

Chapter 3:

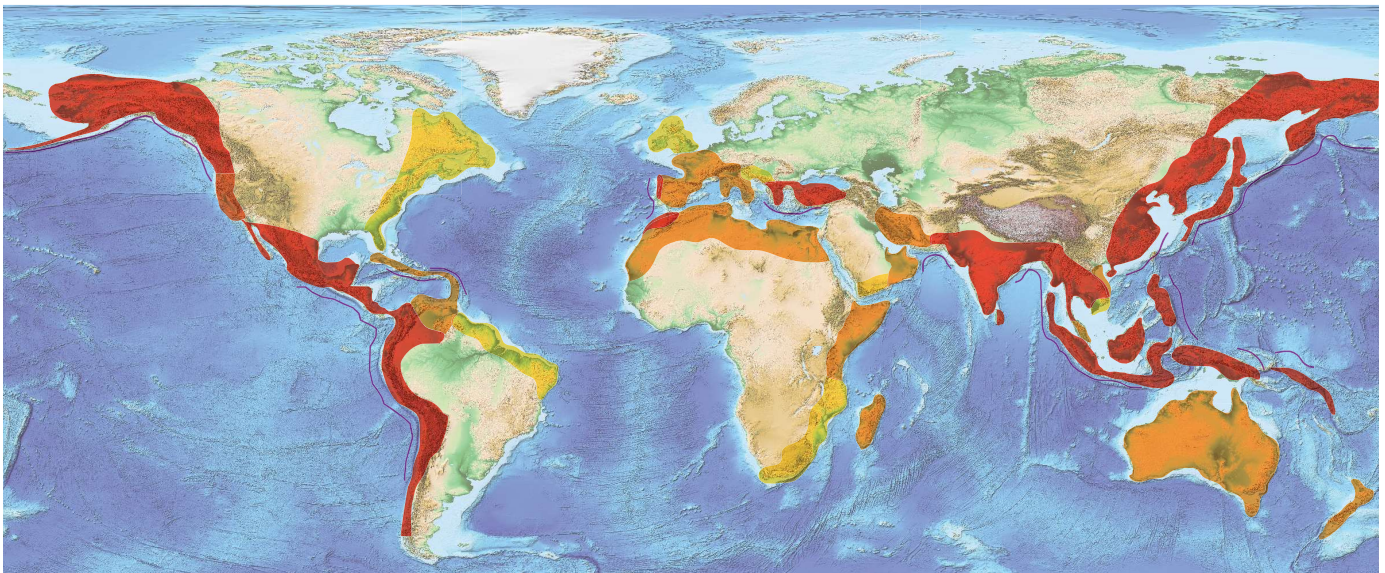
Plate Motion and Tsunamis

Imagine you are at the beach on a warm summer day, and you suddenly feel the ground shake beneath you! Should you worry about a tsunami? It's important to know that not all earthquakes cause tsunamis—the magnitude and location of the earthquake and the type of plate boundary involved all affect whether a tsunami will occur.

Tsunamis are most often caused by earthquakes, but not just any earthquakes. The earthquake must occur under or very near the ocean. Earthquakes that are centered inland don't cause tsunamis. Also, only very strong earthquakes can cause tsunamis. Most earthquakes have a magnitude below 2.5—too small to be felt by people at all. Earthquakes that are magnitude 6.5 or higher cause very strong shaking and can make it hard for people to stay standing. An earthquake under the ocean must be even bigger than that—it must have a magnitude larger than 7.0 to release the energy required to cause a tsunami.

Earth's surface is made of huge plates that move slowly over time. The places where these plates meet are called plate boundaries. Sudden movement at some types of plate boundaries can generate earthquakes. The type of plate boundary where an earthquake happens partly determines whether that particular earthquake will cause a tsunami.

Tsunami Threat

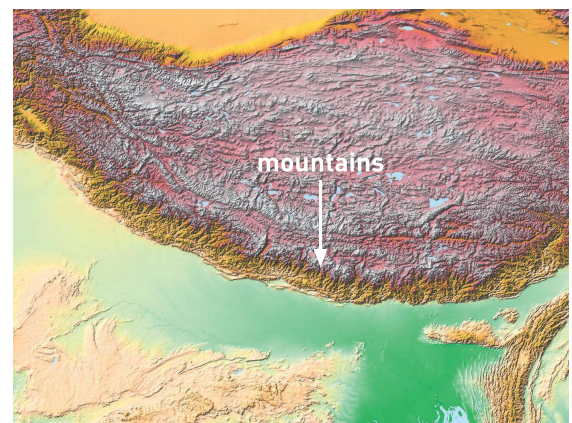
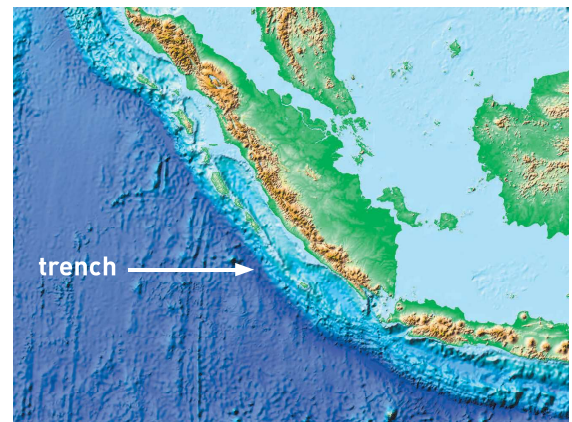
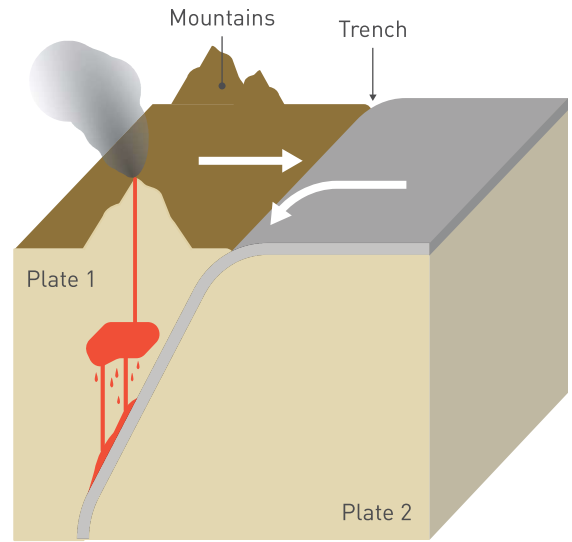


