Where do most earthquake epicenters and volcanoes occur?

Earth’s crust and upper mantle is divided into 10 or so major plates and several minor plates, sort of like pieces in a jigsaw puzzle. The major plates are the Eurasian Plate, Indo-Australian Plate, Pacific Plate, Nazca Plate, South American Plate, African Plate, North American Plate, Philippine Plate, Antarctic Plate, and Scotia Plate. These plates join together along plate boundaries.

The study of the formation and movement of lithospheric plates is called plate tectonics. Scientists have learned that the plates interact in three different ways at the plate boundaries: they can separate – that is move apart (diverge); move toward each other (converge); or slide past one another.

Interactions at the plate boundaries cause earthquakes and volcanoes around the world. Earthquakes occur along fault lines. They can occur along all the types of plate boundaries, including plates that are sliding past one another either in opposite directions or in the same direction at different rates. Volcanoes are located along converging plate boundaries and diverging plate boundaries. Geologists believe that some areas in Earth’s interior are hotter than other areas. These hot spots melt rock, which is forced upward toward Earth’s crust as magma to form volcanoes. The Hawaiian Islands sit on top of a hot spot beneath the Pacific Plate.

In this Virtual Lab, you will identify the locations of six earthquake epicenters and six volcanoes on a world map. Then you will compare these locations to the locations of plate boundaries. The epicenter of an earthquake is the point on Earth’s surface directly above Earth’s interior where earthquake energy is released. Keep in mind that the US. Geological Survey National Earthquake information Center registered over 200,000 earthquakes during a recent 12-year period and that they are approximately 600 active volcanoes in the world today. Latitude and longitude are measurements in degrees (0) and minutes (‘), by which a location on Earth’s surface can be precisely determined. Latitude is measured north or south of the equator. Longitude is measured east and west of the prime meridian, the designated zero meridian that passes through Greenwich, England.

Objectives:

* Plot the geographic locations - given latitude and longitude – of a number of earthquake epicenters and volcanoes on a world map.
* Observe, describe, and analyze the plotted data.
* Compare and contrast any patterns of volcanic and earthquake activity occurrences in relationship to Earth’s plate boundaries.

Procedure: Prepare a data table… See below

The Earthquakes button is selected when you open the activity. The map shows the locations of six earthquake epicenters. You can find a description of each of these earthquakes in the table below the map.

1. Look at the table to find out the latitude and longitude measurements of the first earthquake’s epicenter.
	1. Find and click this location on the map.
2. Using the arrows, scroll down to the next epicenters shown in the table.
	1. Find and click the locations of the other five epicenters listed in the table.
3. When all the epicenters have been identified, the Video button and the Show Plate Boundaries button will be activated.
4. Click the Video button and watch the earthquake video.
5. Click the Show Plate Boundaries button and determine whether any of the earthquake epicenters you plotted are associated with the plate boundaries.
6. Record your data in the Table.
7. Click the Volcanoes button to see the locations of six volcanoes on the map.
8. Match each volcano’s latitude / longitude measurements with a volcano spot on the map.
9. When all the locations of the volcanoes are identified, the Video button and the Show Plate Boundaries button will be activated.
10. Click the Video button and watch the volcano video.
11. Click the Show Plate Boundaries button and determine whether any of the volcanoes you plotted are associated with the plate boundaries.
12. Record your data in the Table.
13. Click the Reset button to compare the data for a different set of earthquake epicenters and volcanoes.
14. Complete the Journal questions.

Data Collection: Prepare a data table with the following headings. Add as many rows as needed to show data recorded for all earthquakes and volcanoes.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name/Location | Epicenter Latitude | Epicenter Longitude | Nearest Plate | Other information |
|  |  |  |  |  |

Journal Questions: Where do most earthquake epicenters and volcanoes occur?

1. Is there a relationship between the locations of earthquake epicenters, volcanoes, and plate boundaries?
	1. If so, describe the relationship.
2. According to the theory of continental drift, all of the world’s continents were once connected as one large landmass and have, over the course of hundreds of millions of years, drifted apart into the positions they occupy today. Do the results of this activity support the theory of continental drift?
	1. If so, how?
	2. Explain your answer.
3. Why is it easier to predict where an earthquake epicenter will occur than it is to predict when it will occur?
	1. Explain.
4. The Richter scale describes how much energy an earthquake releases. With every increase of 1.0 on the scale, 32 times more energy is released. How many times more energy would be released by a quake measuring 2.0 more units on the Richter scale?
5. Why do you think the area around the Pacific Plate is called the Pacific Ring of Fire?
6. The Hawaiian Islands have formed as the Pacific Plate moves northwestward over a hot spot of Earth’s interior that provides magma to form several volcanoes. Explain what could happen if the Pacific Plate continues to move.
7. How can volcano eruptions be predicted?