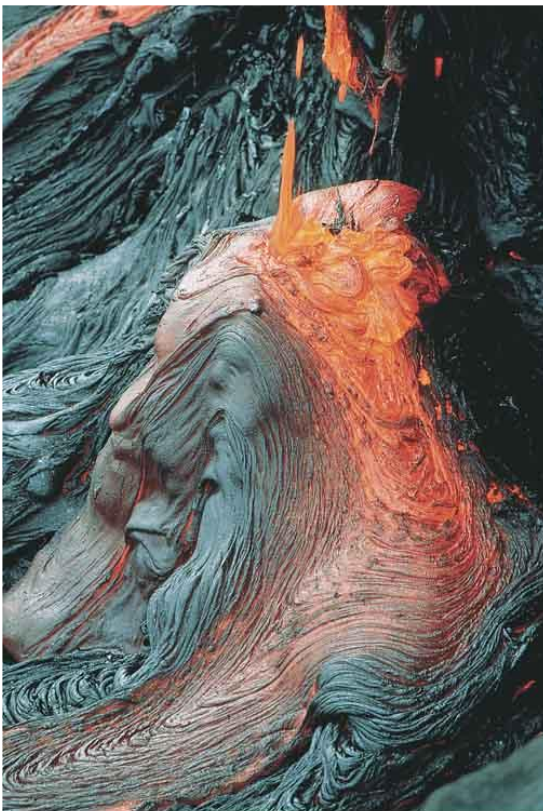


Volcanism

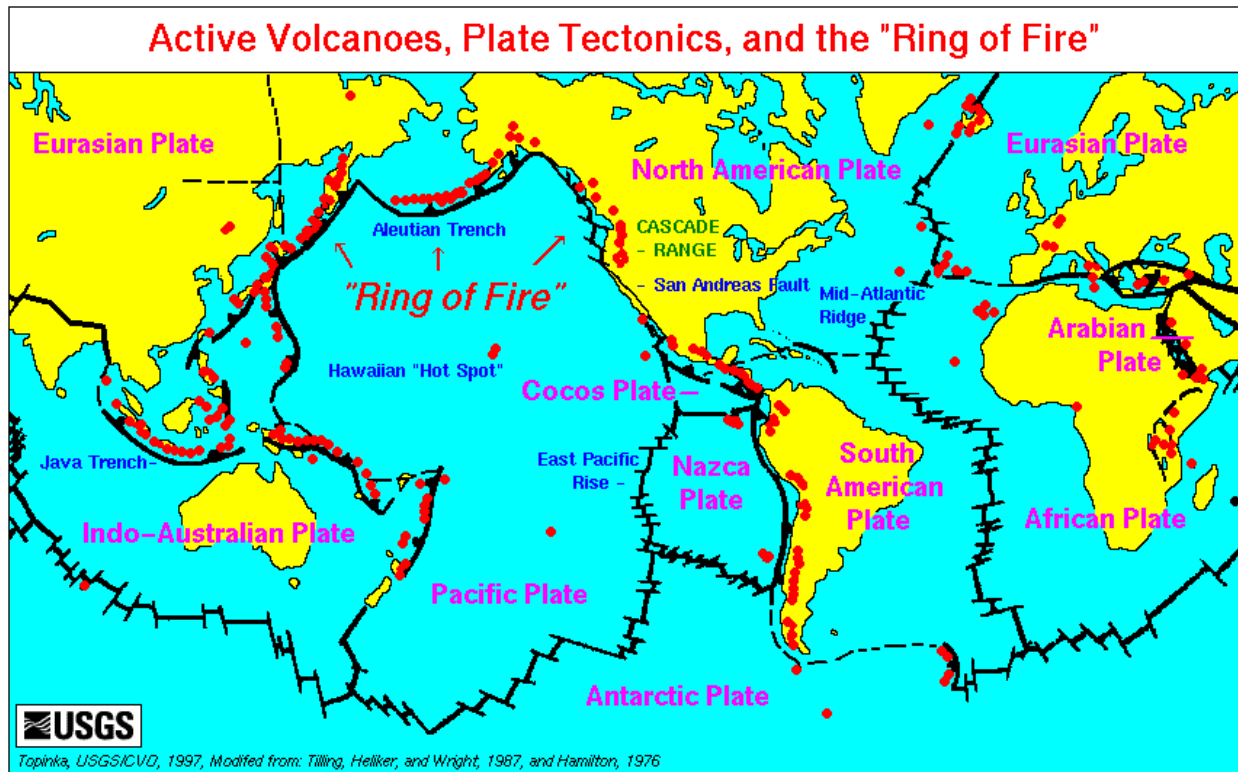


Most incredible volcano expedition ever 2012 - the full version 11 min
<http://www.youtube.com/watch?v=VuOrUwFn6bU>
USE Scientist gets too close to lava lake! - Richard Hammond's Journey to the Centre of the Planet - BBC 4 min
<http://www.youtube.com/watch?feature=endscreen&v=egEGaBXG3Kg&NR=1>
USE WHAT HAPPENS TO YOU IF DROPPED INTO VOLCANO: 3:49
<https://www.youtube.com/watch?v=9UIDFHOgbYI>



Zones of Volcanism 18.1

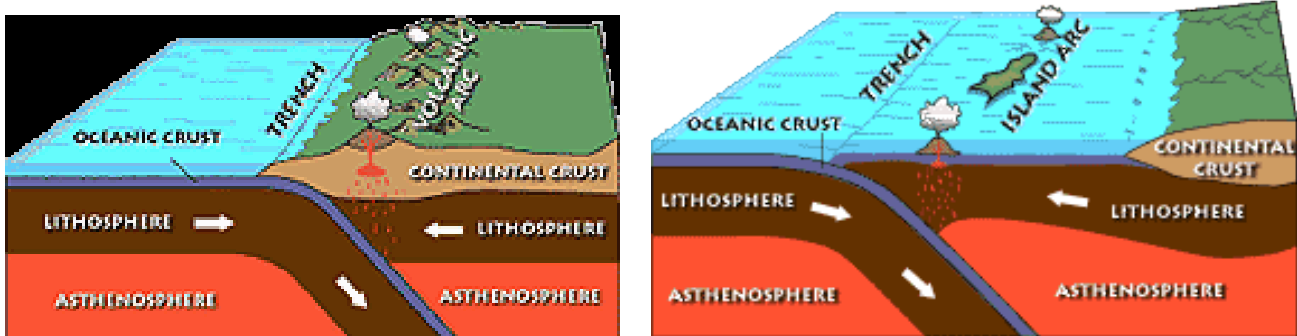
- **Volcanism** – describes all processes associated with the discharge of magma, hot fluids, and gases
- Most volcanoes form at plate boundaries.
- The majority form at convergent boundaries and divergent boundaries.



