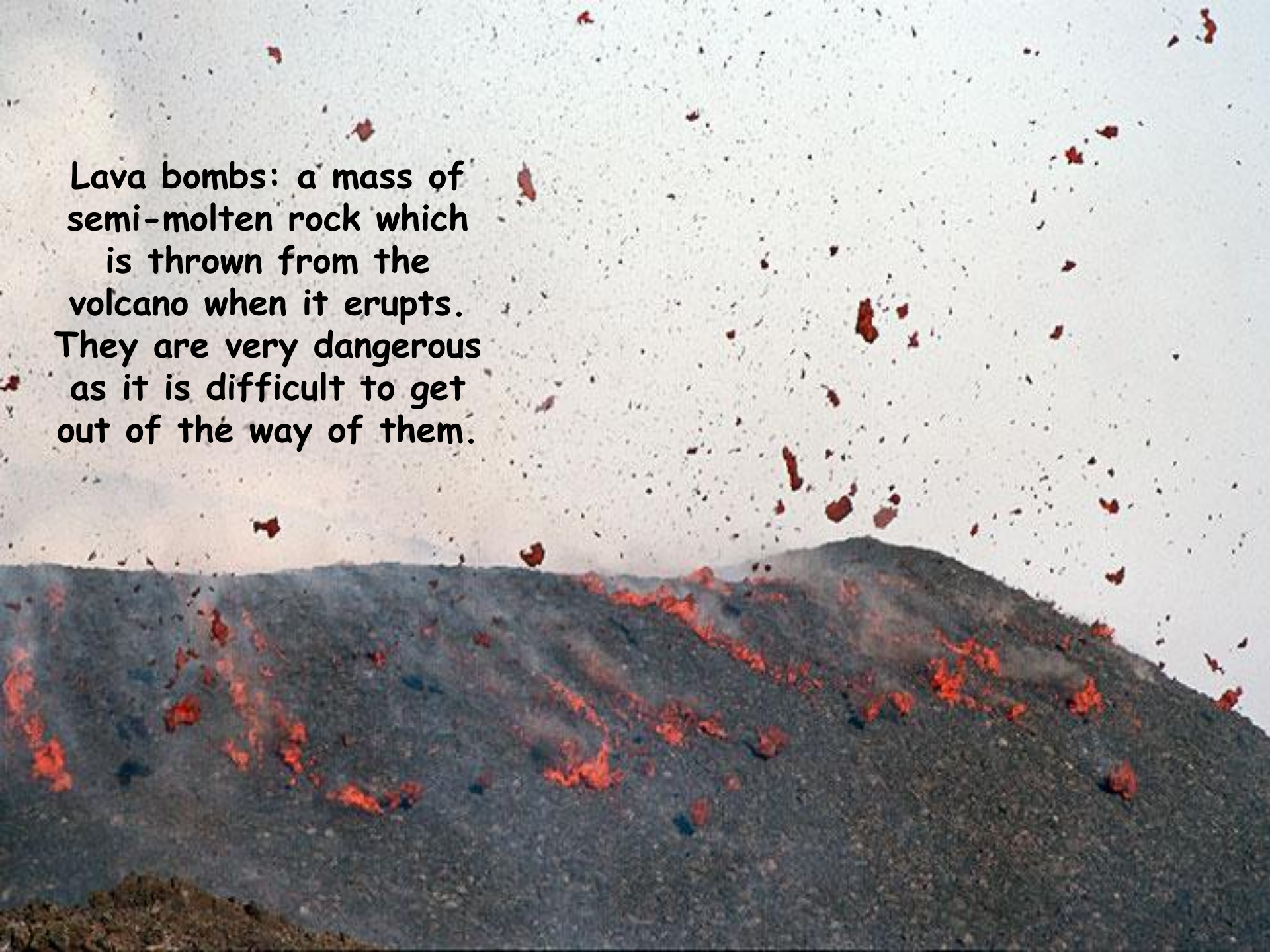
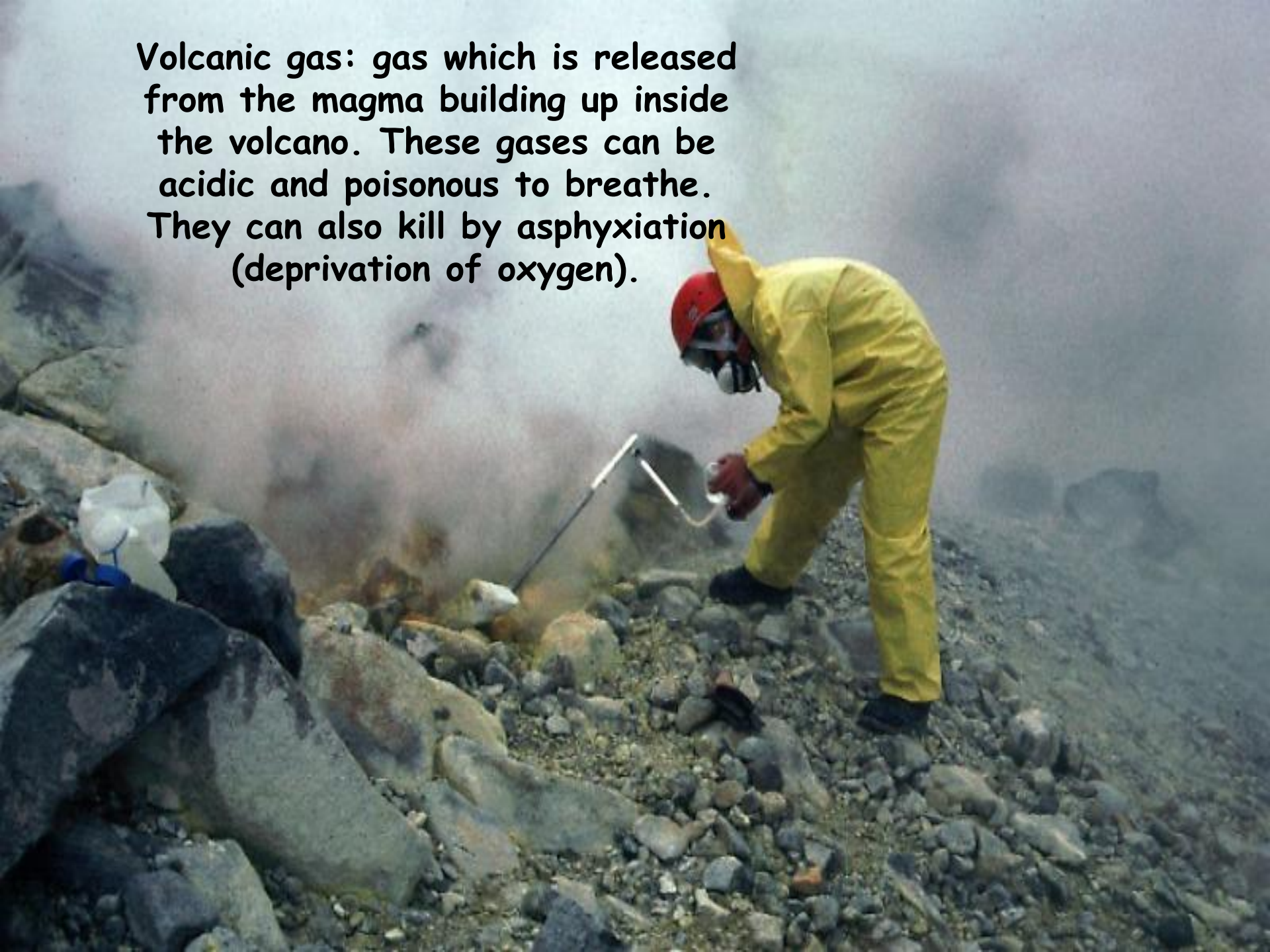
Volcanic Eruptions:

