

Glossary

- Aa**
Lava with blocky, rubbly structure
- Accretionary lapilli**
Rounded balls of fine ash, commonly with a concentric structure, formed by accretion of damp ash in eruption clouds (see *lapilli*)
- Active volcano**
A volcano that is currently erupting (e.g. Montserrat) or in an ongoing eruptive phase (e.g. Kick 'em Jenny)
- Airfall (see *pyroclastic fall*)**
- Aftershocks**
A series of smaller earthquakes which may follow a large earthquake
- Agglomerate**
A **breccia** composed largely or entirely of fragments of volcanic rocks
- Alkaline/Alkali**
A term applied to **igneous rocks** in which the **feldspar** is dominantly K or Na rich
- Allochthonous**
A term used to describe rocks that are out of place, i.e. that have been transported significant distances from their original place of formation, usually by tectonic processes
- Alluvium**
A general term for sediments (clay, silt, sand, gravel, boulders etc) deposited by a stream or other body of running water. The term applies to deposits of recent time that have not been consolidated and cemented into rock
- Amphibole**
A silicate mineral common in volcanic rocks
- Andesite**
A type of volcanic rock with 55–63 wt.% SiO₂. (see also **magma**)
- Ankaramite**
A dark basaltic rock containing the minerals olivine and augite
- Aragonite**
A mineral species of calcium carbonate (CaCO₃) that makes up coral skeletons and coral sand
- Arc (see *volcanic arc*)**
- Asama style eruption**
A type of volcanic activity intermediate between a dome extrusion and an explosive eruption, in which pyroclastic flows 'boil over' the rim of a crater without forming an eruption column. Such eruptions produce semi-vesicular andesite block and ash flow and/or surge deposits
- Ash**
Volcanic ash is the fine material (< 2 mm in diameter) that is ejected from a volcano and convected upwards in the eruption column before settling out downwind to form air fall deposits
- Ash fall**
When volcanic ash settles out of an eruption column it forms ash fall. Ash falls can blanket the entire landscape for kilometres around a volcano. Close to the eruption vent, ash may be thick enough to collapse buildings and destroy vegetation
- Ballistic projectile**
A large fragment of lava (generally > 64 mm in size) that follows a ballistic trajectory when ejected from the volcano. These rocks are called 'blocks' if they were solid at the time they were fragmented and 'bombs' if they were liquid. They usually land within 2 km of the vent but can travel as far as 5 km, or even further if the eruption is very explosive
- Basalt**
A type of volcanic rock with 45–55 wt.% SiO₂. (see also **magma**)
- Basanite/Basanitoid**
A type of **alkali basalt** containing the mineral olivine
- Biotite**
A silicate mineral of the mica group common in volcanic rocks
- Block**
A large (>64 mm) fragment of angular volcanic ejecta
- Block and Ash flow**
A type of pyroclastic flow that forms when a lava dome collapses
- Bomb**
A large (>64 mm) fragment of fluidal-shaped volcanic ejecta
- BP**
Before present (used when quoting radiocarbon ages where the 'present' refers to 1952)
- Breccia**
A coarse-grained rock, composed of angular, broken rock fragments held together by a mineral cement or a fine-grained matrix
- Broadband**
Modern seismometers that record over a wide band of frequencies (0.02 to 50 Hz)
- Calc-alkaline**
A term applied to igneous rocks in which the **feldspar** is dominantly Ca rich
- Caldera**
A caldera is a large, more or less circular-shaped depression (diameter >1 km) which forms when **magma** is either withdrawn or erupted from a shallow underground magma reservoir, resulting in the collapse of the roof rocks of the reservoir. The collapse can take place during and/or just after the caldera-forming eruption. A slow subsidence of the caldera floor can continue for a long time after the end of the eruption, and arrival of new magma into the feeding system may trigger resurgence of the caldera floor and/or eruption along existing ring faults
- Carbon or ¹⁴C dating**
A method of determining the dates at which volcanic rocks were

erupted based on the analysis of material that was previously alive (e.g. charcoal)

Carbonate platform

Shallow, extensive, flat, offshore areas where both biological and non-biological carbonates (minerals containing CO_3^{2-} in combination with Ca and Mg, e.g. CaCO_3) are deposited

