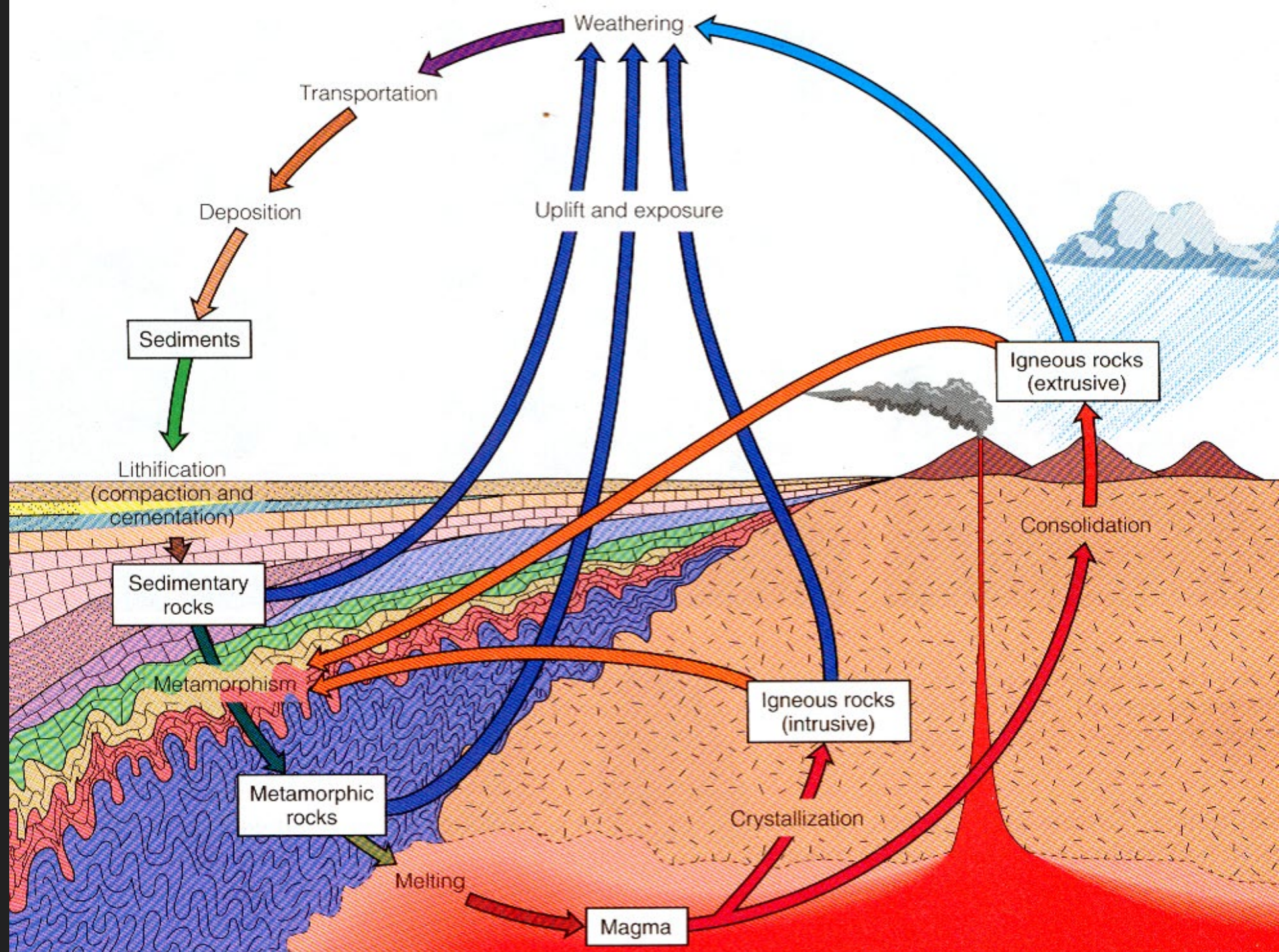
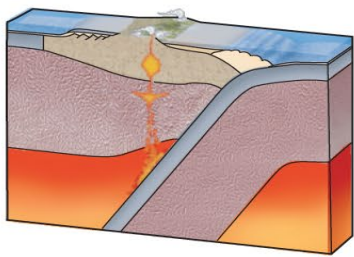


