HYDROELECTRIC POWER ASSESSMENT STATE OF HAWAII

ASIA PACIFIC CLEAN ENERGY SUMMIT
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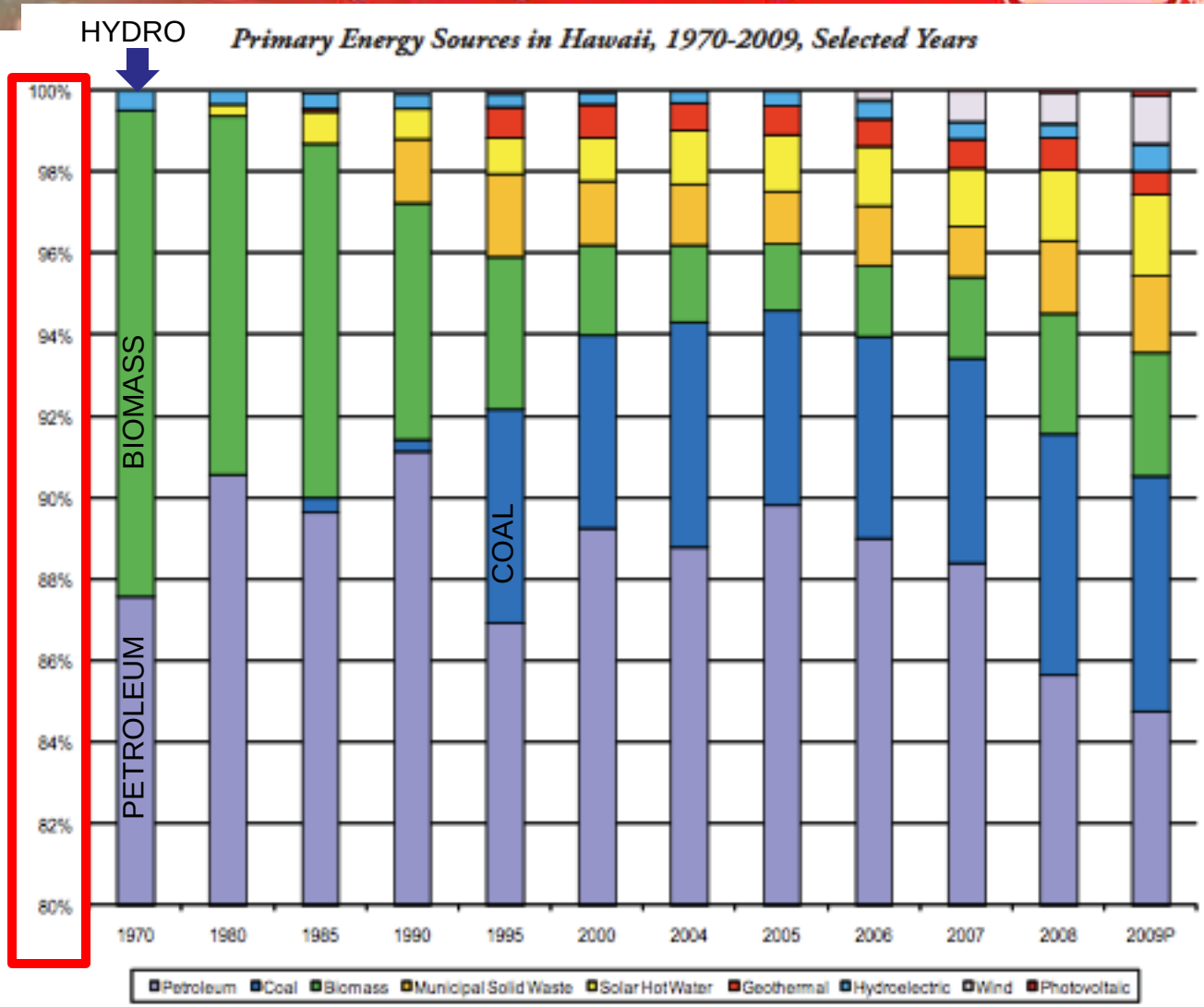
Partners in this Study

- Dept. of Business Economic Development and Tourism (DBEDT)
- EA Engineering Inc.
  - Scott Moncrief
  - Phil Potter
- University of Hawaii
  - Luis Vega

- Initiated in 2009
  - State of Hawaii's 2030 Clean Energy Initiative; meet the State's goal of 70 percent clean energy by 2030
- 100% Federally funded
- State-Wide Assessment
- Tool for decision makers
- Does Hawaii have the energy resources?