Clinopyroxene

A silicate mineral common in volcanic rocks

Columnar jointing

A type of structure seen in outcrops of volcanic rocks (most commonly lava flows) in which the rock is broken into a closely packed series of hexagonal columns, usually as a result of contraction during cooling of the lava

Conjugate faults

A term describing two faults that formed at the same time but are aligned in different directions

Conglomerate

A type of sedimentary rock comprising rounded fragments of water-worn rock or pebbles cemented together

Coulee

A long winding channel cut through lava formations

Cretaceous

A period of geologic time that extends from 136 to 64 million years ago

Cryptodome

A mound caused by the accumulation of viscous **magma** just beneath the surface

Cumulate blocks

Fragments of **igneous rock** made up of aggregates of crystals that formed in a plutonic environment

Dacite

A type of volcanic rock with 63–70% SiO_2 . (see also **magma**)

Dead volcano

A volcano that scientists believe no longer has the ability to erupt again is sometimes referred to as ‘dead’

Debris avalanche

A debris avalanche is a sudden and rapid movement of rock and other debris (e.g. vegetation) driven by gravity. It may result from the collapse of the side of an oversteepened volcano or gravitational collapse of unconsolidated sediments. Depending on their scale, debris avalanches may destroy everything in their path. They can occur during volcanic eruptions or when a volcano is not actively erupting. They are one of the most hazardous but least common volcanic events

Dike (also ‘dyke’)

A tabular shaped intrusive **igneous rock** that cuts across bedding or other structural features of the surrounding rock

Disconformity

A geologic surface that separates younger strata from older strata and represents a time of non-deposition, possibly combined with erosion

Distal

A term that means ‘far away from the source’ (cf **proximal**)

Earthquake swarm

A group of many shallow earthquakes of similar size occurring closely clustered in space and time with no dominant main shock. Earthquake swarms may indicate that **magma** is moving beneath a volcano, and often precede volcanic eruptions in the Lesser Antilles. (see also **volcanic earthquake**)

EDM

Electronic Distance Measurement is a technique for monitoring ground deformation at volcanoes by measuring precise distances using electromagnetic radiation

Effusive eruption

Effusive eruptions occur when molten rock (**magma**) reaches the Earth’s surface and erupts passively, producing lava flows and lava domes. They generally occur when the gas content of the magma is low. Basaltic magmas tend to erupt effusively and produce lava flows. The dominant style of the ongoing eruption of the Soufrière Hills Volcano in Montserrat has been the effusive eruption of lava leading to the formation of a lava dome

Eocene

An epoch of geologic time that extends from 54 to 38 million years ago

Epicentre

The point on the surface of the Earth directly above the **hypocentre** (or focus) of an earthquake

Eruption (see volcanic eruption)

Eruption column

A turbulent, buoyant mixture of hot volcanic particles and gases ejected explosively from a volcano

Eruption column collapse

The collapse of an eruption column occurs when the density of the volcanic particles entrained in the column exceeds the upward buoyancy of the column. The volcanic particles fall back down to the ground under the influence of gravity and can form pyroclastic flow, surge and fall deposits

Explosive eruption – 3 types

An explosive eruption involves the rapid expansion of gas causing the surrounding rock or magma to fragment explosively. There are 3 types of explosive eruptions:

Magmatic eruptions

Explosive magmatic eruptions occur when dissolved gases in a rising **magma** expand to form gas bubbles which then burst as the magma nears the Earth’s surface, leading to explosive fragmentation of the magma. The bigger fragments are ejected ballistically while the smaller fragments may be transported vertically into the atmosphere to form an eruption column. The collapse of an eruption column can result in the formation of energetic pyroclastic flows and surges, as well as abundant airfall. Several magmatic explosions have occurred during the ongoing eruption of the Soufrière Hills in Montserrat, and this is the type of eruption that produced the Roseau Tuff in Dominica, and the Choiseul and Belfond pumice deposits in Saint Lucia.

