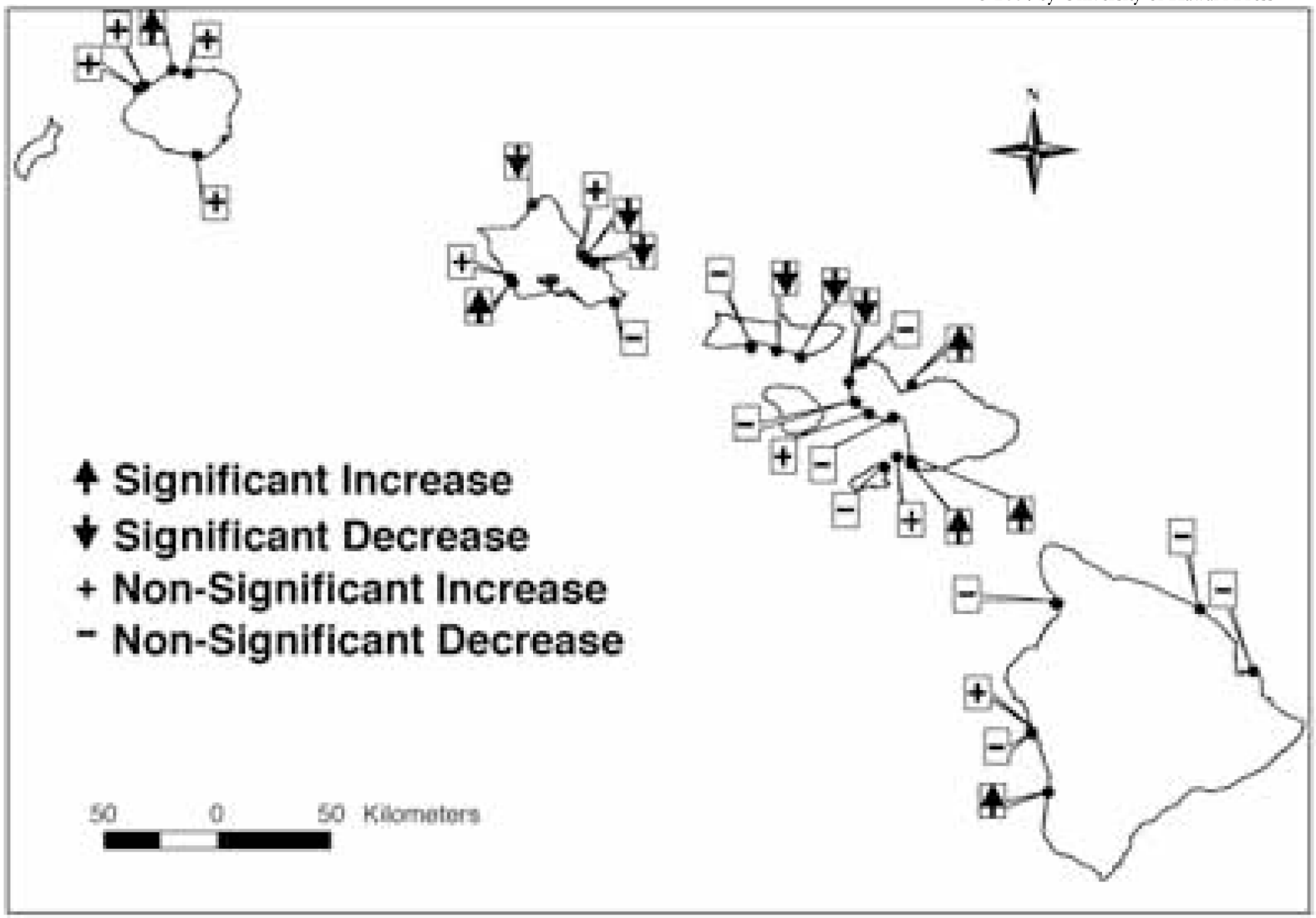
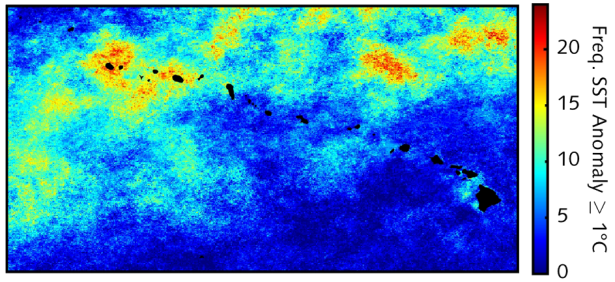


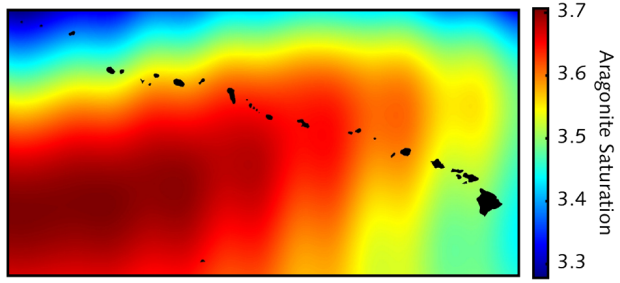
FIGURE 3. Changes in coral cover at each of the shallow (<5 m) monitoring sites.

