



Overview:

In this lesson, students analyze tsunami time travel maps to build an understanding of wave speed as a tsunami propagates around the ocean.

Targeted Alaska Grade Level Expectations:

Science

- [3-4] SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating.
- [4] SA1.2 The student demonstrates an understanding of the processes of science by observing, measuring, and collecting data from explorations and using this information to classify, predict, and communicate.
- [3] SA2.1 The student demonstrates an understanding of the attitudes and approaches to scientific inquiry by answering “how do you know?” questions with reasonable answers.

Math

- [3] S&P-2 The student demonstrates an ability to analyze data (comparing, explaining, interpreting, or justifying conclusions) by using information from a variety of displays (tallies, tables, pictographs, bar graphs, or [Venn diagrams L])
- [4] S&P-2 The student demonstrates an ability to analyze data (comparing, explaining, interpreting, evaluating; drawing or justifying conclusions by using information from a variety of displays (tables, bar graphs, or Venn diagrams))

Objectives:

The student will:

- identify patterns of wave propagation;
- identify the location of a tsunami source by looking at a tsunami time travel map; and
- determine time elapsed between the time of the source event and tsunami runup at different locations.

Materials:

- Square Pan
- Water
- Small stone
- VISUAL AID: “Wave Patterns”
- VISUAL AID: “Tsunami Time Travel Map”
- STUDENT WORKSHEET: “Tsunami Speed”

Science Basics:

The speed of a tsunami depends on the depth of the ocean. Although speeds can exceed 600 miles per hour in the deep ocean, watercraft on the surface may not be aware that they are in the midst of a tsunami, as the height from crest to trough will only be a few feet or less and the distance between wave crests may be about a hundred miles apart. As tsunamis approach the coasts, the waters shallow and the speed decreases causing the height of the wave to increase.

Activity Procedure:

1. Explain students will learn about the speed of tsunamis.
2. Ask students what can trigger, or start, a tsunami? (*earthquakes, volcanoes, landslides*) Explain that the location of the trigger is where the wave starts.
3. Fill the pan halfway with water. Explain the pan is a model of the ocean. Explain that you will drop the stone in the center of the pan and at the edge of the pan. The stone will serve as the model for a tsunami trigger. The students should observe closely to see how the waves travel from the rock. Display VISUAL AID: "Wave Patterns." Explain that each square represents a possible way in which waves move away from a trigger. Allow "think time" for students to consider which example shows the wave starting from the center of the pan. When they have an idea of the answer ask them to hold up the number of fingers representing their response. Then ask students, using the previous process, to identify the letter of the pan that shows the wave beginning from the edge of the pan. Explain that number 2 and 3 are incorrect patterns of how waves spread.
4. Display VISUAL AID: "Tsunami Time Travel Map." Explain this visual aid shows the time it takes a tsunami to move across the ocean. Explain waves move in the ocean as they did in the pan. Ask students to identify where this tsunami began (*Hawaii*). Identify locations around the Pacific Rim. Then explain that each band represents 1 hour. Model how to use the map to see how fast the tsunami reached California (*5 hours*). Then ask students to determine travel time for other locations.
5. Distribute STUDENT WORKSHEET: "Tsunami Speed" for students to complete. Page 1 (questions 1 and 2) may be more appropriate for younger children and both pages (questions 1 through 4) for older children.

Answers:

1. *A star should be drawn on or near Seward, Alaska.*
2. *A. 7-8 hours
B. 5-6 hours
C. 14 hours
D. 1-2 hours*
3. *A star should be drawn on California.*
4. *A. 6:00-7:00 a.m.
B. 6:00-7:00 a.m.
C. 10:00 a.m.
D. 4:00 p.m.*