Convergent Volcanism

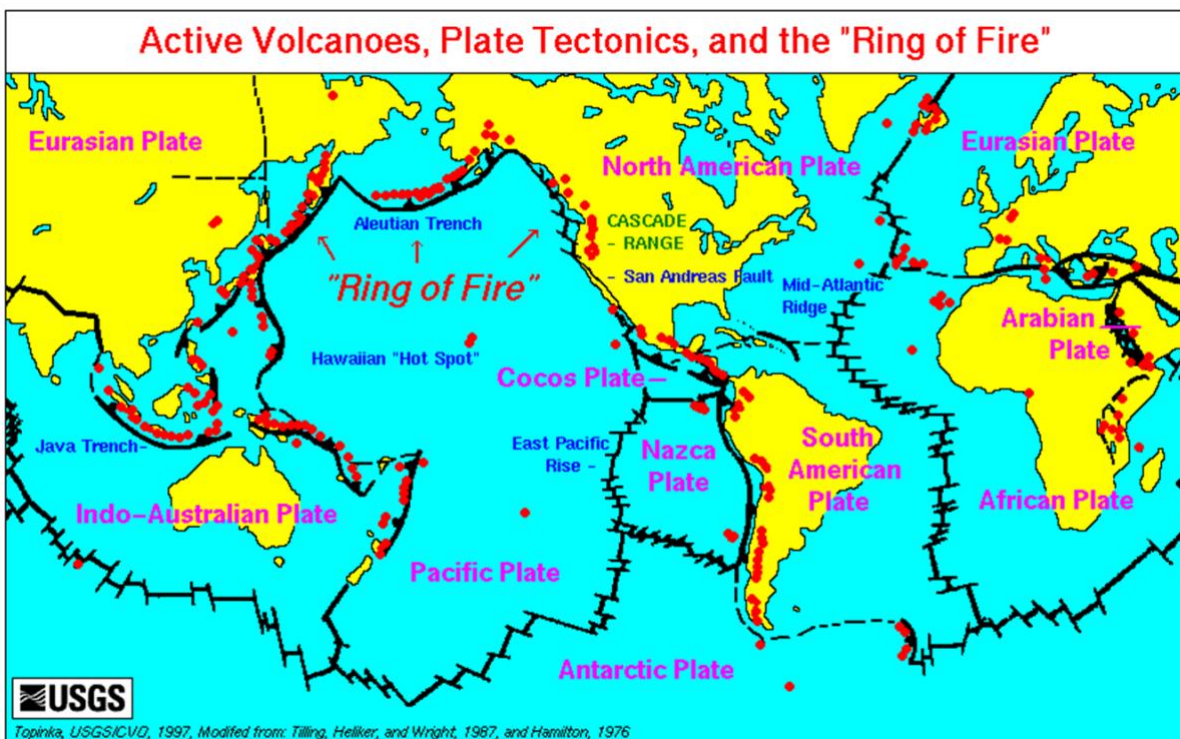
- Remember: In an oceanic-continental subduction zone, the denser oceanic plate slides under the continental plate into the hot mantle.
- Parts of the plate melt and magma rises, eventually leading to the formation of a volcano.
 - What is causing the melting?
 - 1) friction: adds heat
 - 2) partial melting: different minerals melt at different temperatures
 - 3) high water content: more water, lower melting point: easier to melt

- Most volcanoes located on land result from oceanic-continental subduction.
 - These volcanoes are characterized by explosive eruptions.
- Most volcanic islands are the result of oceanic-oceanic subduction



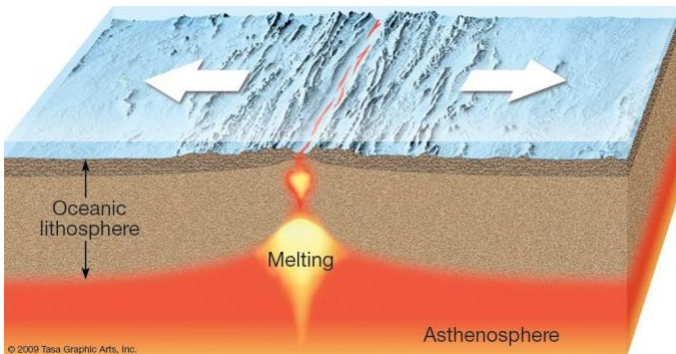
Two Major Belts associated with convergent boundaries

- The larger belt, the **Circum-Pacific Belt**, is also called the Pacific Ring of Fire.
 - The outline of the belt corresponds to the outline of the Pacific Plate.
- The smaller belt is the **Mediterranean Belt**.
 - Its general outline corresponds to the boundaries between the Eurasian, African, and Arabian plates.



