

Name: _____

Date: _____

LEARNING EXPERIENCE 1

UNDERSTANDING TSUNAMIS AND THEIR SOURCES WITH A FOCUS ON ASTEROID IMPACTS

Introduction

Earthquakes can generate tsunamis by displacing the sea floor. The shift in the sea floor displaces the water from its equilibrium position and gravity acts to restore it. This oscillation of the sea surface, if sufficiently large, generates tsunami waves. Volcanic eruptions, explosions, and impacts all displace the water in similar ways, all of which can produce tsunamis. The major difference between earthquakes and other sources of tsunamis is that the energy dissipates much more quickly in non-earthquake sources, therefore the destructive force of the wave is less when it reaches shore.

Procedure

1. Write a brief description of how you think a tsunami might be generated from an asteroid impact.
2. Watch video of bursting a balloon in a tub of water to represent an explosion of a meteorite on impact with the ocean. Observe the waves created by the explosion. You can find the video on the internet at <http://www4.tpg.com.au/users/aoaug/tsuballn.html>.
3. Sketch the tsunami wave for at least four different points in time on a separate piece of paper. Be sure to label your sketches. For example draw the shape of the water at the moment the asteroid hits the water, then immediately after it explodes, and at some time later when the waves have spread out.
4. Now watch a model of a tsunami generated from ground deformation such as an earthquake <http://www.tsunami.civil.tohoku.ac.jp/hokusai2/main/eng/nicaragua.mov>. Sketch the tsunami wave for at least four different points in time on a separate piece of paper. Be sure to label your sketches.
5. Now watch models <http://www.tsunami.civil.tohoku.ac.jp/hokusai2/introduce/Tsunami-topics/irian.mov> of the generation and propagation of the 1996 Irian Jaya tsunami, <http://www.tsunami.civil.tohoku.ac.jp/hokusai2/main/eng/ALASKA.MOV> a model of a tsunami off the coast of Alaska, and <http://www.tsunami.civil.tohoku.ac.jp/hokusai2/main/eng/usu3.mov> of a landslide-

Cataclysms and Catastrophes Project (NSF GEO-0224501)

induced tsunami paying particular attention to the constructive and destructive interference of individual wave trains.

Critical Thinking Questions

1. What are the main cause of tsunamis?
2. How are tsunami waves generated? What is the driving force?
3. What are the differences in waves generated from impact sources and earthquake sources?
4. Which direction do tsunami waves travel with respect to their source?