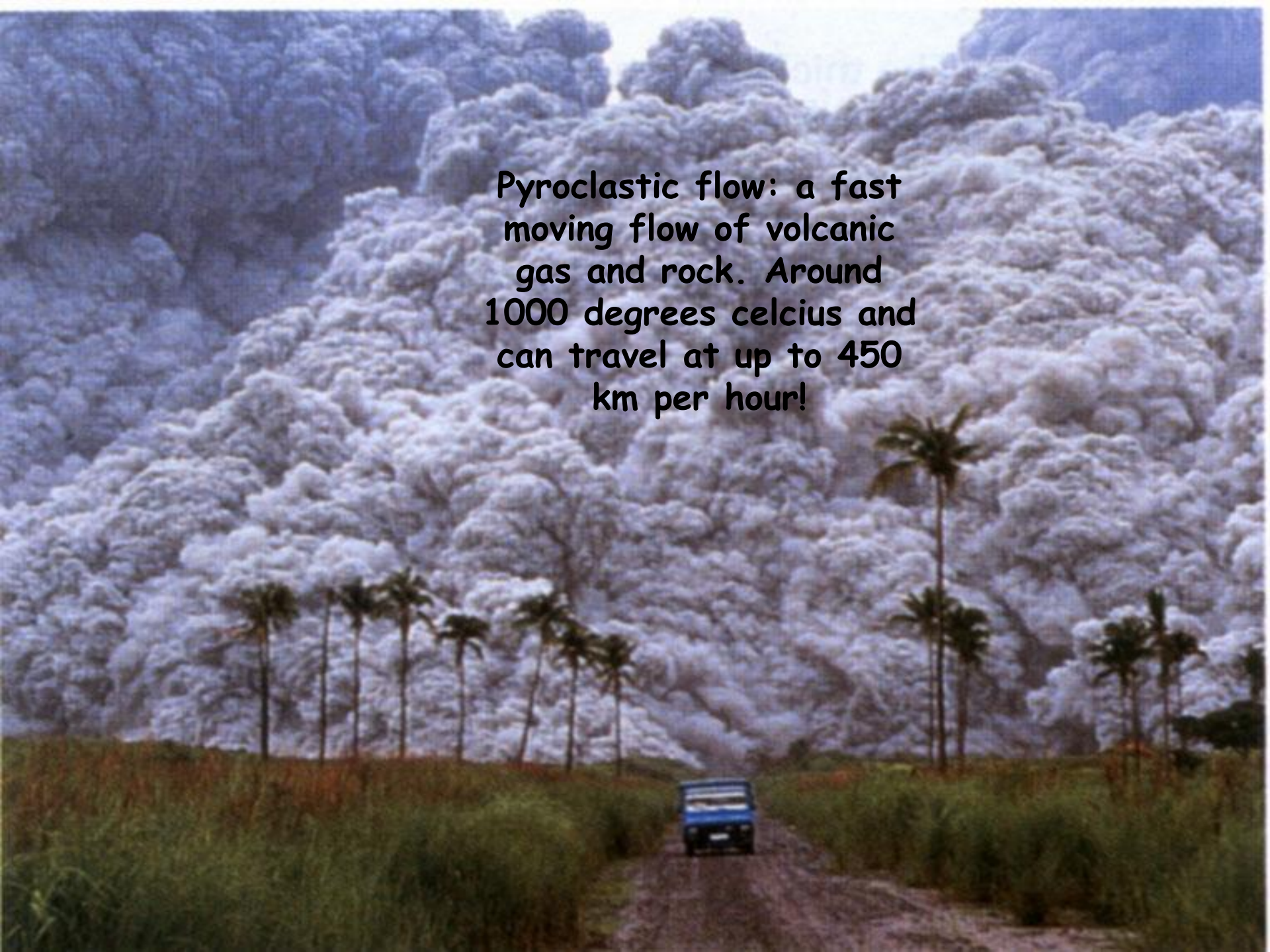
Lava: the molten (liquid) rock which erupts from a volcano. Previous to an eruption it is called magma. It ranges from 700 – 1200 degrees celcius. It can flow for huge distances before cooling down to the point where it solidifies.

