



CALIFORNIA STATE SCIENCE FAIR 2005 PROJECT SUMMARY

Name(s) Joshua J. Compton	Project Number J0608
Project Title An Assessment of Barrier Designs in Minimizing the Impact of Tsunami Waves on Shorelines	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective is to determine whether barriers placed offshore can effectively minimize the impact of tsunami waves. Which barrier design is most effective in reducing the amount of energy transferred to the shoreline, also referred to as the run-up area?</p> <p>Methods/Materials A wave tank (244 cm long) was designed and constructed using plexiglass. A run-up was constructed in one end of the tank, using plexiglass, to simulate a shoreline. A wave generator was constructed at the opposite end of the tank, using a hinged plexiglass plate and a 4.56 kg weight. Barriers were also designed and shaped out of wood. Ten experiments were performed for each; the control, triangular barriers, circular barriers, and elliptical barriers. In each experiment, the amount of run-up, wave speed, and wave level was measured. Wave amplitude, height, energy, and energy fluctuation were calculated using measured values.</p> <p>Results The elliptical barriers had the least amount of run-up, with a mean value of 59.41%. The triangular barriers were second at 61.36%, circular barriers at 82.53%, and control at 89.59%. The circular barriers had the least amount of wave energy measured at the point of impact, with a mean value of 5.99 Joules per meters squared. The triangular barriers had the greatest amount of energy measured at the point of impact, with a mean value of 6.96 Joules per meters squared.</p> <p>Conclusions/Discussion The elliptical barriers were the most effective in minimizing the impact of the waves, dissipating the waves' energy and reducing the amount of energy transferred to the run-up. When the waves hit the elliptical barriers, energy was transferred into smaller waves that collided with one another. This action dissipated much of the energy, possibly turned some of the energy into heat and some reflected back into the water, reducing the amount of run-up. The placement of elliptical shaped barriers along the shoreline could help prevent the loss of life and the destruction from tsunami waves.</p>	
Summary Statement Three barrier designs were analyzed, using a wave tank, to determine how effective they were in minimizing the impact of a tsunami wave along a shoreline.	
Help Received My father helped construct the wave tank; My mother helped record data during the experiments; Dr. Crawford, Humboldt State University Oceanography Department, gave me advice on energy formulas.	