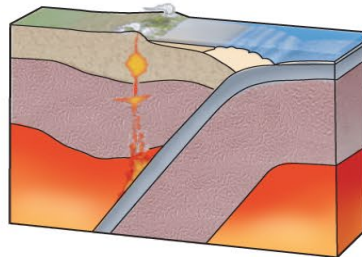
Volcanoes

University of Northern Iowa – Department of Earth and
Environmental Sciences

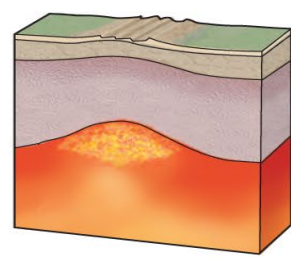




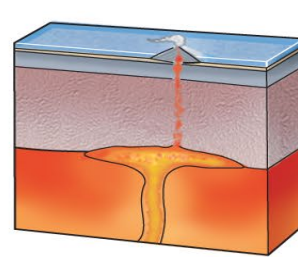
Ⓘ = Island arc



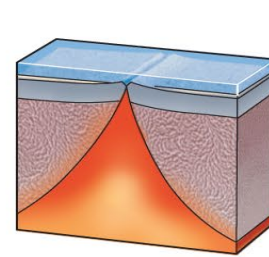
Ⓒ = Continental arc



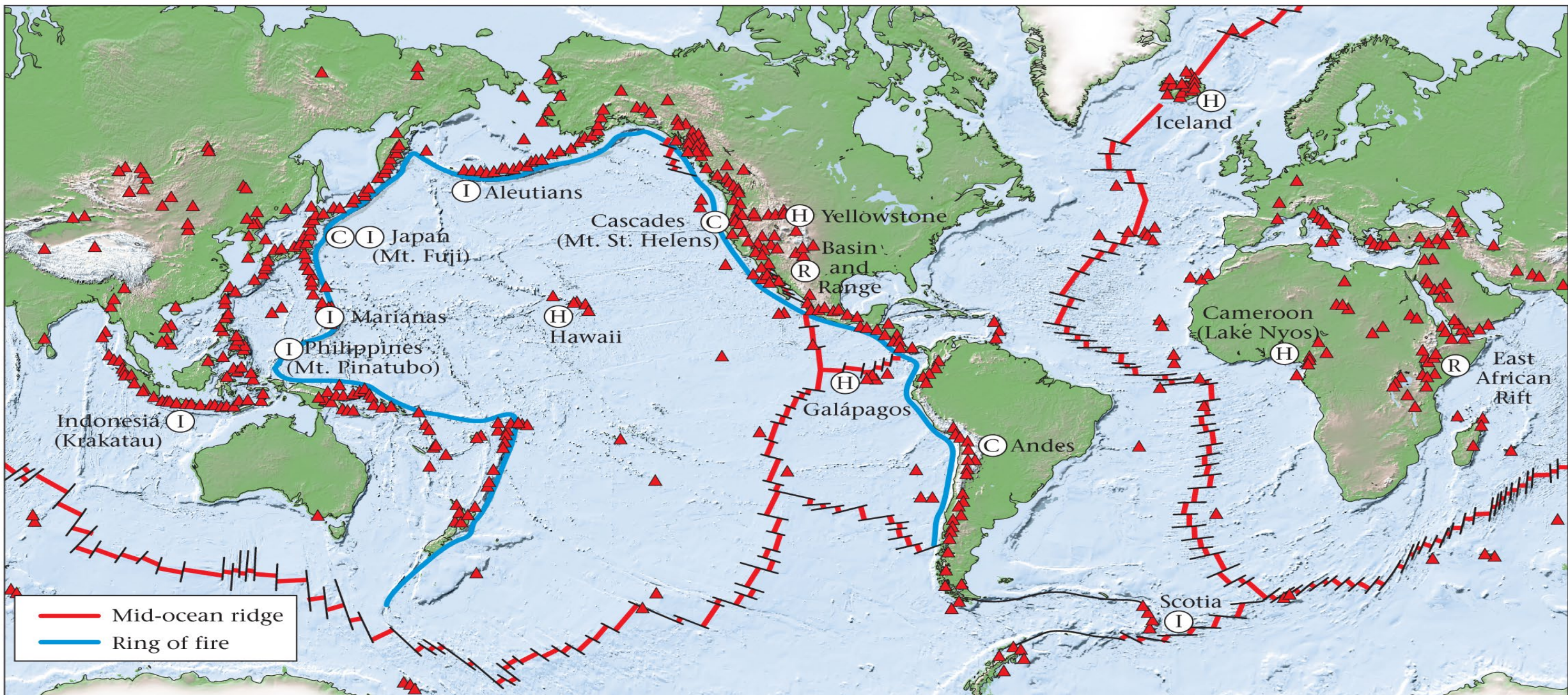
Ⓓ = Rift



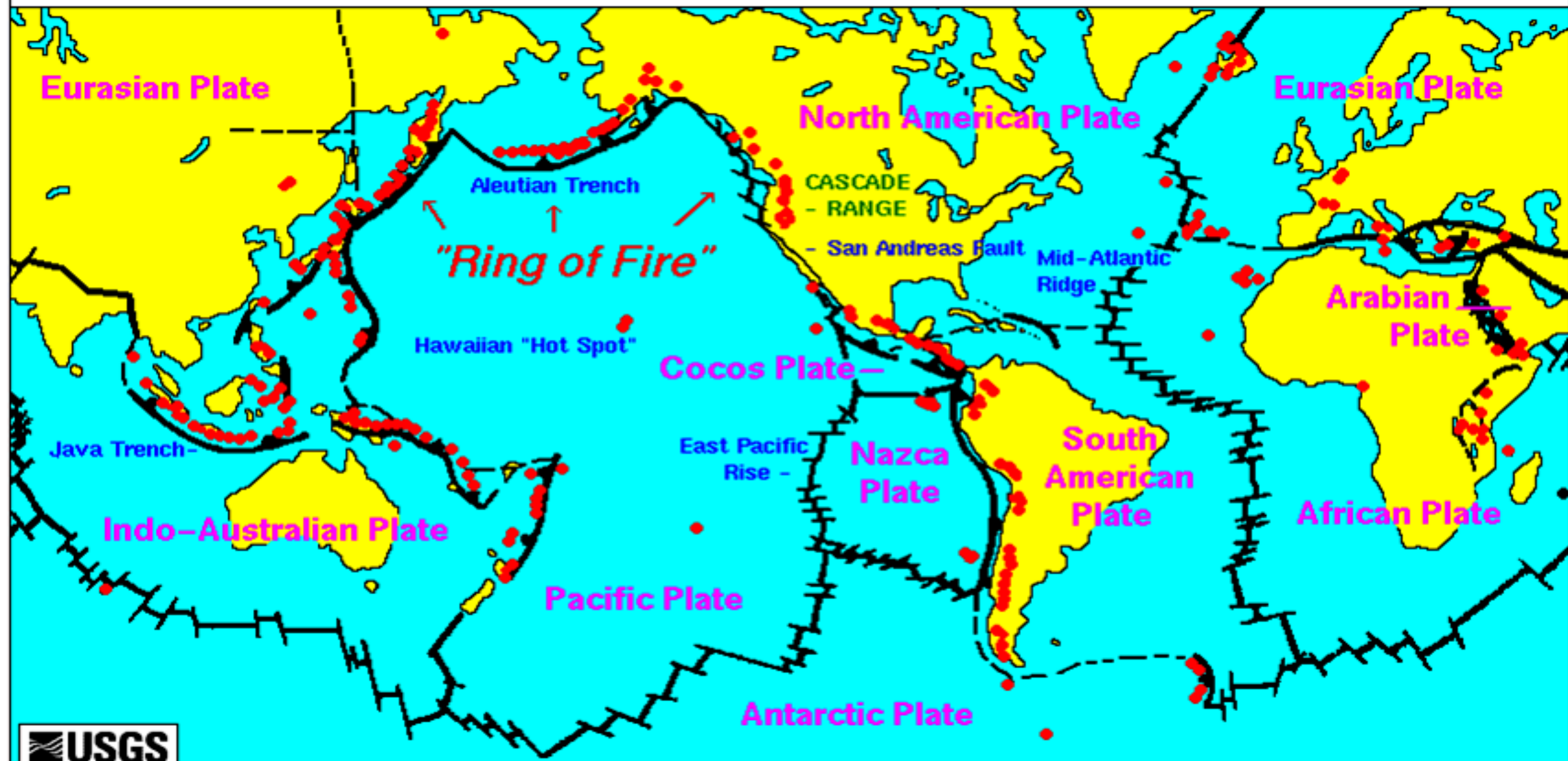
Ⓕ = Hot spot



Ⓜ = Mid-ocean ridge



Active Volcanoes, Plate Tectonics, and the "Ring of Fire"



Lava Chemistry

○ Mafic

○ Intermediate

○ Felsic

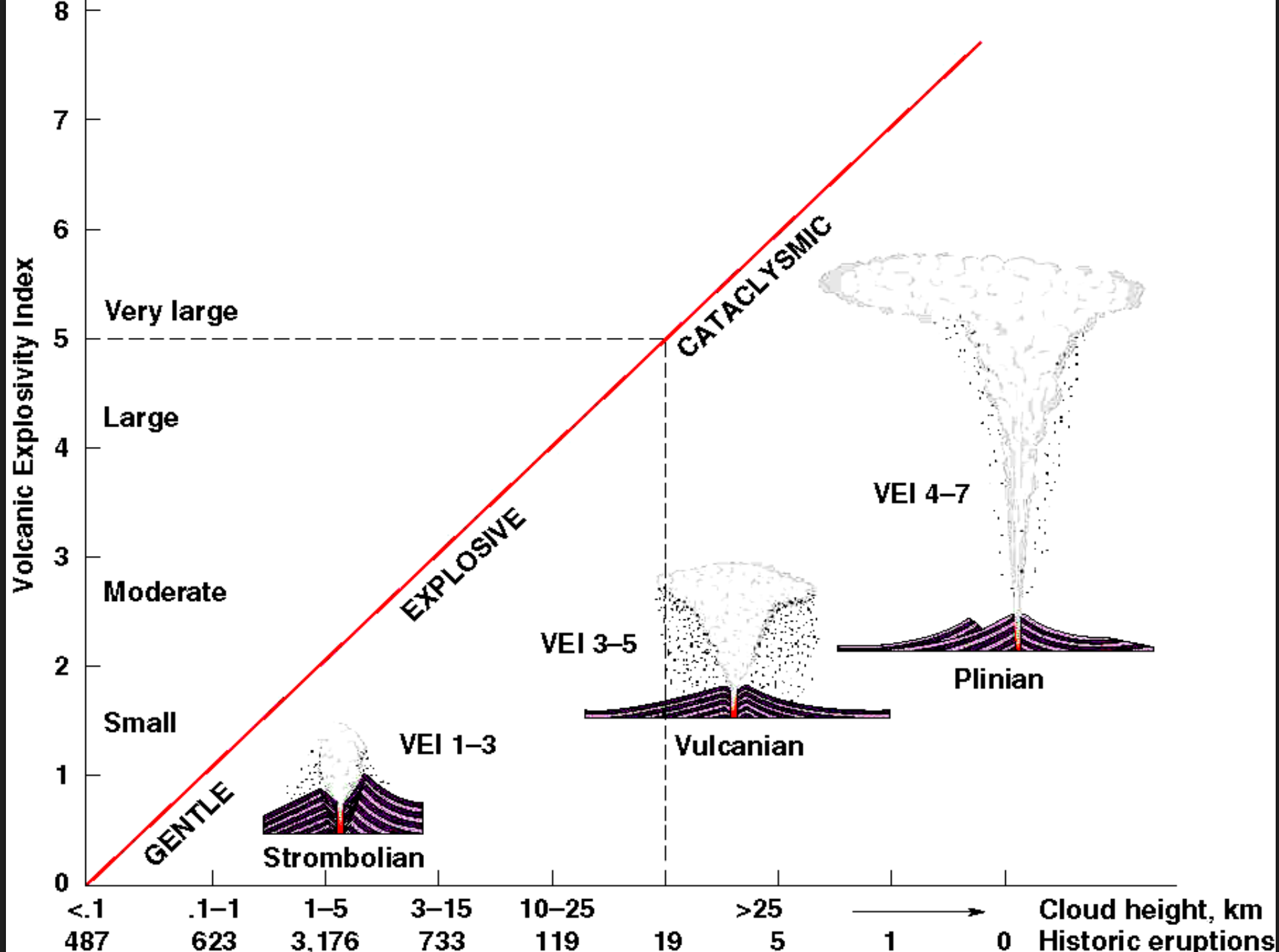
○ Lava Viscosity



Viscosity & Explosions

- Low viscosity = Small explosive eruptions
- High viscosity = Highly explosive eruptions