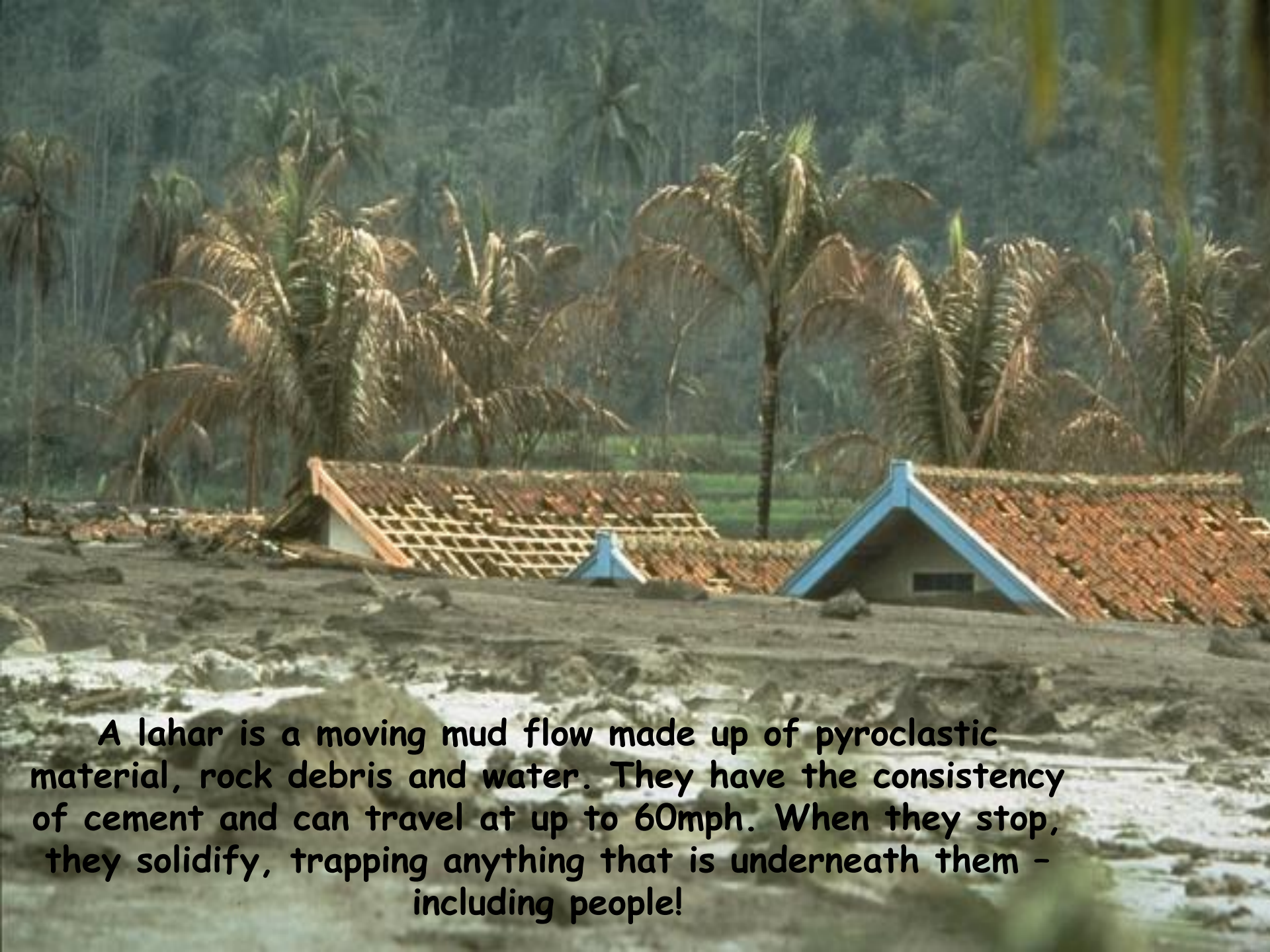

Lava bombs: a mass of semi-molten rock which is thrown from the volcano when it erupts. They are very dangerous as it is difficult to get out of the way of them.

