Reduction of Tsunami Impacts on Coastal Inhabitants and Infrastructure by Armoring Shorelines Using Hydrodynamics

Perry, Dakota (School: WP Davidson High School)

Last year I set out to research why it was so hard to stop a tsunami and what kind of barrier I could design that would limit the amount of devastation that one created. I found some remarkably interesting findings in my data, that a double-curved barrier shaped like a “W” had a profound effect on the force of a Tsunami. The “W” Barrier used Hydrodynamics to divert the Tsunami energy onto itself. This year I wanted to improve the design of 2 of the best barriers from last year. The Double Wall Barrier and the “W” Barrier. By analyzing my results and watching the high-speed videos I was able to improve my designs. I decided on a Fibonacci curve barrier and an Offset Barrier. The Offset Barrier included an opening for ship and wildlife traffic as last year’s Double Wall Barrier did not. I used a smaller barrier offset to break up the wave flowing between the opening. I designed the Fibonacci Barrier using a Fibonacci Curve. This curve forces the wave to slam into itself reducing the energy of the wave by using hydrodynamics. Testing was accomplished by a home-built tsunami generator. The generator creates a consistent tsunami wave across a long tank with a raised beach area on the opposite end. The barriers are then tested 15 times each. The height, speed, and force of the wave are recorded before and after the barrier. The results of the Fibonacci Barrier performed the best out of any of my designs and shows that the use of hydrodynamics can greatly reduce the power of a Tsunami. Overall, my experiment went extremely well, and was able to meet my expectations of what I wanted my design to accomplish. I would like to do more in-depth research on a larger scale to see if my design can be improved upon.

Awards Won:

Fourth Award of $500