Biogeophysical parameters thought to be primarily responsible for driving reef condition

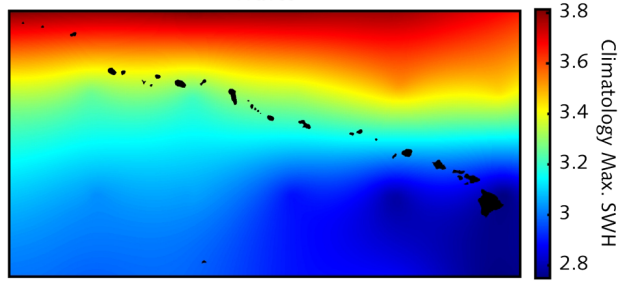
Thermal Stress



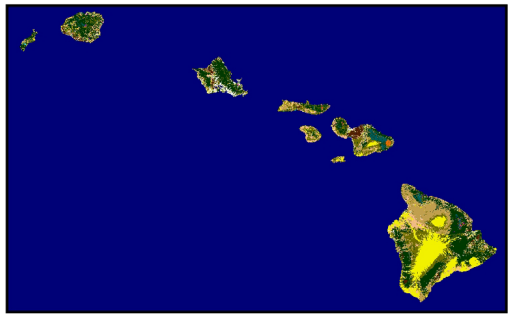
Ocean Acidification



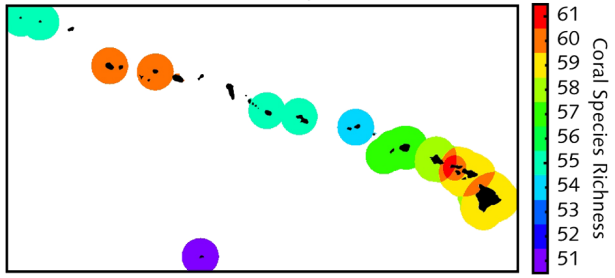
Waves



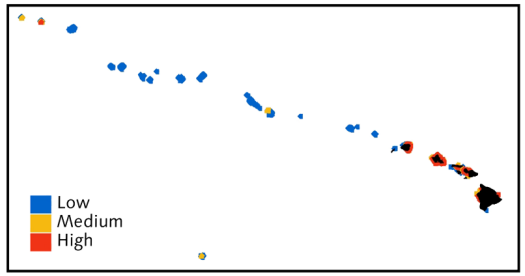
Land Use



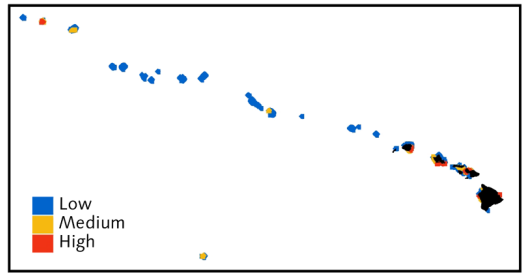
Biodiversity



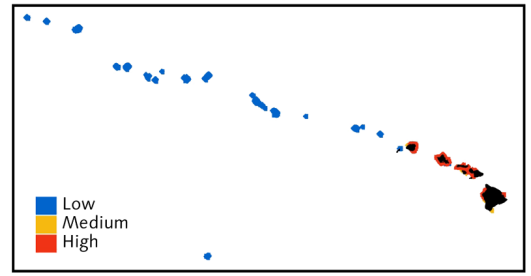
