Different types of lava erupt to form different types of volcanoes. The type of volcano can indicate if the eruptions will be explosive or peaceful.

Felsic lava has a lot of silicon and oxygen chains, and very little iron and magnesium. (Imagine tangled spaghetti strands.)

Mafic lava has a lot of iron and magnesium that break up the silicon and oxygen chains. (Imagine elbow macaroni.)

1) Which type of lava would be runny? mafic felsic

2) Which type of lava would be viscous (thick)? mafic felsic

Below are two simplified profiles of volcanoes. The profile of a volcano can give us a clue if it is built from thick, viscous lava or runny lava (think about toothpaste vs. honey).

3) On the diagram below, write "runny" next to the volcano that is formed from runny lava and "viscous" next to the volcano that is formed from viscous lava.

4) On the diagram below, write "mafic" next to the volcano that is formed from mafic lava, and "felsic" next to the volcano that is formed from felsic lava.

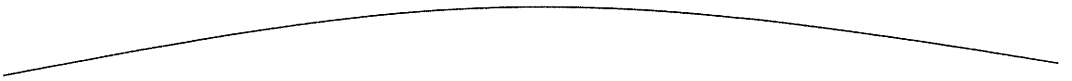
The igneous rock rhyolite is formed from felsic lava, which is why it is light in color. The igneous rock basalt is formed from mafic lava, which is why it is dark in color.

5) On the diagram below, write "rhyolite" next to the volcano composed of rhyolite, and "basalt" next to the volcano composed of basalt.

Volcanoes will erupt explosively if the gasses in the lava cannot easily escape. Runnier lava will allow the gas to bubble out peacefully, so there is no explosion. However, viscous lava will not allow the gas to escape, so the pressure builds until an explosion releases the gas.

6) Which type of lava will easily let gasses escape? felsic lava mafic lava

7) Write "explosive" next to the volcano that would erupt explosively and "peaceful" next to the volcano that will erupt peacefully.



Shield volcano

Composite volcano

Not to scale

8) Based on the type of eruption, which volcano would you rather live next to—a shield volcano or composite volcano? Explain your answer.

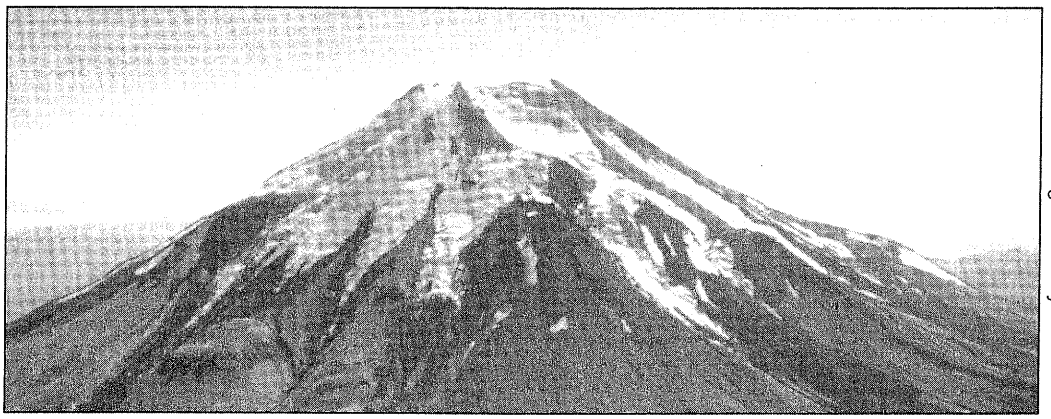
9) Two students are debating which volcano they would rather live next to.

Student 1: *I would prefer to live next to a composite volcano because the lava is so thick and viscous that they don't have long lava flows. The lava flows will slow down and stop before they get to my house.*

Student 2: *But, composite volcanoes have explosions that can't be predicted, so they are more dangerous than runny lava. I would prefer to live next to a shield volcano, where the runny lava flows in predictable patterns.*

With which of these students do you agree? Why?