- Most fossil fuel dependent state in the nation
- 90% of energy needs supplied by imported oil
- Spend as much as $7 billion annually outside the islands to meet energy needs

-DBEDT



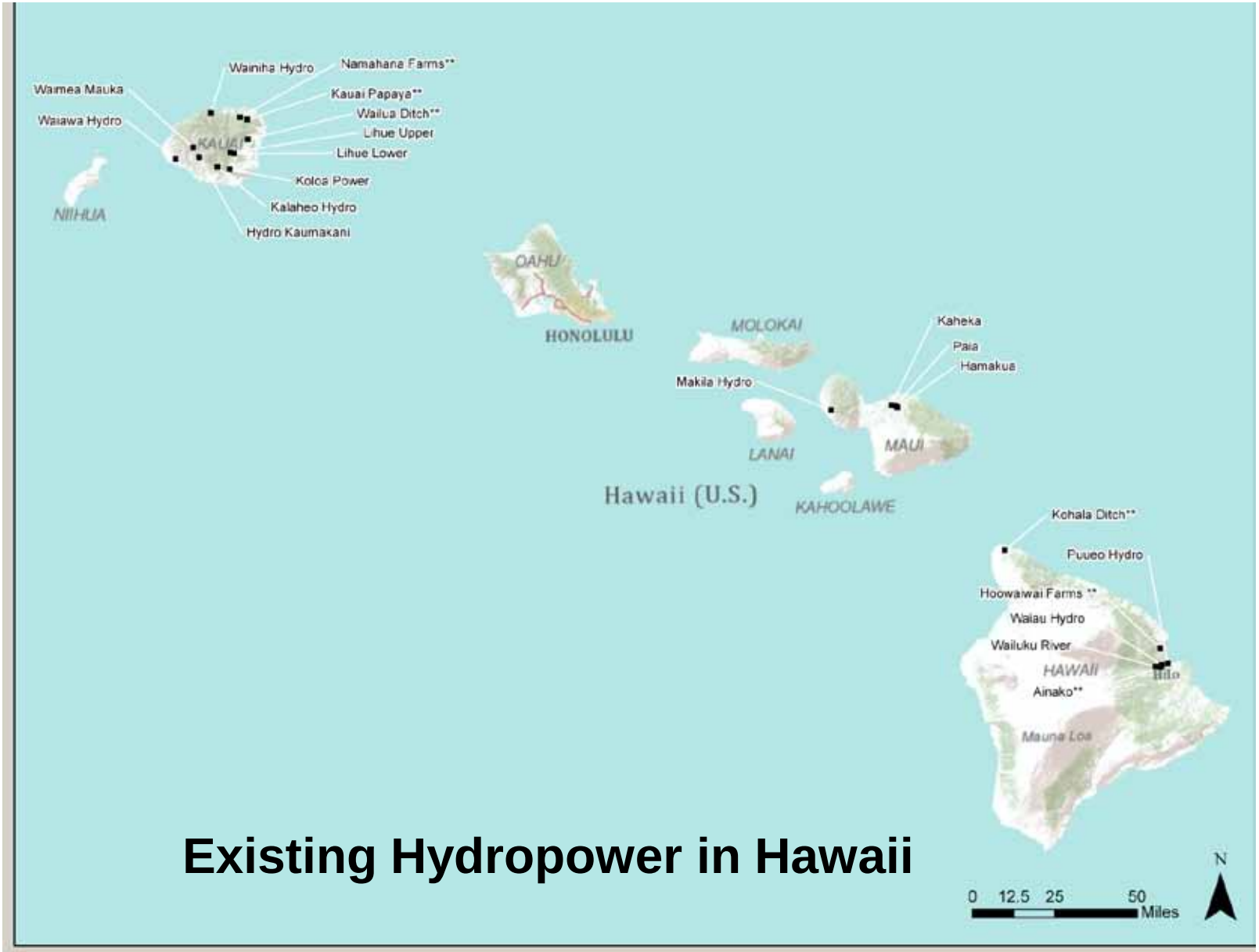
Current Energy Portfolio

Assessment of State of Hawaii Hydroelectric Power Potential

- Traditional hydroelectric power
  - Islands of Kauai, Oahu, Molokai, Maui, and Hawaii
- Ocean energy potential
  - Wave energy
  - Ocean Thermal Energy Conversion (OTEC)