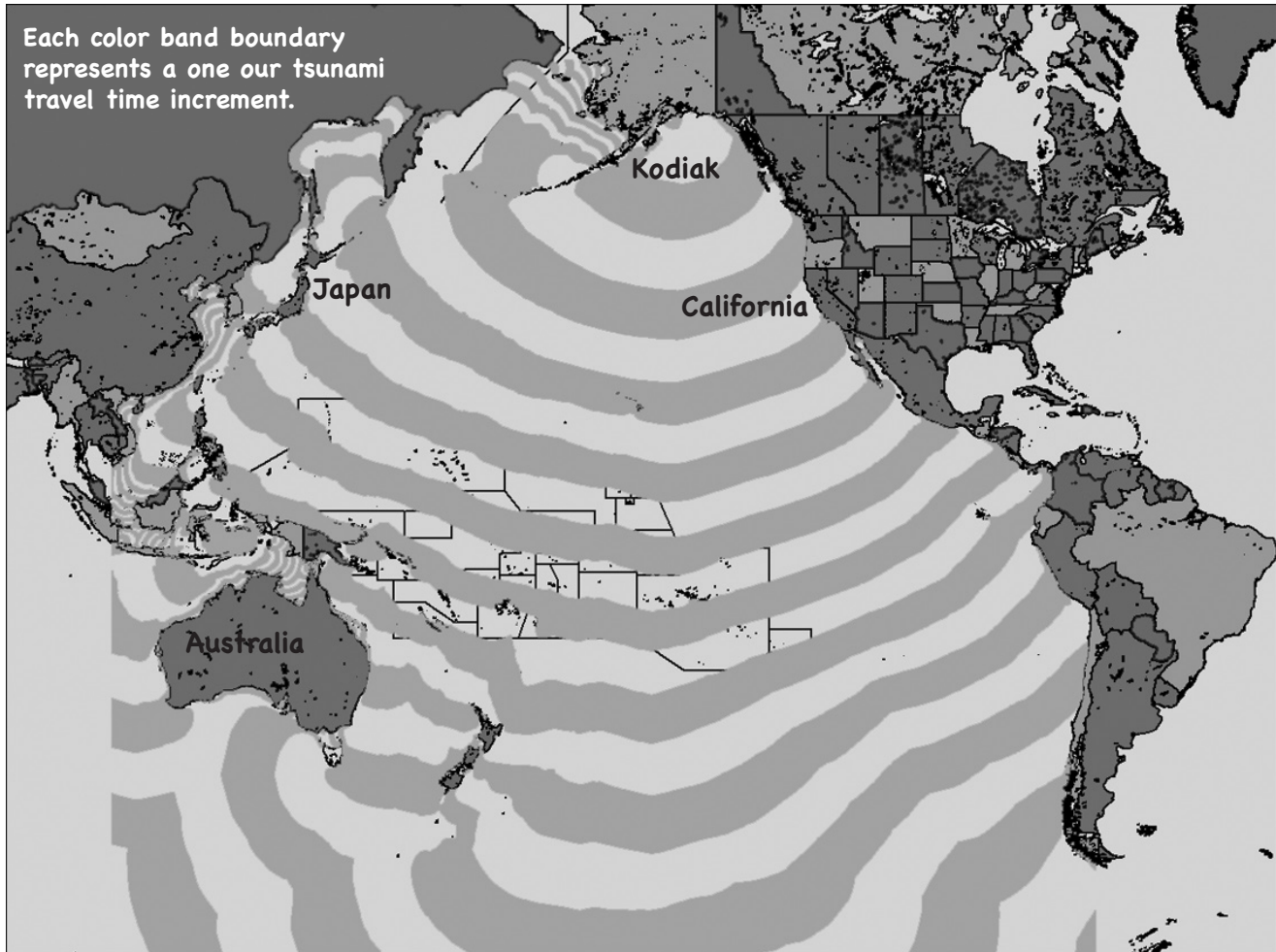
Name: _____

Student Worksheet (page 1 of 2)

Tsunami Speed



Directions: Use the map below to complete the following questions.