Coastal Development Threat



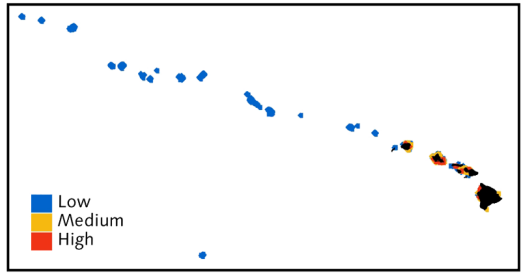
Marine Pollution Threat



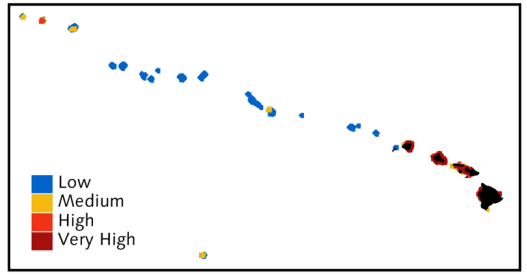
Overfishing Threat



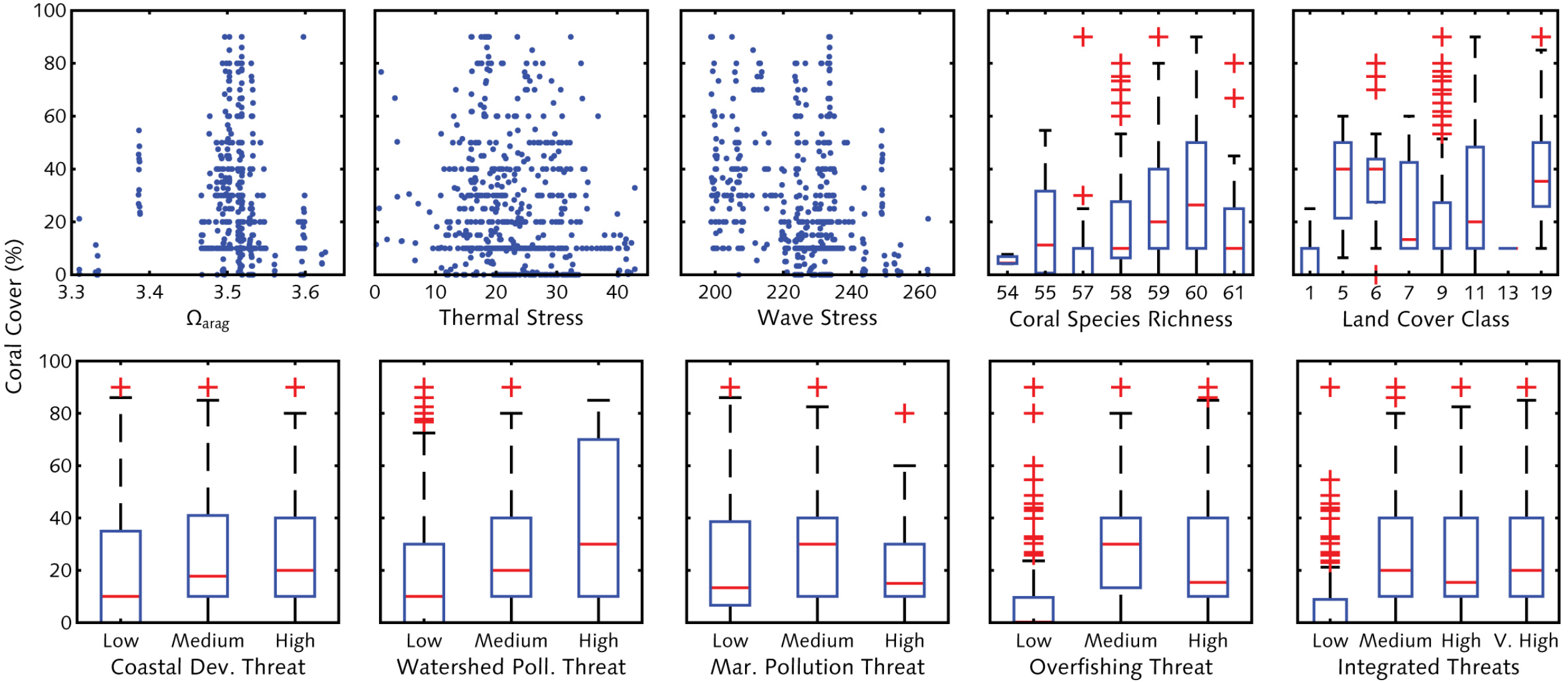
Watershed Pollution Threat



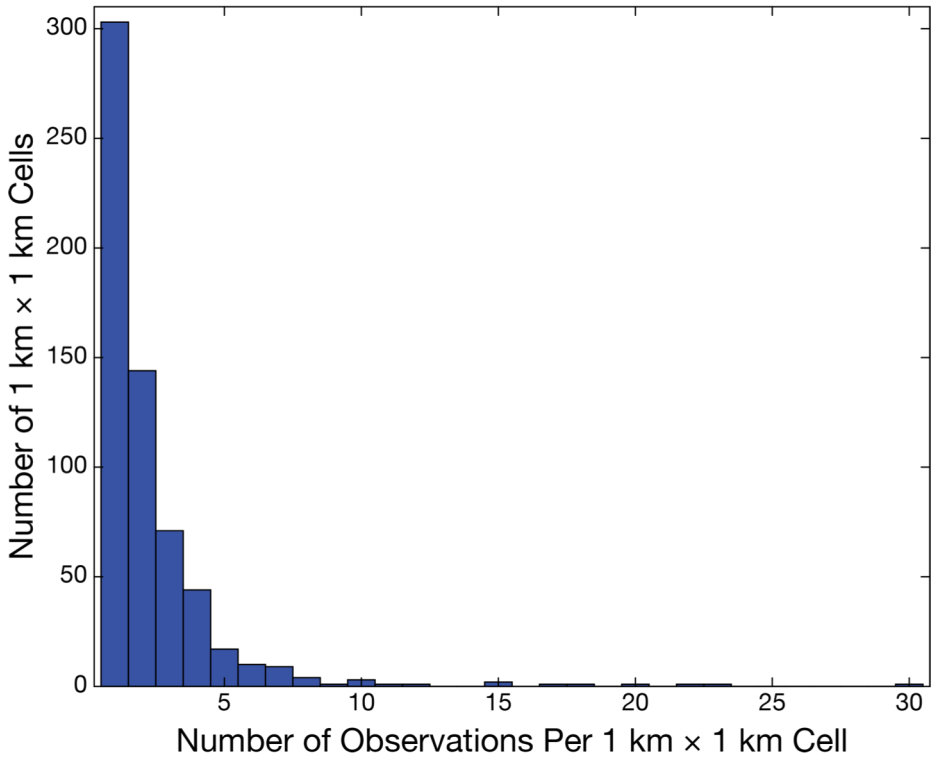
Integrated Local Threats



Relationships between coral cover in Hawaii and biogeophysical forcing parameters