Components of the Study included:

- USACE 905b Report
- Technical Appendix
- GIS mapping information
- Matrix of traditional hydropower sites with screening criteria



Existing Hydropower in Hawaii

The assessment covers hydropower potential in Hawaii at a high level:

- Power potential
  - available power head
  - potential flow
- Economic analysis
- Environmental Concerns
- Social concerns

Environmental parameters:

- Known aquatic habitats of concern (coral reefs, etc.)
- Protected species habitat designations (Endangered Species Act listed species)
- State Waters Classification
  - Marine Class AA
  - Class 1a and Class 1b waters (Inland)
- Conservation District – Protective Subzones

Potential Social issue parameters:

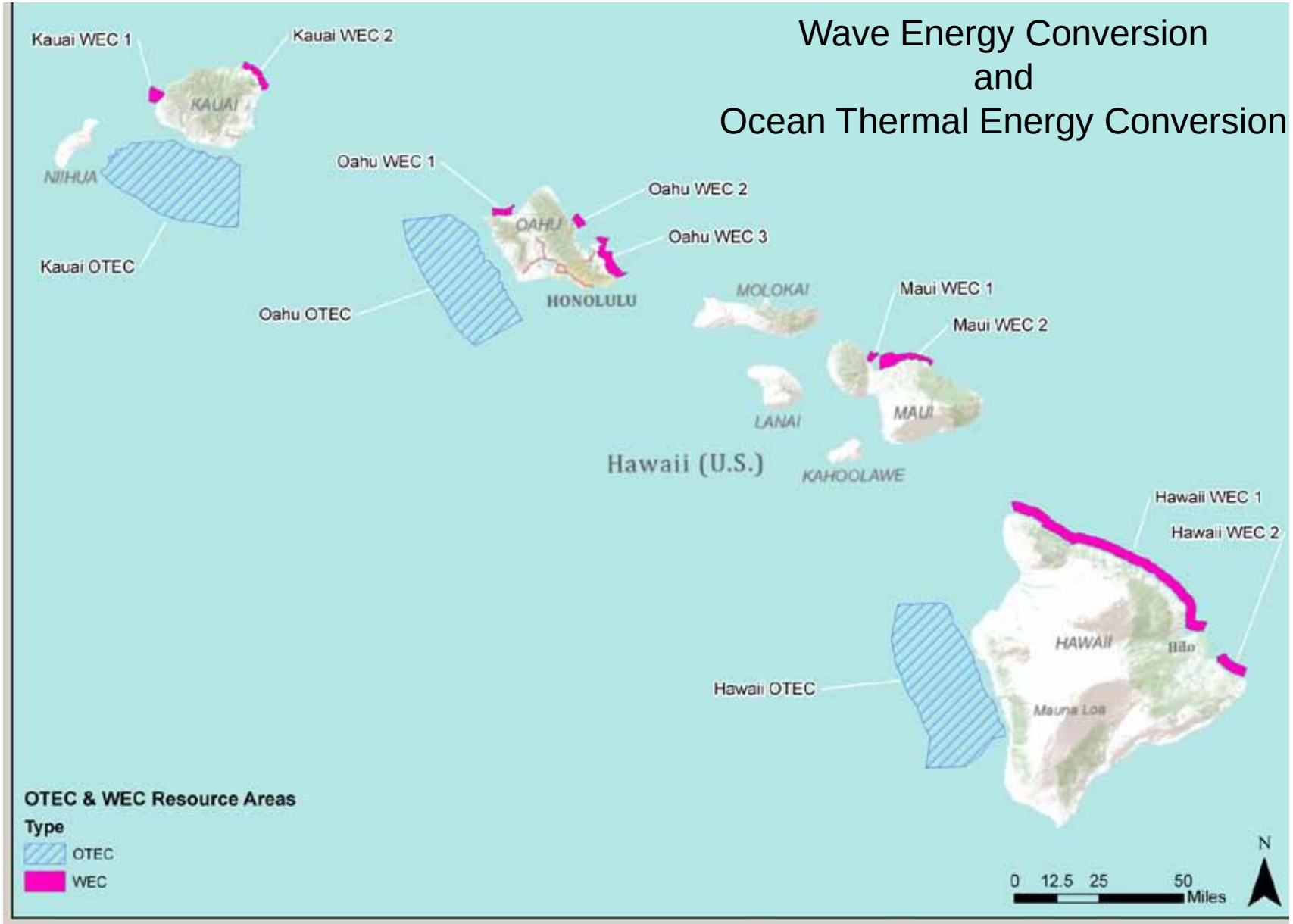
- Cultural significance
- Archeological Resources
- Historical Resources
- Recreational Value
- Scenic Value

