Research at O.H. Hinsdale Wave Research Lab

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Introduction

The O.H. Hinsdale Wave Research Lab (HWRL) is the largest of its kind in the Americas. At the HWRL they focus on projects ranging from structural engineering to coastal engineering using large scale physical models. The two major projects that we focused on were, studying the effects of wave energy converter, and the effects of large scale tsunamis on chains of islands.

Wave Energy Converter

In September of 2014 M3 Wave placed a 30 foot long wave energy converter off the coast Astoria, Oregon. After 13 days, the converter failed due to unexpected sand scour which caused the device to tilt.

Fig. 1 – 30 foot wave converter prior to launch.

With the help of OSU, M3 Wave is trying to replicate the circumstances on a 1/5th scale. A sand box has been placed at the bottom of the large wave flume to replicate the ocean floor. The scaled down wave converter was placed on the sand. Data collected by sonar and a floating camera, shows scours around the model.

Fig. 2 – 1/5th scale wave energy converter. With change in water pressure above the device, air is pushed back and forth spinning a turbine to produce clean energy.

We helped with prototypes of a floating camera mount, promptly named the “Jellelephant”. This camera mount is used to photograph and record the sand.

Fig. 3 – Image of scoured sand at bottom of large wave flume.

Fig. 4 – Current iteration of the “Jellelephant”

Tsunamis and Chains of Islands

According to Dr. Kaihatu, a common belief throughout Indonesia, the safest place to be during a tsunami is the side of the island facing away from the origin of the tsunami. Researchers are testing this idea.

Fig. 5 - Tsunami hitting coastline

Up to four reconfigurable model island can be placed in the directional wave basin, where tsunamis can be generated to test run up on the islands.

Fig. 6 – Model islands located in directional wave basin. Tsunami run up is the distance the water travels up the land mass. Label A represents the run up from a test run.

Fig. 7 - Shows run up elevations with 10 different wave heights.

Fig. 8 – Sprinkling sediment prior to run

We were able to help with the experimental setup of several runs through a variety of tasks including sprinkling sediment.

We would like to thank Dr. Skip for providing the opportunity to have this experience in a research setting. We would also like to thank our mentors, Alicia Lyman Holt, Mike Morrow, George Cross, Mike Delos-Reyes, Jim Kaihatu, and Adam Keen, for guiding us.

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