CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
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Project Number
J0702

Project Title
Scoping the Waves

Abstract

Objectives/Goals
To discover whether ground vibration waves travel faster uphill or downhil.

Methods/Materials
Materials: Oscilloscope, laptop computer, log, vibration sensors, cables, tape-measure, hill

Methods:
Control: Place sensors side by side and connect oscilloscope . Drop the log 14 feet and 4 inches away from the sensor. Look at the graph of the vibrations to see that the output is the same from both sensors. If they are the same, then continue to downhill procedure. (If they are not the same, you may need to look at the sensors to see if something is wrong with one of them.)
Set-up: Pick a steep slope and place sensors at top and bottom of hill. Measure the distance between vibration sensors, 45 feet 4 inches, with tape measure. Set up oscilloscope and connect the two vibration sensors to a laptop computer.
Downhill: Leave vibration sensors with one positioned at the top of the hill and one at the bottom of the hill, 45 feet 4 inches apart. Drop log five feet behind the sensor, so that the vibration passes past the first sensor and continues downhill to the second sensor. Save data recorded in computer. Determine time from sensor to sensor using oscilloscope cursors. Record data. Analyze speed using formula: speed (ft./sec) = distance(ft.)/time(sec). Repeat steps 2-6, ten times and find average speed from the 10 test results.
Uphill: Repeat downhill procedure but from the bottom of the hill.

Results
The mean travel time for the ground vibration to pass between the two sensors going uphill was 22.64 milliseconds, from ten trials. The mean travel time from ten trials going downhill was 22.64 milliseconds. I observed that the wave gets smaller as it moves away from the point of impact. When the wave travels uphill it gets signifcantly smaller than the wave traveling downhill over the same path.

Conclusions/Discussion
In conclusion ground vibrations do not travel significantly faster uphill or downhill the speed is about the same for this type of soil. If I were to do this experiment again, I would try different soil types (sand,clay,and rocky soils.) The most fun part about this experiment was learning how to use an oscilloscope and using it. Now I am also using it to see different things like the difference between my cockiel's chirps and my two parakeet's chirps.

Summary Statement
This project investigates and compares ground vibration speeds travelling uphill and downhill using vibration sensors and an oscilloscope.

Help Received
My dad used the log to hit the ground to cause vibration waves, and explained to me how the ocilloscope worked.