Wave Energy Conversion

and

Ocean Thermal Energy Conversion

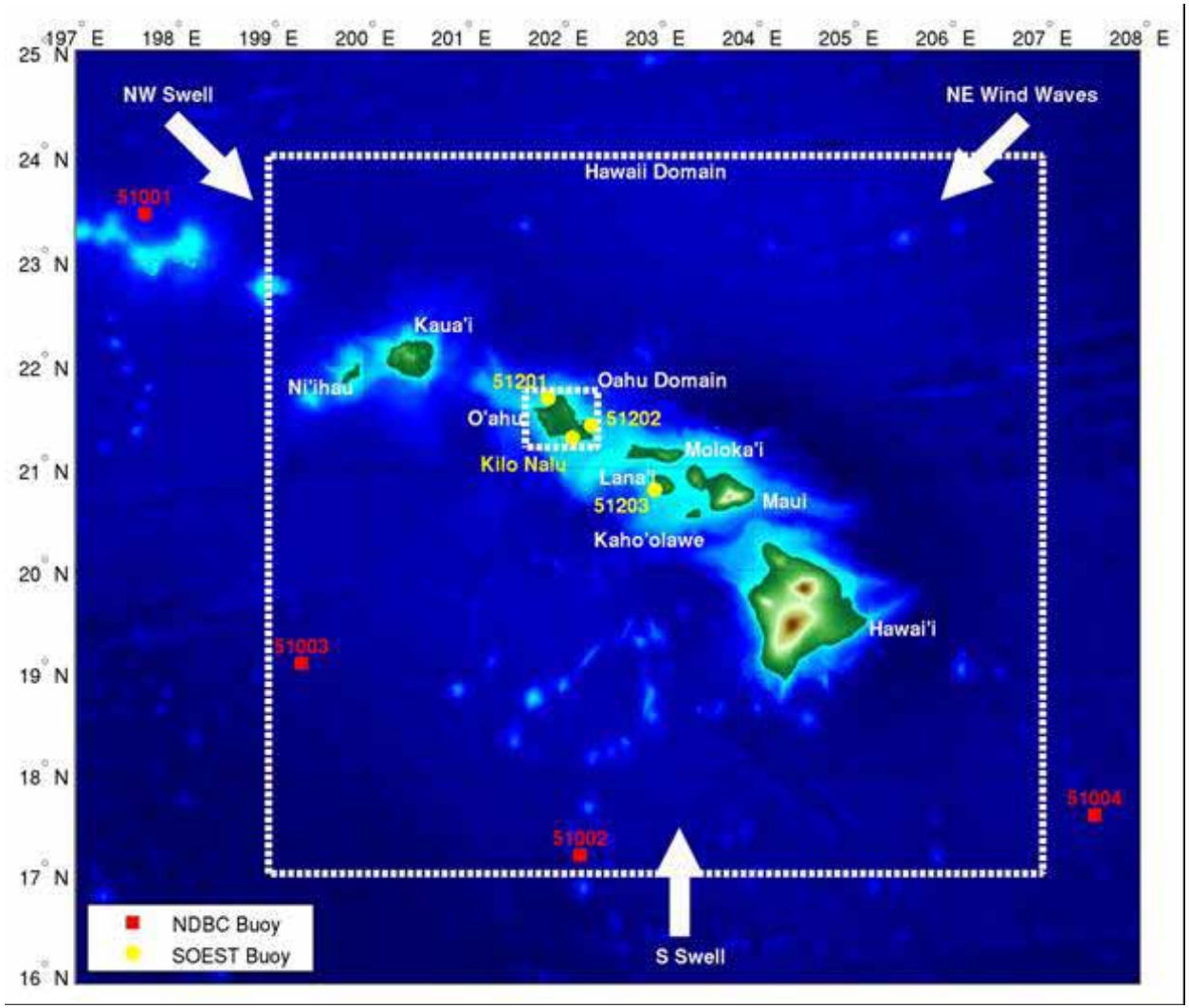
Wave Energy Conversion and Ocean Thermal Energy Conversion



