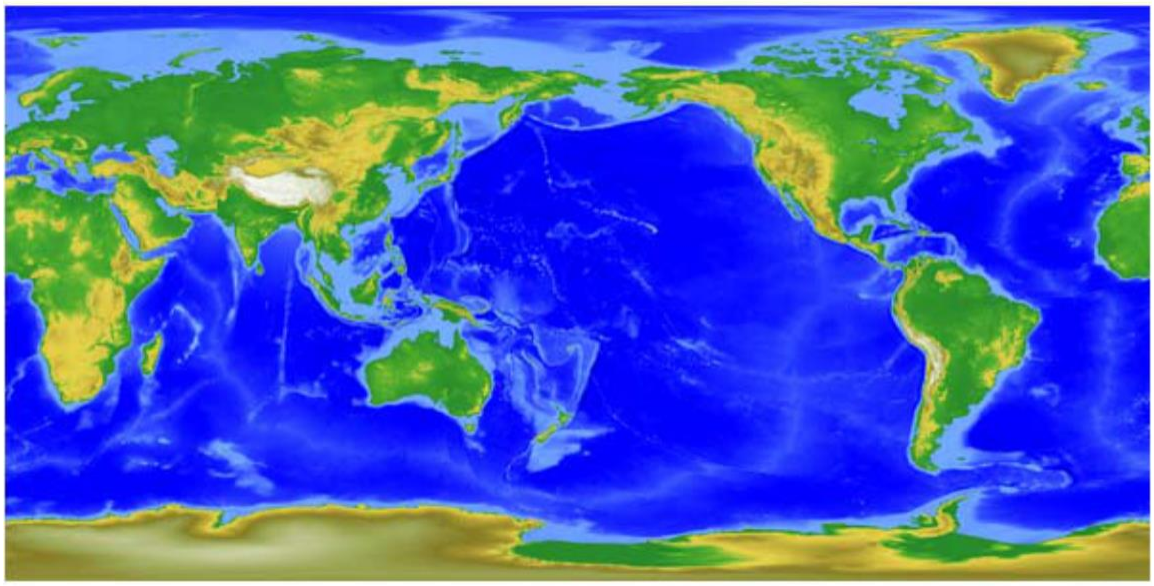
Worksheet 1: Teacher Version for Lessons:

-Where Do Tsunamis Occur? *-Sources of Tsunam is*

-Seismic Detection *-Tsunami Alerts*

1. **Earth's surface is broken into large, slowly moving pieces called** _____. *Answer: tectonic plates*

2. **On this m ap, circle at least three different locations that have historically experienced large earthquakes, volcanoes, AND tsunamis.**



Possible answers: west coasts of North America and South America, Japan and other areas along west side of Pacific basin, the area along the eastern Indian Ocean, the Mediterranean, and the Caribbean.

3. **How do the locations of plate boundaries relate to the locations of earthquakes, volcanoes, and tsunamis?**

_____
_____
_____
_____
_____
_____
_____

Possible answers: They are often the same. Earthquakes and volcanoes tend to occur on these plate boundaries. Tsunamis can happen near these boundaries, but at farther locations as well.

4. **Why are subduction zones important?** _____
_____
_____

Answer: Subduction zo nes are areas along tectonic plate boundaries where large earthquakes and volcanoes often occur. These large earthquakes and volcanoes can cause tsunamis.

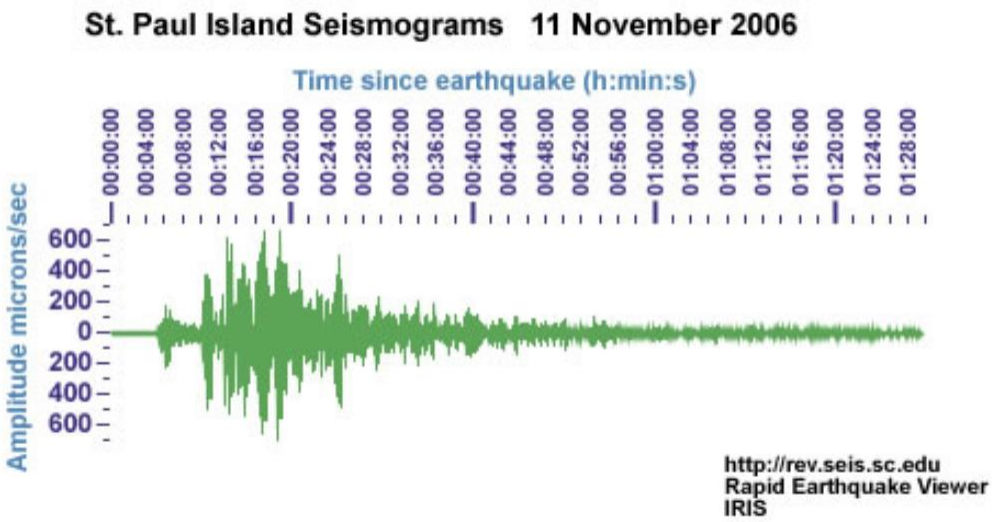
5. **Can tsunamis occur in areas that don't experience earthquakes? Why or why not?**
Answer: Yes. Tsunamis can travel across oceans and damage areas far away from the earthquake source.

6. **What type of data help scientists first know about the possibility of a tsunami?**
_____
Answer: seismic data

7. **At a mini mum, how many stations need to report seismic w ave arrival times for scientists to locate the earthquake?** _____
Answer: 3

8. **The size of an earthquake is one factor in determining whether an earthquake causes a tsunami. What term do scientists use to measure earthquake size?**
   Answer: Magnitude (or moment magnitude)

9. **In this seismogram, when does the first Primary (P) wave arrive at the station? When does the S- wave arrive? P-wave: _____ minutes S-wave: _____ minutes**



Answer: P-wave ~6 minutes, S-wave ~10 minutes

10. **Which of the following factors can determine whether an earthquake can cause a tsunami? (**Choose all that apply)

___ a. Earthquake size/magnitude
___ b. The time it takes waves to reach the coast
___ c. The size of the rupture area
___ d. Whether the rupture was under water
___ e. How much land was lifted
___ f. How the ocean responded
___ g. The type of plate boundary or fault
___ h. Whether the rupture releases hot magma *Answers: a, c, d, e, f, and g.*

11. List four events that can cause a tsunami.

_____
_____
_____
_____

Answers: earthquakes, landslides, volcanoes, meteors

12. True or False: Volcanoes are the most common source of large tsunamis. (Circle the correct answer.)
Answer: False. Earthquakes are the most common source.

13. Name three ways that an earthquake can displace an amount of water large enough to make tsunamis.

_____
_____
_____

Possible answers: dropping the seafloor, thrusting up the seafloor, generating a landslide.

14. The two highest levels of alert issued by a Tsunami Warning Center for an impending tsunami are:

_____ _____

Answer: Tsunami Warning, Tsunam i Advisory

15. What is the difference between a Tsunami Warning and a Tsunami Watch?

_____
_____
_____
_____
_____
_____

Answer: A Tsunami Warning means a dangerous tsunami is imminent and persons in a vulnerable coastal area within the Warning should take immediate action. A Tsunami Watch means it's possible a tsunami could affect a coastline within a time period, and people in the Watch area should stay tun ed for further information.