

## Tsunami

### What controls the speed of a tsunami wave?

[www.earthlearningidea.com/PDF/45\\_Tsunami\\_demo\\_final.pdf](http://www.earthlearningidea.com/PDF/45_Tsunami_demo_final.pdf)

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The spreading of a tsunami wave involves both large and micro scales:

(1) the potential energy, given by vertical displacement of an extensive water mass, is converted into kinetic energy to drive the tsunami wave.

(2) water particles as an energy-transfer medium move in circular paths.

These phenomena are difficult for students to understand but this Earthlearningidea provides a graphic link between the theory of wave motion and potentially lethal natural phenomena to reduce the cognitive load for learning.

#### **Suggestions:**

(1) Provide an animation in the form of static key frames, for example, BBC NEWS Special Reports: The tsunami disaster explained - - <http://news.bbc.co.uk/2/hi/asia-pacific/4136289.stm> for attention cueing as a means to enhance learning. Despite a well-control experiment, the motion of the wave is still too fast to observe.

(2) Provide a demonstration to differentiate between 'wave' and 'current'. In my experience, to recognize the difference between a wave and a current is difficult for the 10th grade student in Taiwan. For example, when the first wave crest or trough reaches the one end of the tank, a leaf placed on top of the water just shifts slightly in the horizontal position. In profile, the leaf vibrates with the water vertically. Thus, students can construct prior knowledge for the follow-up of the Earthlearningidea.

(3) Investigating the relationship between the slope of the tank and the wave height. When a tsunami arrives in shallowing water, the base of the wave is slowed down by friction. The wave crest overtakes the base and may then pile up to form a 'wall of water', which crashes down on the beach. The wall of water is one of the threatening dangers. Ask the students to work out what things might affect the wave height at which a tsunami travels. We can provide some examples, such as, the wall of water in December 2004 was over 10m height in Sri Lanka, but less than 2m height in the Maldives.