Phreatomagmatic eruptions

Phreatomagmatic eruptions occur when magma comes into contact with water causing the water to flash to steam. The

expanding steam disrupts not only the pre-existing solid rock but also the magma itself so that the fragments thrown out are a mixture of broken-up old rocks and fragmented magma. Like magmatic eruptions, phreatomagmatic eruptions can produce ash fall, pyroclastic flows and pyroclastic surges. The 1979 eruption of the Soufrière of St. Vincent began as a phreatomagmatic eruption and this is also the predominant eruption style of the Kick 'em Jenny submarine volcano

Phreatic eruptions

Phreatic eruptions occur when confined, sub-surface geothermal waters are heated to temperatures above their boiling point and flash to steam, thereby expanding to form an explosion. Such eruptions eject abundant hot steam, hot water, mud and old rock debris in to the air. In some cases the mud and water ejected may be acidic. No new magma is involved in a phreatic eruption, although the heat needed to flash water to steam and thus generate a phreatic eruption is often provided by an underlying magma body. In some instances, particularly if they occur in a sequence, phreatic eruptions may herald the arrival of an actual magmatic eruption. In the Eastern Caribbean, there have been numerous phreatic eruptions, e.g. the 1976-1977 eruption of La Soufrière in Guadeloupe, the 1880 and 1997 eruptions in the Valley of Desolation in Dominica and the 1766 eruption at Sulphur Springs in Saint Lucia

Extensometry

A technique used to monitor ground deformation at active volcanoes

Feldspar

A common rock-forming silicate mineral

Fluviatile (also 'fluvial')

Of, found in, or produced by a river

Focal depth

The depth from the *epicentre* to the *hypocentre* of an earthquake

Foraminifera

A type of small marine animal often present as micro fossils in rocks

Forecast

A comparatively imprecise statement of the time, place, and nature of expected activity. Forecasts can be further subdivided into long- and short-term forecasts. Long-term forecasts are those that pertain to the coming years, decades or longer. Most hazard assessments (including those in this atlas) are essentially long-term hazard forecasts. Short-term forecasts are those that pertain to the coming hours, days and weeks, and are usually issued when unrest is escalating sharply, or a hazardous eruption has just begun. (cf. *prediction*)

Fractionation

The process of changing the composition of a *magma*, usually by crystallisation of minerals during cooling

Fumarole

Fumaroles are cracks or openings in the ground through which volcanic gases from beneath the Earth's surface escape. Monitoring of fumaroles by analysing the gases and measuring temperatures may be useful in predicting volcanic eruptions.

Volcanic gases are often acidic, and condensation of the gases can lead to alteration and dissolution of rock near the surface, making areas surrounding fumaroles prone to collapse or subsidence

Garnet lherzolite

An *ultrabasic* rock containing the mineral garnet

Geothermal activity

Activity related to heat generated by the interior of the Earth. Typical features are hot springs, geysers, *fumaroles* and bubbling mud pools

Geothermal system

A concentrated zone of geothermal activity. Geothermal systems form when rainwater seeps into the ground where it is heated by hot rock. The hot water becomes buoyant, and rises back to the surface along cracks. In some places the water is heated so much that it rises as steam. Geothermal systems consist of a heat source, permeable rock and water. They are usually found in volcanic areas, but can also occur in areas where there is no volcanic activity (along fault zones for example)

GPS

GPS stands for **G**lobal **P**ositioning **S**ystem. This is a geophysical technique used to accurately determine the locations of specific points in three dimensions. Very small (mm scale) changes in the locations of these points can be recorded over time

Graben

A sunken area (depression) between two roughly parallel faults formed as a result of extension, or pulling, of the crust. The faults converge toward one another below the surface, so that they look like the letter "V" in cross section

Harmonic tremor

A continuous release of seismic energy, detected by *seismographs*, typically associated with the underground movement of magma

Hazard (see *volcanic hazard*)

Hazard maps

A volcanic hazard map is a graphical representation of the areal distribution of the various hazards to which the territory on and around a volcano would be exposed in the event of a renewal of volcanism, generally in the short to mid term; i.e. in years or tens of years. It is the basic tool used by civil authorities to evaluate volcanic risk and plan risk mitigation actions and can provide valuable input into land-use planning during periods of quiescence at a given volcano