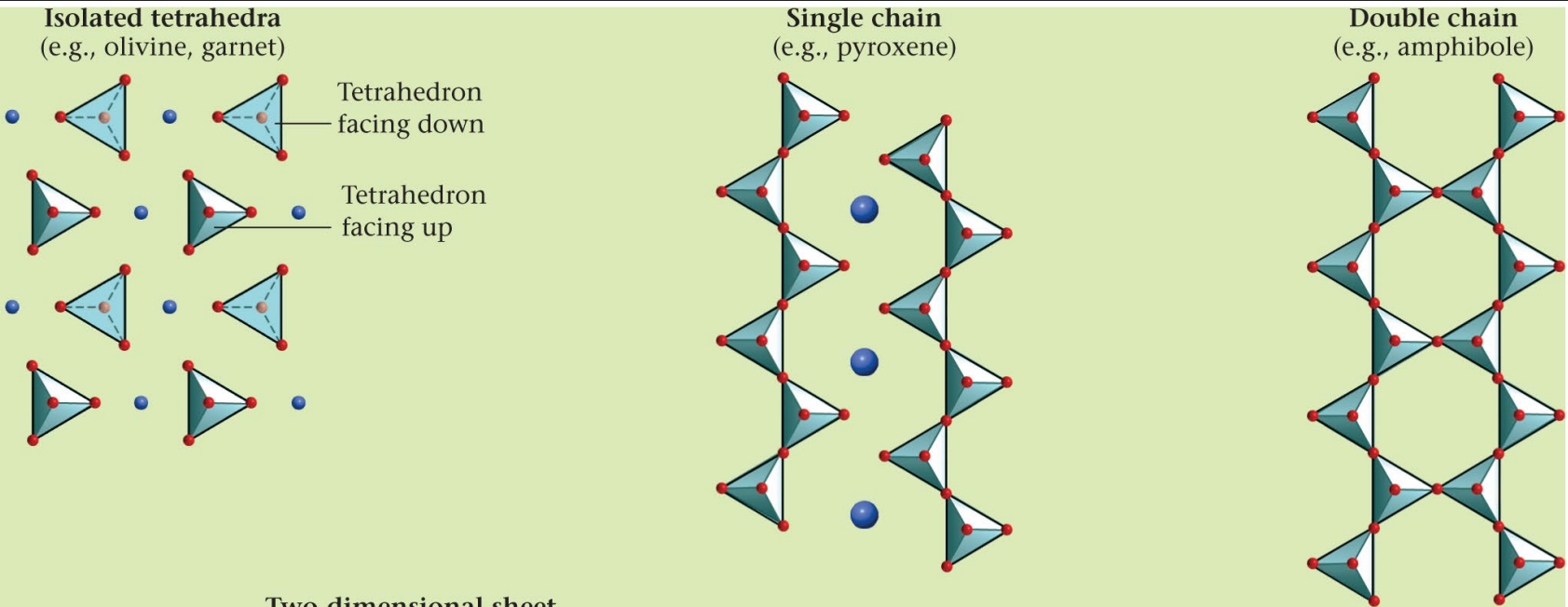


Viscosity Vs. Temperature

- High temperature magma = Low viscosity
 - Hot spots, Mid-ocean ridges,
- Low temperature magma = High viscosity
 - Beneath continents

Viscosity Vs. Composition

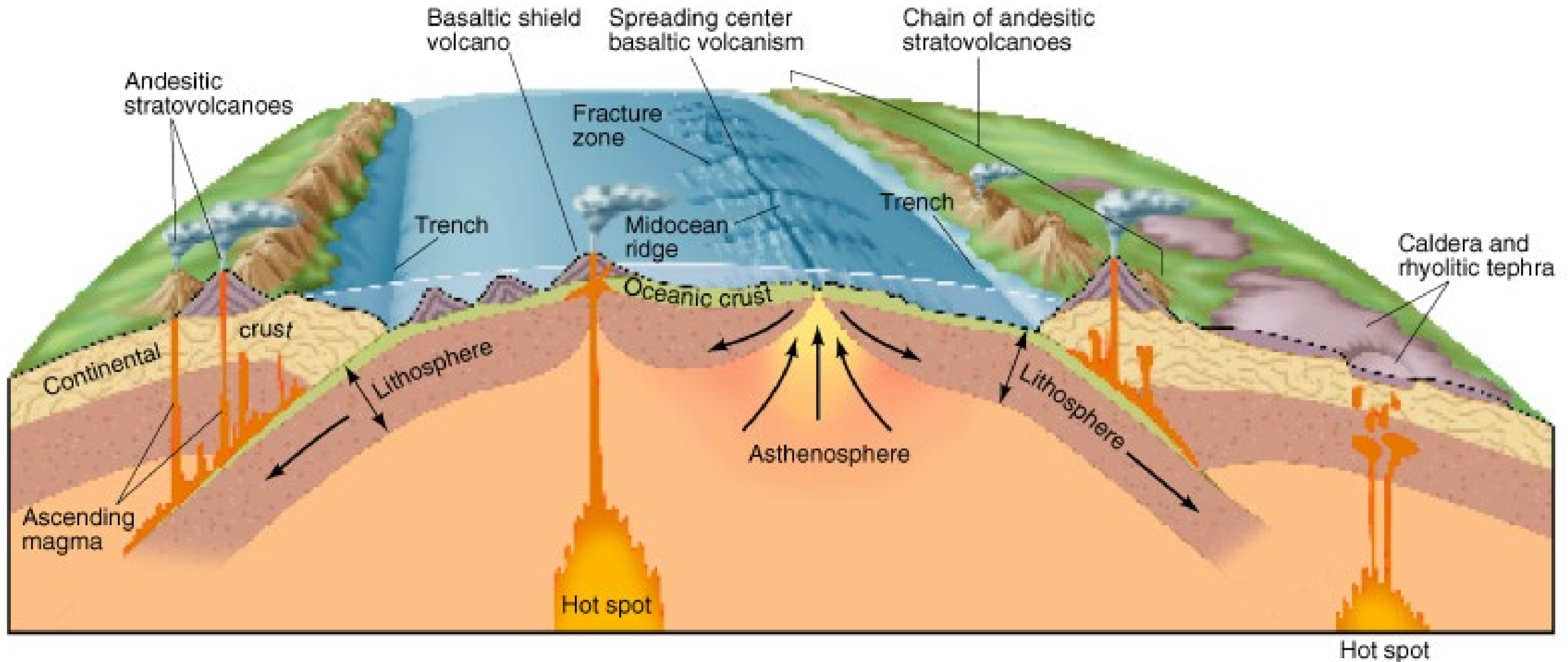
- Silica content (SiO_2) is the key
 - High silica content = high viscosity
 - Low silica content = low viscosity