Volcanic ash: made up of tiny pieces of pulverised rock from the magma and the vent of the volcano mixed with the steam of the eruption.



Volcanic gas: gas which is released from the magma building up inside the volcano. These gases can be acidic and poisonous to breathe. They can also kill by asphyxiation (deprivation of oxygen).

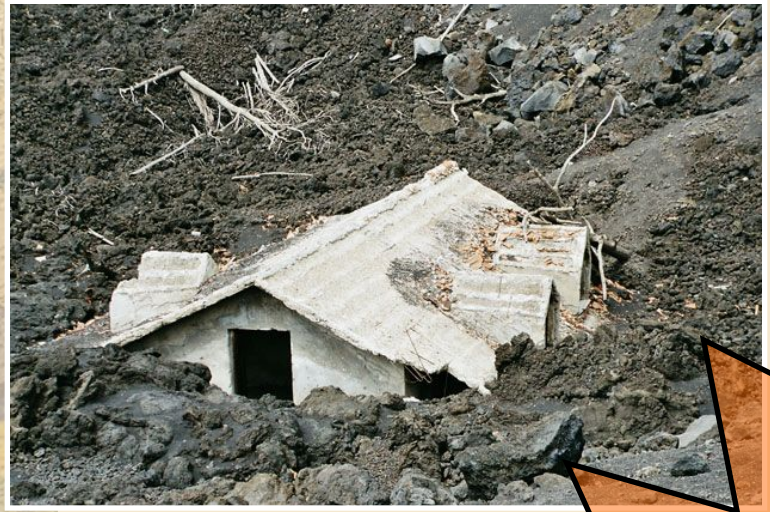

Pyroclastic flow: a fast moving flow of volcanic gas and rock. Around 1000 degrees celcius and can travel at up to 450 km per hour!



A lahar is a moving mud flow made up of pyroclastic material, rock debris and water. They have the consistency of cement and can travel at up to 60mph. When they stop, they solidify, trapping anything that is underneath them – including people!

Living with Volcanoes

Vesuvius, painted by Johan Dahl, 1826



Lava from Mt Etna, Italy swamps a house.

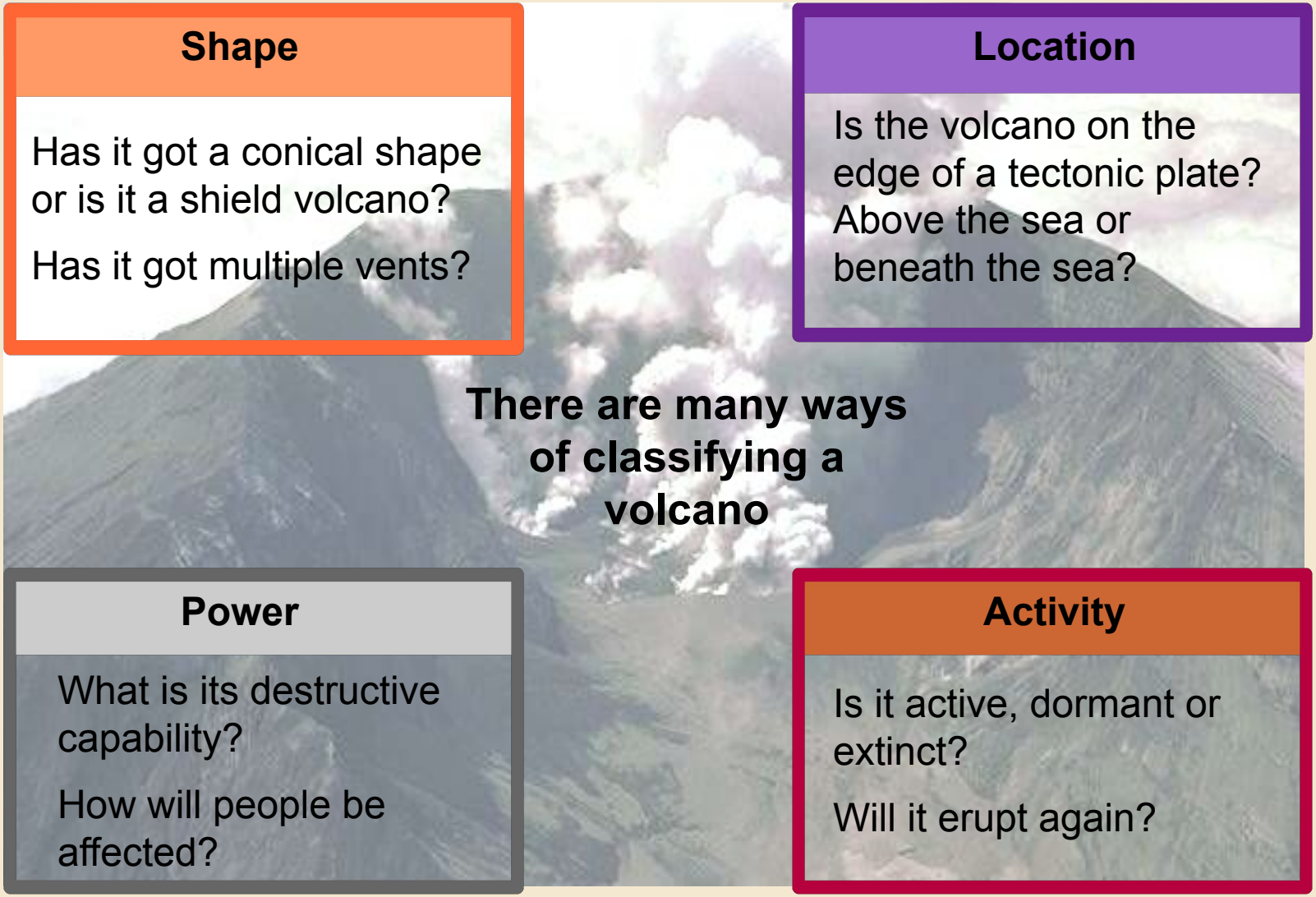
An undersea eruption off the Reunion Islands