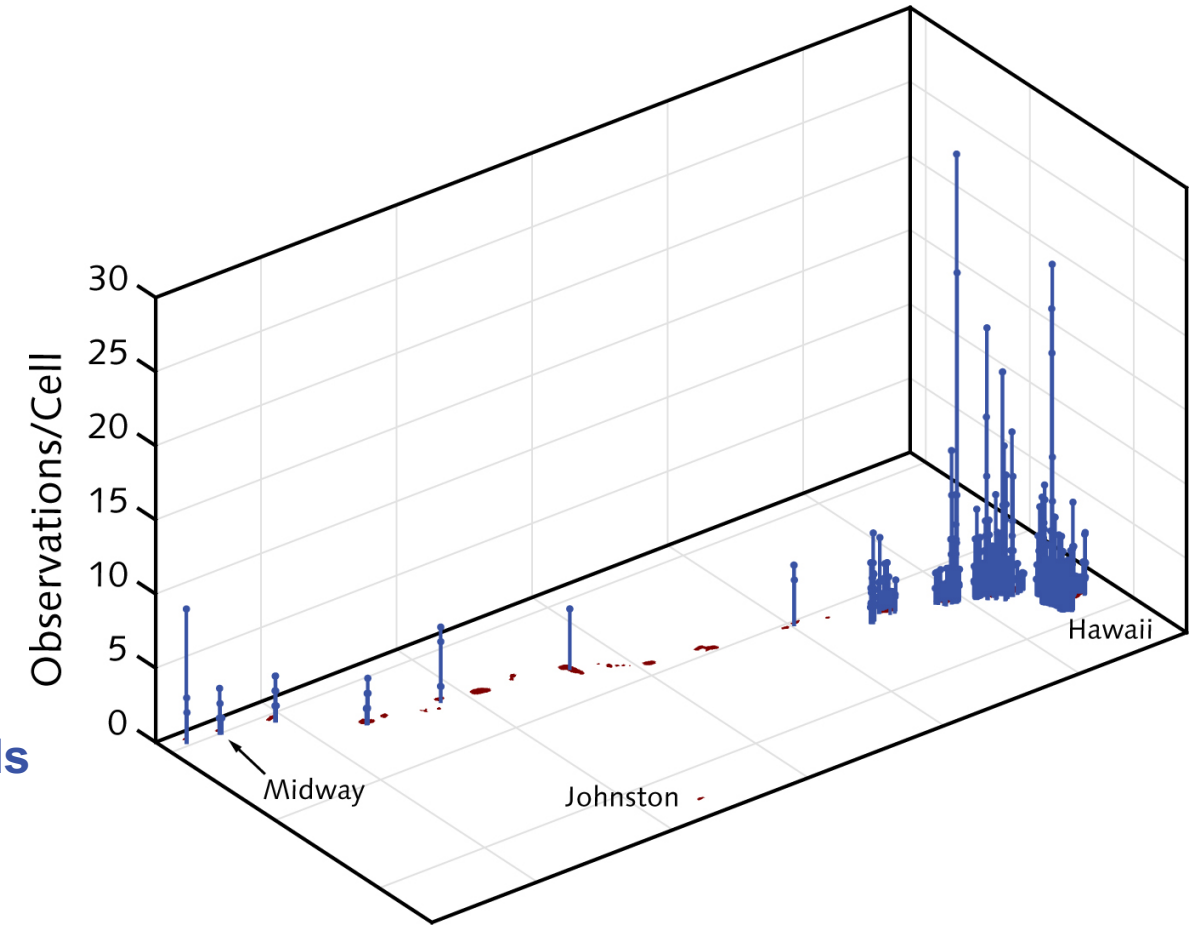


- Patterns do not support prevailing understanding of how reefs relate to their environment
- In truth, available data are not actually representative of the ecosystem scale