Divergent Volcanism

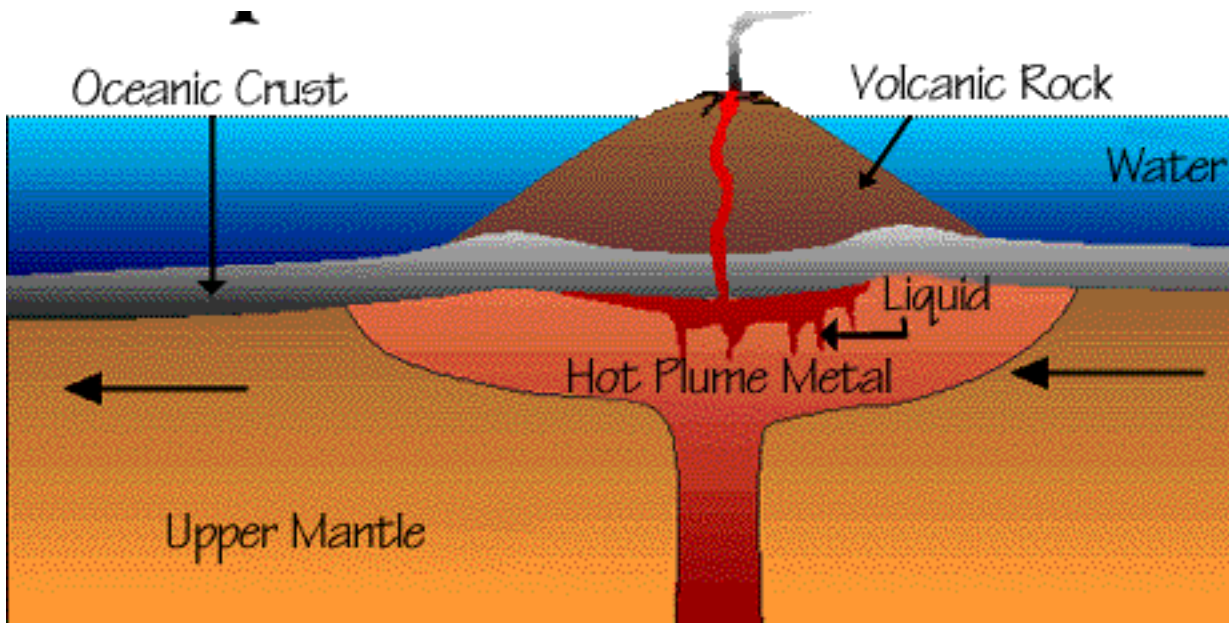
- Eruptions at divergent boundaries tend to be nonexplosive.
- Many occur along the Mid-Atlantic ridge, East Pacific Rise, Indian Ridge
 - **Rift zones:** Place where two lithospheric plates are moving apart. Magma replaces the gap. This magma comes from the asthenosphere that has risen and melted due to pressure relief melting
- Most form in the oceanic basin
- Ocean crust is primarily basalt and gabbro
 - Emplaced as vertical dikes, gabbro plutons, and pillow lava
- At the divergent boundary on the ocean floor, eruptions often form huge piles of lava called **pillow lava**.



USE Pillow Lava - Lava Dive Hawaii 2:50 min
http://www.youtube.com/watch?v=gn_IW5Vsxaw
Pillow Lava | Nautilus Live
https://www.youtube.com/watch?v=g_r6CFO7yaU
AMAZING UNDERWATER PILLOW LAVA - Lava Dive Hawaii 3:24 min
<http://www.youtube.com/watch?v=xsJn8izcKtg>

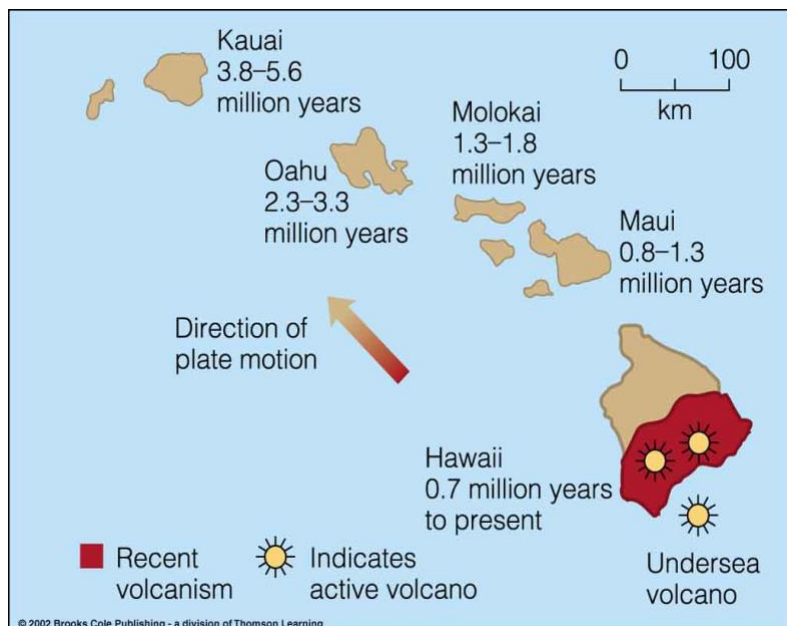
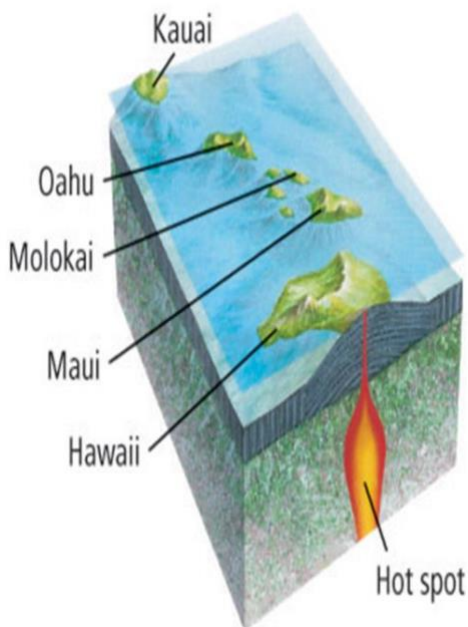
Hot Spots

- Some volcanoes form far from plate boundaries over **hot spots**.
- A hot spot is an unusually hot area in Earth's mantle where high-temperature plumes of mantle material rise toward the surface.



Hot Spots and Hawaii

- The Hawaiian islands are located over a plume of magma.
- The hot spot formed by the magma plume remained stationary while the Pacific Plate slowly moved northwest.