Wave Energy Conversion (WEC) sites were considered on the islands

- Wave Power flux was determined at each site
- The wind waves are the most consistent and yield an offshore power levels in the range of 5 to 25 kW/m.

Hawaii Wave Power Climate Patterns



WEC Site Considerations

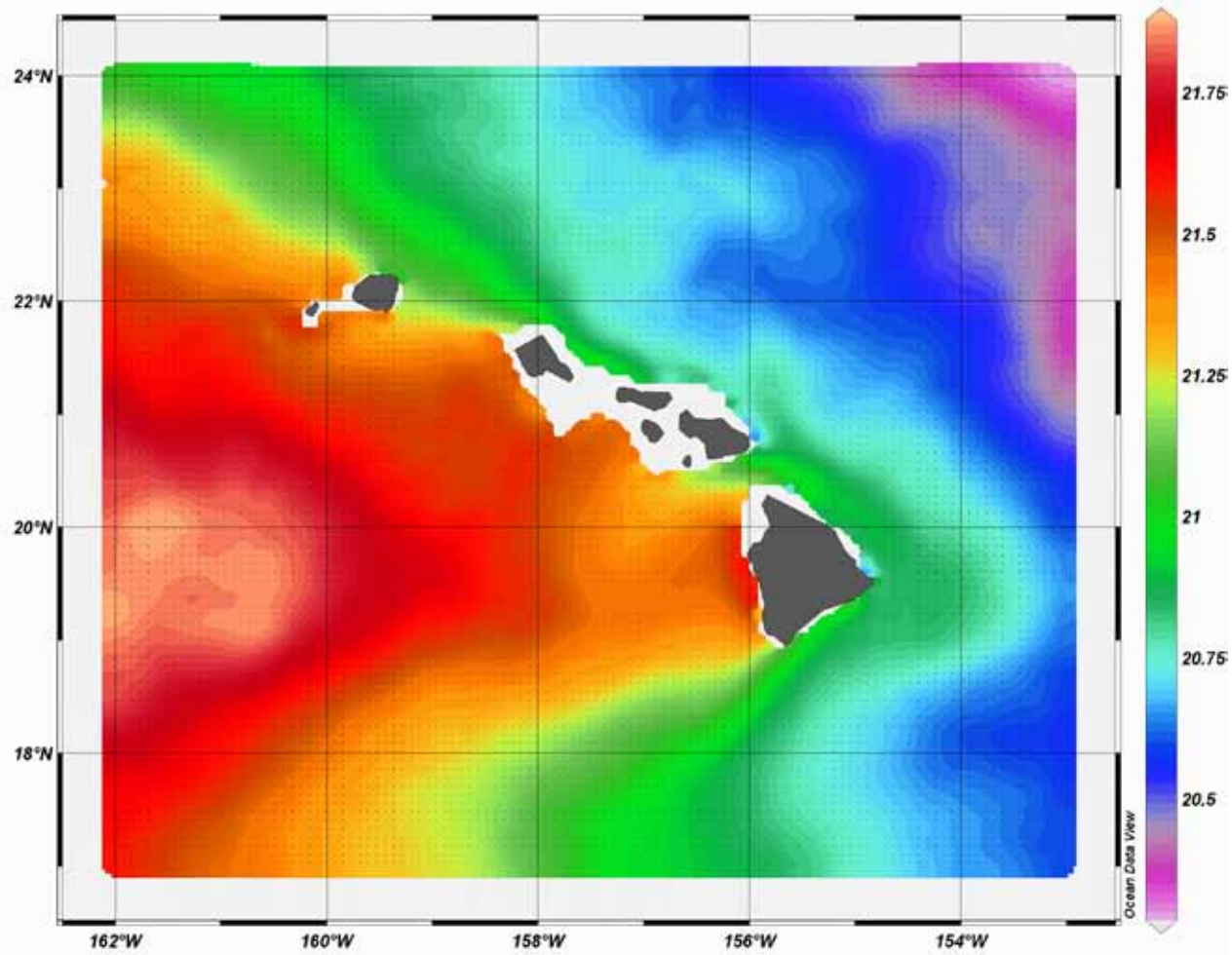
- Proximity to shore with buoys in 70m water depth (potentially visible from shore)
- Aquatic habitat impacts
- Recreational areas of high use
  - Swimming, surfing, canoeing, fishing…
- Culturally sensitive areas