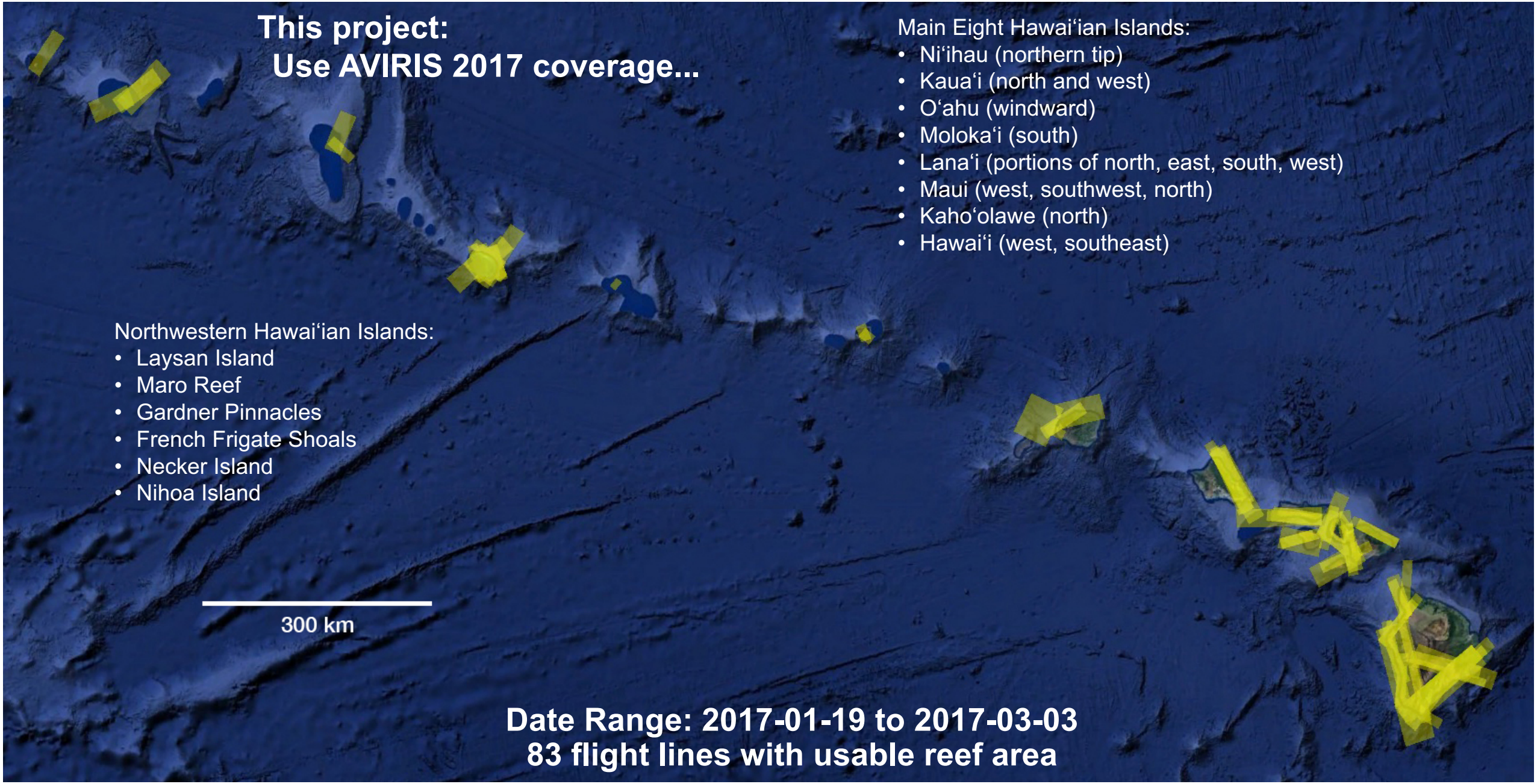


Hawaii — Readily Available Data on Benthic Cover 2005–2013

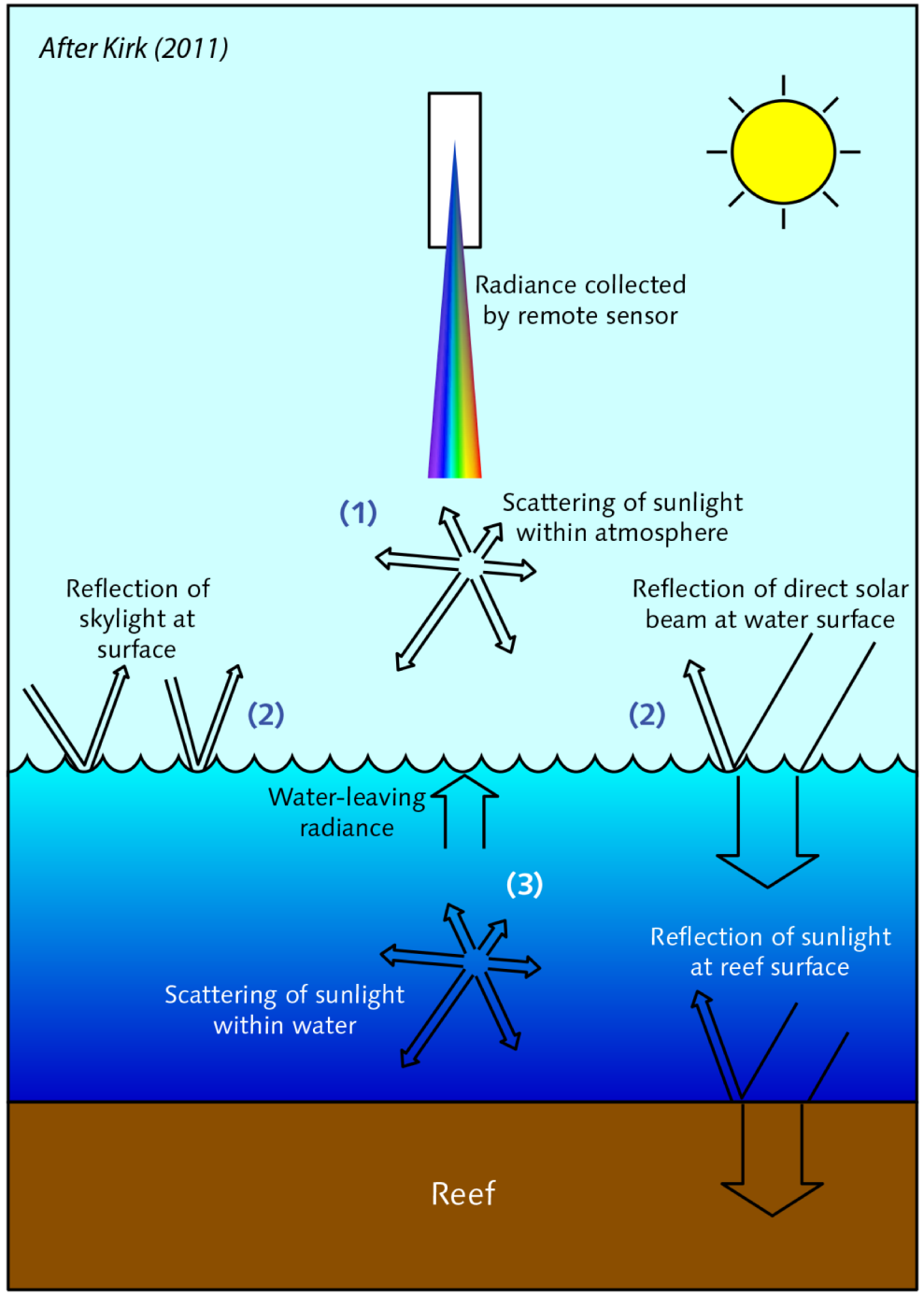
- Hawaii Coral Reef Assessment and Monitoring Program
- NOAA National Centers for Coastal Ocean Science Biogeography Branch



- Binned to 1 km × 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


This project:
Use AVIRIS 2017 coverage...
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)
Northwestern Hawai‘ian Islands:
• Laysan Island
• Maro Reef
• Gardner Pinnacles
• French Frigate Shoals
• Necker Island
• Nihoa Island
300 km
Date Range: 2017-01-19 to 2017-03-03
83 flight lines with usable reef area

