

Submarine Earthquakes, Part I

By Trista L. Pollard

¹ When people hear the word earthquake, they visualize shaking buildings, cracked road surfaces, and collapsed bridges. What about **submarine earthquakes**? A submarine earthquake is an earthquake that occurs under the ocean floor. You are probably saying, "I thought the ocean floor was only made of sand, so how can an earthquake happen?" Let's explore the bottom of the ocean to find out!

² If we were to drain the water from the world's oceans and take a ride along the bottom, we would see that the land under the sea has similar landforms to the earth's surface that is above water. The ocean bottom begins at the **continental shelf**. The continental shelf is a gentle sloping underwater plain that surrounds all of the earth's continents. This is also an extension to the coastal plain that exists above the water. As we travel from the continental shelf, we would reach the **continental slope** and the smooth-surfaced **continental rise**. All three sections make up the **continental margin**.

³ Once we pass the continental margin we get into some of the deepest parts of the world's oceans. In this area, the ocean floor has trenches. These trenches can be thousands of kilometers long, hundreds of kilometers wide, and extend three to four kilometers below the surrounding ocean floor. In the Pacific Ocean, there are long V-shaped trenches that border the edges of volcanic islands. In fact, the Pacific basin is encircled or surrounded by these trenches. Beyond the trenches we would see the **mid-ocean mountains** and **mid-ocean ridges**. This is the area, especially in the Pacific Ocean, where a large number of underwater volcanoes exist. It is these volcanoes and the areas near the trenches that produce submarine earthquakes.

⁴ Under the Pacific Ocean west of the Pacific Northwest coastline, there is an oceanic plate called the **Juan de Fuca Plate**. Located under the states of Oregon, Washington, and California in the United States is the **North American (Continental) Plate**. The plates under the earth's surface are crust sections that move through sliding over time. These plates meet at the **Cascadia Subduction Zone** which is about fifty miles off the western shore of the United States. This area (remember the continental margin and the trenches underwater) is earthquake prone.

⁵ When the Juan de Fuca Plate collides with the Continental Plate, it slides underneath, sticking to the Continental Plate. Since plates continually move over time, this sticking becomes a big problem. How is it solved? Well, pressure and stress build up where the de Fuca Plate sticks to the Continental Plate over time, eventually causing a large underwater earthquake. Of course, once the earthquake occurs, the plates are separated and, over time, will begin the process again. Scientists have measured past submarine earthquakes in the Cascadia Subduction Zone at a magnitude of 8 or higher on the **Richter scale**. Subduction Zone earthquakes tend to have ground shaking that lasts for a minute or longer. These earthquakes are also quickly followed by many large aftershocks which could occur over days and **tsunamis**.

⁶ The mid-ocean mountains and ridges are also prone to shallow earthquakes. The eruption of underwater volcanoes, since they are near faults under the ocean floor, can also cause submarine earthquakes. In *Submarine Earthquakes, Part II*, we will look at the most damaging effects of underwater earthquakes- tsunamis.

Submarine Earthquakes, Part I

<p>1. Submarine earthquakes are earthquakes that occur _____.</p> <p><input type="radio"/> A Beneath the earth's surface under the ocean</p> <p><input type="radio"/> B Near volcanoes on land</p> <p><input type="radio"/> C In the mountains above the earth's surface</p> <p><input type="radio"/> D None of the above</p>	<p>2. Underwater volcanoes do not cause submarine earthquakes.</p> <p><input type="radio"/> A False</p> <p><input type="radio"/> B True</p>
<p>3. The earth's continents are surrounded by _____.</p> <p><input type="radio"/> A Continental divide</p> <p><input type="radio"/> B Continental plate</p> <p><input type="radio"/> C Continental breakfast</p> <p><input type="radio"/> D Continental margin</p>	<p>4. The trenches that are located just beyond the continental margin can extend 3 to 4 kilometers below the ocean floor. How many feet would that be? (Kilometers to feet: multiply by 3,281)</p> <p>_____</p> <p>_____</p>
<p>5. Submarine earthquakes in the Cascadia Subduction Zone have been measured at a magnitude of 8 or above on the Richter scale.</p> <p><input type="radio"/> A False</p> <p><input type="radio"/> B True</p>	<p>6. In the Pacific Ocean, volcanic islands are surrounded by _____.</p> <p><input type="radio"/> A Shallow trenches</p> <p><input type="radio"/> B V-shaped slopes</p> <p><input type="radio"/> C U-shaped trenches</p> <p><input type="radio"/> D V-shaped trenches</p>
<p>7. Use the information about the trench depth in number 4. What would the depth of the trenches be in miles? (Kilometers to miles: multiply by .62)</p> <p>_____</p> <p>_____</p>	<p>8. What are the characteristics of Subduction Zone earthquakes?</p> <p>_____</p> <p>_____</p>