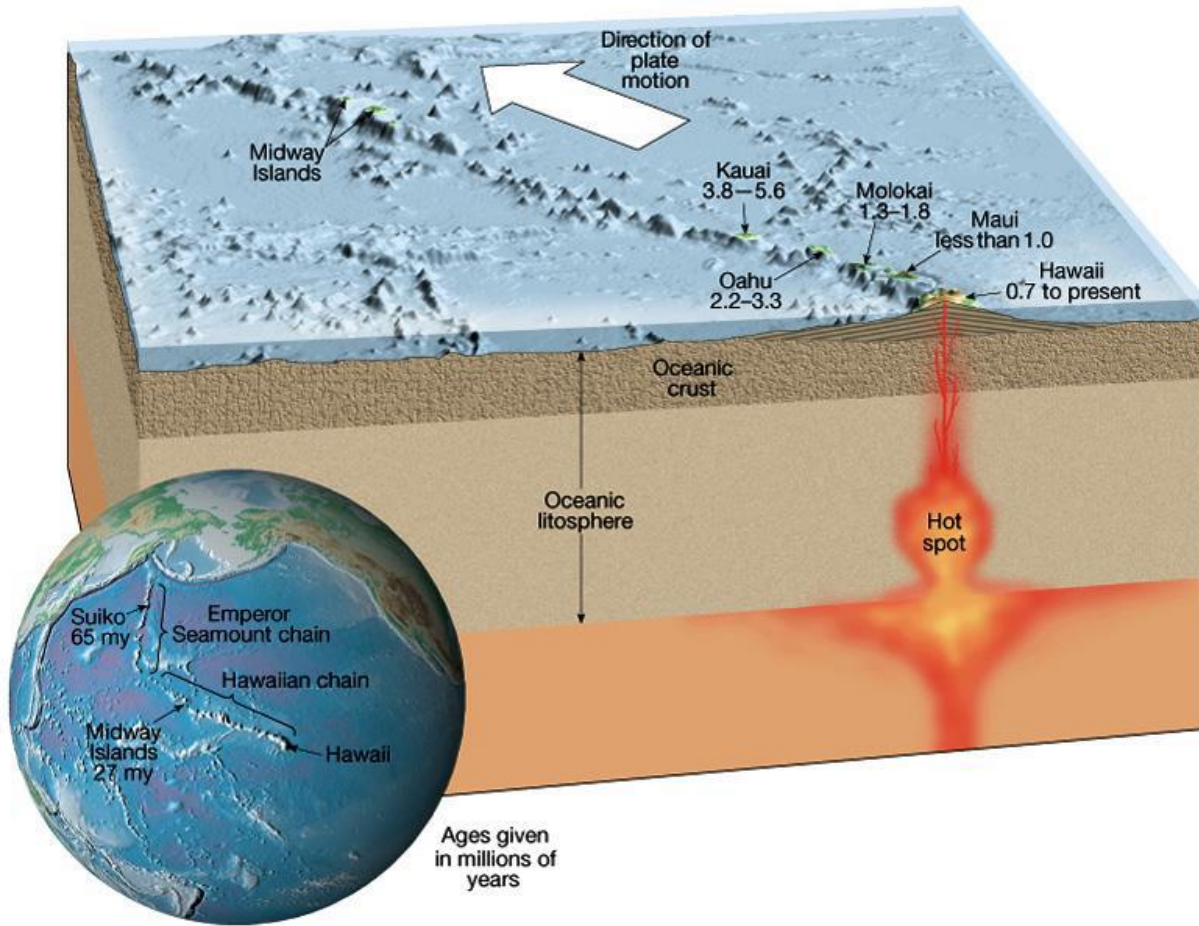


- The volcanoes on the oldest Hawaiian island, Kauai, are inactive because the island no longer sits above the stationary hot spot.
- The world's most active volcano, Kilauea, on the Big Island of Hawaii, is currently located over the hot spot.

Lava flow at Kilauea

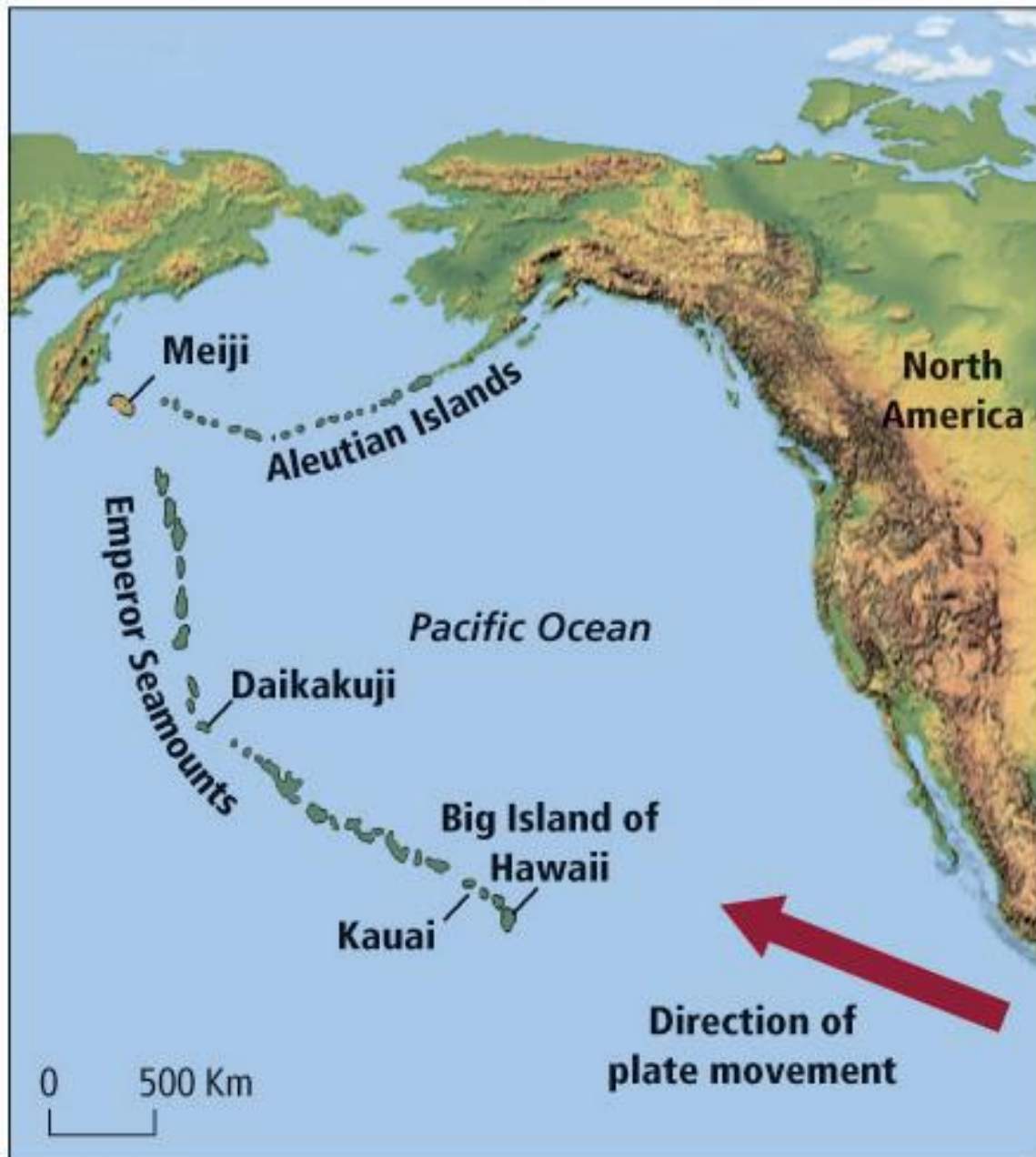


- The rate and direction of plate motion can be calculated from the positions of hot spot volcanoes.