- High probability of underwater earthquakes
- High risk of tsunamis
- Medium risk of tsunamis
- Low risk of tsunamis

In the event of an earthquake on the seafloor, tsunamis are more likely to hit some coastal areas than others. The areas of highest risk are shown in red.

CONVERGENT PLATE BOUNDARIES

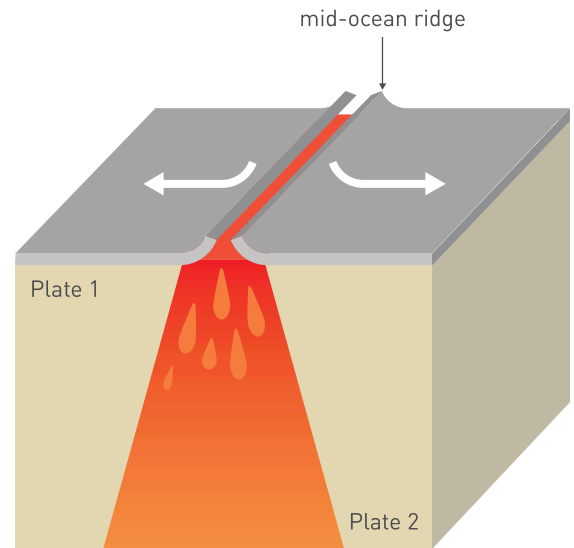
Convergent plate boundaries occur where two plates are moving toward each other. Often at a convergent plate boundary, one plate will move under the other. This is called subduction. Convergent boundaries often cause mountain ranges to form, which we typically see on land. On the seafloor, convergent boundaries result in landforms known as ocean trenches, where seafloor is destroyed as one plate moves under the other. As subduction occurs, pressure builds up between the plates. A large earthquake can release this built-up pressure, resulting in a quick vertical movement of the plate. In the ocean, this type of plate movement also shifts the water above the seafloor upward, which can cause a tsunami.



Large earthquakes occur most frequently at convergent (or subducting) plate boundaries, where a dense plate is moving under a less dense plate.

DIVERGENT PLATE BOUNDARIES

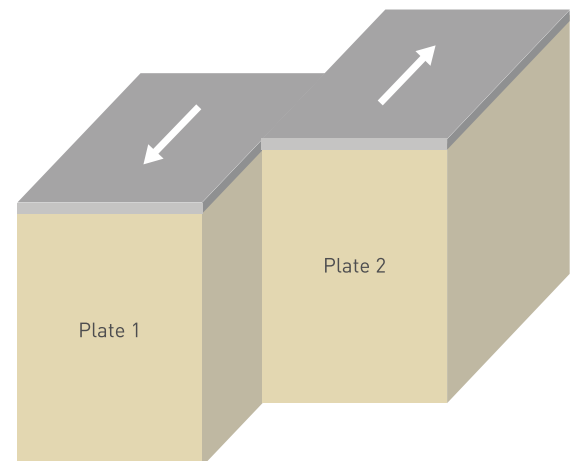
Divergent plate boundaries occur where two plates are moving away from each other. Under the ocean, the result is usually the formation of new seafloor, which causes landforms known as mid-ocean ridges. While there can be earthquakes at divergent plate boundaries, they are typically not strong enough, and do not generate enough vertical shift in the seafloor, to cause a tsunami.



Earthquakes that take place at divergent (or spreading) boundaries are usually not strong enough to cause tsunamis.

TRANSFORM PLATE BOUNDARIES

Transform plate boundaries occur where two plates are moving sideways past each other. There are no major landforms at transform boundaries, but there are many earthquakes. While it's possible to generate a tsunami at this type of plate boundary, the earthquakes from this plate movement are unlikely to cause tsunamis because plates moving horizontally do not typically raise or lower the seafloor—or the water above it.



Earthquakes that take place on transform boundaries, where two plates slide past each other, are unlikely to cause tsunamis because they do not raise or lower the seafloor very much.