

Earthquake Liquefaction - Student Activity

In 2011, an earthquake destroyed many of the buildings in the city of Christchurch, New Zealand. However, most of the damage wasn't caused by the shaking from seismic waves; it was the effect the shaking had on the unconsolidated sediments beneath the buildings that caused the most damage.

Watch your teacher demonstrate what happens to water from the surface and make notes here.

Task 1: Shaking sediments → liquefaction

Because river sediments have not been buried into the Earth they have not been compressed or compacted. They are not rock. There are lots of spaces between the broken bits of rock and sand for water to be stored.

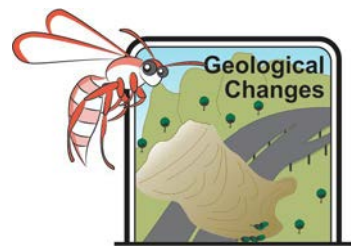
Materials per group:

- Two beakers or glasses the same size
- Dry sand
- Water

Method

1. Fill both glasses to the same height with dry sand or dry soil.
2. Add water to one glass until it can absorb no more. The sand should be wet but water should not lie on the surface.
3. Leave the glass of dry sand untouched.
4. On a flat surface, gently slide both glasses back and forth for one minute. This movement replicates the movement due to seismic waves (compression waves) during an earthquake.
5. Observe, measure, and report any changes after shaking the glasses, or differences between the glasses.





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Observations

Discussion

Was this a “FAIR TEST”? Explain your answer

The sand in the wet glass experienced *liquefaction*. What do you think happened to the sand and water in the wet glass when you shook it?

Task 2: What happens to buildings on top of liquefied areas?

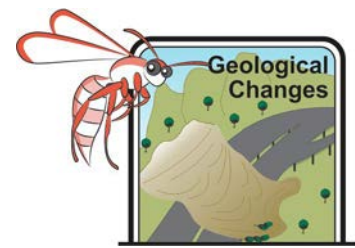
Materials per group

- Two beakers or glasses of the same size.
- Dry sand
- Water
- Two marbles or solid objects to represent buildings

Method

1. Fill both glasses to the same height with dry sand or dry soil.
2. Add water to one glass until it can absorb no more. The sand should be damp but water should not lie on the surface.
3. Add an object representing houses on top of the sand in each glass.
4. Leave the glass of dry sand untouched.
5. On a flat surface, gently slide both glasses back and forth for one minute. This movement replicates the movement a building would experience during an earthquake.
6. Observe, measure, and report any changes. What happened to the marbles in each glass?

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Observations

Extension information

The ground under parts of Christchurch liquefied during the earthquakes in 2011, partially burying houses, disrupting roads and railways, and destroying household services such as sewage, electricity and gas provision. The areas can never be used for building again.

During some earthquakes, cattle and humans have been buried in liquefied mud.

In areas like the river flats of California, the old river sediments are full of underground water. Farmers pump the aquifers for irrigation of vines and vegetables. The loss of water between grains of sand causes collapse of the sediments above, resulting in a sinkhole. The collapse is registered as a small earthquake by local seismometers.