

A Tsunami Study: The Effect of Water Depth on Wave Velocity

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Why I chose this area of science



The main reason I want to work on this problem is that I have seen the devastation caused by tsunamis and believe that this experiment could change the evacuation protocols for tsunamis in many tsunami-prone countries.



The hypothesis

I hypothesize that the shallower the water, the larger the velocity of the wave will be. This is because, in deep water, a tsunami moves very fast and has a long wavelength and a small amplitude. As it enters shallower water, it slows down and the wavelength decreases. This causes the wave to wave much taller.



Procedure

1. Gather Materials
2. Find a well-lit location at which to perform your tests, preferably indoors. Remove any items away from the location that could be damaged by water. Place the water tank on a white or light-colored surface, such as a white sheet; this will allow you to see the waves.
4. Turn off any surrounding lights
5. Fill the tank with a few centimeters of water, this will help you to practice making and tracking the waves
6. Draw a small line with the permanent marker, approximately 2.5 cm below the rim of the tank, on the outside. Draw the line on one of the shorter ends of the rectangular tank. This is the height from which you will drop the wood block. Bring in your volunteer to help you track the wave.
7. Line up the bottom of the wood block at the marked line. From the marked line, drop the wood block and watch the resulting wave.
8. Carefully bring the desk lamp over to shine light onto the tank. Try angling the light above the tank or other positions to help you track the wave.
9. Once you feel comfortable creating and tracking waves, start the experiment.
10. Empty or fill the water tank after your practice runs until you have 3 cm of water in the tank. Use the metric ruler for accuracy.
11. Repeat 10 times for each of the 3 water depths (3 cm, 6 cm, 9cm)
12. The formula for Velocity is Distance/Time

Experiment data

The Effect of Water Depth on Wave Velocity

Water Depth	Time to travel water tank										Average time across tests	Average time in all trials	Average Wave Velocity
	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6	Test 7	Test 8	Test 9	Test 10			
4 cm	5	6	7	8	9	10	11	12	13	14	1.424	4.52	1.775
7 cm	1.44	1.38	1.41	1.35	2	1.15	1.07	1.26	1.66	1.7	1.442	4.52	1.746
10 cm	1.82	1.92	1.38	1.31	2.25	1.4	1.6	1.51	1.73	1.62	1.654	4.52	1.515

Conclusion

My hypothesis was proved as the average velocities for trial 1 are greater than trials 2 and 3. The average velocity for trial one is 1.775, the average for trial 2 is 1.746, and finally the average for trail 3 is 1.515. It is clear to see that the average velocities are decreasing as the water gets deeper.