CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)
Jacob C. Baker

Project Number
J0101

Project Title
Wave Watchers

Abstract

Objectives/Goals
How does increasing the water height of a wave tank affect the speed and height of the wave?

Methods/Materials
Build the wave tank out of Lexan glass, Acrylic Cement, a pulley system with string, a plate made out of Lexan glass, steel, screws to screw in with a screwdriver and tape a ruler onto the side of the tank and set up a high-speed camera in front of it. Set constants for the size of the plate, weight on one end of the pulley, the distance of the drop of the weight, (how high the plate goes) and the angle of the pulley. Add one inch of water into the tank with the plate above water. Drop the weight on the other end of the pulley so that the water comes up and creates a wave. Record the wave with a video camera and then repeat the process nine times. Record waves 10 times, this time with the wave heights two and three inches. Review videos and measure the waves from the water at rest to the crest (top) of the wave. Record how long it takes the wave to travel eight inches to record wave speed.

Results
Some trends in my data are that as an average the water depth of 5.2 had the lowest wave height, the average water depth of 10.2 cm had the second highest wave height. Finally, the highest wave height had the average water depth of 7.8. The data increases on a curve and then starts to go down after peaking in height. The 7.8 cm water depth also seemed to have the most variance in its maximum wave height data. The trends in the speed data seem to be almost the opposite of the water height data. The higher the wave, the slower the wave travels. The 5.2 wave depth had the highest wave speed, the 10.2 wave depth had the second highest wave speed, and the 7.8 water depth had the lowest wave speed. The wave speed decreases on a curve and the wave starts to travel faster after reaching the slowest speed. The water depth of 7.8 cm also seemed to have the most variance in data.

Conclusions/Discussion
When the water height was at 5.08 centimeters the wave height averaged about 2.159 centimeters, when it was at 7.62 centimeters it averaged about 3.62 centimeters, and when it was at 10.16 centimeters it averaged about 3.143 centimeters. It makes sense that the wave that was the biggest was also the slowest because it came up in my research that the bigger the wave, the slower it is.

Summary Statement
I tested how a wave speed and height differs between water depths with bigger waves being the slowest.

Help Received
Mr. Le from ADCO helped me build the wave tank. Dr. Eric Person helped mentor me.