Mafic

'Gentle' activity

Explosive activity

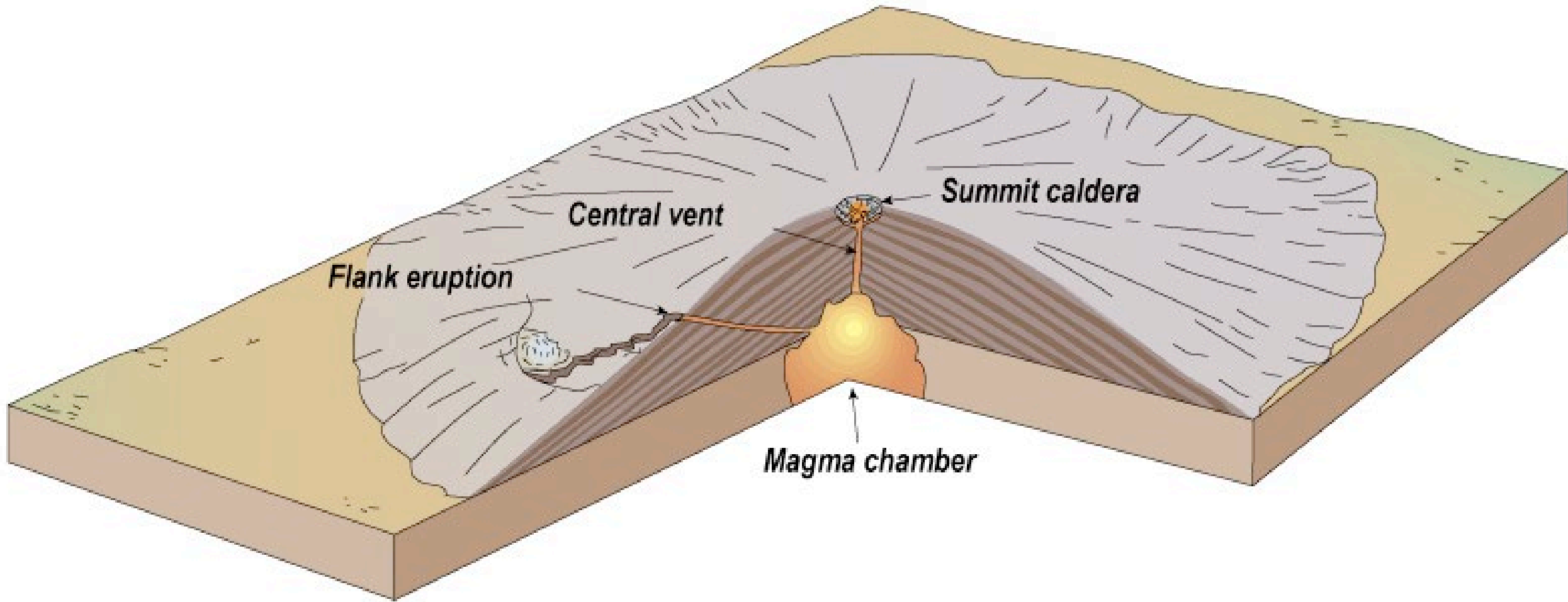


Volcano cone (Types)

- Gentle Eruptions
 - Shield
 - Flood Basalt
- Violent Eruptions
 - Stratovolcanoes
 - Calderas

Shield

- Large
- Basaltic
- Gentle slopes
- Common in ocean settings
 - Iceland
 - Hawaii
 - Galapagos

