



MAKAI OCEAN ENGINEERING

ARPA-E MARINER

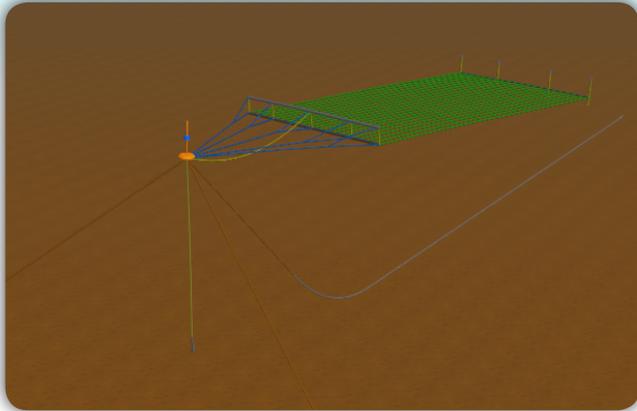
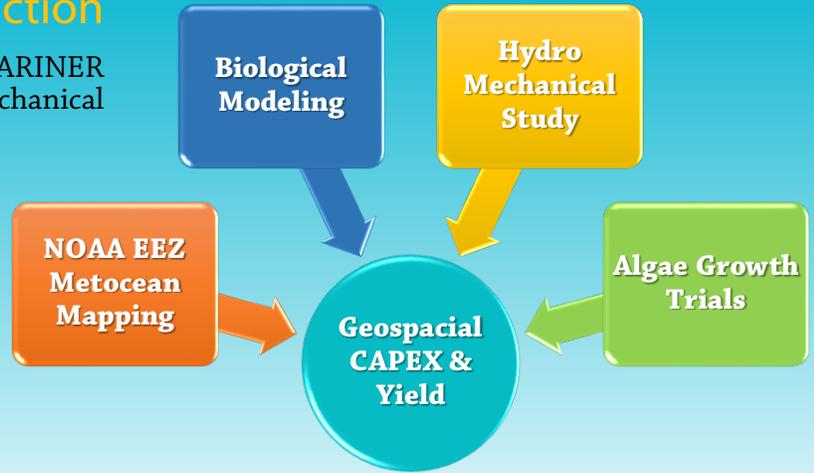
Macroalgae Farm Performance Prediction

Makai Ocean Engineering's work under the ARPA-E MARINER project provides a fully three-dimensional hydro-mechanical and biological model of offshore macroalgae farms.

This model is an enabling technology to support macroalgae farms to be designed that meet commercial metrics for biofuel production.

Technology Impact

- Support designs for commercial algae farms
- Provide predictions for maximum yields
- Geospatially map & parameterize CAPEX



Hydro-Mechanical Modeling

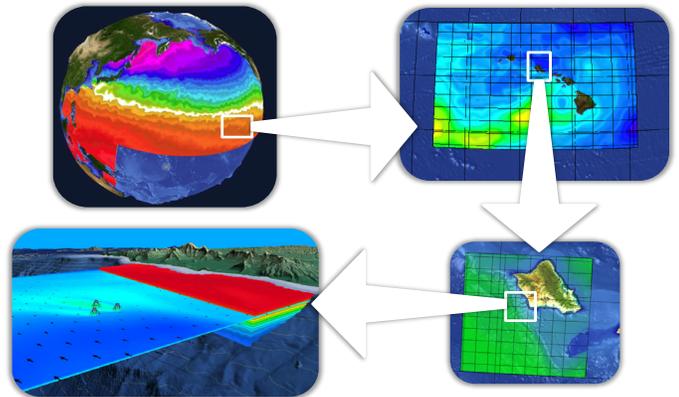
The hydro-mechanical model utilizes a “global lumped mass model” to simulate the motions and forces of a farm system due to waves and currents. The model outputs quantitative predictions on the farm’s structural loads as a function of wave, current and water depth.

The data obtained from this model allows the various components of the algae system to be properly sized, and obtain cost estimates for such components. Applying these parameterizations against a database of geospatial metocean conditions allows the capital expense of an algae farm to be assessed as a function of location.

Biological Modeling

Makai’s ocean circulation and water quality model has been developed to simulate the flow, nutrient transport, and algae growth in realistic conditions. The model will simulate the nutrient dynamics at the local and regional levels.

Makai initially developed the Makai-EFDC source code in order to simulate the fate of the waters surrounding the deep seawater discharges used on Ocean Thermal Energy Conversion (OTEC) plants.



Algae Growth Trials

Kampachi Farms has worked with Makai to grow macroalgae and measure response to nutrient supply, photosynthetically available light, temperature, and species selection. These tests were conducted at the Natural Energy Laboratory of Hawaii Authority in Kona, Hawaii.

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