

Approximately 10% of the world’s 1,500 geologically recent volcanoes are located in the United States. The United States ranks third in number of volcanoes with a history of recent eruptions (past 10,000 years) behind Japan and Indonesia. Recent activity has been located only west of the Rocky Mountains.

Two types of active volcanoes are found in the Western United States. Volcanoes of the Aleutian Islands and Cascade Mountains, along the Pacific Rim are completely different than those of the Hawaiian Islands, in the central Pacific. Both the Aleutian and Cascade volcanoes are formed as the North American Plate overrides an oceanic plate. These volcanoes are called composite volcanoes. They are formed in alternating layers of ash, lava, and other ejected materials fused by heat. The mountain itself is steep-sided and is the classis types of most well-known volcanoes. Eruptions are often explosive, sending ejected materials high into the atmosphere.

In contrast, the volcanoes of Hawaii have broad, relatively flat slopes. They are formed completely of lava from eruptions, and are called shield volcanoes. Shield volcanoes are the largest volcanoes on Earth. The Island of Hawaii is formed from five shield volcanoes reaching from the ocean floor (19,680 feet below sea level) to more than 13,120 feet above sea level, for a total height exceeding Mount Everest. Shield volcanoes are characterized by large volumes of lava.

Geologist James Dwight Dana, while traveling with the worldwide U.S. Exploring Expedition, recognized the chronological sequencing of island in many of the linear Pacific island chains: older to the northwest, younger to the southeast. Although the Hawaiian Islands may be the best known, they are not the only Pacific island chain to share a linear, parallel west-northwest and south-southeast trend. Thousands of miles to the south-southeast lay the Marquesas, Society, Gambier, and Cook Austral Island Chains, all with the youngest islands on the southeastern end, parallel to one another, and the Hawaiian Islands.

By examining the dates of the last known eruptions of the islands it is possible to:

1. Determine the direction of motion of the Pacific Plate over the hot spot
2. Determine the velocity of the plate as it moves over the hot spot, and
3. Make a prediction about when the next island may appear at the southeast end of the chain.

**Materials**

Figure 2.9 (A-C)

Table 2.6

Calculator

Protractor

Scissors

Tape

**Procedure**

1. Cut off the edges of Figure 2.9 (A-C). Tap all three sections together to make a continuous map. This is a map of Hawaii Island Chain, from Loihi Seamount southeast of the Island of Hawaii, to Kanmu Seamount on the west-northwest end.
2. Table 2.6 lists the location and names of various islands and seamount in the Hawaiian Island Chain, and times of the last known eruptions in millions of years.

**What conclusions can you draw from this data?**

**In which direction do the islands get younger?**

**Are the eruptions over, or are they likely to continue?**

**Where would the new eruptions occur?**

1. Using the data in Table 2.6 and Figure 2.9, you need to do the following:
   1. Locate and label the islands and seamounts on the map.
   2. Measure the distance between a given island and the Loihi Seamount in kilometers and fill it in on Table 2.6.
   3. Calculate the plate movement in centimeters per year using the date of the recent eruption as the time the island was over the hot spot and the measured distance. Use the following formula:

Distance from Loihi Seamount (in km) = velocity of plate movement

Date of most recent eruption (millions of years)

1. Convert the kilometers to centimeter and millions of yeas to determine the answer in centimeters per year. Complete the calculations for all islands and seamounts in Table 2.6.
2. **What are possible sources of error in our calculations?**
3. **What will the Hawaiian Island Chain look like in 10 million years?**