

US Geological Survey Research

Land-Based Sources of Pollution on Coral Reefs



Pollutant sources

- local to global

Transport mechanisms

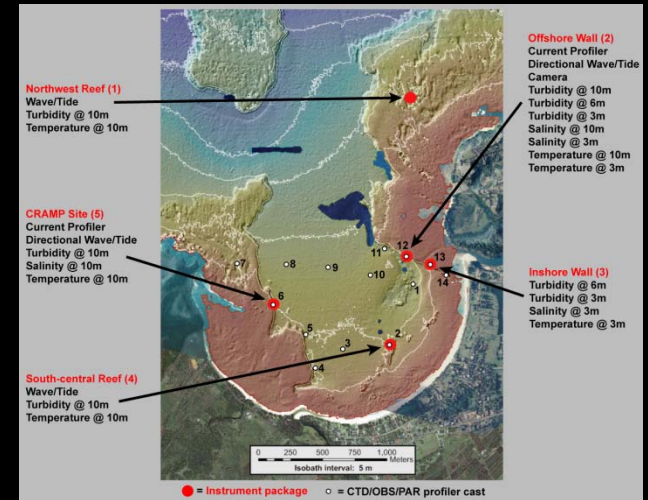
- atmospheric deposition
- surface runoff
- groundwater

Surface runoff

Comprehensive “ridge to reef” monitoring and research

- Watershed stream gaging and monitoring
- Vegetation/grazing factors
- Erosion vulnerability
- Sediment flux
- Contaminants and nutrient influx
- Effects on coral ecosystem

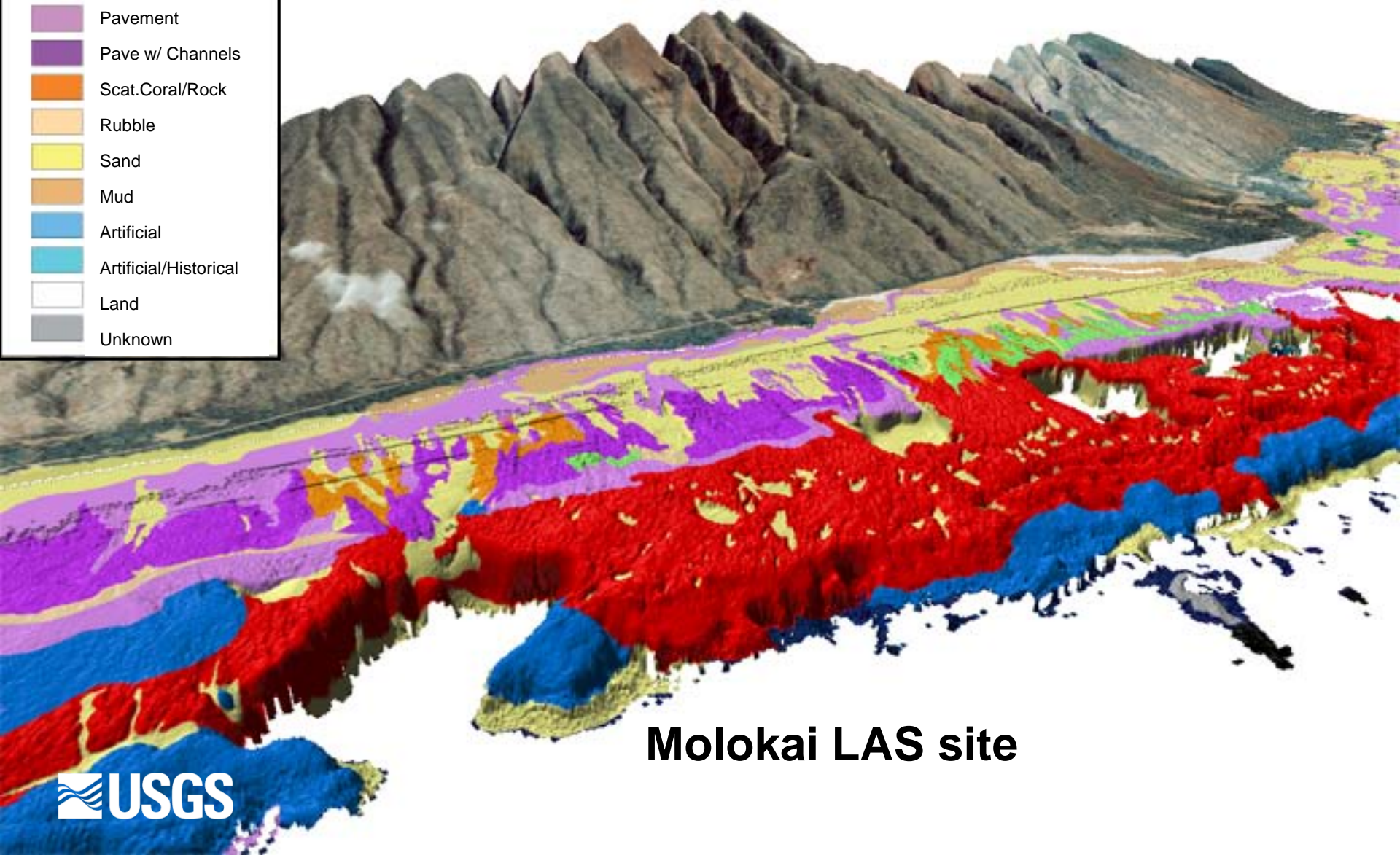
Sites: Molokai; Hanalei Bay, Kauai; Samoa



