

## Volcanic Activity

Volcanic eruptions can transform the earth's surface, both destructively and constructively in a short period of time.

e.g. Mt. St. Helens -1980-

blast changed elevation of the volcano from 9500 ft to 8155 ft (-1345 ft) in a matter of moments.

Parícutin -1943, near Mexico City.

- 1) Two weeks prior to eruption, earth tremors felt.
- 2) Next smoke and hot, glowing rock fragments erupted from the volcano.
- 3) The cone grew to 40 m the next day; 100 m by the fifth day.
- 4) Within two years, the cone had grown to 400 m.
- 5) Volcano went quiet after nine years of activity.

Mauna Loa, Hawaii - largest volcano on earth.

- 1) 1 of 5 volcanoes that make up island of Hawaii.
- 2) Base rests 16,400 ft below sea level; its summit reaches a height of 13,677 ft above the water - total height of about 30,077 ft.
- 3) It was built in one million years, and is a result of numerous eruptive cycles.

Showed incredible force unleashed by volcanoes and associated environmental damage:

Morphology of volcanoes

Volcano - a mountainous accumulation of material.

- built from repeated lava flows

Crater - a steep-walled depression located at the summit of many volcanoes

It is connected to a magma chamber via a pipeline conduit, or vent.

The vent and crater are produced by the erosive force of gases and effervescent magma.

Calderas - circular depression > 1km in diameter. Form when the summit of a volcanic structure collapses into the partially emptied magma chamber below.

Factors which control volcanic activity:

- 1) composition of magma
- 2) temperature of magma
- 3) % of dissolved gases in magma

These factors affect magma's mobility and viscosity:

Less viscous magmas flow better.

More viscous have a greater resistance to flow.

- 1) Composition:

Basalt - 50% silica

Granite-70% silica

Higher silica → higher viscosity.

Silica structures limit flow.

Granitic lavas have short thick flows.

Basaltic lavas are fluid and travel great distances.

## 2) Temperature:

hotter magmas are less viscous and flow better.

## 3) Dissolved Gases:

Increase the fluidity of a magma.

Gases released near surface due to decreasing confining pressure. They expand and occupy hundreds of times their original volume.

Very fluid basaltic magmas allow their expanding gases to escape easily- Lava Fountain.

Highly viscous magmas impede the escape of gases until they explosively eject the magma.

## *Materials Extruded During An Eruption*

### 1) Lava Flows:

Basaltic flows, being less viscous, are usually fluid and flow in thin broad sheets. Can flow fast and over great distances (150 km).

pillow lavas-formed when lavas are ejected into deep water. Look like stacked pillows.

### 2) Gases:

~1-5% of total weight of a lava - mostly water vapor, lesser CO<sub>2</sub>, nitrogen, and sulfur.

### 3) Pyroclastic Material

particles of pulverized rocks and lava

formed during explosive eruptions of viscous lavas.

vary in size from very fine dust and sand size ash to large volcanic bombs and blocks.

fine ash and dust particles are produced when gas explosively expands from the extruded lava and disseminates the lava into very fine fragments.

dust can be extended great distances and change the earth's temperature.

## Volcanoes

three classes based on their eruptive patterns and characteristics: shield volcanoes, cinder cones, and composite cones (stratovolcanoes).

### 1) Shield Volcanoes -

broad slightly domed structure formed from extruded fluid lava. Has a low slope.

Built of basaltic lavas with small % pyroclastics.

Example - volcanoes of Hawaii

Mauna Loa-largest volcano on earth.  
 height of ~ 30,000 ft.  
 built in one million years  
 result of numerous eruptive cycles.

Early stages of consists of frequent eruptions of thin flows of very fluid basalt.  
 In latter stages of growth, activity is more sporadic and pyroclastic ejections are more prevalent. thicker, shorter flows steepen the slopes of the summit areas.

## 2) Cinder Cones

built from ejected lava fragments.  
 they have very steep slopes.  
 usually small <1000 ft,  
 form as parasitic cones on larger volcanoes, and frequently are found in groups.  
 represent the last phase of activity in a region of older basaltic flows.

## 3) Composite Cones

stratovolcanoes - large, symmetrical structure  
 interbedded lavas and pyroclastic deposits product of viscous andesitic lavas  
 After long periods, eruptive style changes and with flows giving way to violent pyroclastic ejections. most violent type of volcanic eruption. often unexpected and devastating.

nuée ardente - a fiery cloud of hot gases infused with incandescent ash. These turbulent steam clouds and companion ash flows travel down steeps in excess of 200 km/hr. The ground hugging portion of a glowing avalanche are rich in particulate matter that is suspended by hot buoyant gases. Thus the flow travel in frictionless masses.

nuée ardentes - associated with highly viscous granitic magmas.

*Other volcanic hazards:*

lahars - a type of mudslide.  
 deposits of volcanic ash and debris become saturated with water and flow down deep volcanic slopes following stream valleys.

Some are a result of rainfall, while others may result from ice and snow melting.

Tsunamis: oceanic volcanic landslides may cause tsunamis

Flood Basalts:

large amounts of volcanic material extruded from cracks or fractures called fissures.

material can be distributed over a wide area, some 150 km from its source - fluidity.

Ex.: Columbia River Basalts