Fluxes of light received by a remote sensor pointed at a coral reef

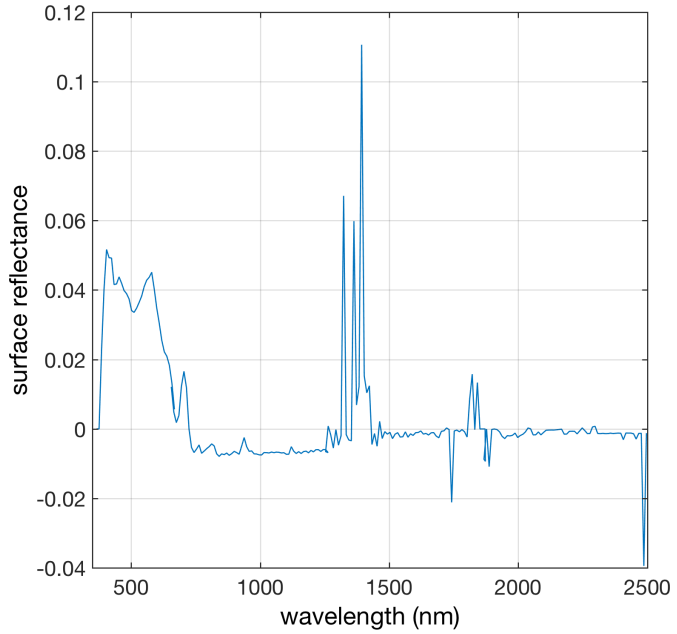


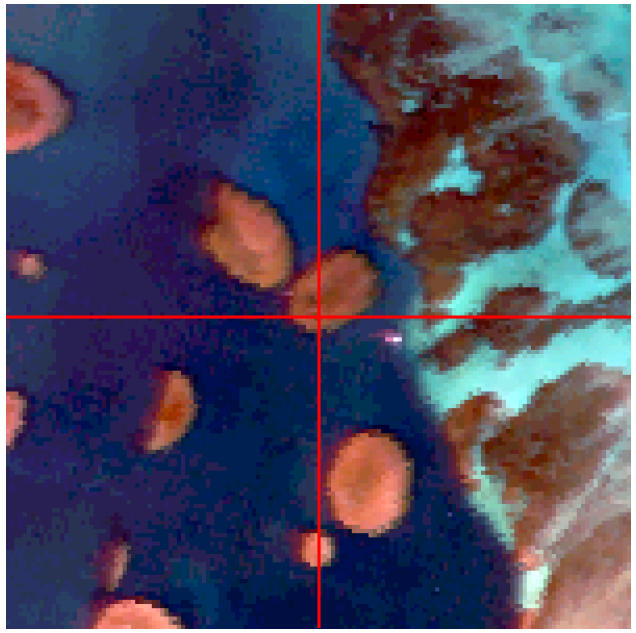
(1) Atmosphere correction

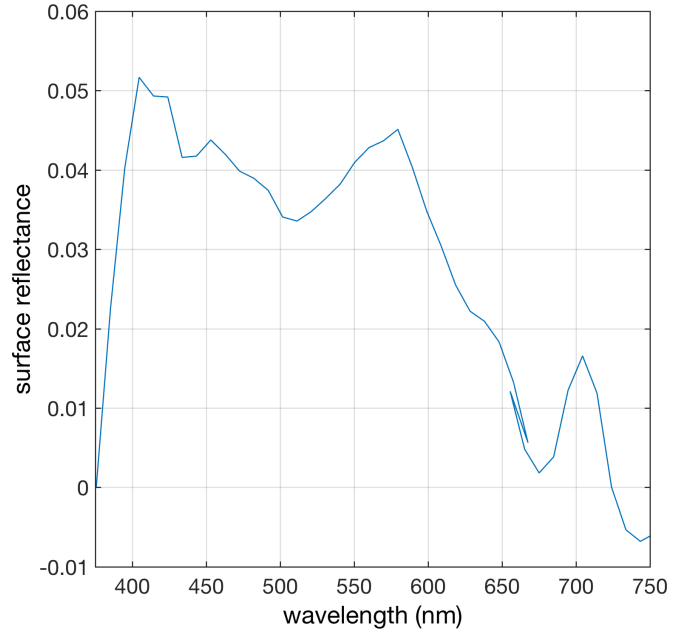
(2) Glint correction

(3) Water column correction

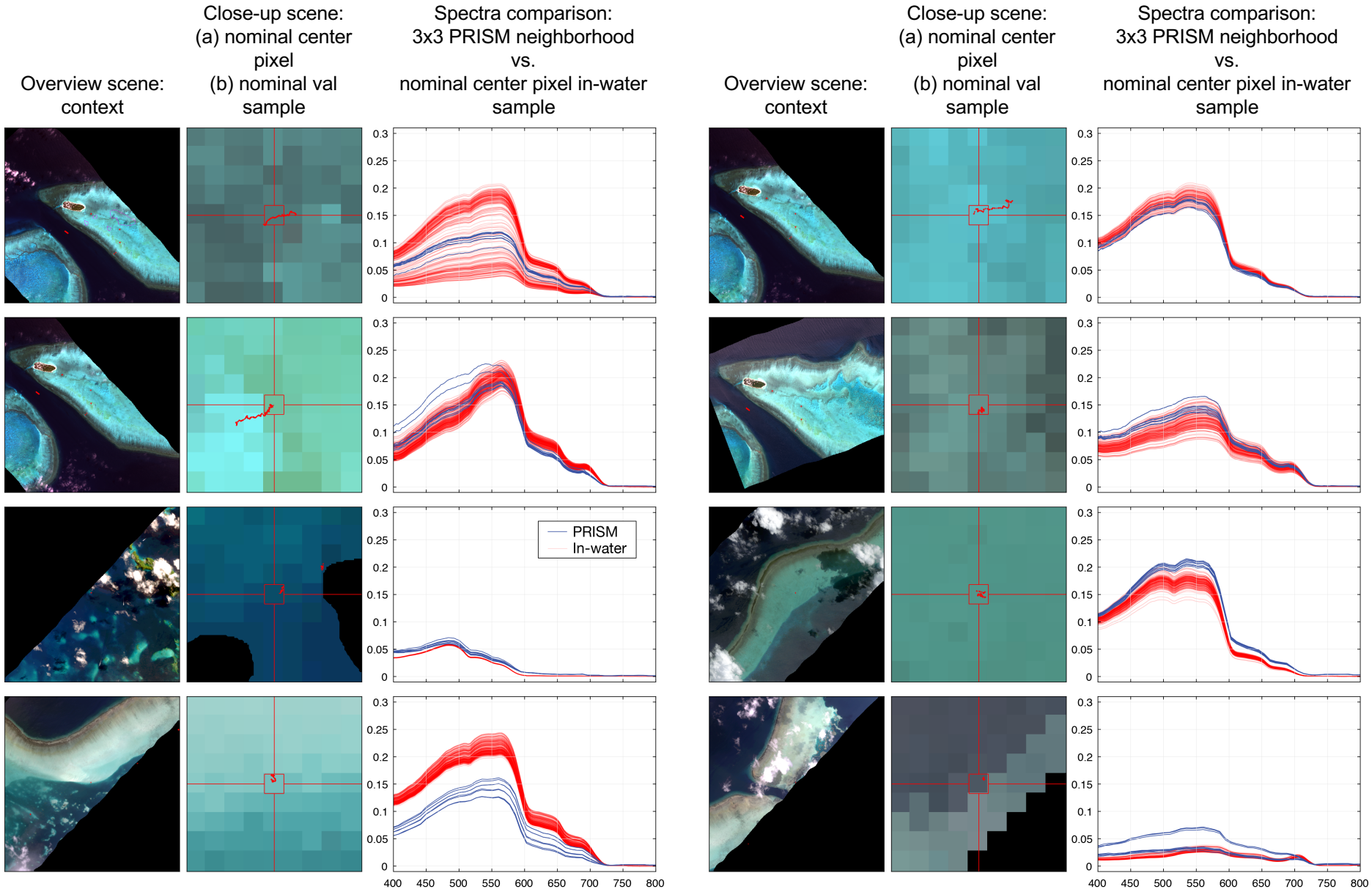
AVIRIS atmosphere correction — Kaneohe Bay





