

LAVA LAYERING

(Teacher Page)

Target Level: Elementary through middle school

Purpose: To learn about the stratigraphy (layers) of lava flows produced by multiple eruptions.

Background: Dark, flat maria (layers of basaltic lava flows) cover about 16 percent of the Moon's total surface. They are easily seen on a full Moon with the naked eye on clear nights from most backyards. The maria, quite similar to Earth's basalts, generally flowed long distances and flood low-lying areas such as the floors of big craters. Yet, the eruption sources for most of the lava flows on the Moon are difficult to find because they were buried by younger flows.

Generally, the overall slope of the land and local features such as small cliffs and depressions, influence the path of lava flows. Maps of the Moon show complicated lava flows, some in layers. The study of rock layers is called stratigraphy.

On the Moon, many older flows are covered by younger flows and become more pocked with impact craters. On Earth, old lava flows are usually more eroded and have more vegetation than young flows. Field geologists use differences in roughness, color, and chemistry to further differentiate between lava flows. They also follow the flow margins, channels, and levees to try to trace lava flows back to the source area.

Activity: This activity examines the patterns of lava flows produced by multiple eruptions. We use a short cup to hold the baking soda because we are looking at the flows and not at constructing a volcano model. Volcanoes, like those so familiar to us on Earth, are not present on the Moon. Three volcanic areas on the Moon include: the Aristarchus plateau, Marius Hills, and Rumker Hills.

Preparation: A baking soda-vinegar mixture and playdough are used to model lava flows. Different colors identify different eruptions. Students will be asked to observe where the flows traveled and to interpret the stratigraphy. Cover the work area and be prepared for spills!

In Class: This activity can be done individually or in teams. Making a vertical cut through the flow reveals the stratigraphy of the section.

Wrap-Up: Have students compare their layered lava patterns of their classmates' patterns. Did they recognize individual flows by color and outline? Point out how the oldest flow is on the bottom of the stack. Each succeeding flow covers older flows. The youngest flow is on top.

LAVA LAYERING

(Student Sheet)

Purpose: To learn about the layers of lava flows formed by more than one eruption.

Vocabulary: eruption, source, stratigraphy

Materials: paper cups (4 oz. size, some cut down to a height of 2.5 cm); cafeteria tray or cookie sheet (1 for each eruption source); tape; tablespoon; baking soda; vinegar; food coloring, 4 colors; playdough or clay in the same 4 colors as the food coloring; soda straws; tooth picks; plastic knives or something to cut playdough with (i.e. cardboard).

Procedure:

1. To save time, Teacher can make volcanoes with two (2) lava flows using steps 3 through 8 below.
2. Students should then examine the existing lava flows. Draw a model of the flows and observe their relative ages and characteristics of the flows.
 3. Place one tablespoon of baking soda in the cut down cup .
 4. Fill 2 tall paper cups each with 1/8 cup of vinegar.
5. To each paper cup of vinegar add 3 drops of food coloring; make each cup a different color. Set them aside.
6. You are now ready to create an eruption. Pour red-colored vinegar into your source cup and watch the eruption of "lava."
 7. Use red playdough to cover the areas where red "lava" flowed.
8. Repeat steps 5 and 6 for each color of vinegar and playdough. You may add fresh baking soda to the source cup or spoon out excess vinegar from the source cup as needed.
 9. Trade your volcano for another groups' volcano.
10. Using the straws and tooth picks to cut-out core samples from the lava flows. Try to determine the relative ages of the flows.

Results:

(Volcano #1)

1. After the four eruptions, can you still see the original land surface (tray)? Where?
2. Describe what you see and include observations of flows covering or overlapping other flows. Make a sketch.
 3. Where is the oldest flow?
 4. Where is the youngest flow?
 5. Did the flows always follow the same path? (be specific)
 6. What do you think influences the path direction of lava flows?

(Volcano #2)

7. Since you have not watched the eruptions, how would you know that there are many different layers of lava? Give at least 2 reasons.
8. Which of the reasons listed in answer 7 could be used to identify real lava layers on Earth?
9. What are other ways to distinguish between older and younger layered lava flows on Earth?
10. Which of the reasons listed in answer 9 could be used to identify lava layers on the Moon?
11. What are other ways to distinguish between older and younger layered lava flows on the Moon?
12. Make a vertical cut through an area of overlapping playdough "lava" layers. Draw what you see in the vertical section. Color your sketch and add these labels: oldest flow, youngest flow.