Holocene

A period of geologic time that spans the last 10,000 years

Hornblende

A silicate mineral common in volcanic rocks

Hyaloclastite

A deposit containing fragments of volcanic glass formed by non-explosive or explosive shattering, usually as a result of magma coming into contact with water

Hydrothermal activity

Activity related to hot water

Hydrothermal alteration

When hydrothermal water (hot water) moves through rocks beneath the surface, chemical reactions between the water and the rocks occur. These chemical reactions change (or alter) the rocks by destroying original minerals and depositing new minerals. Hydrothermally altered rocks commonly have white, yellow, orange or red colouration and may be softer than unaltered rocks

Hydrothermal eruption

A hydrothermal eruption is an eruption of steam and rocks whose energy derives solely from the internal dynamics of a geothermal system, i.e. no magma is involved. Such eruptions are common in active geothermal fields and can be locally very destructive, causing loss of life and damage to structures. They have been known to eject clasts up to 2-3 m in diameter up to several hundred meters from the vent, and may produce craters and deposits known as hydrothermal eruption breccias. They form when water flashes to steam which erupts, cracking (brecciating) rocks and ejecting them at the surface. Such eruptions are usually triggered by local depressurisation, e.g. due to earthquakes or the sudden release of overburden from landsliding. They can also be triggered if the system becomes sealed or covered, allowing internal pressures to increase and become greater than that of the surrounding rock. This sealing can occur naturally (e.g. if silica precipitates from geothermal waters to form an impermeable deposit) or by man (e.g. if asphalt or concrete slabs are placed over geothermal features). A hydrothermal eruption may last for several days, and continue until the steam forms too slowly to provide sufficient lifting power to eject rocks from the crater, although steam may continue to be discharged for up to several years after the hydrothermal eruption has ended. Hydrothermal eruptions may cause major changes to the hydrology of the geothermal field

Hypersthene-normative

Said of an igneous rock that contains hypersthene, one of the rock-forming pyroxene minerals, in its calculated “*norm*”

Hypocentre (focus)

Most earthquakes result from sudden breakage of rock within the Earth. The point at which the breakage starts is called the hypocentre or focus of the earthquake

Igneous rocks

One of the three main groups of rocks (the others being sedimentary and metamorphic). Igneous rocks originate from *magma*, and may be either extrusive or intrusive (*plutonic*)

Ignimbrite

A pyroclastic deposit primarily comprising ash and pumice that forms as a result of a large, explosive eruption that generates pyroclastic flows

Isopach

A line joining points of equal thickness

Jurassic

A period of geologic time that extends from 135 to 195 million years ago

ka

Thousand years

Lapilli

The pyroclastic fragments ejected from a volcano that are between 2 and 64 mm in diameter

Lahar

A lahar is a rapidly flowing dense mixture of rock debris and water originating from a volcano. Also known as ‘mudflows’ or ‘debris flows’, lahars resemble the behaviour of wet concrete as they flow. The source of the water may be a crater lake, heavy rain or snow. The loose ash and volcanic fragments are transformed into a dense fluid-rock mixture that rushes down the slopes of a volcano and into surrounding valleys. Lahars are destructive to everything in their path, and the threat from lahars may last for years after an eruption has ended

Lateral blast

A lateral blast is a laterally directed volcanic explosion of rock fragments and gas that explodes outwards at high velocity from the side of a volcano. It can affect a 180° sector and extend up to 30 km outward from the volcano. Lateral blasts are not affected by topography and can develop without warning. These types of eruptions are rare but can be triggered by failure of newly erupted lava domes or by the collapse of a large portion of the volcanic edifice

Laterite

A deposit of hydrated iron oxides formed as a result of rock leaching, that typically forms in tropical regions with a pronounced wet and dry season

Lava

Magma that erupts passively at the Earth’s surface

Lava dome

A bulbous mass on a volcano produced when thick, viscous (‘sticky’) lava is slowly squeezed from the vent. The steep sides of lava domes often become unstable and can collapse, causing a type of small pyroclastic flow known as a block and ash flow. Lava domes are abundant in the Lesser Antilles and their collapse has caused significant loss of life