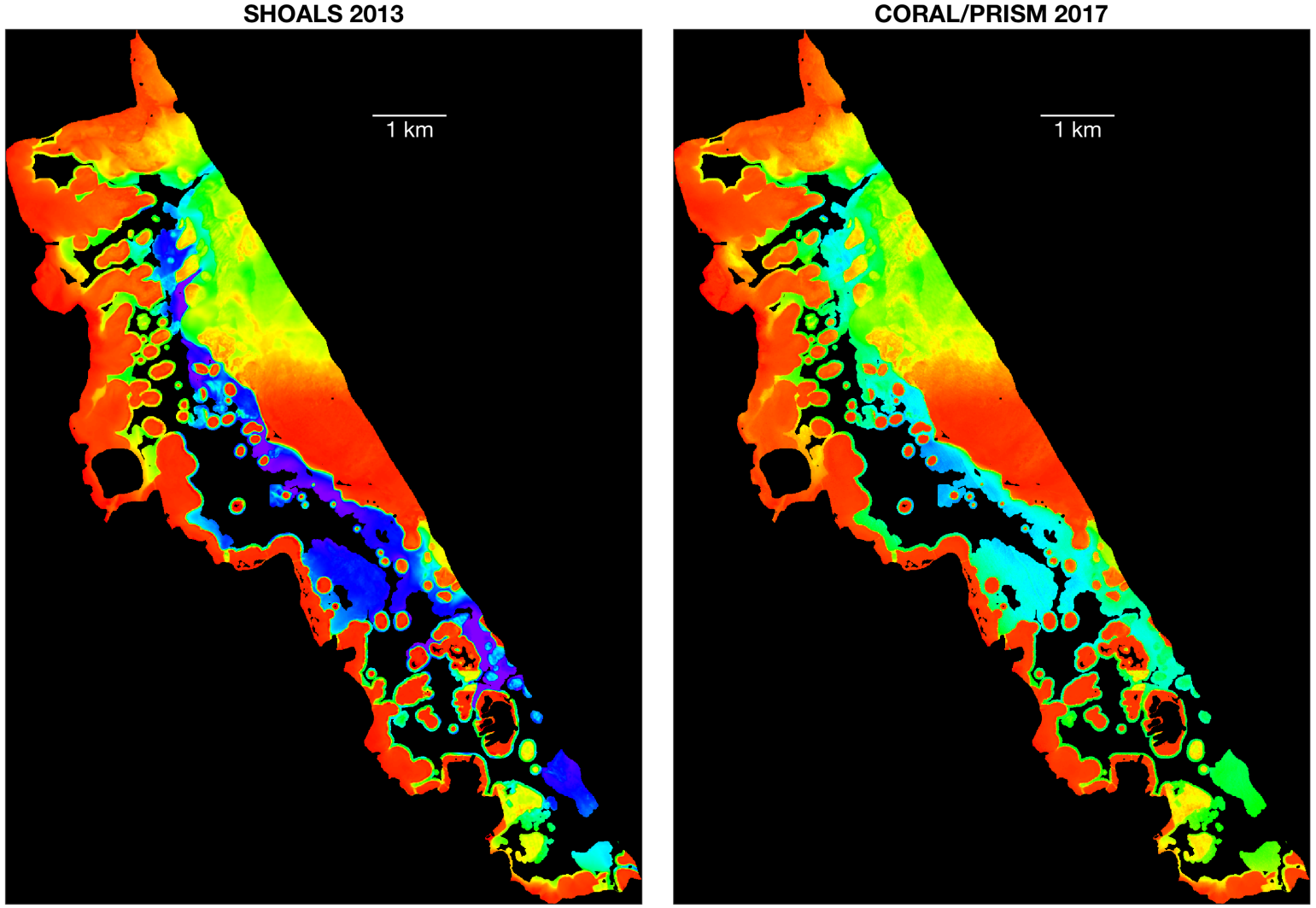


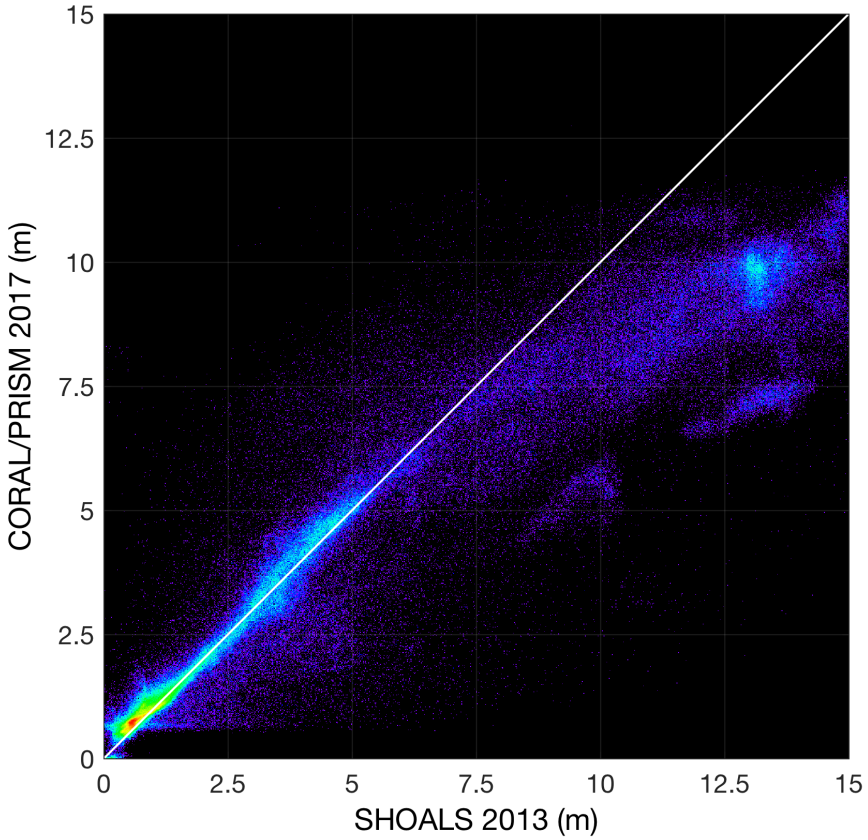
CORAL/PRISM Atmosphere Correction Validation — GBR & Palau



(1) Two very different atmosphere conditions and time periods: southern GBR Sep 2016 and Palau May 2017
(2) Qualitatively very accurate in both spectral shape and magnitude — Quantitative statistics in progress
(3) Inaccuracies readily explained by geopositioning errors, both PRISM and in-water

