

Volcanoes

- A mountain formed by the extrusion of molten rock and/or rock fragments from a vent or opening within the earth



Volcanoes

- Structure typically includes
 - A cone-shaped body
 - Vent: the space connecting the volcano with the magma chamber below
 - Magma chamber: the large chamber that holds magma beneath a volcano
 - Neck: the portion of the volcano immediately around the vent
 - Crater: the depression at the top of a volcano

Volcanic Materials

- Volcanoes extrude various materials including lava, pyroclastic material and gases



<http://volcano.and.nodak.edu/vwdocs/vwlessons/kinds/kinds.html>

Lava

- Lava is simply molten rock
 - The same as magma except lava implies that the molten rock was extruded onto the surface
- May be classified according to content
 - Felsic
 - Intermediate
 - Mafic
- Flows may also have varying degrees of **viscosity** (resistance to flow)

Viscosity

- The viscosity of a lava is dependent upon:
 - **Amount of silica**
 - More silica = greater viscosity (slower flow)
 - **Temperature**
 - Higher temperature = less viscosity (faster flow)
 - **Amount of dissolved gases**
 - More dissolved gases = more viscosity (slower flow)

Viscosity

- Two primary flow types have been identified with mafic lavas

- Pahoehoe: smooth, ropey



- Aa: rough, jagged



Pyroclastic Material

- Pyroclastic material are fragments of preexisting rock that are blown out by the force of the eruption
- Distinguished by size
 - Ash: very small fragments
 - Lapilli: walnut-size fragments
 - Blocks (Bombs): very large fragments

Gases

- Dissolved gases in magma provide the force that extrudes magma from a vent
- The gases are mostly water vapor and carbon dioxide but may also include nitrogen, sulfur dioxide, and hydrogen sulfide
- The nature of the lava determines what type of eruption will take place (quiet versus explosive)

Quiet Eruption

- Non-viscous magmas (basaltic) usually allow dissolved gases to escape relatively easily during an eruption



<http://volcano.and.nodak.edu/vwdocs/vwlessons/kinds/kinds.html>

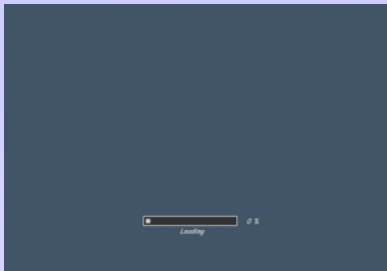
Explosive Eruption

- Viscous magmas (granitic) may impede the flow of escaping gas
- This gas would then build up inside the volcano, increasing in volume and pressure
- Eventually the pressure would cause an enormous explosion as the gas escapes into the atmosphere



<http://volcano.and.nodak.edu/vwdocs/vwlessons/kinds/kinds.html>

Explosive Eruption



Explosive Eruption



Nuee Ardente

- A cloud of gas and pyroclastic material that erupts from a volcano and flows down a volcano, relatively close to the ground surface
- Can reach speeds greater than 60 mph and are very dangerous



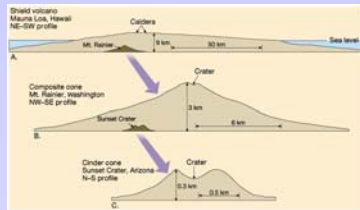
Nuee Ardente

- In 1902, Mount Pelee on the island of Martinique generated a nuee ardente that destroyed the nearby town of St. Pierre, killing roughly 28,000 people



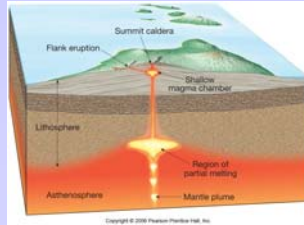
Types of Volcanoes

- There are three types of volcanoes:
 - Shield
 - Stratovolcano
 - Cinder cone



Shield Volcano

- Largest type of volcano
- Broadly sloping sides
- Composed mostly of basaltic lava
- Usually form from non-violent eruptions of mafic lava
- Hawaii and Mt. Fuji are examples



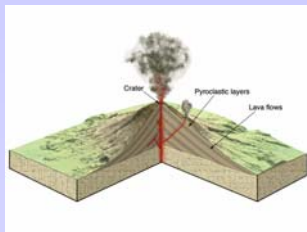
Shield Volcano



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Stratovolcano

- Also known as a composite volcano
- Moderate in size and slope
- Composed of alternating layers of lava and pyroclastic material
- Cascade Mountains (Mt. Shasta, Mt. Rainier, Mt. St. Helens) and the Andes are examples



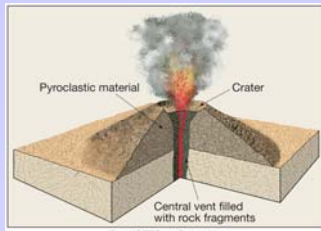
Stratovolcano



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Cinder Cone

- Smallest volcano
- Steep sides
- Composed mostly of pyroclastic material
- Can sometimes be found on the sides of shield volcanoes
- Sunset Crater in Arizona and Parícutin in Mexico are examples



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Cinder Cone



http://volcanoes.usgs.gov/images/jpg/Photoglossary/30424305-084_large.JPG

Volcano Formation



Other Volcanic Landforms

- There are features that indicate volcanic activity although no volcano may be evident in the area
- This indicates that past volcanic activity has occurred and has since subsided
- These features include
 - Calderas
 - Volcanic necks

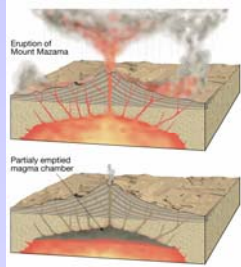
Calderas

- A caldera is a large depression that forms as the summit of a volcano collapses into a partially empty magma chamber



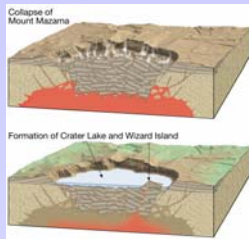
Calderas

- In the case of Crater Lake, after an eruption of Mount Mazama, much of the molten rock and gases escaped from the magma chamber
- This caused a lack of support for the overlying volcano

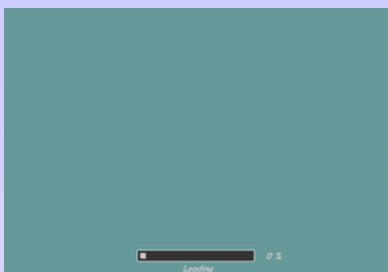


Calderas

- The overlying volcano then collapsed into the partially emptied magma chamber
- Rainfall and snowmelt caused the caldera to fill with water and a subsequent eruption formed Wizard Island (a cinder cone)



Calderas



Volcanic Neck

- A volcanic neck is the remnant of an ancient volcano
- If a volcano stops erupting, it stops growing
- If eruptions cease, the volcano will be subjected to weathering and erosion and will ultimately be worn down
- The volcanic neck represents the innermost portion of an eroding volcano



http://www.jnetil.com/airscapes/2004_july/ship_rock.html
