Teacher's Notes

Violent Volcanoes

This activity lets pupils investigate how and why volcanoes erupt with a fun, hands on, practical experiment.

Level: NI: Key stage 2
ROI: 3, 4, and 5th class

Time required: 15/20mins activity, plus 5/10 mins set up

Curriculum links: This experiment links with the National Curriculums of Northern Ireland (The World Around Us) and Ireland (Geography, History and Science)

Northern Ireland	**Ireland**
Change Over Time: **Ways in which change occurs over both short and long periods of time in the physical and natural world (KS2):** How the world has changed over time; How some materials can change or decay while others do not, such as fossil formation **How change is a feature of the human and natural world and may have consequences for our lives and the world around us (KS2):** comparing an aspect of the community over a long period of time; Some of the characteristics of past societies and distinctive features of life in the past.	**Geography - Natural Environments:** The local natural environment; Land, rivers, and seas of my county; Rocks and Soils; Weather, climate and atmosphere
Place: Features of, and variations in places, including physical, human, climatic, vegetation and animal life (KS2): Places then and now	**History - Local Studies:** Buildings, sites or ruins in my locality; My locality through the ages; Continuity and change in the local environment;
Interdependence: The effect of people on the natural and built	**Science – Living Things:** Human life; Plant and animal life

environment over time (KS2): Ways in which the use of natural resources through time has affected the local and global environment; Local habitats; Ways in which the use of natural resources through time has affected the local environment	

Learning Objectives:

- To learn about Ireland's history of volcanoes and how they have created the current landscape
- To learn about past and current volcanoes, and human's interactions with them
- To learn about the science behind a volcanic eruption through the build up of pressure and release of gasses
- To learn about the different types of volcanoes, and the three different states of volcanoes
- To investigate the creation of gasses, in particular Carbon Dioxide

Prior Knowledge:

Pupils should be familiar with the following terms and concepts:

- The Earth's structure, crust, mantle and core
- The crust being divided into tectonic plates
- Fault lines between tectonic plates
- Gasses including carbon dioxide

Background Information

What is a volcano?

A volcano is the general term given to an opening in the Earth's crust which allows lava, volcanic ash and gases to escape from a magma chamber beneath the surface.

The name volcano comes from the volcanic island of Vulcano, part of the Aeolian Islands of Italy. Vulcano was in turn named after Vulcan, the Roman god of fire.

Generally volcanoes are classed as being extinct, dormant or active. An extinct volcano is one that is unlikely ever to erupt again. A dormant volcano is one that there is no written record of any eruptions. An active volcano is given as being any that has erupted in written record.

Are there different types of volcanoes?

When we think of volcanoes we tend to get a picture in our head of a cone shaped mountain, spewing lava and gas into the surrounding area. Whilst this is a good example, it is just one of many different types of volcano. Below are listed a number of different volcano types:

1. **Stratovolcano:** Tall conical mountains composed of lava flows and other volcanic materials in alternate layers. Classic examples include Mount Fuji in Japan and Mount Vesuvius in Italy.
2. **Shield volcano:** So called because of their shield-like profile, shield volcanoes form from runny (low viscosity) lava. The Hawaiian island chain is a series of shield volcanoes.
3. **Fissure vent:** A flat, linear crack through which lava emerges. Classic examples include numerous fissure eruptions on the island of Iceland.

Where do we find volcanoes?

Volcanoes are generally, but not exclusively found at tectonic plate boundaries (see plate boundary map). All of these plates are moving, albeit very slowly, and depending on how these plates move, volcanoes may occur.

1. **Divergent plate boundaries:** this is where two (or more) plates are moving away from each other. As the plates spread apart, lava erupts through the fissure created and as it cools and hardens, new rock is formed.
2. **Convergent plate boundaries:** this is where two (or more) plates collide and one is pushed beneath the other (or subducted) and forms a subduction zone. As the subducted plate descends into the Earth, it is melted and turns into magma, which then ascends back to the surface and forms a volcano.
3. **Hot spots:** these do not form at plate boundaries, but instead as a rising column of molten material that arises from deep within the Earth, known as a

mantle plume. The position of the mantle plume remains constant but the tectonic plates continue to move across this hot spot, often leaving a trail of 'islands' known as a volcanic chain.