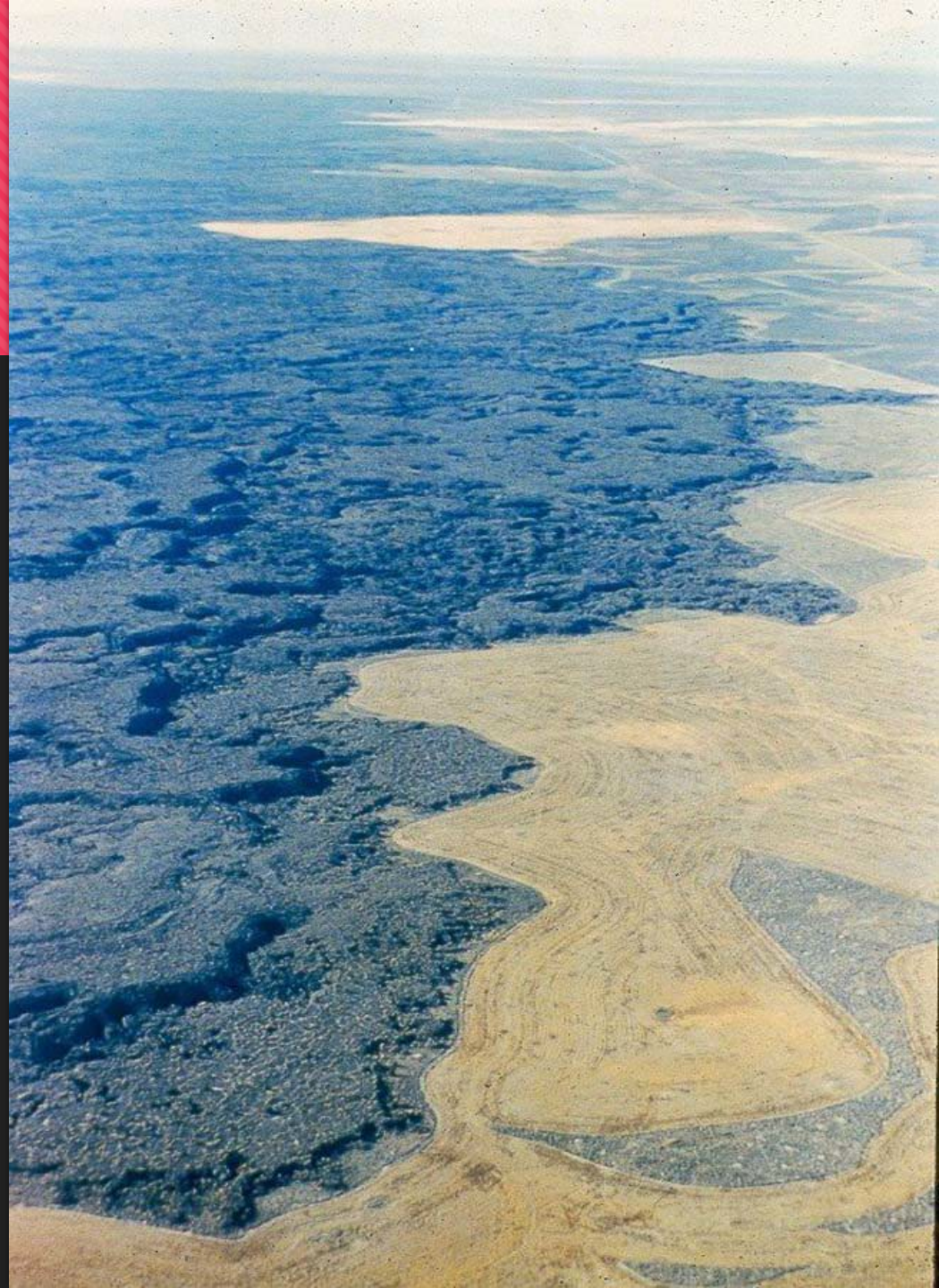


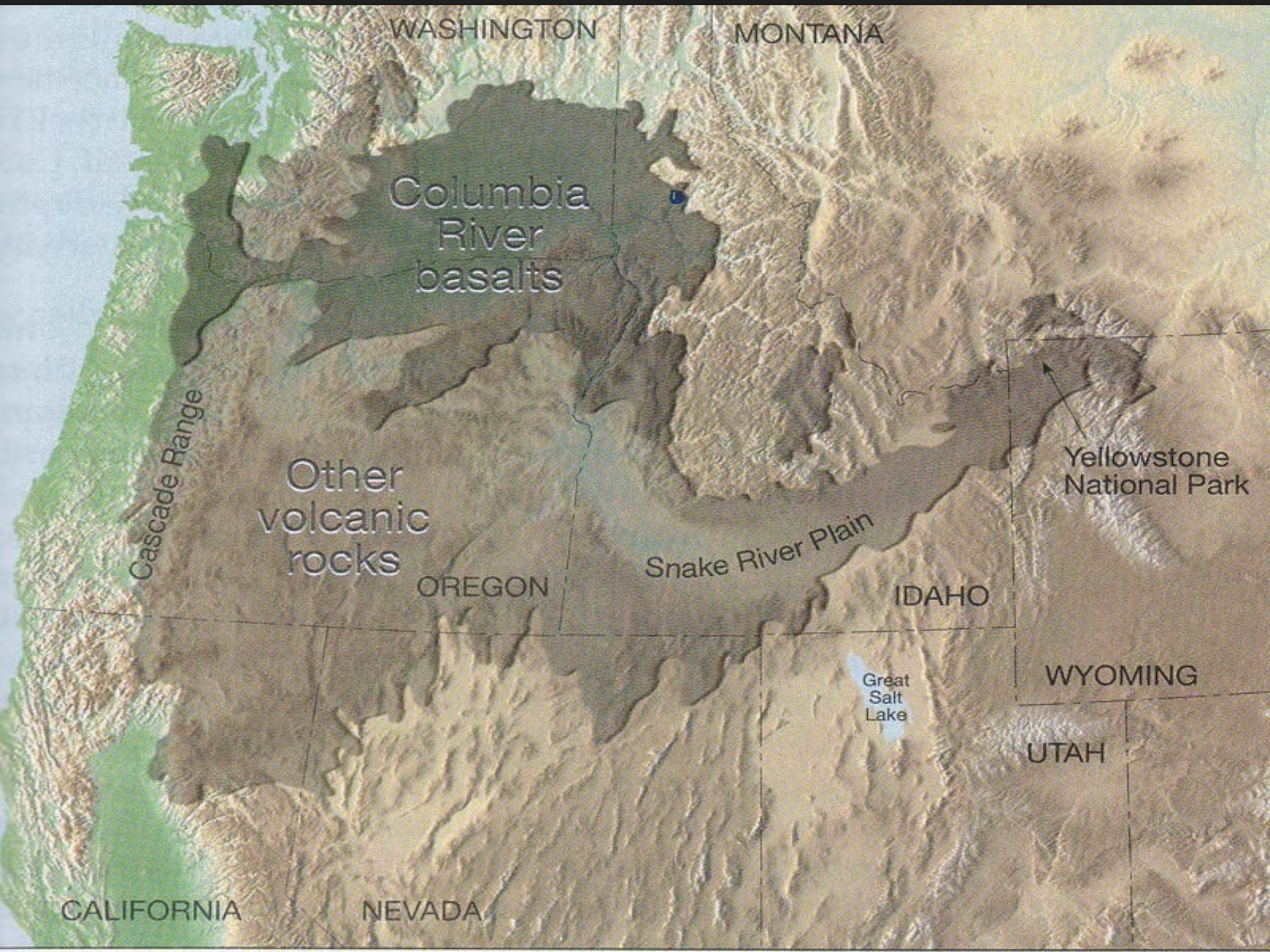
(b) Shield volcano

Continental Flood Basalts

- Thick
- Flat-lying layers of Basalt
- Erode to form stepped plateaus
 - Columbia River Plateau

Hawaiian Basalts







USGS Photo by Lyn Topinka, Sept. 27, 2002, Basalt cliffs along the Columbia R., near Lyle, Wa.