Dominant Geomorphologic Structure

- Aggregate Reef
- Spur and Groove
- Agg. Patch Reef
- Ind. Patch Reef
- Pavement
- Pave w/ Channels
- Scat.Coral/Rock
- Rubble
- Sand
- Mud
- Artificial
- Artificial/Historical
- Land
- Unknown

High-Resolution Benthic Habitat Mapping (Lidar, satellite, aerial, towed UW camera, and scuba surveys)



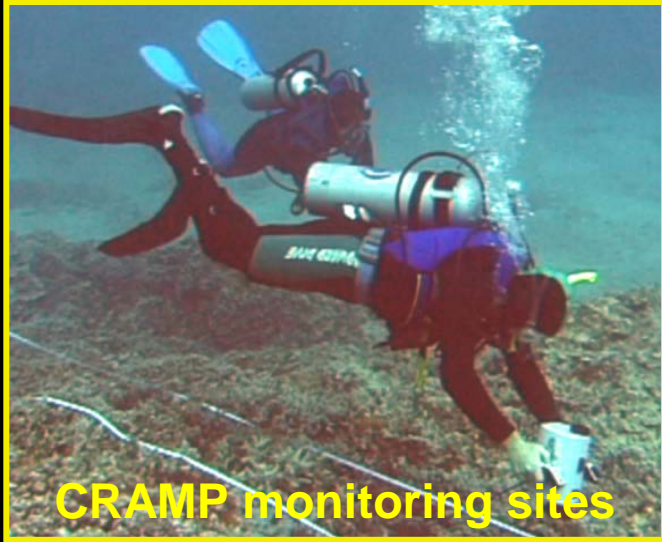
Molokai LAS site



Ridge to Reef – Understanding land-sea linkages



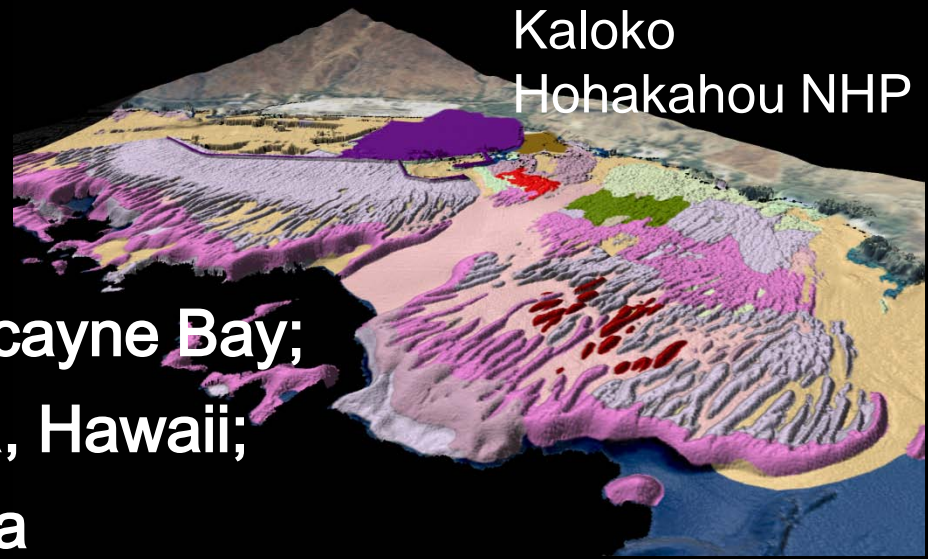
Moloka'i reef health



Ground-water discharge

- Geochemical and geophysical techniques to map and quantify groundwater discharge
- Physical processes driving interaction of groundwater and surface water
 - identify chemical constituents of groundwater
 - quantify nutrients, trace metals and contaminant loading
- Transport pathways