Volcanoes are one of the most destructives forces in nature to affect mankind.

Volcanoes erupt ash and lava that can destroy surrounding land for several kilometres

Volcanoes dot the Indonesian landscape

Classifications of Volcanoes



There are many ways of classifying a volcano

Shape

Has it got a conical shape or is it a shield volcano?

Has it got multiple vents?

Location

Is the volcano on the edge of a tectonic plate? Above the sea or beneath the sea?

Power

What is its destructive capability?

How will people be affected?

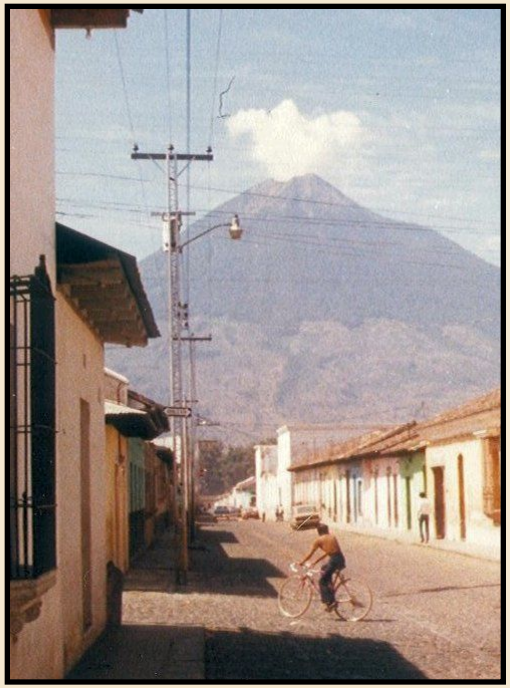
Activity

Is it active, dormant or extinct?

Will it erupt again?

Volcanoes and humans

Erupting volcanoes have not put people off living in close proximity to volcanoes and history is full of the terrible devastation that volcanoes can bring to human settlement.



Volcanoes are found all around the world, usually along the edges of tectonic plates.