Flow types

- Pahoehoe
- Aa

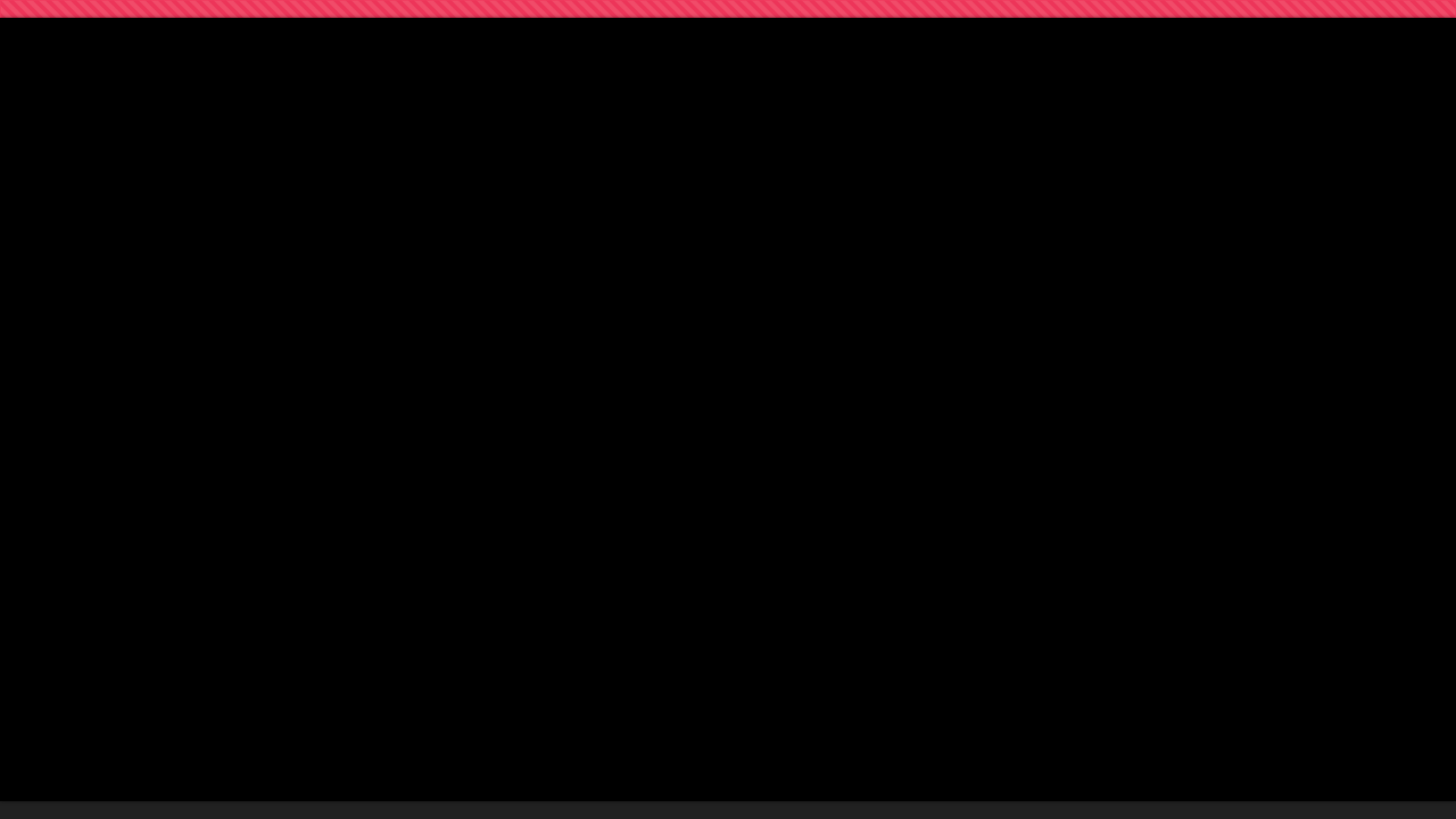


Pahoehoe



Aa







Columnar Basalt







Gooseberry Falls, MN

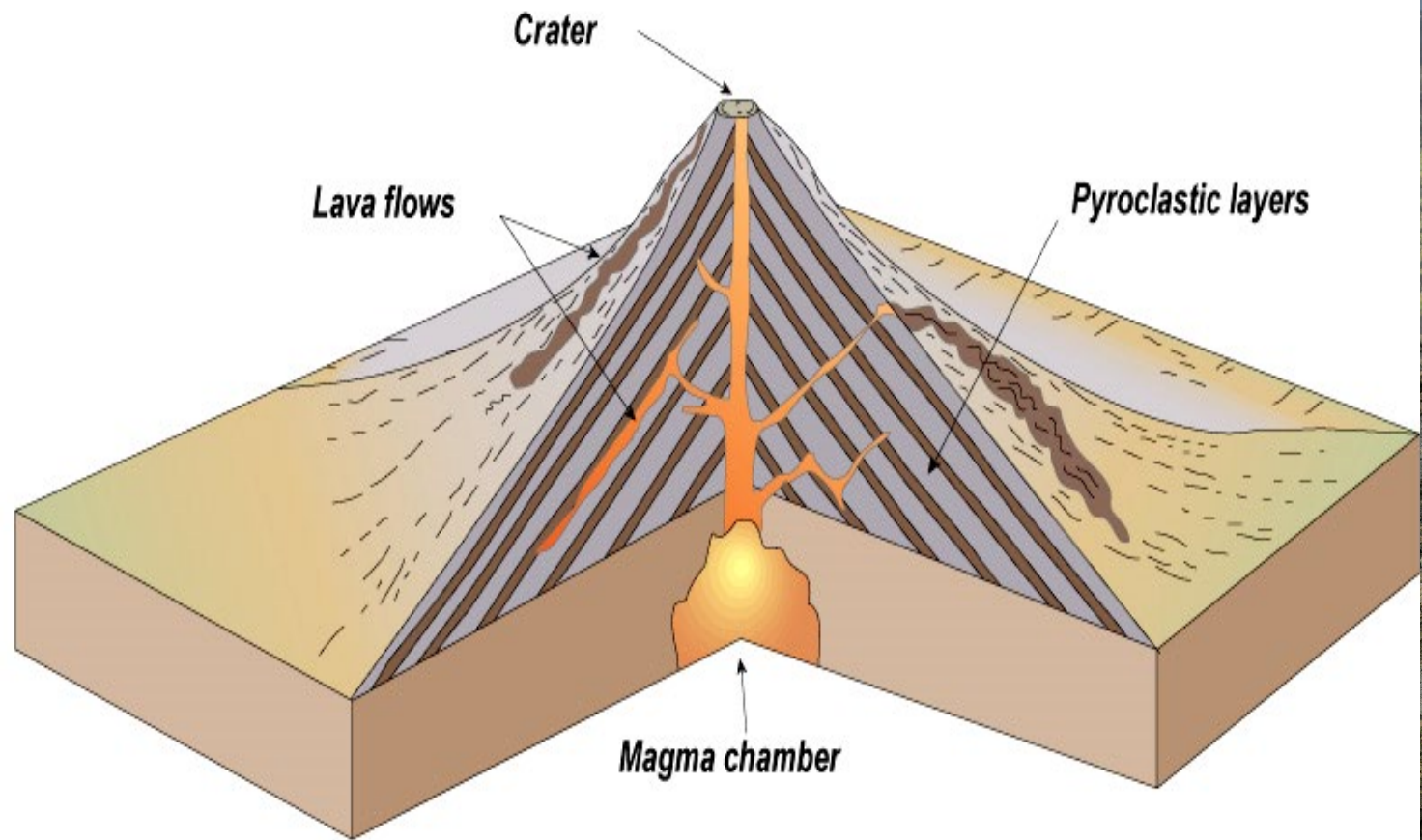
Pillow Basalts





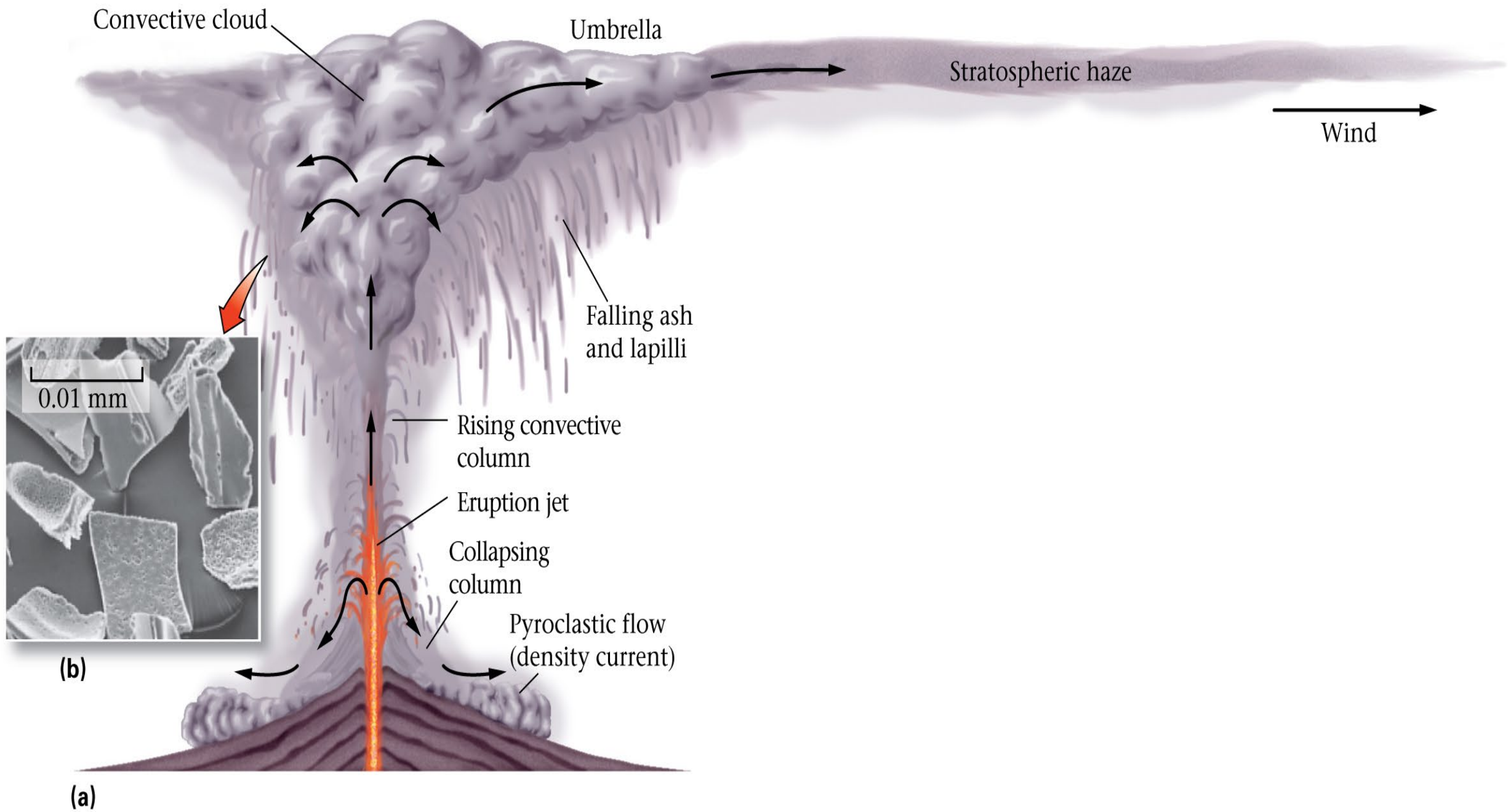
Explosive Eruptions

- Stratovolcanoes
 - Composite cones
- Mixed composition (basaltic to felsic)
- Steep slopes
- Thousands of feet high
- Beautiful areas
 - Mount Vesuvius
 - Mount Rainier
 - Mount St. Helens