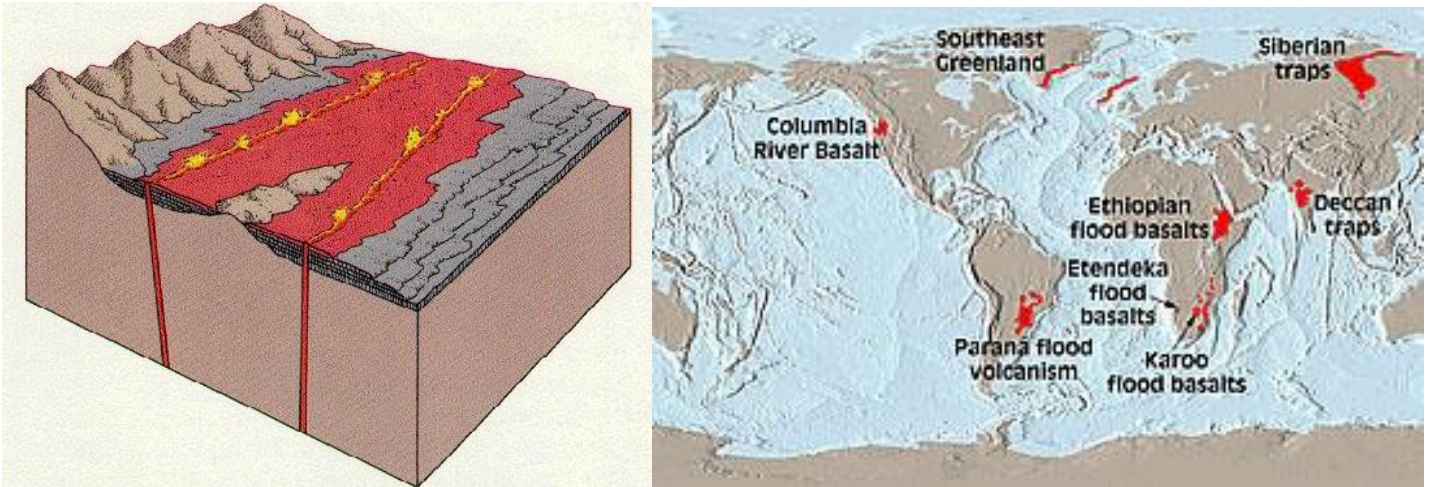
- The Hawaiian islands are at one end of the Hawaiian-Emperor volcanic chain. The oldest seamount, Meiji, is at the other end of the chain and is about 80 million years old.

Hawaiian-Emperor Volcanic Chain

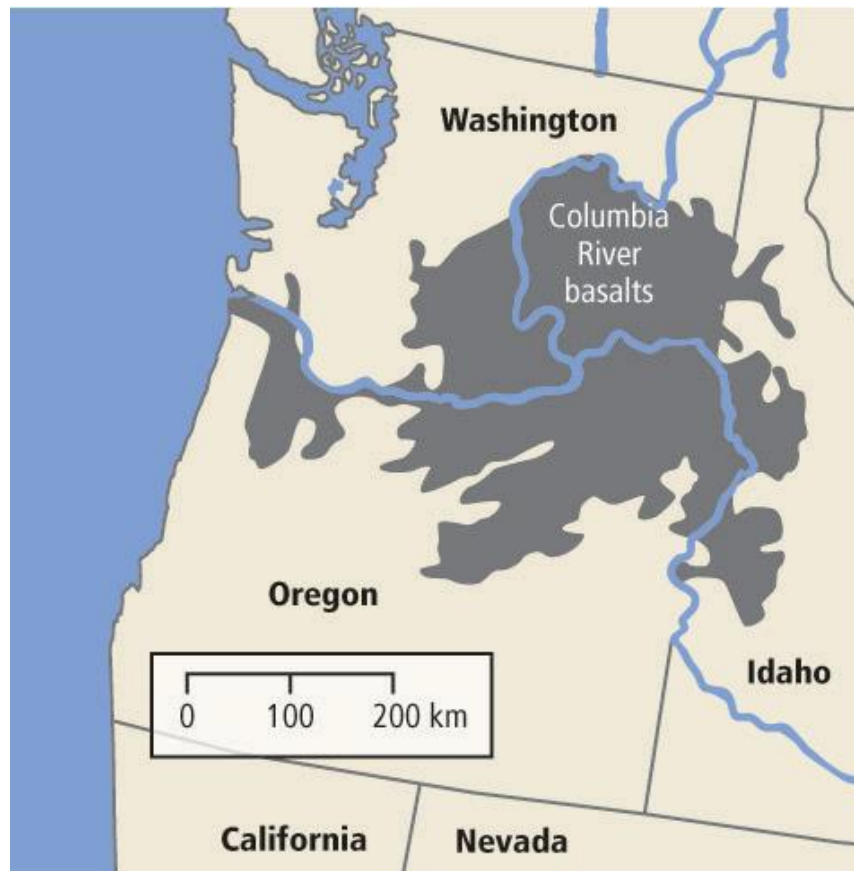


Hot Spots and Flood Basalts

- **Flood basalts** form when lava flows out of long cracks in Earth's crust.
- These cracks are called fissures.
- Low viscosity, runny, lava spread out and build up flat plains called basalt plateaus