Are there any volcanoes in Ireland?

There are no active volcanoes in Ireland as it is simply not close to any plate boundaries or hot spots. However, this was not always the case as Ireland's position on the globe has changed drastically throughout geological time. Listed below are a number of volcanoes and volcanically-related sites throughout Ireland.

Croghan Hill, Co. Offally: This is the remains of an extinct volcano that would have erupted over 300 million years ago. At that time Ireland would have been on the edge of a tectonic plate so volcanic activity was common (see the reference to the Border Uplands area below).

Antrim Coast: There are a number of extinct volcanoes and examples of volcanic activity all the way around the Antrim Coast with the best known example being the Giant's Causeway that formed as a fissure eruption about 60 million years ago. Other examples of sites that formed as a result of volcanic activity include Carrick-a-Rede, Slemish Mountain (an ancient volcanic plug) and Scawt Hill.

Loch na Fooey, Co. Galway: On the shores of Loch na Fooey there are some excellent examples of pillow lavas that would have erupted under water causing them to cool upon contact with the water and lava would have gathered in the 'pillow' behind. This would have originated from a volcano that erupted 490 million years ago.

Copper Coast Geopark, Co. Waterford: Around the same time as the volcanic eruption in Co. Galway, there were eruptions in the area that we now know as Co. Waterford. These eruptions would have also been on the sea floor and as the sea water mixed with lava, the chemical reactions resulted in the formation of copper. It is from this copper that the Copper Coast Geopark takes its name.

Are there any examples in the Geopark area?

Unfortunately there are no good examples of volcanic activity in the Geopark area. However, there are a few thin layers of a material called bentonite exposed in the rocks of Cuilcagh Mountain. This is a type of clay-mineral that forms as a result of volcanic ash fall out. As it is formed within rocks that are about 320 million years old, we can assume that a volcano was erupting at the same time. As we know from the Icelandic volcano ash cloud, volcanic ash can travel for many thousands of kilometres so it may have travelled to here from very far away. But geologists believe

that the ash came from Co. Tyrone as there are lavas of the same age found in and around the Clogher Valley.

Violent Volcanoes - Experiment

Aims: Create a volcano and get it to erupt violently

What You'll Need

6 cups of flour
2 cups of salt
4 tbsp cooking oil
2 cups of water
A large bowl or basin
Small empty soft drink bottle (250ml capacity is best)
Warm water
Red food colouring
Washing up liquid
2 tbsp bicarbonate soda
1 cup of white vinegar

Instructions

1. First make the cone of the volcano. Mix the flour, salt, cooking oil, and 2 cups of water. The resulting mixture should be smooth and firm (more water may be added if needed).
2. Stand the small bottle on a table (a tray can be used) mold the dough around it into a volcano shape. Don't cover the hole or drop dough in the bottle.
3. Fill the bottle about 2/3 full with warm water and add a bit of red food colouring.
4. Add 6 drops of washing up liquid to the bottle contents.
5. Add the bicarbonate of soda to the liquid.
6. Slowly pour vinegar into the bottle and watch your volcano erupt!

What's happening?