(d) Composite volcano

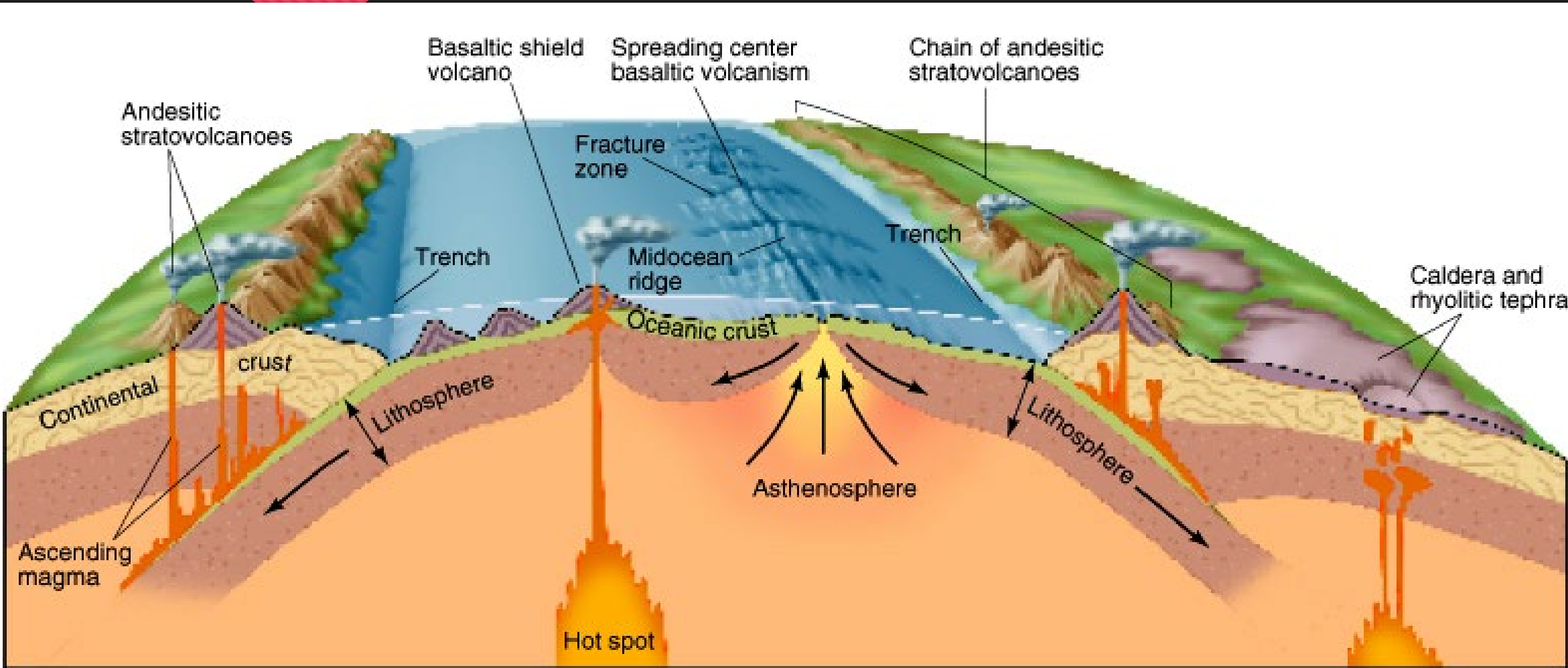




Mount Rainier



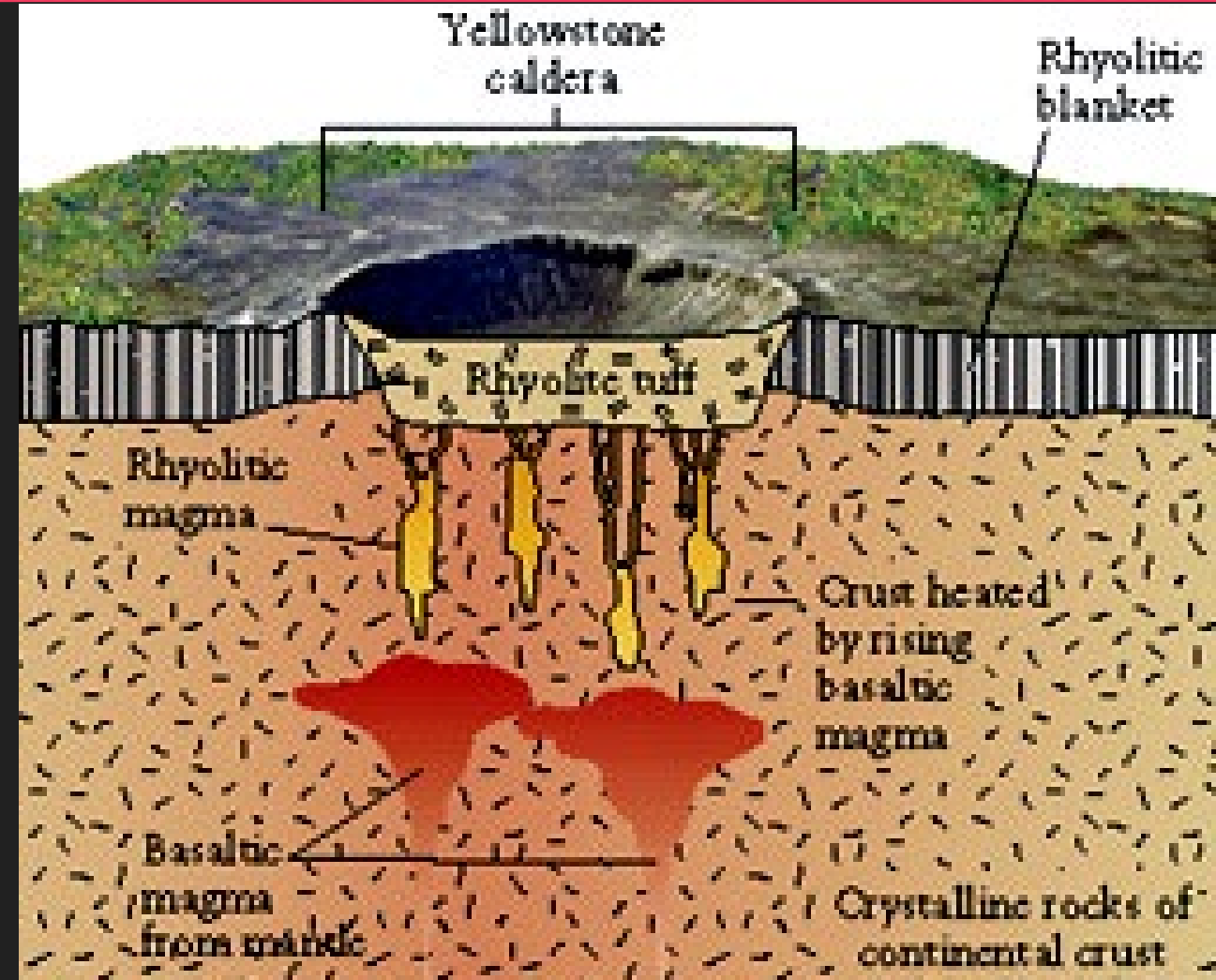
Intermediate magma



Hot spot

Collapsing a Stratovolcano

- Caldera
- A collapsed volcano
- Volcanic crater



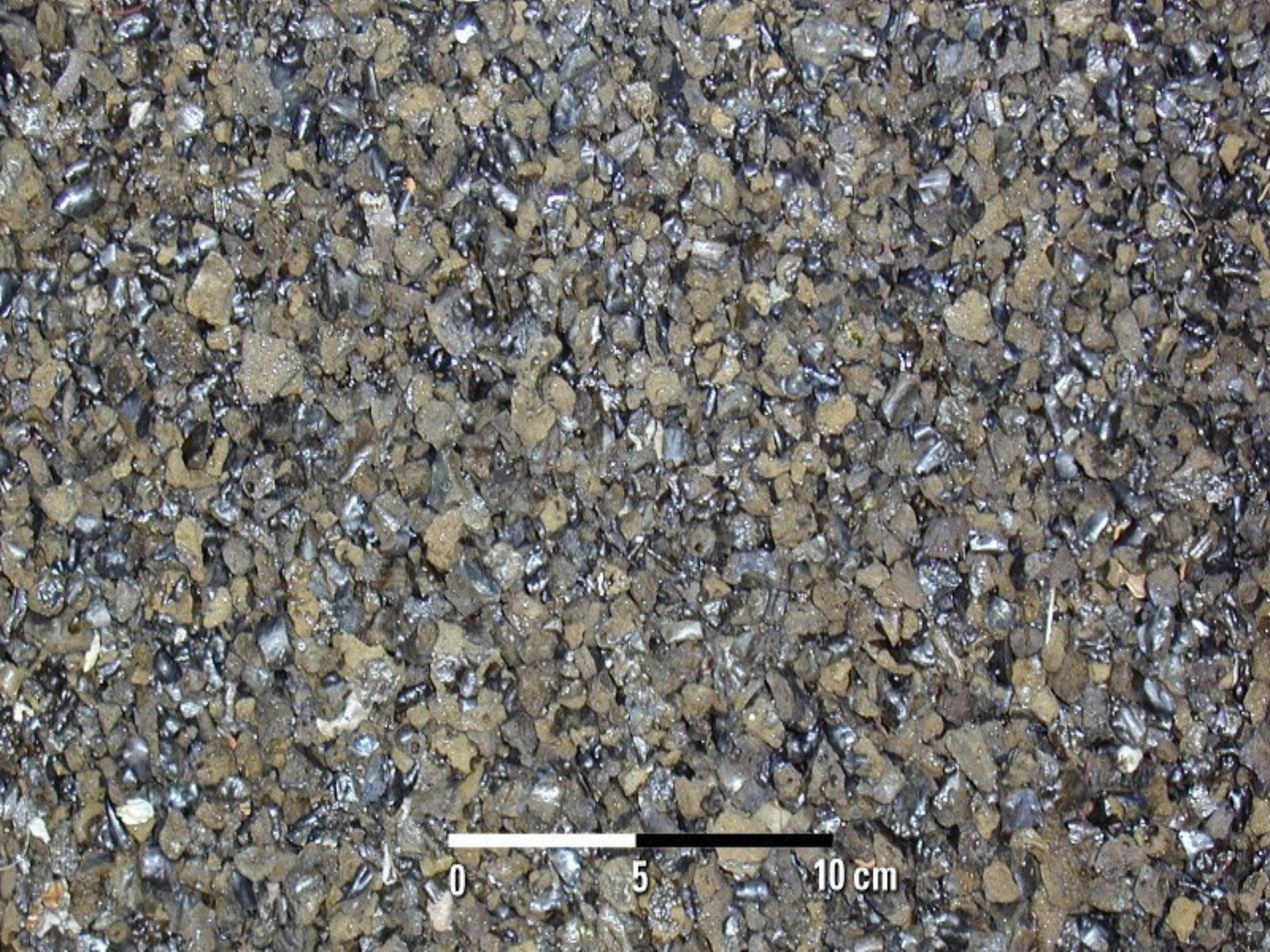
Pyroclastic material

- Ash

- Lapilli

- Bombs







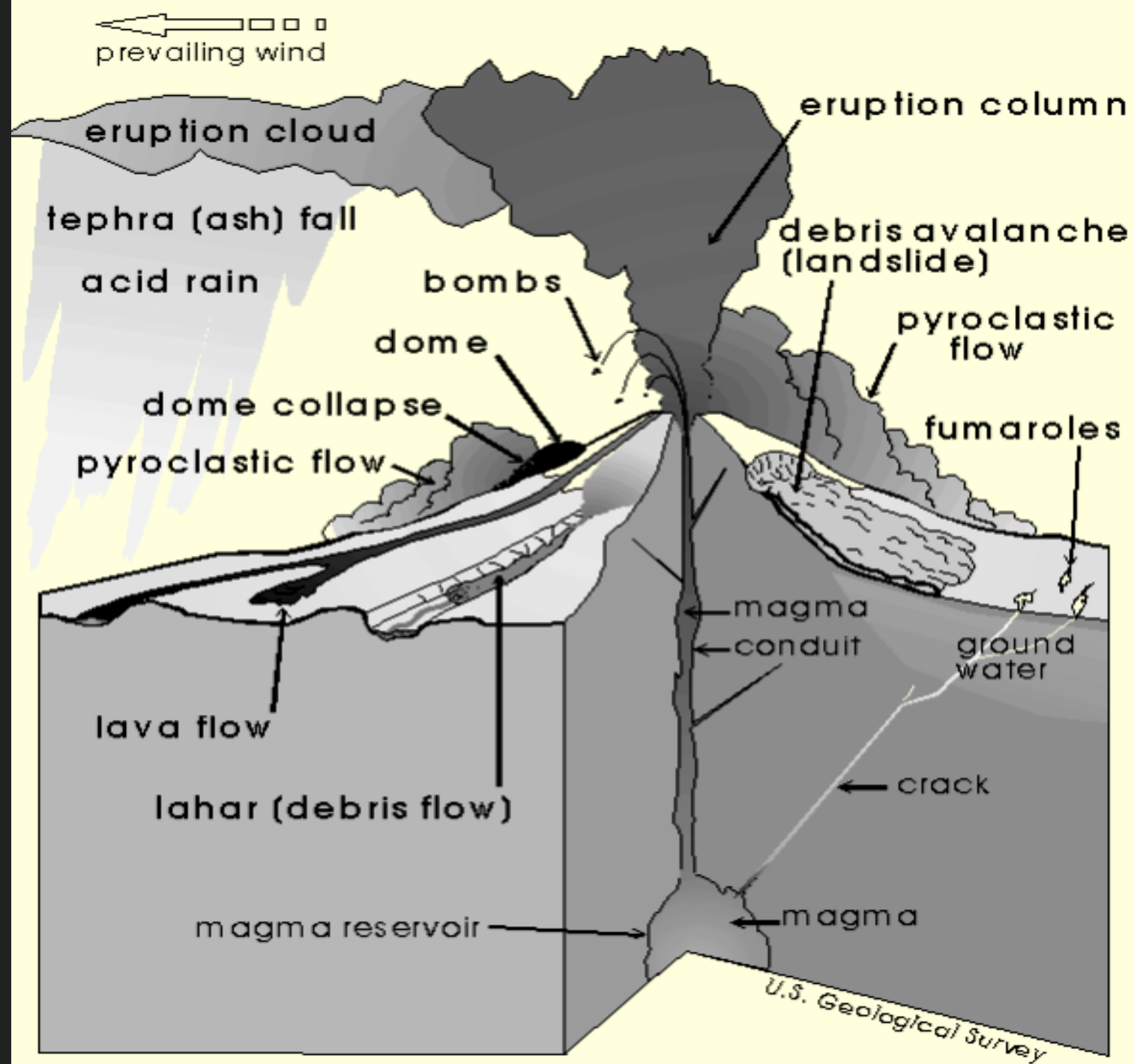


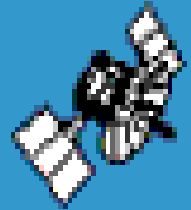




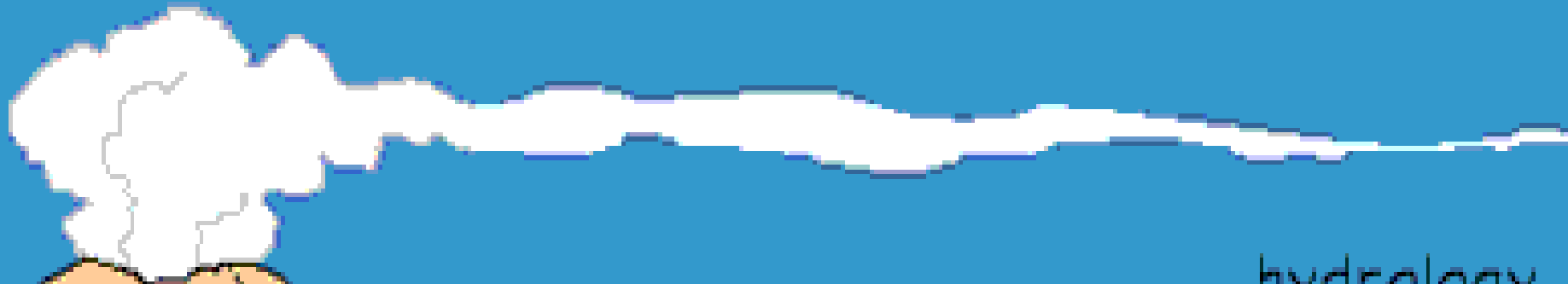