Lava flow

A lava flow is a hot stream of molten rock that travels down valleys on the slopes of a volcano. The distance lava flows travel depends on the viscosity (‘stickiness’) of the lava. If the lava is viscous (sticky), it cannot flow easily so it tends to form short thick lava flows or pile up around the vent to form a hill, or lava dome. Lava flows destroy everything in their path and can cause forest fires

Lightning strikes

Powerful displays of lightning can occur during volcanic eruptions. Such lightning results from friction between ash, rock fragments, steam and gases in the eruption cloud. Lightning strikes can pose a threat to life and property and disrupt communication systems. Atmospheric effects in the eruption column would generate frequent lightning strikes to about the radius of the ballistic trajectories

Lithified unit

A term used to describe a unit that has undergone the process of lithification, i.e. the formation of a massive rock from a loose sediment

Lithologic unit

A rock unit

Lithosphere

The rigid outermost part of the Earth

Live volcano

A volcano that is currently erupting or that scientists believe has the capacity to erupt again is sometimes referred to as 'live'

Ma

Million years

Maar

A flat-bottomed roughly circular crater, often filled with water, that formed during shallow explosive interaction between magma and groundwater

Mafic

A general term used to describe ferromagnesian ('dark') minerals, or rocks containing these minerals; mafic lava has a silica content of less than about 55 wt. %

Magma

Magma is a mixture of molten rock, crystals and gases present beneath the Earth's surface. It usually accumulates in magma chambers before erupting at the surface. Magma is divided into types according to silica (SiO₂) content, which controls viscosity (ease of flowing) and hence influences eruptive styles. The most silica-poor (45–55 wt.% SiO₂) fluid magmas are called **basaltic** magmas. **Andesitic** and **dacitic** magmas have intermediate compositions (55–63 wt.% and 63–70% SiO₂, respectively). The most silica-rich, viscous magmas (> 70 wt.% SiO₂) are called **rhyolitic** magmas

Megabreccia

A megabreccia is an extensive **breccia** that contains large clasts

Mesozoic

An era of geologic time that extends from 230 to 70 million years ago

Microgravity

Microgravity monitoring involves the measurement of small changes in the value of gravity at a network of stations

Microphyric

A term describing the texture of a fine-grained igneous rock

Miocene

An epoch of geologic time that extends from 26 to 7 million years ago

Modified Mercalli Intensity (MMI)

The MMI is a value assigned to a specific site or location after an earthquake, which gives an indication of the observed level of intensity and which is based on a scale that ranges from imperceptible shaking to catastrophic destruction

Monogenetic volcano

A volcano that erupts only once

Ne-normative

Said of an igneous rock that contains nepheline, a silica-poor mineral, in its calculated "**norm**"

Norm

The norm is a rock-classification method sometimes used

for **igneous rocks**, which is based on expressing chemical composition in terms of a series of arbitrarily selected minerals

Nuée ardente

An incandescent cloud of gas and volcanic ash emitted during an explosive volcanic eruption. These days more commonly called pyroclastic flows

Obsidian

A black volcanic glass, usually of rhyolitic composition, formed by rapid cooling of viscous lava

Oligocene

An epoch of geologic time that extends from 38 to 26 million years ago

Paleosol

An ancient or fossil soil horizon

Pelean style eruption

A type of eruption typified by phreatic/phreatomagmatic explosions followed by dome growth which is continually interrupted by pyroclastic emissions through and around the dome, and gravitational collapse of the dome. The type example of this eruption is the 1902-05 eruption of Mt. Pelée in Martinique

Petrogenesis

The branch of petrology that deals with the origin of rocks, especially **igneous rocks**

Petrology

The study of the composition, occurrence, and origin of rocks

Phenocrysts

Relatively large crystals found set in a finer-grained groundmass in a **porphyritic** igneous rock

Phreatic Eruption (see explosive eruption)

Phreatomagmatic eruption (see explosive eruption)

Pillow lava

Mounds of elongate lava "pillows" formed by repeated oozing and quenching of hot basalt lava extruding underwater

Pleistocene

An epoch of geologic time that extends from 2 million to 10,000 years ago

Plinian style eruption

A violently explosive magmatic eruption that produces a powerful convecting column that reaches into the stratosphere and can be up to 45 km in height. Destabilisation of the eruption column can lead to frequent generation of extremely energetic pyroclastic density currents and extensive ash fall. The direction and strength of prevailing wind during the eruption have a profound effect on the dispersal of ash and thus the areas affected by ash fallout. This is the type of explosive magmatic eruption that produced the Roseau Tuff in Dominica, and the Choiseul and Belfond pumice deposits in Saint Lucia

