

# Tracking Tsunamis

On December 26, 2004, scientists at the Pacific Tsunami Warning Center learned of the speed of the Indonesian tsunami and tracked it as it moved across the Indian Ocean. They were able to notify East African officials of the impending disaster. In this activity, you will calculate the approximate speed of three tsunamis and create a time travel map and chart that shows their arrival at specific geographic locations.

## Procedure

- 1 Research and label your world map with each of the geographic locations presented in the scenarios.
- 2 Use your drawing compass to draw the wave front at each location as it radiates out from its epicenter. Place the compass tip on the epicenter and the pencil on the landfall location, then make the largest arc possible on the map. Do this for all scenario locations.
- 3 Read each of the scenarios on your "Tsunami Scenarios" handout and apply the formulas to determine the approximate speed of the tsunami and the time it takes for it to reach each location.
- 4 For each scenario, write down the order in which the tsunami will strike each location. List some ways that people, if notified, might prepare for the approaching tsunami.

## WAVE SPEED FORMULA

$$\text{speed} = \sqrt{g \times d}$$

where speed (meters/second) = square root of  $g$  (acceleration due to gravity, which is  $9.81 \text{ meters/second}^2$ )  $\times d$  (water depth in meters)

Your speed calculation initially will be in meters/second. Convert meters/second to kilometers/hour using the following formulas:

$$1 \text{ hour} = 60 \text{ minutes} = 3,600 \text{ seconds}$$

$$1 \text{ kilometer} = 1,000 \text{ meters}$$

To convert your units to meters/hour, multiply your initial answer by 3,600. Divide the result by 1,000 to convert from meters/hour to kilometers/hour. Round your final answer to the nearest whole number.

## TRAVEL TIMES CALCULATION

Calculate travel times by dividing distance by tsunami speed. Remember to convert the decimal part of the number to minutes by multiplying the decimal part by 60. For example, one point four (1.4) hours equals 1 hour and 24 minutes.

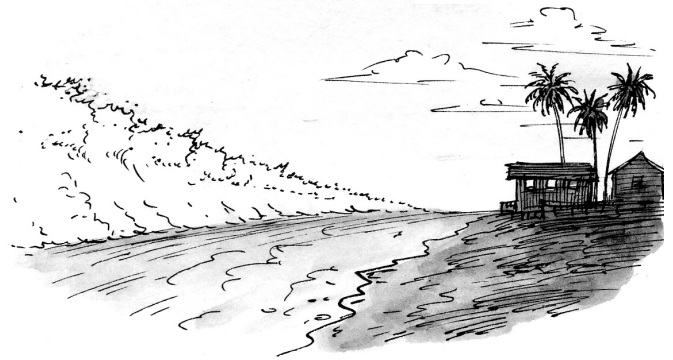


# Tsunami Scenarios

## Scenario A

Seismologists have just registered an earthquake in Seward, Alaska, that is big enough to produce a tsunami. The ocean depth is 4,000 meters. Use the wave speed formula to approximate the tsunami's speed. After calculating the speed, use your atlas to estimate distances from the tsunami's epicenter to each location. Calculate the travel time to each location and write it on your map.

- Kodiak, Alaska
- Kauai Island, Hawaii
- Kwajalein, Marshall Islands



## Scenario B

A tsunami has just been detected off of Ka Lae, Hawaii. The ocean depth is 4,500 meters. Use the wave speed formula to approximate the tsunami's speed. After calculating the speed, use your atlas to estimate distances from the tsunami's epicenter to each location. Calculate the travel time to each location and write it on your map.

- Dutch Harbor, Alaska
- Kwajalein, Marshall Islands
- Samoa

## Scenario C

A large part of a volcano in the Gran Canaria, Canary Islands, has just fallen into the ocean that is 3,500 meters deep. Use the wave speed formula to approximate the tsunami's speed. After calculating the speed, use your atlas to estimate distances from the tsunami's epicenter to each location. Calculate the travel time to each location and write it on your map.

- Terceira, Azores
- Safi, Morocco
- St. Johns, Newfoundland

# World Map