Volcanic hazards

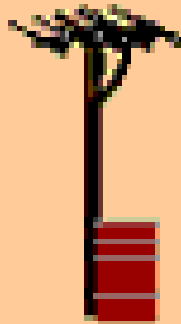




remote sensing



hydrology

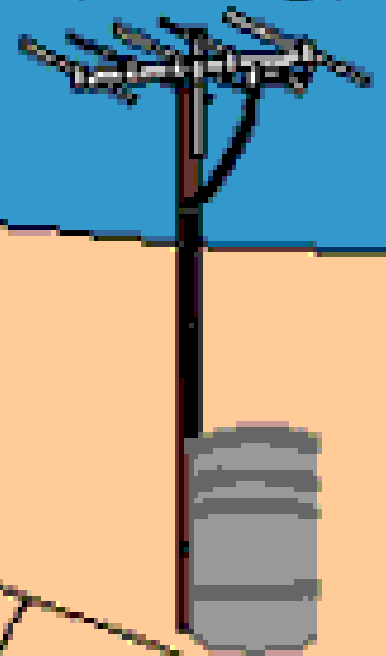


seismicity

gas



geophysical measurements



ground deformation





Pyroclastic Flows

- Nuee ardente “Glowing Cloud”
- 50 to 100 mph!!!!!!!
 - Hot gas
 - Pyroclastic material









USGS Photo by Lyn Topinka, September 24, 1980



Pompeii, Italy





Benefits

- *Thermus aquaticus*
- DNA polymerase
- \$300 million industry



Iceland