Columbia River Basalts

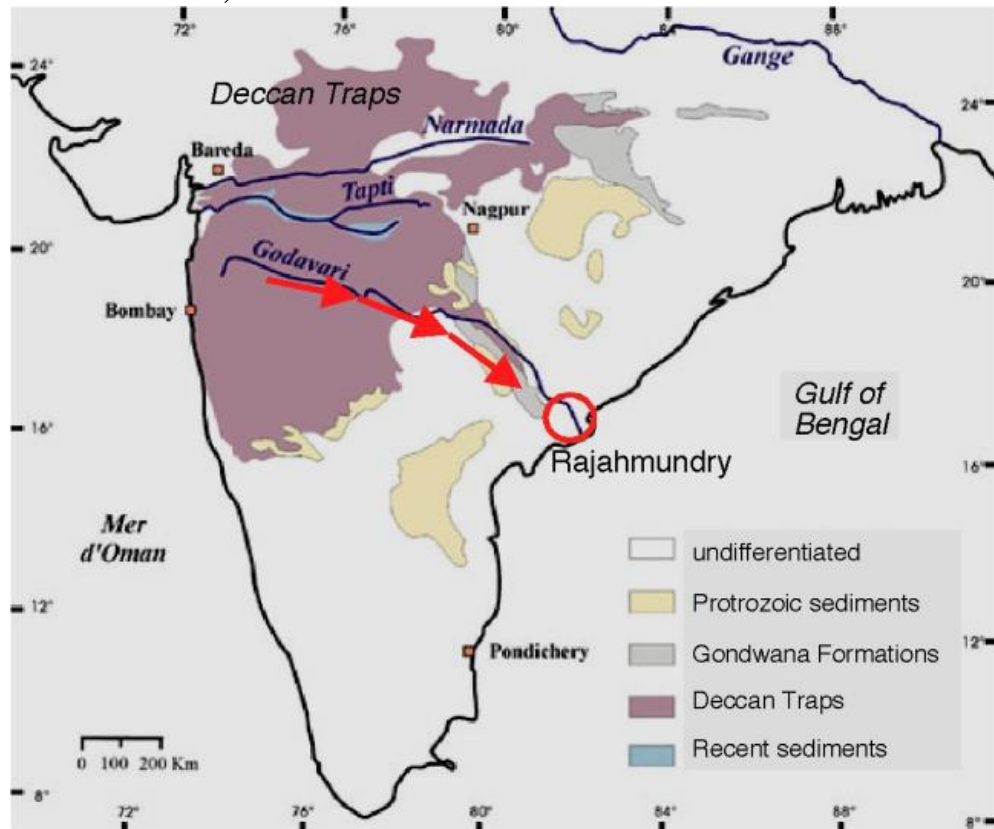




© LYN TOPINKA, 2005

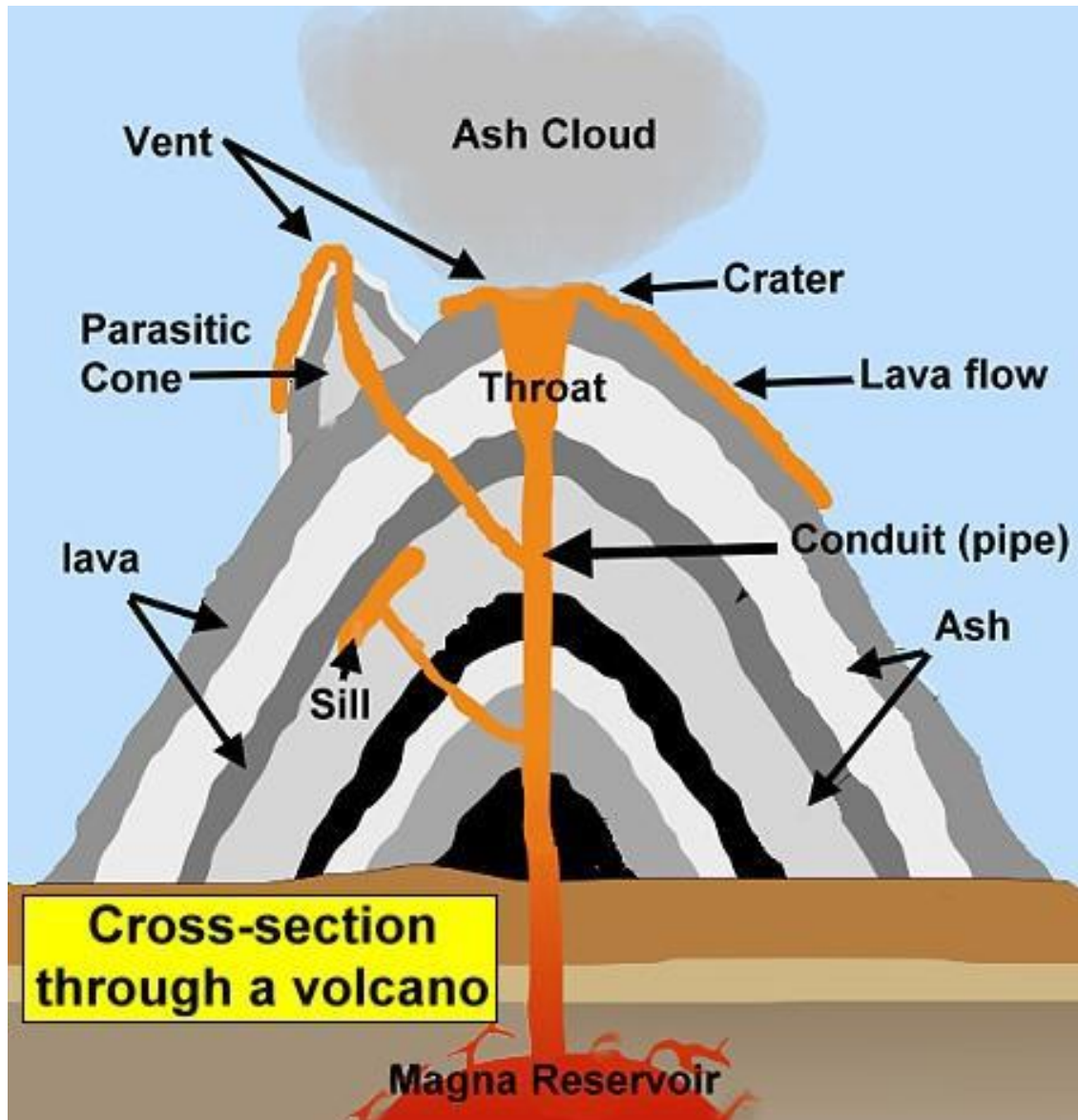
Deccan Traps

•About 65 M.Y.A. in India, a huge flood basalt eruption created an enormous plateau called the Deccan Traps. The volume of basalt in the Deccan Traps is estimated to be about 512,000 km³.