CORAL/PRISM Through-Water Algorithm Validation



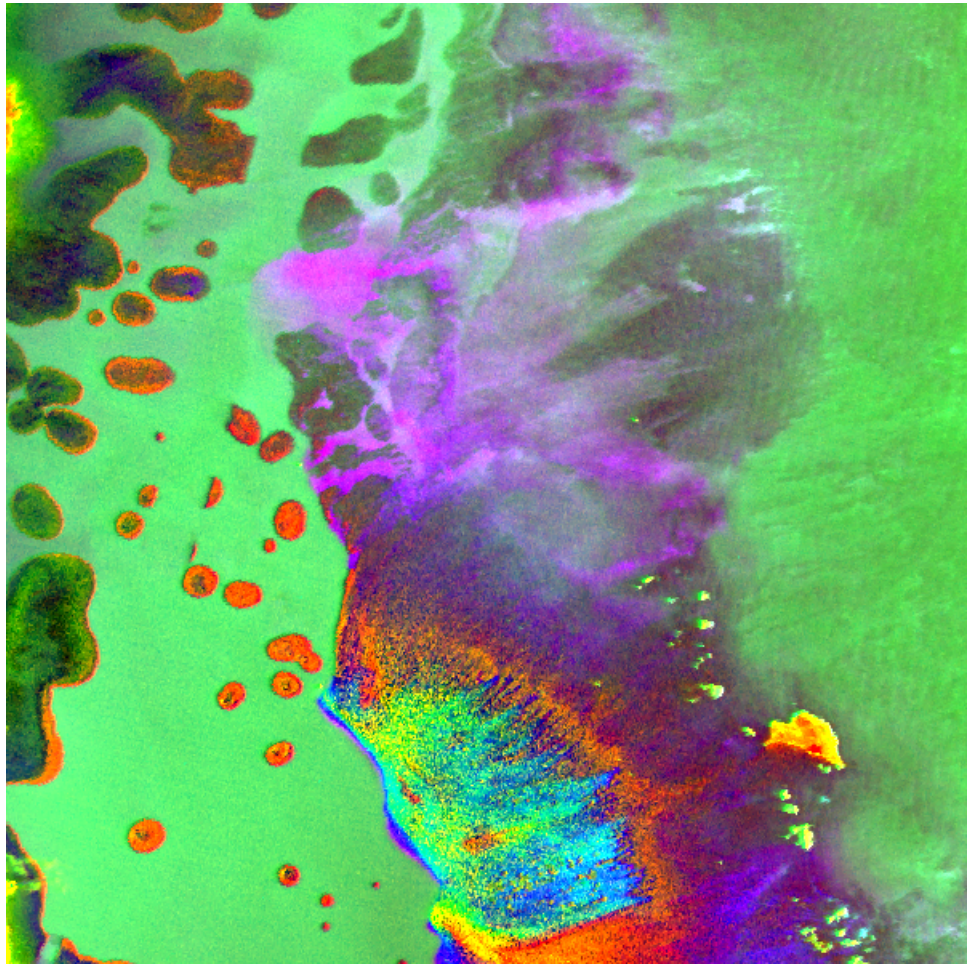


Bathymetry retrieval accurate to at least 7 m

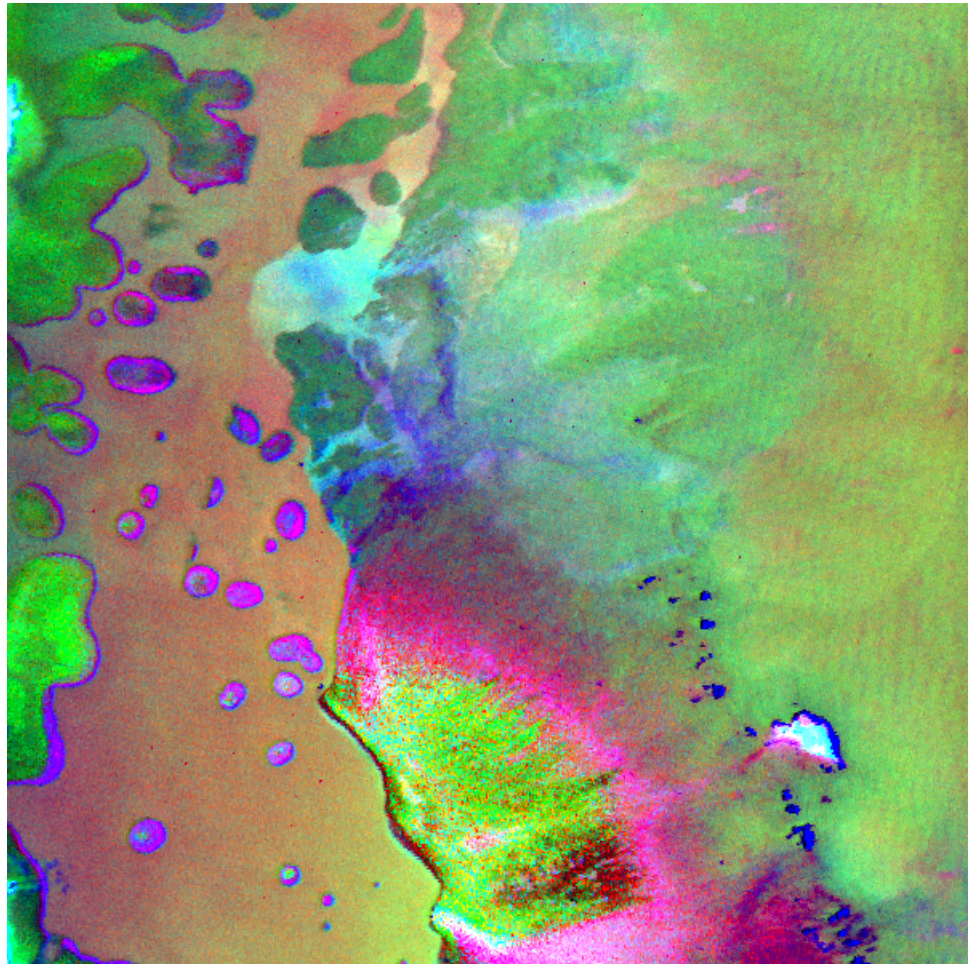
CORAL/PRISM Through-Water Algorithm Validation

- Benthic type.....?

PC 4, 3, 2



PC 6, 5, 4



The information is there...


Thank you!