Pliocene

An epoch of geologic time that extends from 7 to 2 million years ago

Plutonic

A term used to describe igneous rocks that form beneath the surface of the Earth

Polygenetic volcano

A volcano that erupts repeatedly, often in an episodic manner

Porphyritic

A texture term which describes **igneous rocks** containing relatively large crystals (known as **phenocrysts**) set in a finer-grained matrix

Prediction

A comparatively precise statement of the time, place and, ideally, the nature and size of impending activity. A prediction usually covers a shorter time period than a forecast and is generally based dominantly on interpretations and measurements of ongoing processes and secondarily on a projection of past history (cf. forecast)

Proximal

A term that means 'close to the source' (cf. **distal**)

Pumice

A lightweight volcanic rock that contains many vesicles (holes where gas bubbles used to be). Pumice is a quenched sample of gas-rich **magma** that has erupted explosively

Pyroclastic

The word pyroclastic is derived from two Greek words meaning "fire" and "broken". It refers to rocks which have been broken into fragments by the action of heat. The smallest fragments (less than 2 mm in diameter) are called **ash**. Fragments between 1mm and 1 cm in diameter are called **lapilli**. Larger fragments are called '**blocks**' if they were solid at the time they were fragmented and '**bombs**' if they were liquid.

Pyroclastic fall (airfall)

Pyroclastic fall refers to the **ash**, **lapilli**, **blocks** or **bombs** produced during an explosive magmatic eruption that fall to Earth, usually from an eruption column

Pyroclastic flow

A hot (100-600°C) fast-moving (>100 km/hr) mixture of **ash** and **pumice** fragments in a turbulent gas cloud travelling down the flanks of the volcano or along the ground surface. Such flows form when an eruption column or a lava dome collapses. They usually travel down valleys and cause total devastation of the area over which they flow. People in the path of a hot pyroclastic flow can be killed by asphyxiation, heat and noxious gases. Pyroclastic flows have been the main cause of destruction and loss of life in Montserrat since 1995

Pyroclastic surge

A highly-fluidised, low density, fast-moving turbulent flow. These are cold and wet when they form at the base of an eruption column (base surge) or hot and dry when they form on top or at the front of a pyroclastic flow (ash-cloud and ground surge, respectively). Pyroclastic flows and surges from Mt. Pelée completely destroyed the town of St. Pierre in Martinique in 1902, killing about 30,000 people

Pyroxene-phyric

Said of an igneous rock that contains **phenocrysts** of the mineral pyroxene

Quartz

A common rock-forming silicate mineral (composition: SiO₂)

Quartz normative

Said of an igneous rock that contains **quartz** in its calculated "**norm**"

Quaternary

An epoch of geologic time that extends from 2 million years ago to the present

Rhyolite

A type of volcanic rock with >70% SiO₂. (see also **magma**)

Risk (see volcanic risk)

Sandstone

A type of sedimentary rock in which the particles range from 1/16 mm to 2 mm

Saprolite

A soft, earthy red or brown, decomposed igneous or metamorphic rock that is rich in clay, and formed in place by chemical weathering

Scoria

A highly **vesicular**, usually light weight, volcanic rock of **basaltic** or **andesitic** composition

Sector Collapse

Sector collapse, or edifice failure, is the collapse of a portion of a volcano, and is often a result of earthquakes, rising magma, or abundant precipitation in combination with high relief, steep slopes, and unstable or altered rock. Sector collapse often results in a **lateral blast** and/or **debris avalanche**

Seismograph

A group of instruments used to record earthquakes. A seismograph includes a seismometer as well as all equipment used to convert, transmit and display the signals generated by the seismometer

Seismometer

A sensitive instrument installed on or in the ground to detect earthquakes

Self-potential

A passive geophysical method that measures naturally occurring electrical potentials of rocks and groundwater

Shale

A fine-grained sedimentary rock that can be readily split along closely spaced bedding planes