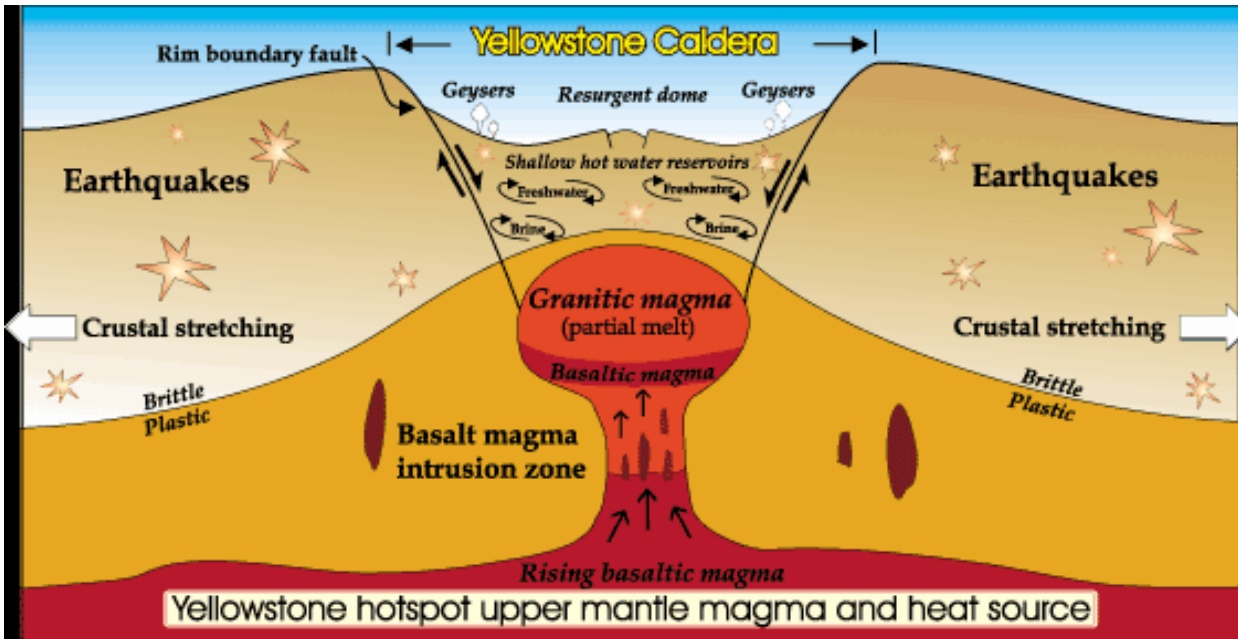


Anatomy of a Volcano

- Over time, layers of solidified lava can accumulate to form a mountain known as a volcano.
- Not all volcanoes have the same profile!! All will have the following.
- Conduit** – tube like structure that lava travels through to reach the surface
- Vent** - opening that lava emerges through
- Crater** – bowl-shaped depression found at the top of the volcano surrounding the vent



- **Caldera** – large volcanic crater; often forms after the magma chamber beneath a volcano empties after a major eruption
 - the summit or side of the volcano collapses into the empty chamber and leaves a large, circular impression



Crater Lake Formed when Mount Mazama collapsed in approximately 5,677 B.C.



Types of Volcanoes

•The appearance of a volcano depends on two factors:

- 1) the type of material that forms the volcano
- 2) the type of eruptions that occur

} Talk more about these two factors in section 18.2

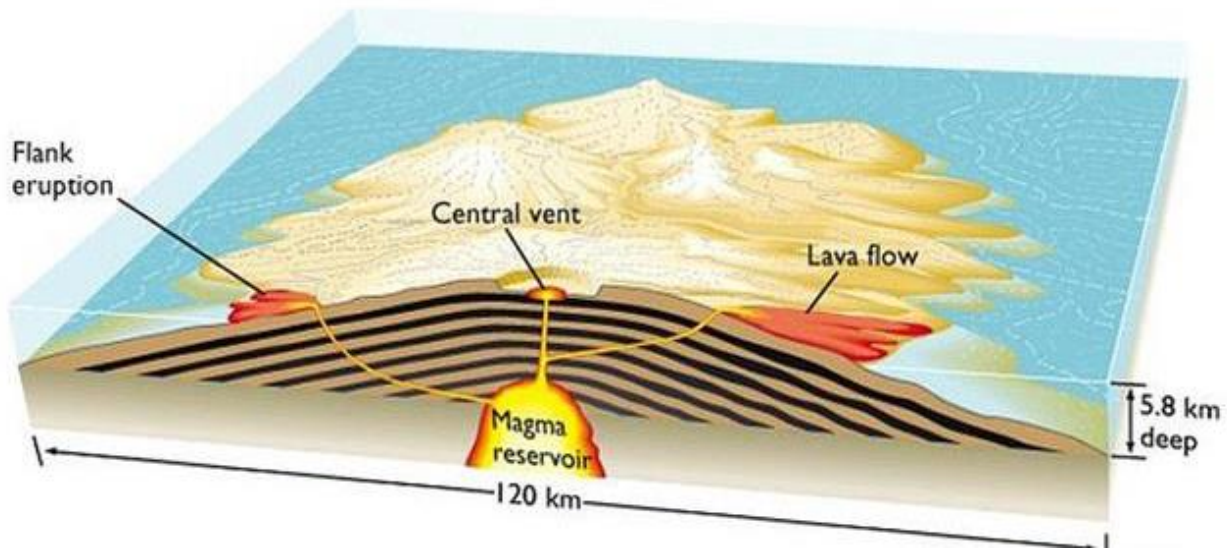
•Four basic types: Shield, Composite (Stratovolcano), Cinder Cone, & Supervolcano

Shield Volcanoes

- Largest
- Long, gentle slopes (2-10°)
- Composed of numerous layers of solidified basalt lava
- Quiet explosions