Vulcan de Agua, Guatemala

Vulcan Irazu, Costa Rica

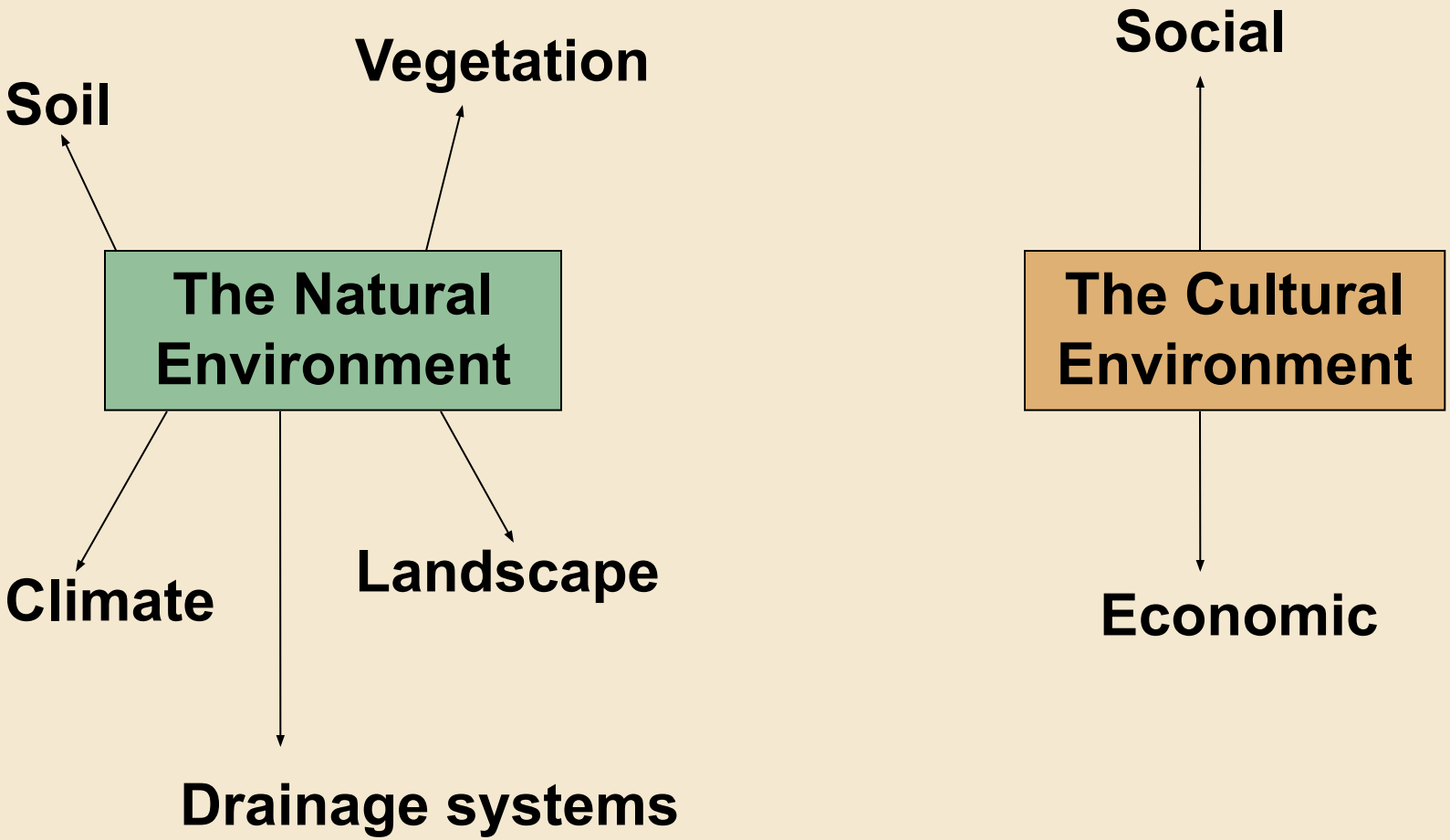
The Volcanic Hazard

Earthquakes and even tsunamis can accompany a volcanic eruption. The main volcanic hazards to directly result from an eruption are:

- The effect on the atmosphere of the emission of gases and ash.
- The effect on the landscape from the lava flows and pyroclastic rocks.

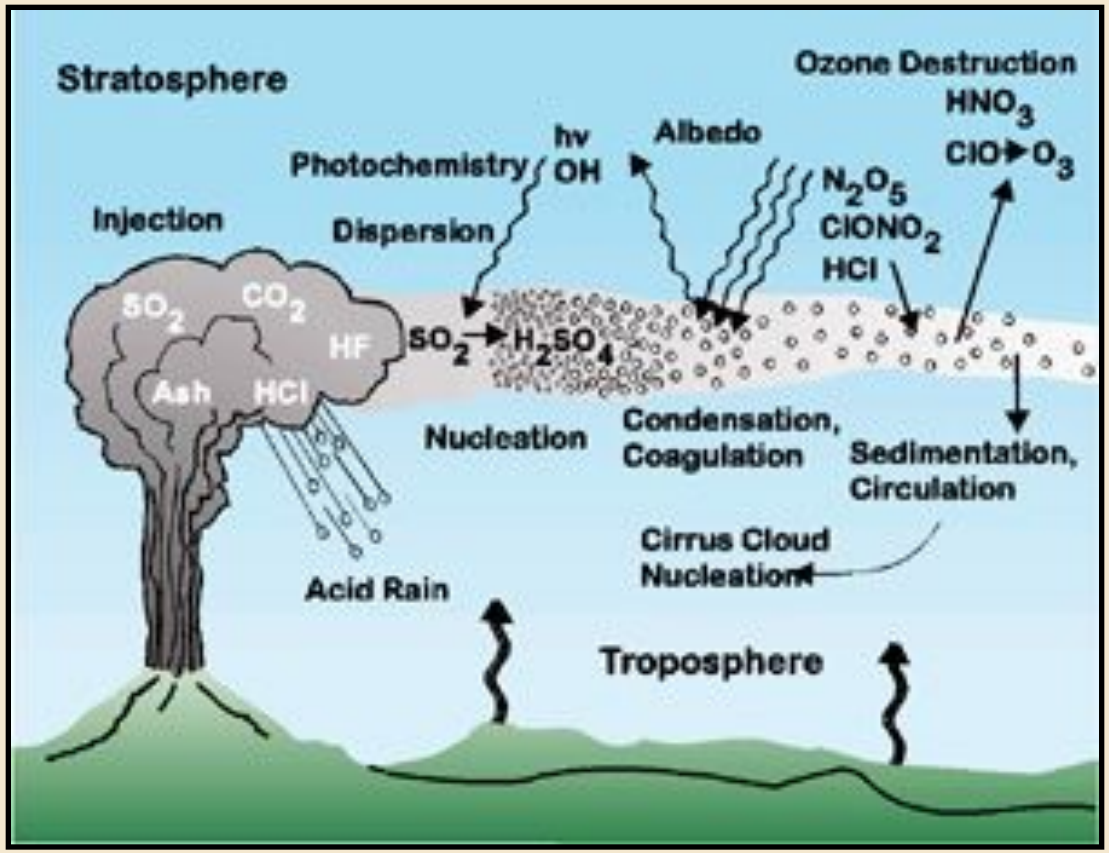
Ash fills the sky whilst a pyroclastic flow sweeps down Mayon Volcano in the Philippines. (1984)