10) The photograph below is of a volcano in the United States. What can you determine about the volcano based on the picture (e.g., type of volcano, lava, rock, eruption...)?

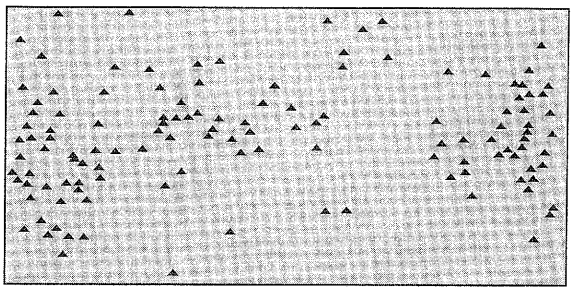


Hoblitt/U.S. Geological Survey

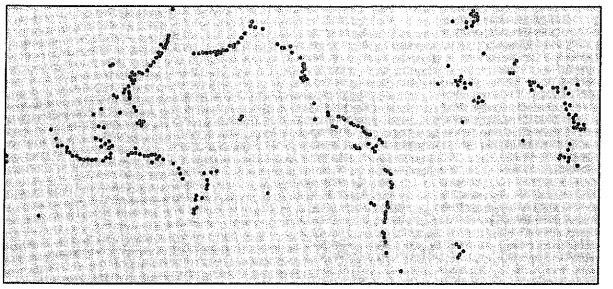
Part 1: Observing Volcano Distribution

When a scientist makes a discovery, it helps to have as many different sources of information as possible confirm that discovery. Here we will look at two ways to determine the types of volcanoes on other planets.

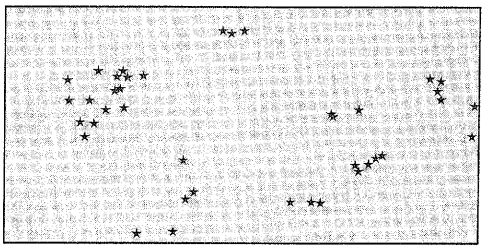
1) Examine the maps of volcanoes on Mars, Venus, and Earth. Take one minute to determine if there is a clear pattern in the location of volcanoes on each planet, or if they are distributed in random groups. If there is a pattern, describe what kind of pattern you see.



Volcanoes on Venus (triangles)



Volcanoes on Earth (dots)



Volcanoes on Mars (stars)

Part 2: Analysis

Volcanoes form either at randomly distributed hotspots or lined up along tectonic plate boundaries. A single planet might have both types of volcanoes.

2) Why do the volcanoes on Earth form where they do? hot spots plate tectonics

Explain how your answer is related to your observations about the maps.

3) Why do the volcanoes on Venus form where they do? hot spots plate tectonics

Explain how your answer is related to your observations about the maps.

4) Why did the volcanoes on Mars form where they did? hot spots plate tectonics

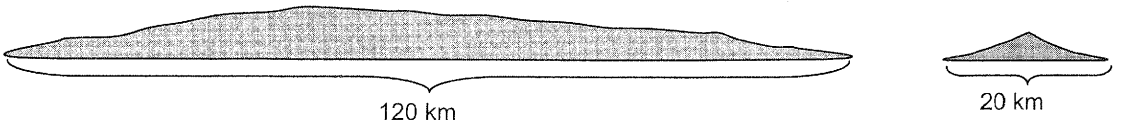
Explain how your answer is related to your observations about the maps.

