Modeling Wave Characteristics For Desalination Glider Deployment

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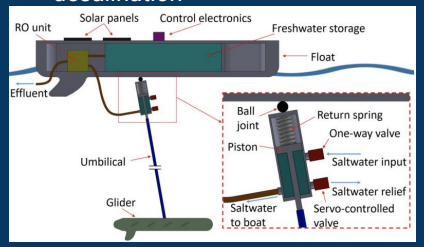
ENGINEERING HONORS PROGRAM
UNIVERSITY OF MICHIGAN

Problem: Coastal Areas Face Water Shortages Due to Natural Disasters & Poor Infrastructure

- Existing solutions require expensive infrastructure systems that take too much time to install

Solution: Mobile, Anchorless Desalination Glider

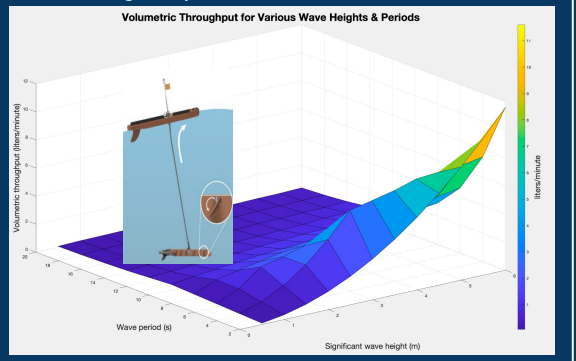
- Design a piston-pump system to convert wave energy for propulsion and desalination



$$P_{wave} = \frac{\rho g^2 H^2 T w}{\pi n}$$

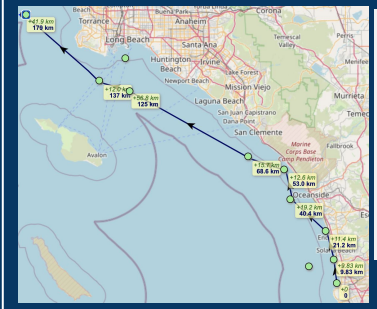
Wave Characteristics are Needed for Efficient Glider Operation

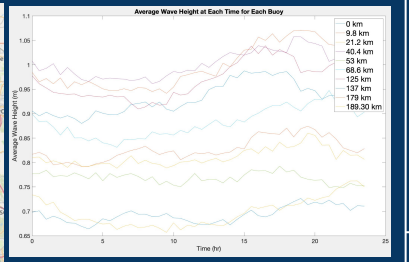
- Wave energy is a function of wave height & period



Research Goal: Develop Synthetic, Interpolated Data for Modeling Wave Height/Period & Simulate an Efficient Deployment Mission

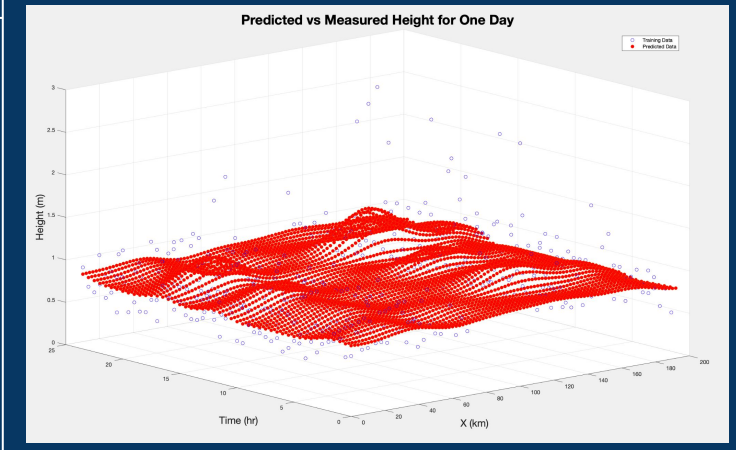
- Sample data displays spatiotemporal variation





Gaussian Process Modeling Allows for Synthetic Data Generation

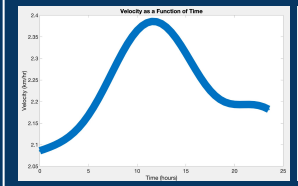
- Resulting plot demonstrates synthetic data generation every 2 km and 30 min for one day, allowing us to predict interpolated spatiotemporal characteristics based on a training data set

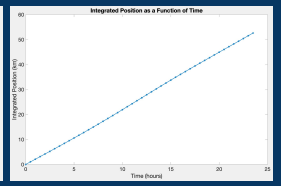


- Ideally we would want spatial variation in 2D, however a lack of pre-existing high resolution data limits us at this time to model in 1D

Mission Path is Determined by Interpolation & Integration

- Interpolating velocity based on synthetic data & maximizing this profile yields an optimal mission path





Simulated Mission **Results**

Total Volume: 1234 L
Distance Traveled: 52.6 km
Avg Throughput: 51.5 L/hr

