

INTRODUCTION TO VOLCANOES





an <u>opening</u> in the earth's surface through which lava, hot gases, and rock fragments <u>erupt</u>

ORIGIN OF VOLCANOES

- Magma <u>50-100</u> miles below the earth's surface slowly begins to <u>rise</u> to the surface
- 2. <u>Pressure</u> from the surrounding rock causes the magma to <u>blast</u> or <u>melt</u>.
- 3. The magma then finds a pipe (channel) to the surface where magma erupts onto the surface through a vent (opening in the Earth's surface).

ORIGIN OF VOLCANOES

4. The magma, now called lava, <u>builds</u> up at the <u>vent</u> forming a volcano



ORIGIN OF VOLCANOES

 Often the volcano sides will be higher than the vent forming a depression called a <u>crater</u>







CALDERA:

an unusually large crater or the remains when the <u>cone collapses</u> into its own magma chamber



ANATOMY OF A VOLCANO CONE: the <u>above</u> ground structure built from <u>lava and/or tephra</u>



PIPE: the path that magma takes from the <u>magma chamber</u> to the <u>vent</u>



MAGMA CHAMBER:

the reservoir located under the volcano where <u>magma collects</u> and becomes the supply of magma/lava to build the volcano



PARASITIC CONE:

 a smaller secondary volcano built on the side of or near the main volcano, but sharing the same pipe to the magma chamber



FUMAROLE: a secondary only gases!





a long fissure (crack) from which lava flows





VENT: <u>opening</u> of the volcano, through which lava, ash and gases flow



TAKE A MINUTE **TO LABEL** THE PARTS ON THE DIAGRAM (NOT ALL PARTS ARE SHOWN)





TEPHRA (PYROCLASTIC, ROCK FRAGMENTS)

VOLCANIC DUST: <u>Smallest</u> particles and carried by atmosphere circulation





VOLCANIC ASH:

- <u>0.25-0.5 cm</u> diameter
- Generally settles out within miles of the cone but can be carried greater distances by stronger winds.
- Forms a mudflow when mixed with water



BOWB:

- Smaller bombs (gravel, pea size) are called <u>cinders</u>.
- Walnut size bombs are called <u>lapilli</u>.
- Larger fragments up to 4+ feet in diameter are called <u>bombs.</u>





water vapor, <u>carbon dioxide</u>, nitrogen, <u>sulfur dioxide</u>, hydrogen sulfide, <u>chlorine</u>



TYPES OF VOLCANIC ERUPTIONS

Two factors determine the type of eruption:

- Amount of <u>water vapor</u> & other <u>gases</u> in the magma
- The <u>chemical composition</u> of the magma

EXPLOSIVE ERUPTIONS

- Trapped gases under <u>high</u> pressure will violently explode when the magma reaches the <u>lower</u> pressure of the surface.
- Has granitic magma is very thick and plugs the vent causing the pressure to build until it blows violently out the vent
- The <u>high</u> water content of the magma produces more water vapor which when mixed in granitic magma produces explosive eruptions

EXPLOSIVE ERUPTIONS



MT. PINATUBO

MONT SERRAT



THE ERUPTION OF MT. ST. HELENS IN 1980



QUIET ERUPTIONS



- Low pressure gas
- Has <u>fluid</u> magma (flows more eaisly and will flow instead of explode)
- And has low <u>water</u> content

TYPES OF VOLCANO MOUNTAINS

CINDER CONES:

- <u>Small base</u>, steep-sided, loosely consolidated
- Up to 1000 feet tall
- Life span of a <u>few</u> years
 - Commonly built from gravel size lava rock fragments call <u>cinders</u>
- Has <u>violent</u> eruptions, dangerous when close.

CINDER CONE VOLCANOES







TYPES OF VOLCANO MOUNTAINS

CINDER CONES:





- High pressure gas bubbles causes thick lava to explode into the air, lava begins to cool as it rises and falls becoming very sticky
- When lava hits the ground it <u>sticks</u> rather than flows
- This builds a steep cone with a small base



SKETCH A CINDER CONE VOLCANO:

TYPES OF VOLCANO MOUNTAINS

SHIELD VOLCANOES:

- Large base, gentle slope, lava rock layers
- A few <u>miles</u> high
- Life span of a <u>million</u> years or more
- The lava is hot, thin, very <u>fluid</u>, often <u>basaltic</u>.
- **EXAMPLE**: Hawaiian Islands



Take a look at these examples:

<u>http://www.volcano.si.edu/world/tpgallery.cfm?cateqory=Shield%20Volcanoes</u>





The Mauna Loa volcano in Hawaii the largest volcano on Earth—has the broad expanse characteristic of shield volcanoes. It spreads across half the island of Hawaii.

SHIELD VOLCANOES



MAUNA KEA

Shield Volcano



SHIELD VOLGANOES

SKETCH A SHEILD VOLCANO:

TYPES OF VOLCANO MOUNTAINS COMPOSITE (STRATO) VOLCANOES:

- Large mountain volcano often <u>snow capped</u>, a few miles high
- Life span of million years or more
- Have alternating eruptions of <u>tephra</u> (airborne) and <u>lava</u>. The tephra adds <u>height</u> to the volcano and the lava <u>cements</u> the tephra together and adds to the <u>base</u>.
- Found mostly in <u>subduction</u> zones and have violent eruptions.

EXAMPLES: Mt Rainier, Mt Fuji, Mt Kilimanjaro

COMPOSITE (STRATO) VOLCANOES:







SKETCH A COMPOSITE VOLCANO:

VOLCANO ACTIVITY LEVELS (STAGES) ACTIVE (AWAKE):

 Has erupted within recent time and can erupt again at <u>any time</u>.

PRE-ERUPTION ACTIVITIES:

- Increase in <u>earthquake</u> activity under the cone
- increase in temperature of cone,
- melting of ice/snow in the crater
- swelling of the cone
- steam eruptions
- minor <u>ash</u> eruptions





MT ST. HELENS

DORMANT (SLEEPING):



- <u>No</u> eruption within recent times, but there is record of past eruptions
- Can become <u>active</u> and erupt again after a <u>"wake up"</u> period
- Example: Mt. Rainier





- No eruption within recorded history
- Not expected to <u>ever erupt again</u>
 Example: Mount Mazama (Crater Lake)





CRATER LAKE

MOUNT BUILLES

- The most <u>dangerous</u> volcano in the US
- The danger is mostly from <u>mudflows</u> traveling down river valleys at a speed of 25mph and destroying everything in its path
- 100,000 people live on the solidified mudflows of previous eruptions