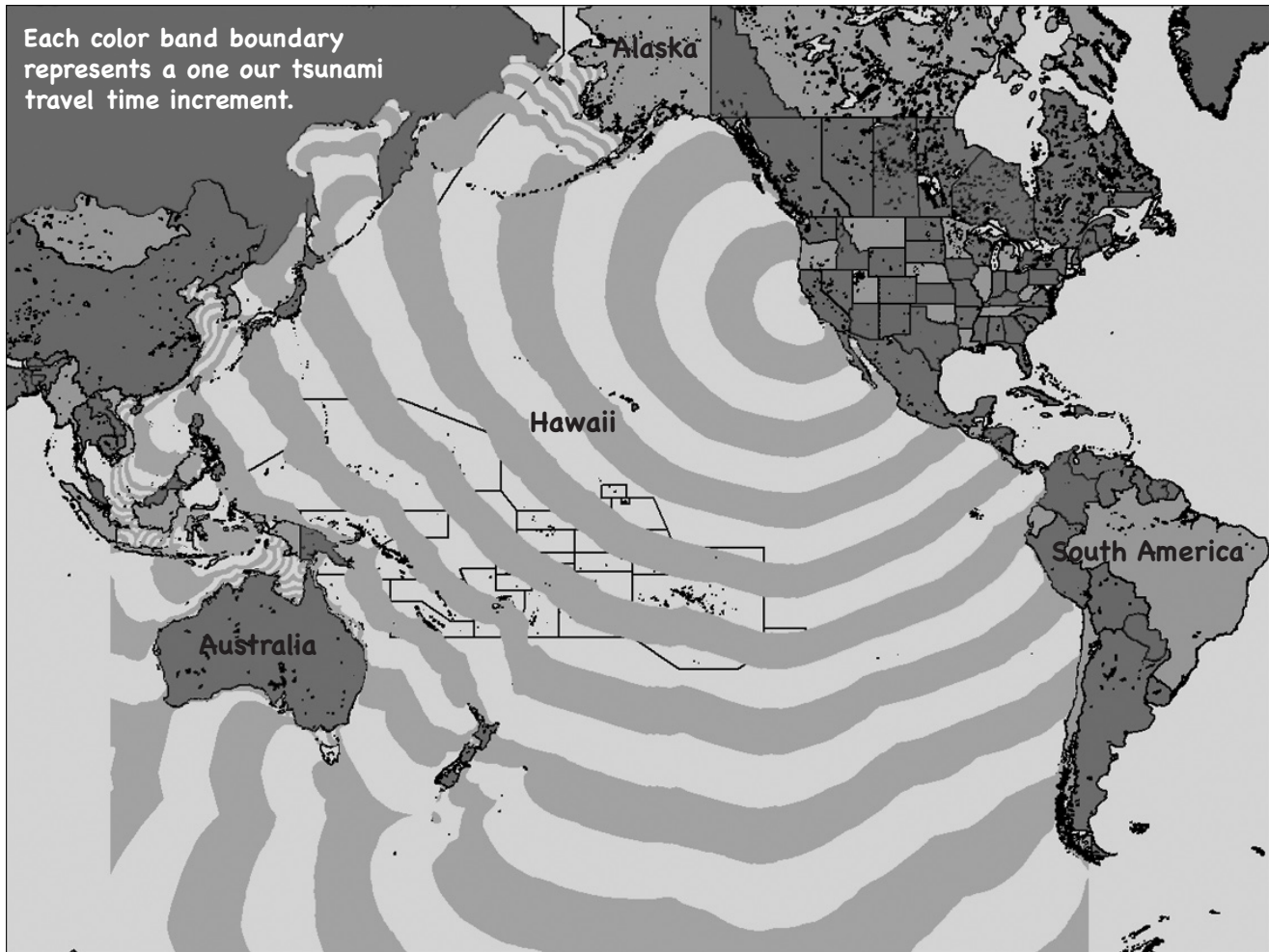
Kodiak, Alaska Full color version found at <http://wcatwc.arh.noaa.gov/travel.times/tttkodiak.gif>

1. Draw a star where the tsunami began.
2. How many hours will it take for the wave to reach
 - A. Japan? _____
 - B. California? _____
 - C. Australia? _____
 - D. Kodiak? _____

Name: _____

Student Worksheet (page 2 of 2)

Tsunami Speed



San Francisco, California Full color version found at <http://wcatwc.arh.noaa.gov/travel.times/tttsanfr.gif>

Use the map above to complete the following questions.

3. Draw a star where the tsunami began.
4. If the tsunami began at 1:00 a.m. what time did it reach
 - A. Hawaii? _____
 - B. Alaska? _____
 - C. South America? _____
 - D. Australia? _____