Silicic

Said of a rock or magma that has about > 62 wt. % silica (SiO₂). (synonym = felsic)

Siltstone

A fine-grained sedimentary rock containing particles that range in size from 1/16 - 1/256 mm

Somma

A caldera or volcanic crater partially filled by a new central cone; named after Mt. Somma in Italy

Soufrière

Soufrière, the name of several Caribbean volcanoes, and the name commonly used in the Caribbean for *fumarole* or fumarolic area, means “source of sulphur”

Spatter

Lapilli to **bomb**-size fragments of basaltic lava often produced by non-explosive Hawaiian-type eruptions. Spatter only remains airborne for a short period of time, and is therefore still liquid when it hits the ground surface

Stratigraphy

The study of stratified (bedded) rocks, especially their sequence in time, the character of the rocks and the correlation of beds in different localities

Stratovolcano

A large volcanic edifice constructed of layers of lava flows interbedded with pyroclastic deposits. Stratovolcanoes tend to have a steeply conical form, and may display very persistent activity (e.g. Etna and Stromboli in Italy); erupt at fairly regular intervals (e.g. Kick ‘em Jenny) or alternate periods of activity with long periods of inactivity (e.g. Mt. Pelée). The length of these periods is very variable, and can reach thousands of years

Strombolian eruption

Strombolian eruptions are named after Stromboli volcano off the west coast of Italy, where a typical eruption consists of the rhythmic ejection of incandescent cinder, **lapilli**, and **bombs** to heights of a few tens or hundreds of feet. Lava flows may also occur, and ash may be present in relatively minor amounts. The **tephra** accumulates near the central vent and builds a cinder cone. Magma associated with Strombolian activity is **basaltic** or **andesitic**

St. Vincent style eruption

Explosive eruption of vesiculated basaltic andesite from an open crater, resulting in scoria and ash flows as well as surges, **lapilli** and **ash** fall. The type example of this eruption is the 1902 eruption of The Soufrière in St. Vincent

Subaerial

On the Earth’s surface, as opposed to **subaqueous** (underwater)

Subaqueous

Underwater, as opposed to **subaerial** (on the Earth’s surface)

Subduction

The process by which one of the plates of the Earth’s crust descends beneath another plate

Substratum

Any layer underlying the true soil

Sulphur fire

A sulphur deposit that catches on fire can produce burning, molten sulphur that flows downhill. While it is flowing, it may have the appearance of fluid lava. As the sulphur burns, however, it vaporises rather than solidifying, and leaves little or no trace

Swarm

A group of many earthquakes of similar size occurring closely clustered in space and time with no dominant main shock

T phase

T-phase, also known as “T-waves”, are low frequency sound

waves that are transmitted very efficiently through the ocean and are recorded on seismographs. They can be generated by earthquakes or large landslides near or beneath the sea, or by submarine explosions such as eruptions. All of the historical eruptions of Kick ‘em Jenny have generated T-phase signals

Tectonic Earthquake

A rupture in the stiff, outermost part of the Earth called the lithosphere. Tectonic earthquakes are triggered by the movement of tectonic plates relative to one another. (cf. **volcanic earthquake**)

Telemetry

The set of instruments and communications that send a data signal from their source to a distant data acquisition system

Tephra

All **pyroclastic** fragments that fall to the ground from eruption columns

Tertiary

A period of geologic time extending from 65 million years ago to the present

Tiltmeter

A sensor that detects the ‘tilt’ of the ground, and which is used for measuring ground deformation at volcanoes

Tsunami

A tsunami is a large wave generated by the sudden displacement of water resulting from underwater disturbances such as a large earthquake or submarine volcanic eruption. Tsunamis travel extremely fast, reaching ~800 km/hr in the deep oceans. When tsunamis reach land they inundate low-lying coastal areas

Tuff

A general name for consolidated ash or **tephra**, usually with clasts less than 2 cm

Tuffaceous

Pertaining to sediments which contain up to 50 % **tuff**

Ultrabasic

Said of a **mafic** igneous rock that consists essentially of ferromagnesian (dark coloured) minerals and contains almost no **quartz** and **feldspar**