An eruption can impact on:



The impact on the climate

Not only does an eruption affect the land surrounding the volcano, the emission of ash and noxious gases can contaminate the air for a much larger area. If the air is contaminated, the land beneath is also affected.



This complex diagram illustrates some of the gases that are emitted and their effect in the atmosphere.

The impact on the landscape

A volcanic eruption can clearly change the landscape. In Hawai'i and Iceland new islands are formed when eruptions occur.

This lava flow is coming from a rift eruption at Krafla volcano, northern Iceland, in 1984.

Other effects on the landscape

A lava flow from Mauna Loa (Hawai'i) moves across a field, completely destroying the vegetation.

A flattened forest on the slopes of Mount St. Helens in the USA. This occurred after a lateral blast from the crater in 1980.

Pyroclastic flows like this one can change the drainage pattern of the region, shifting river channels around. Mt Unzen, Japan. Note that several farms have also been adversely affected.

Land that was once fertile can become covered in hard scoria rock, on which very little can grow.

The ash plume from Mt Pinatubo, Philippines 1991.

Sweeping ash off the roof, from Spurr Volcano, Alaska 1992.

In 1996 the Montserrat Volcano in the Carribbean caused much damage, burying half the town of Plymouth in ash.

Image from Danum-Photos

The Impact on People

Living by an active volcano can be very hazardous

A house is damaged by a blast from Mount St. Helens in 1980

A lahar from Mt Ruapehu rushed down the Tangiwai River in 1953 causing a train to crash and the loss of 151 lives.

List the short and long term impacts on people that an eruption causes.

Lava flows in Hawai'i cross the road. Image by C.M. Riley.

Camping by a volcanic steam vent in Iceland.

Ash can be a major problem. In this photo you can see it blanketing a town near Mt. Pinatubo in the Philippines in 1992. Ash, when mixed with rainwater becomes very heavy. For this eruption, many deaths were caused by collapsing rooves from the ash. Image by M.T. Dolan.

Reducing the Impact of a Volcanic Eruption

Once a volcano erupts, there is not much people can really do, except evacuate the area affected.

Thus reducing the impact of an eruption usually involves a combination of the following:

1. Land Use Planning
2. Civil Defence
3. Research and monitoring
4. Building codes
5. Insurance

A volcano like Mt Ranier located north of Seattle in the USA, (pictured above) last erupted in 1854, and is in a national park. However, there is still thermal activity in the crater, and an eruption is a potential hazard.

Case Study: Mt Ranier

Fact File

Location: 87 km southeast of Seattle, Washington State, USA

Height: 4 392 m

Type: Composite Volcano

Last eruption: 1854

Hazard Status: Active with Hydrothermal activity. Lahars are considered the most potential risk factor. Glaciers and ice on top could melt and add to the lahar flows

Native American name: Tah-ho-ma

View from space.

Note the glaciers

Geologists keep an eye on Mt Ranier and it is considered a moderate volcanic risk.

