Unit 5 overview

Learning objectives

In this unit, students will

- calculate the speed of a tsunami wave and the time it takes to travel a specific distance;
- explain how the amplitude and speed of a tsunami wave vary between shallow water and deep ocean water and the causes of these changes;
- explain why the first tsunami wave may not be the largest or most dangerous; and
- describe hazards associated with tsunamis.

Tsunamis—most often triggered by earthquakes and volcanic eruptions—are a major hazard associated with plate tectonics that is frequently misunderstood by the public. In this activity students will study tsunamis, their causes, and their effects.

Activity 5.1 – Scotch Cap Light Station (Engage)

This section of the activity is designed to help students understand the learning task and make connections to past and present learning experiences. The Scotch Cap Light Station reading shows the immense power of a tsunami and its ability to arrive without warning. Have students discuss their thoughts, ideas, and questions about tsunami hazards. They should think about how tsunami hazards can become disasters, and they should think about how to reduce the risk of disaster.

During the classroom discussion, record all students' ideas on an overhead or a large sheet of paper. Encourage them to consider many different factors. Save the list of questions and ideas for later exploration.

Activity 5.2 – Deadly tsunamis (Explore)

The goal of this activity is to familiarize your students with the data sets and to pique their curiosity. It begins with students being introduced to tsunamis in general, possibly for the first time. (Earthquakes and volcanoes are likely to be more familiar than tsunamis to most American students.) They receive a cursory introduction to the differences between tsunamis and wind-blown waves. Finally, two major, modern tsunami events are analyzed for particular effects: the 1960 Chilean tsunami provides an example of the large-scale, global effects and speed of tsunamis, and a 1993 Aonae, Japan tsunami provides an example of how difficult it can be to detect and, more importantly, warn people of a devastating local tsunami.

There are numerous multimedia files to explore in this section. These files include animated movies and photos from disaster scenes as well as simulations of tsunami events; they are linked to ArcView, so students can explore them within the framework of the GIS. Encourage students who complete this portion of the activity early to explore some of the questions raised in the Engage section of the activity.

Activity 5.3 – Anatomy of a tsunami (Explain)

In this activity, students are introduced more formally to the science concepts of the lesson. They learn more about what tsunamis actually are, how they are formed, and what effects they can have on communities. Students are also introduced to the tsunami magnitude scale and key measurements used to classify tsunamis. In addition, students learn how communities can prepare for, monitor, warn others, and survive tsunami events. Discuss these concepts with your students to ensure they have a firm understanding before continuing with the activity.

Activity 5.4 – Tsunami warning (Elaborate)

In the Elaborate section, students apply what they have learned to a new situation. They test ideas more thoroughly and explore additional relationships. In this case, they examine the 1964 Alaskan tsunami to study the interaction between tsunamis and tides. They also examine tsunami trigger events in an effort to develop a set of criteria for determining when tsunami warnings should be issued.

Evaluating student comprehension

This section provides students with feedback on their understanding of the lesson. Example assessments are provided, but you may develop other assessments that are more closely aligned with your students' interests and abilities. One approach for assessment is to have your students resolve any unanswered questions from the Engage section of the activity.