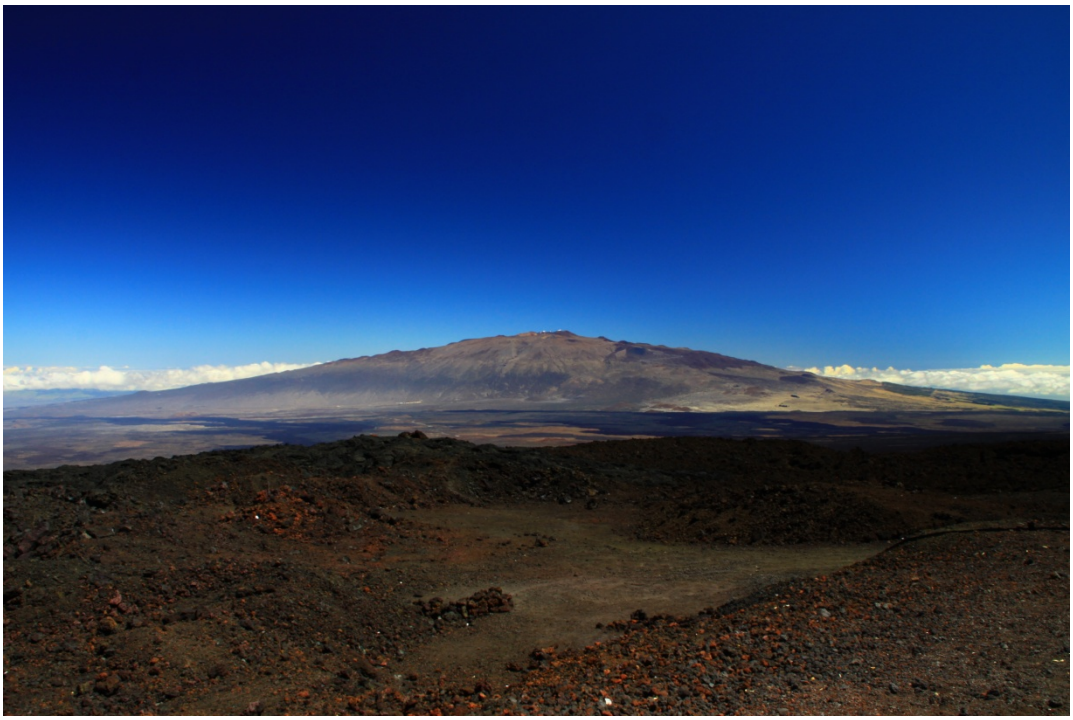
The cool red 'lava' is the result of a chemical reaction between the bicarbonate of soda and the vinegar. In this reaction, carbon dioxide is produced, also present in real volcanoes. As the carbon dioxide is produced, pressure builds up inside the plastic bottle, until the gas bubbles out of the volcano.

Violent volcanoes

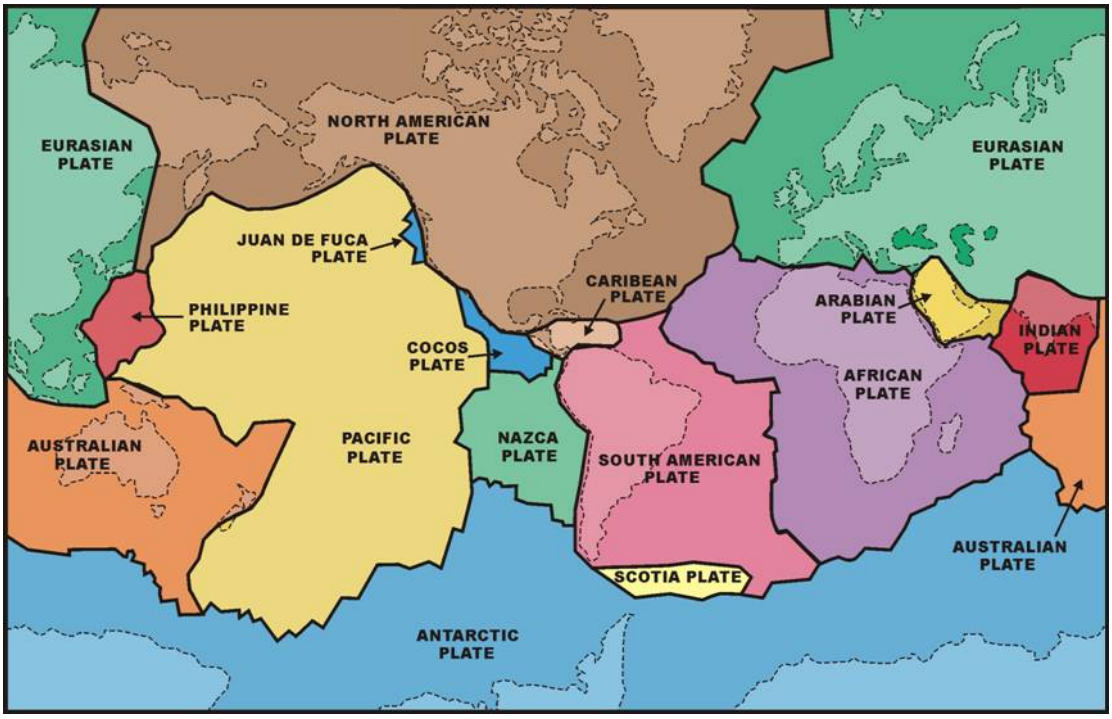
Really violent volcanoes are caused by gas bubbles, as in your own volcano. When molten rock is trapped underground, high pressure keeps gases dissolved inside it. But if the lava breaks through the surface, the pressure suddenly drops and the gas forms bubbles, pushing up the lava like a fizzy drink exploding from a bottle.