Mauna Loa in Hawaii

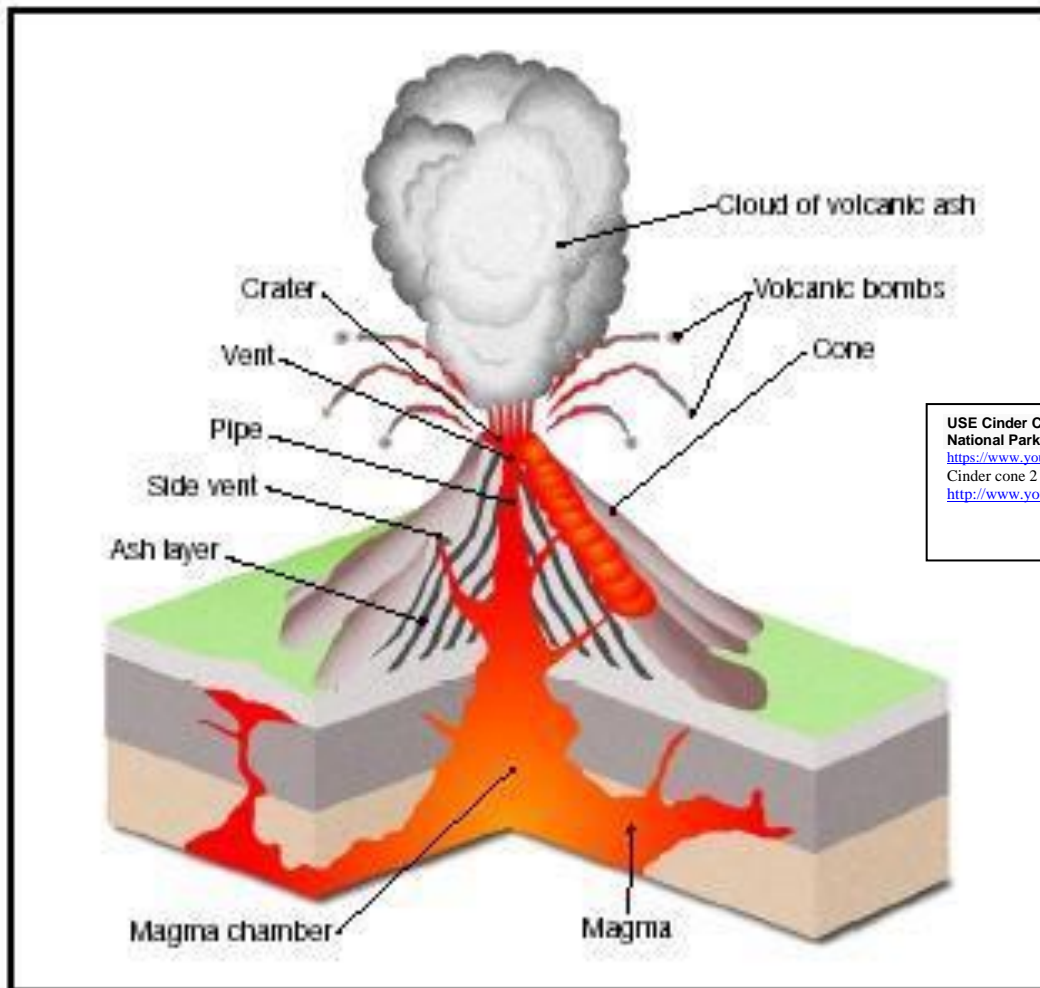




Cinder Cones

- Smallest, but steep (33°)
- Usually less than 500metrs tall
- Forms from small pieces of magma (tephra) that falls back to Earth and piles up around the vent
- Cone-shaped
- Usually short-lived
- Many form on the sides of larger basaltic (shield) volcanoes
- Usually basaltic lava
- Can be explosive if andesitic

Cinder Cone at Lassen Park in California

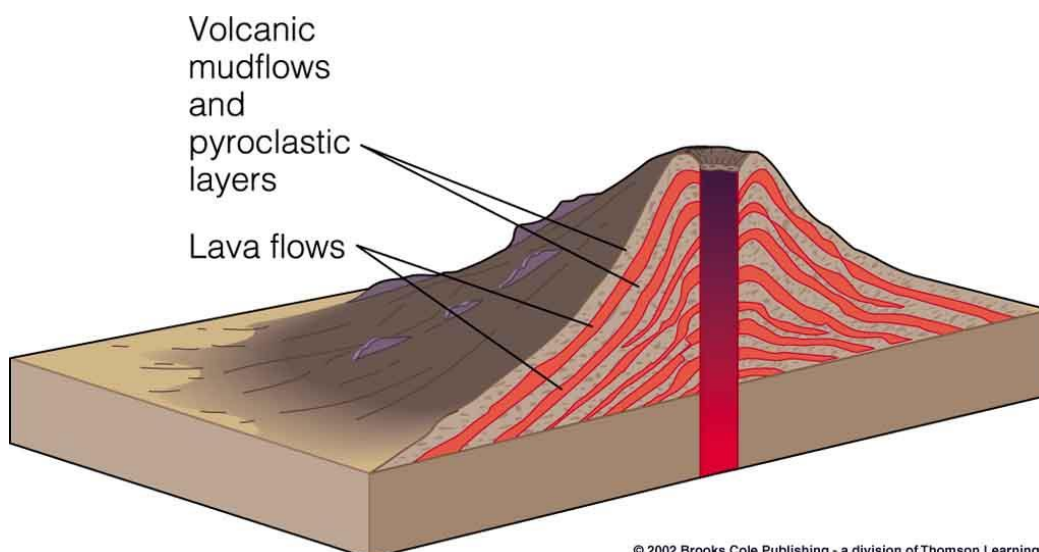


USE Cinder Cone Volcano - Lassen Volcanic National Park California 2:42 min
https://www.youtube.com/watch?v=A_9d2MLClqw
Cinder cone 2 min
http://www.youtube.com/watch?v=aS_xl3nu_mY

Composite (Stratovolcanoes) Volcanoes

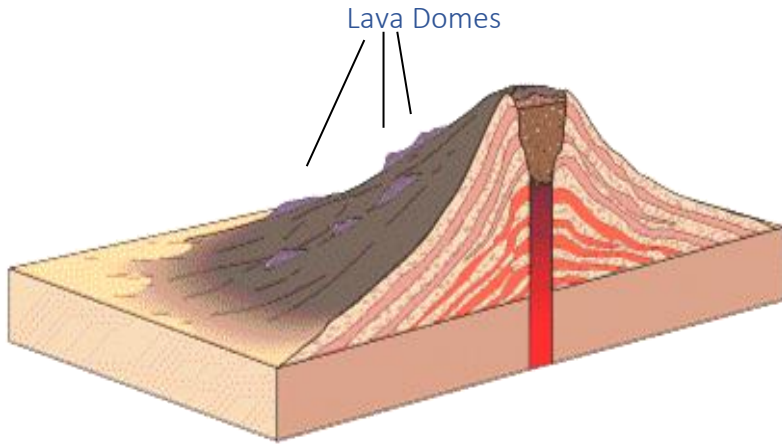
- Composed of layers of hardened chunks of lava (tephra) from violent eruptions alternating with layers of lava that oozed downslope
- Cone-shaped but larger than cinder cones
- Also called “stratovolcanoes”
- Tend to have explosive eruptions with cycles of quiet

Mt. Rainer near Seattle



•Lava Domes

- High-viscosity, felsic magmas move slowly upward to form steep-sided lava domes



Mount St. Helens in Washington State as it appeared before and after it erupted.



•**Lahar:** volcanic mudflow made of unconsolidated pyroclastic materials that flow downhill.

Lahar at Merapi Volcano 1:28 min
<https://www.youtube.com/watch?v=TpwiFVRBTs>



*Lahar Flowing Down Mount St. Helens, March 21, 1982
USGS Photo by Tom Casadevall*