5) Which planet(s) has/have plate tectonics? Venus Earth Mars

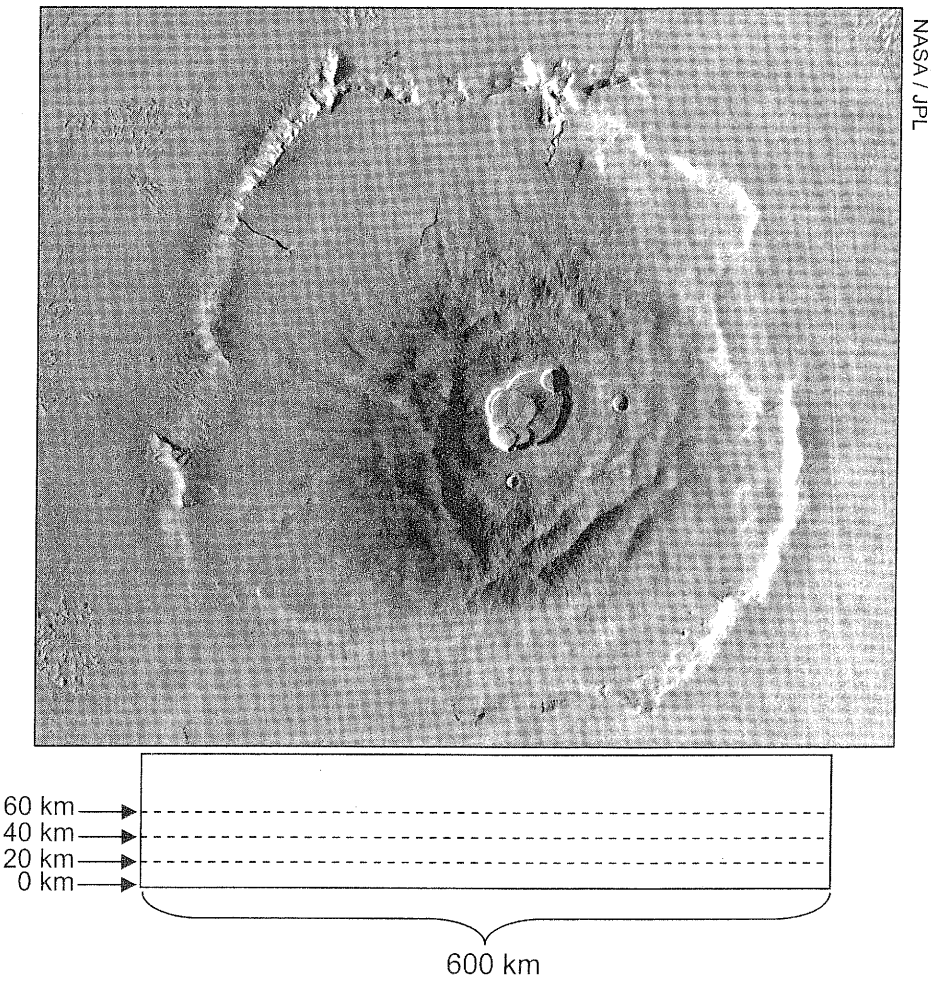
Part 3: Comparing Individual Volcanoes

Another way to determine the cause of volcanoes on other planets is to compare the two types of volcanoes on Earth with volcanoes on other planets. Composite volcanoes (e.g., Mount St. Helens) usually form at plate tectonic boundaries and have steep slopes; shield volcanoes (e.g., Hawaii) usually form at hot spots and have gentle slopes.

6) Look at the profile of volcanoes on Earth drawn to scale. Label each volcano as "composite volcano" or "shield volcano" and indicate if the volcano formed at a hot spot or plate tectonic boundary.



Below is a satellite image of Olympus Mons, an example of a volcano on Mars. This volcano is approximately 25 km tall and 600 km wide. It is possible to use satellite information to create a profile like those of Earth shown above.



7) Use the information about the height and width of the volcano to sketch the profile of this volcano (like those of volcanoes on Earth shown in Question 6) on the graph above.

8) Based on the profiles, is the volcano on Mars a composite volcano or a shield volcano? Explain.

9) Based on the profiles, why did the volcanoes on Mars form? hot spots plate tectonics

Explain how your answer is related to the profile and type of volcano.

You used two methods to determine the type and origin of volcanoes found on Mars: the distribution of volcanoes to determine the likely source of volcanism, and the profile of an individual volcano.

10) Do your two data sets agree? If they do not agree, what might cause the difference?

11) Why is it helpful for a scientist to have two or more different data sets when giving evidence to support a discovery?