



Reading 6.2 – Is a Hotspot Lurking beneath the Continental United States?

Getting Ready

Today, you learned about hotspots. There are not many locations on Earth where hotspots have been found. Using what you have learned this far, do you think it is likely that a major volcanic eruption will occur on the mainland of the United States? Explain your ideas.



Yellowstone National Park

Yellowstone National Park, the first national park in the United States, is located in the northwest corner of Wyoming. It is home to a fascinating array of geologic wonders: geysers that shoot steam and water high into the air, brightly colored pools of water, and ponds of mud that bubble continuously. Each of these aspects of Yellowstone points to something beneath the surface, something hot, something that cannot be seen, but we know it is there because of what it causes on Earth—the Yellowstone Hotspot.

In class today, you simulated a type of volcanic eruption in a beaker using red wax, sand, and water.

What led to the eruption in your beaker?



The eruption occurred because of heating from below. You could see that your beaker was being heated because it was not hidden. However, in the earth it is an entirely different story. The core of the earth (the center) is very hot. It is so hot that some areas of the core are composed of liquid metal. You have learned that thermal energy can be transferred from one material to another. This happens continuously in the earth as energy is transferred from the core to the other layers deep within the earth. Eventually, that heat is transferred all the way out toward the more shallow parts of the earth that are closer to the surface where humans live and breathe.

Sometimes, thermal energy is not transferred equally in all places. Scientists do not really understand why this happens yet, but when this occurs, hotspots form. These are places in the earth's mantle that are much hotter than their surroundings. These hotspots tend to stay in one place. In other words, they remain fixed at one location in the interior of the earth.

You know that not everything on Earth is fixed. You have been studying how plates can slide around on the surface of the earth as rigid slabs of rock. This happens very slowly, as plates have been found to move only a few inches each year. The presence of a hotspot can be

determined by collecting evidence. Volcanoes, often in a linear pattern or in rows, provide visible evidence of hotspots. These volcanoes differ in age from old to young, as a plate moves over the stationary hotspot. This leads to volcanic eruptions and the formation of mountains. You observed the famous Hawaiian Islands on the Driving Question Board in class and noticed the chain of islands. The biggest island is currently volcanically active, which is evidence that the hotspot is located directly below this island.

What is happening on the mainland U.S.? Scientists have found interesting evidence that points to the presence of a hotspot under the Yellowstone area. When volcanoes erupt, they spew out large quantities of molten rock and ash, which settle on the surface of the earth and can even cover the land. Evidence suggests that this hotspot has been around for approximately 17 million years and is responsible for burying many states (Washington, Oregon, California, Nevada, and Idaho) with huge volumes of lava.

As the North American plate has moved throughout Earth's history, evidence has been accumulating in the northwest. A *caldera* is a volcanic feature that is formed when a volcano collapses, leaving a crater or depression in the earth's surface. A string of calderas has been found in a line, pointing straight to Yellowstone National Park. The ages of the lava rock found at each caldera tells geologists when those calderas formed. The farthest caldera is the oldest, and the youngest is the one closest to the park. There is so much activity under this area of the United States, that the entire region is raised slightly, forming a plateau.

What does this evidence mean? The geologic features related to heat (geysers, hydrothermal pools, and volcanic rock) suggest that the hotspot responsible for all of this is currently sitting underneath Yellowstone National Park, even though there is no apparent evidence of volcanic eruptions at the surface, just geothermal phenomena—for now. As the North American plate has slowly glided over this hotspot, it has left evidence along its path. Eventually, this hotspot will erupt again, and when it does, it will be accompanied by much rumbling and unrest within the earth in the form of earthquakes and volcanoes. Large volumes of lava will pour out of the earth, and gases and ash will be released into the atmosphere. This is likely the greatest geologic threat to the entire United States, yet we cannot even see what is causing it. The hotspot remains hidden beneath the plate.

How would a volcanic eruption on the mainland of the U.S. affect your daily life?

