**TSUNAMI** - A tsunami is a series of ocean waves generated by sudden displacements in the sea floor, landslides, or volcanic activity. In the deep ocean, the tsunami wave may only be a few inches high. The tsunami wave may come gently ashore or may increase in height to become a fast moving wall of turbulent water several meters high. A very large disturbance can cause local devastation AND export tsunami destruction thousands of miles away. The word tsunami is a Japanese word, represented by two characters: tsu, meaning, “harbor”, and nami meaning, “wave“. Tsunamis rank high on the scale of natural disasters. Tsunamis are most commonly generated by earthquakes in marine and coastal regions. Major tsunamis are produced by large (greater than 7 on the Richer scale), shallow focus (< 30km depth in the earth) earthquakes associated with the movement of oceanic and continental plates. They frequently occur in the Pacific, where dense oceanic plates slide under the lighter continental plates. Since 1850 alone, tsunamis have been responsible for the loss of over 420,000 lives and billions of dollars of damage to coastal structures and habitats. Most of these casualties were caused by local tsunamis that occur about once per year somewhere in the world. For example, the December 26, 2004, tsunami killed about 130,000 people close to the earthquake and about 58,000 people on distant shores. Predicting when and where the next tsunami will strike is currently impossible. Once the tsunami is generated, forecasting tsunami arrival and impact is possible through modeling and measurement technologies. Although a tsunami cannot be prevented, the impact of a tsunami can be mitigated through community preparedness, timely warnings, and effective response. NOAA has primary responsibility for providing tsunami warnings to the Nation, and a leadership role in tsunami observations and research.

**STEM CONNECTION**

A National Weather Service (NWS) initiative promotes tsunami hazard preparedness as an active collaboration among Federal, state and local emergency management agencies, the public, and the NWS tsunami warning system. The TsunamiReady program is based on the NWS StormReady model. The main goal is improvement of public safety during tsunami emergencies. Scientists and engineers work collaboratively to support better and more consistent tsunami awareness and mitigation efforts among communities at risk. Engineers use their inventiveness to decrease the destruction caused by tsunamis; and mostly importantly, to save lives. Tsunamis cannot be prevented; however, engineers and scientist work together to design equipment to help monitor and gather data for early detection. Early detection is important because people can be warned and evacuated to safety. Equipment from- cameras to continually watch volcanoes, to seismometers measure tremors, and GPS receivers Measure Mountain swelling, pressure sensors monitor air waves caused by explosions, and radar and satellites communicate the height, size and location of ash plumes-are used in tandem to gather data for early detection. In addition, engineers design structures that can survive tsunamis, while other engineers design warning systems such as harbor disaster sirens, automated news media bulletins and emergency communication centers.
PRIOR KNOWLEDGE

- basic understanding of processes that shape the earth
- demonstrate an understanding of the nature of force and motion
- knowledge with constancy and change

GUIDING QUESTIONS

1. **What is a tsunami and what causes a tsunami to occur?** Undersea earthquakes or landslides, volcanic eruptions, or the impact of a large meteorite in the sea (Tsunami is a set of ocean waves caused by any large, abrupt disturbance of the sea-surface). (Tsunamis are most commonly generated by earthquakes in marine and coastal regions).

2. **Why do engineers care about tsunamis?** (Engineers are very concerned with processes that shape the Earth, because they need to be able to design structures to prevent the loss lives and billions of dollars in damage to coastal structures and habitats).

EDUCATIONAL RESOURCES

1. National Oceanic and Atmosphere Administration (NOAA) animation model of a tsunami http://www.tsunami.noaa.gov/


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