Resources

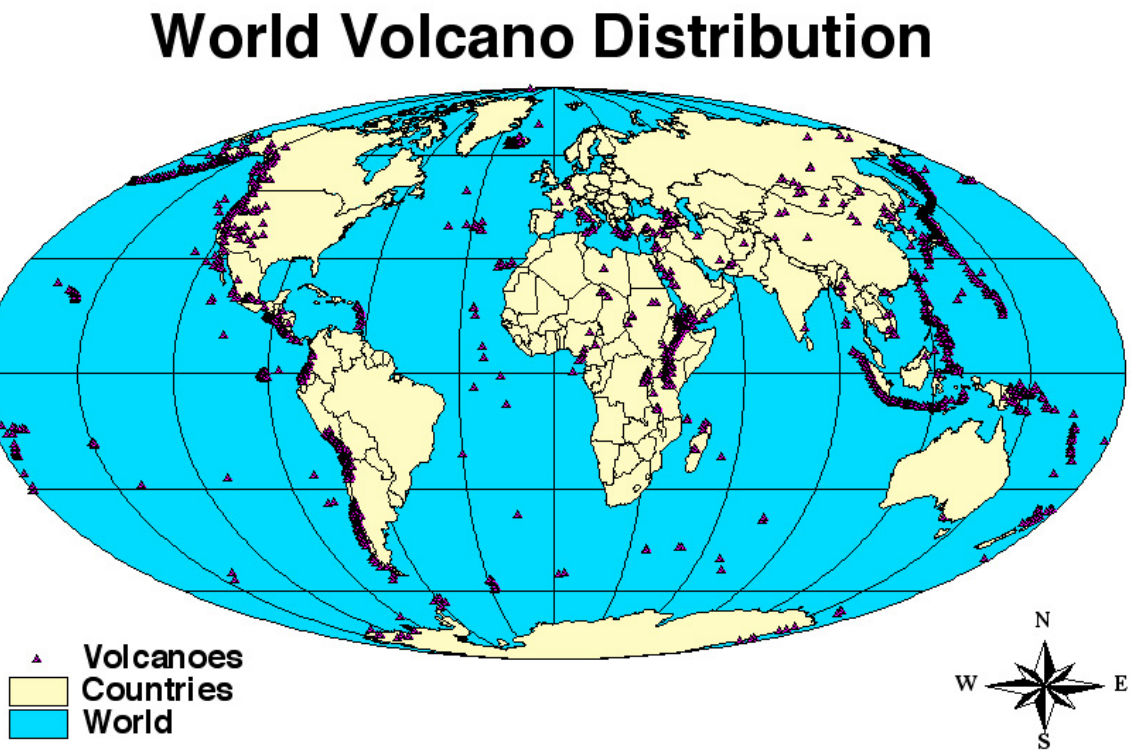
Mt Fuji, Japan – an example of a Stratovolcano



Mauna Kea, Hawaii – an example of a shield volcano



Map of tectonic plates



Map of volcano distribution across the world