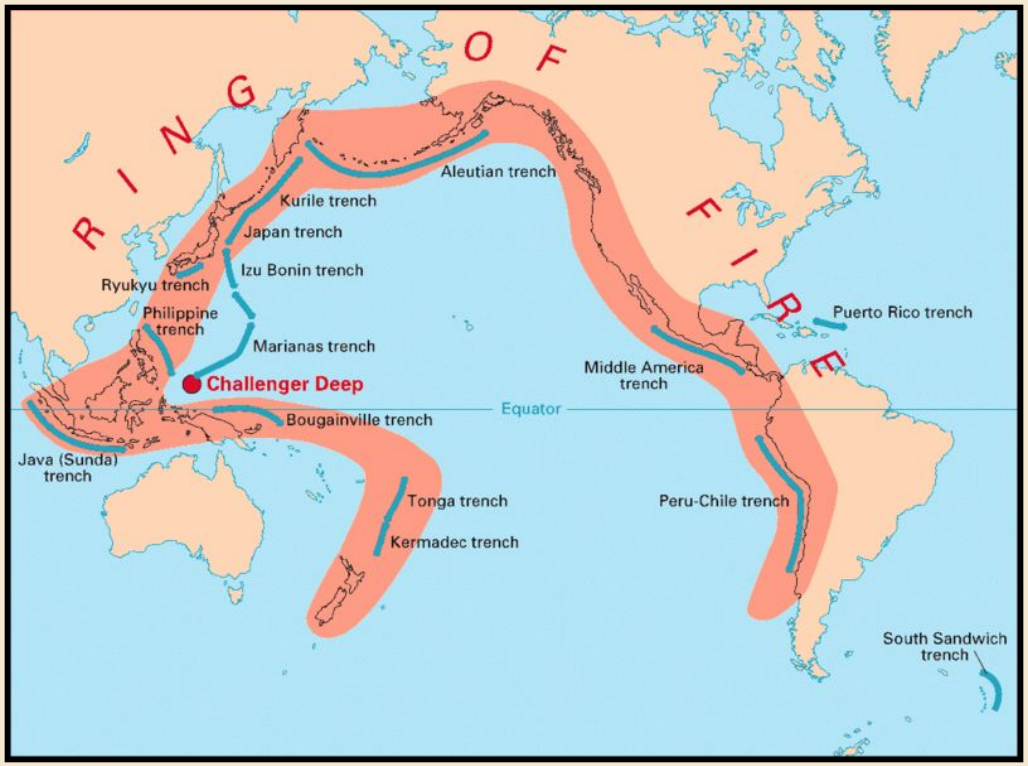
Planning to minimise disaster

The US Geological Survey produced this Hazard Identification Map which helped local authorities to have guidelines about the landuse in the area.

A volcano evacuation sign in the Mount Ranier National Park

Case Study: Indonesia

The caldera of Mount Tambora, on the island of Sumbawa, which last erupted in 1815. It is one of the world's most explosive volcanoes.



Indonesia is second only to Japan as being a volcanologist's dream. Many of its islands are volcanic, due to its location on the Pacific Rim of Fire, and they are very active. Indonesia rates volcanic eruptions as its main natural hazard affecting people.

Major Volcanoes of Indonesia

(with eruptions since 1900 A. D.)

USGS

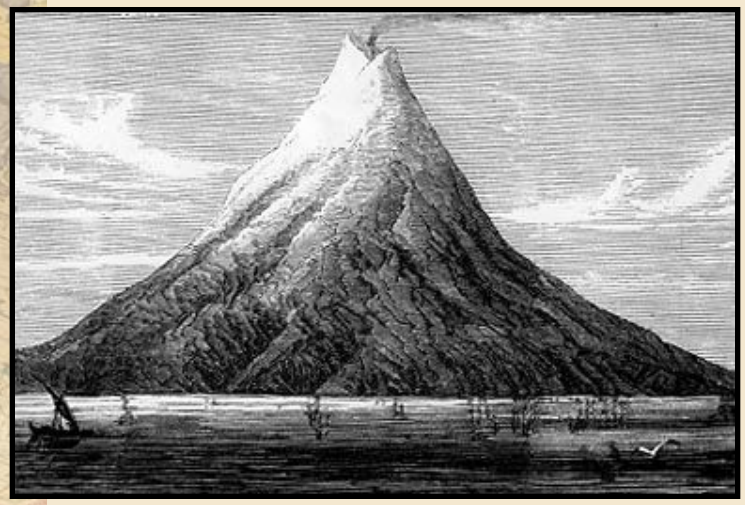
Topinka, USGS/CVO, 2001; basemap modified from: CIA map, 1997; volcanoes from: Simkin & Siebert, 1994

Indonesian Volcanoes

Mount Peuet Sague, Sumatra

Mount Kerinci, which last erupted in 2004.

A drawing of Krakatoa, which last erupted in 1883.



Mt Merapi which last erupted in 2004. Note the close proximity to settlement.

Living with volcanoes in Indonesia

With over 180 million people living in over 13 000 islands, Indonesia is very densely populated, with the island of Java being one of the most crowded places in the world.

Mix this with over 77 active volcanoes, and you have problems.

The Mount Bromo Volcano of the island of Java. The landscape looks very similar to the Central Plateau of New Zealand's North Island.

Statistically…

Indonesia has the world's highest number of active volcanoes and the highest number of eruptions producing fatalities and the greatest damage to land.

Revision

1. **Name some of the ways you can classify a volcano.**
2. **List at least 5 volcanic hazards to come from an eruption.**
3. **Describe something you have learnt about Indonesia's volcanoes.**
4. **List three ways in which the impacts of the volcanic hazard can be lessened for people.**
5. **Can you name three volcanoes from this presentation?**

Landsat image of Sakura-jima volcano, Japan. Notice how close it is to coastal settlement on the left.

Compare the volcanoes you have learnt about in this presentation with volcanoes in your country.

Living with Volcanoes

Popocatepetl, in Mexico is very active, with the latest eruption in November 2000. Image from Volcano World

Information for this PowerPoint presentation was sourced from the following:

- www.wikipedia.org
- United States Geological Survey, Volcano Hazards Program: www. volcanoes.usgs.gov
- The Global Volcanism Program of the Smithsonian National Museum of National History: /www.volcano.si.edu/world/
- Volcano World: www.volcano.und.edu/

Images are from Wikipedia unless otherwise acknowledged.