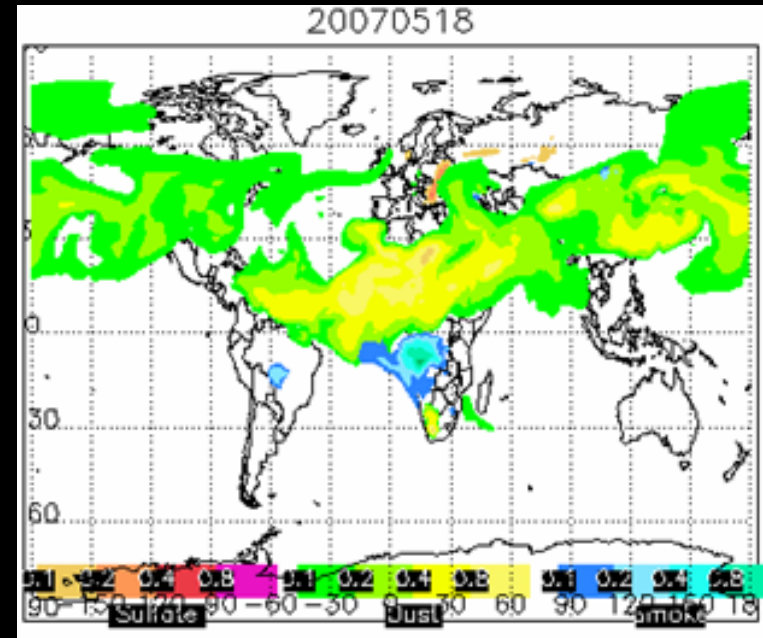
Sites: Florida Keys; Biscayne Bay;
Maunaloa Bay & Kona, Hawaii;
Palmyra Island, Samoa



Atmospheric deposition

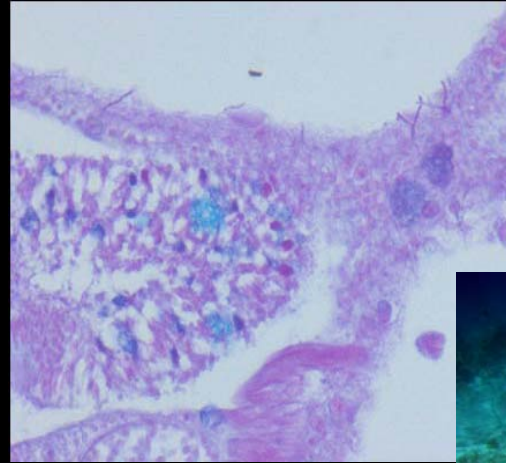
- identification and quantification of metals, nutrients, chemical contaminants and microorganisms transported globally and regionally to downwind coral reef ecosystems
- processes & pathways
- toxicity and ecosystem effects
- laboratory model organism development

Sites: US Virgin Islands, Trinidad/Tobago, Cape Verde, Hawaii, NW Hawaiian Islands



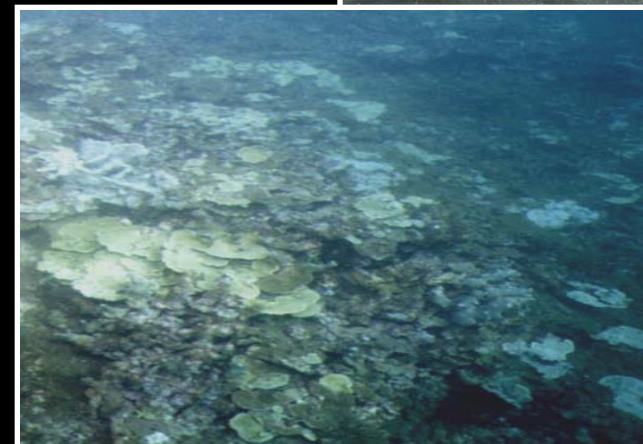
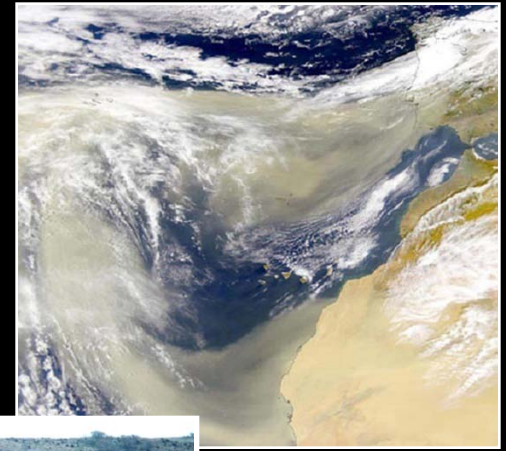
On the Reef

- reef metabolism
- ocean acidification effects
- genetics-environment
- resilience factors
- histopathology
- ecotoxicology
- reef contaminant levels
- optical indicators of stress
- longterm monitoring
 - coral disease, declines



Linked Problems

- Local to global influences
- Watershed degradation
- Polluted surface/groundwater
- Erosion & loss of habitat
- Coastal sedimentation
- Alien species
- Reef degradation
- Species at-risk
- Fisheries collapse
- Loss of ecosystem services



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