Ocean Thermal Energy Conversion (OTEC)

- Temperature differential of greater than 20 degrees Celcius
- Between 20 meters and 1000 meters

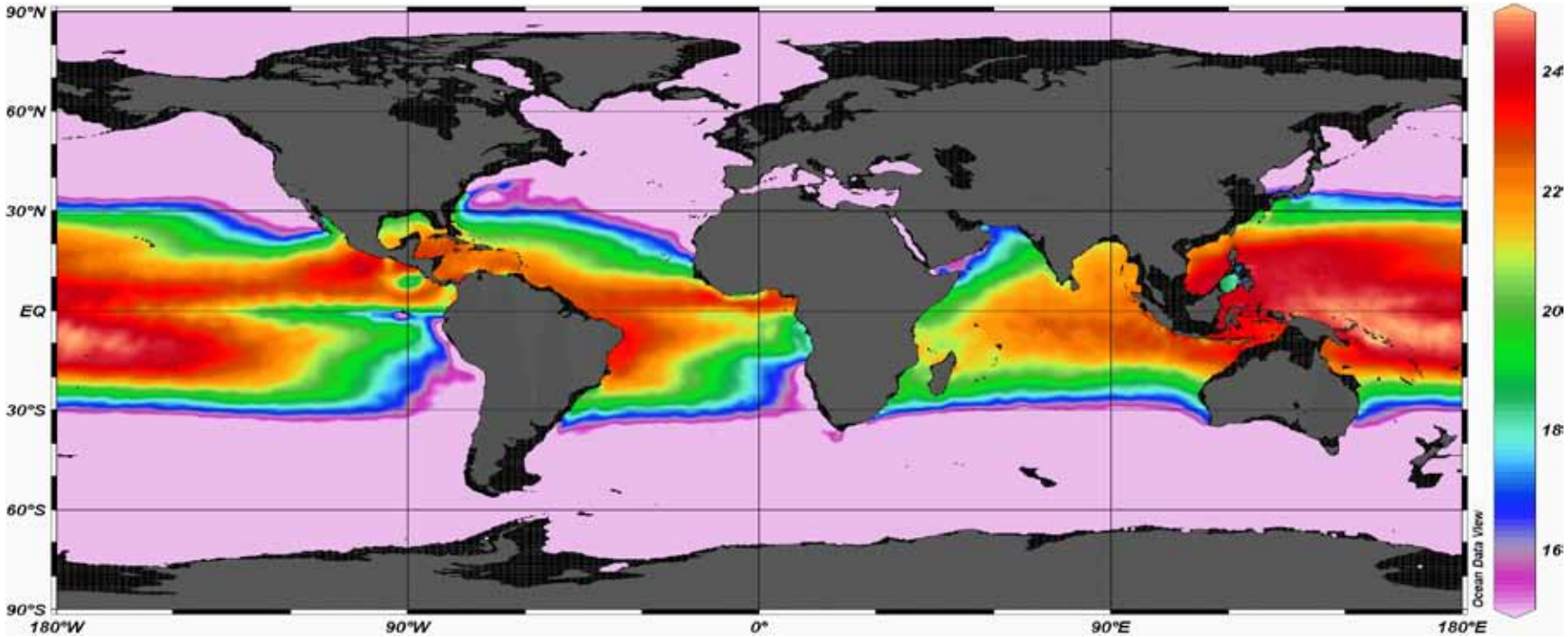
Lockheed Martin

Average ocean temperature differences (between 20 m and 1000 m water depths) around the main Hawaiian Islands from HYCOM + NCODA (1/12°) data for the period July 1, 2007 through June 30, 2009 (the color palette is from 18°C to 24°C)



Worldwide average ocean temperature differences

(between 20 m and 1000 m water depths)



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