Unconformity

The contact between older rocks and younger sedimentary rocks in which at least some erosion has removed some of the older rocks before deposition of the younger

Unconsolidated unit

Unit containing loosely arranged or unstratified sediment whose particles are not cemented together

Undersaturated

A term used to describe igneous rocks deficient in SiO₂

Unlithified unit

A unit that has yet to undergo the process of lithification, i.e. has not yet been converted from loose sediment into indurated rock

Vesicular

Texture of a volcanic rock characterised by an abundance of void spaces (cavities formed by entrapment of gas bubbles during

solidification)

Volcanic arc

A curved chain of volcanic islands (such as the Lesser Antilles) or volcanic mountains (such as the Andes) located near the margins of two plates that has formed due to magmatism at a subduction zone

Volcanic Ash

The fine material (< 2 mm in diameter) that is ejected from a volcano

Volcanic earthquake

An earthquake characterised by high-frequency seismic signals thought to be generated by the fracturing of rock in response to the intrusion and migration of *magma*. Volcanic earthquakes almost always precede the onset of volcanic activity in the Lesser Antilles, although they do not always culminate in a volcanic eruption. They often occur in *swarms*. Volcanic earthquakes are the most effective monitoring tool for predicting a volcanic eruption. In some cases they may in themselves be severe enough to cause significant damage. A sequence of volcanic earthquakes in Montserrat between 1931 and 1938 destroyed a large number of buildings, and volcanic earthquakes in Dominica between 1998 and 2000 triggered numerous rock falls and landslides. (see *earthquake swarm*; *tectonic earthquake*)

Volcanic eruption

The arrival of volcanic products at the surface of the earth during a single volcanic event or, if clearly linked, a series of volcanic events (e.g. the activity at the Soufrière Hills volcano since 1995 is considered a single eruption). Eruptions can be explosive or effusive, depending on the physical properties of the *magma*. Different styles of eruption are often named after type occurrences. Common types of eruptions in the Lesser Antilles include *St. Vincent*-, *Plinian*-, *Pelean*- and *Asama*-style activity

Volcanic gases

Magma contains dissolved gases that are released into the atmosphere during eruptions. In addition, geothermal systems and areas of cold spring activity also emit large amounts of gases. The most common gases in volcanic areas are water vapour (H₂O), carbon dioxide (CO₂) and sulphur dioxide (SO₂) with smaller amounts of hydrogen sulphide (H₂S), carbon monoxide (CO), hydrogen chloride (HCl) and hydrogen fluoride (HF)

Volcanic hazard

Volcanic hazard is the probability of a given area being affected by potentially destructive volcanic processes or products within a given period of time. Technically, therefore, the actual destructive volcanic processes themselves should be referred to as 'hazardous volcanic phenomena' rather than as 'volcanic hazards'. The popular understanding of the word 'hazard' as a 'source of danger', however, means that potentially dangerous eruptive and post-eruptive phenomena such as pyroclastic flows, wind-borne ash, lava flows, volcanic gases and lahars can also be referred to as 'volcanic hazards' when not used in the context of probabilistic assessments

Volcanic risk

Risk is the possibility of a loss (e.g. of life, property, infrastructure) within the area subject to the hazard(s). Risk is evaluated by the

relation: risk = value x vulnerability x hazard. Value includes everything threatened by the hazard, whereas vulnerability is the percentage of the value likely to be lost in a given hazardous event. It is important to understand the differences between hazard and risk. Volcanic hazard results from natural phenomena which are out of man's control and which cannot be avoided. However, appropriate land management and risk mitigation actions based on detailed hazard assessments can reduce both exposed value and vulnerability, and thus risk

Volcaniclastic deposit

The term volcaniclastic deposit is a general term describing any deposit that contains volcanic fragments. It is often used when the process by which a particular deposit formed is unclear. All pyroclastic deposits, lahar deposits and debris avalanche deposits are types of volcaniclastic deposits

Volcano

A volcano is a vent in the Earth's surface where magma and associated gases erupt. The style of eruption and type of volcano depend on the properties and volume of the magma as well as external factors such as crustal structure and presence of groundwater or geothermal systems

Vulcanian eruption

An explosive eruption of less than 1 km³, but with an eruption column often reaching 10-20 km high