# Volcanoes and Hazards

What are the characteristics of volcanoes and their hazards?

# Volcanoes and Hazards

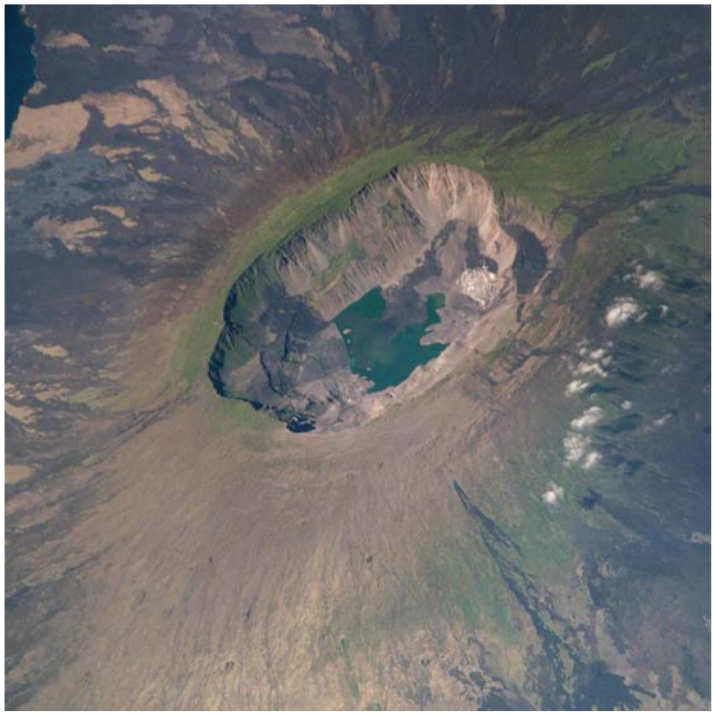
- Volcano - an opening in the planet's crust which allows molten rock, ash and gases to escape

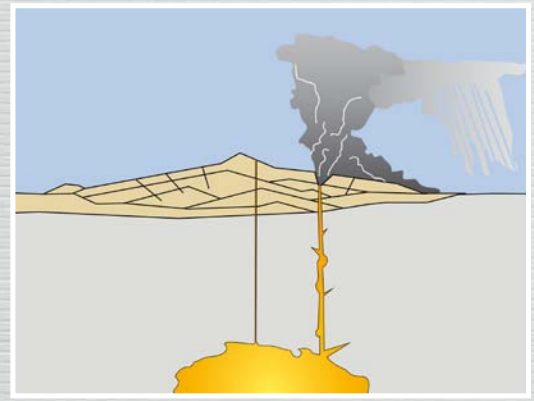
Volcanic Eruptions

Volcanic Eruptions

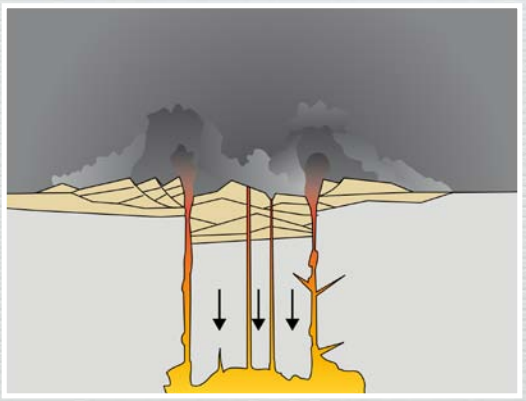
# Volcanoes and Hazards

- Caldera - a large volcanic crater, formed by a major eruption, leading to the collapse of the mouth of the volcano

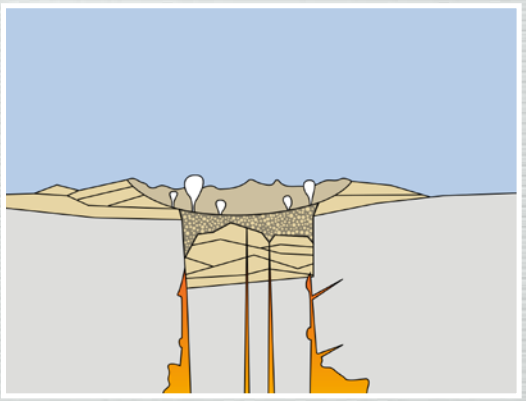




Magma chamber empties during the eruption



Volcano collapses into the empty magma chamber



Caldera forms in the newly sunken volcano

Caldera Formation

Aniakchak Caldera, Alaska

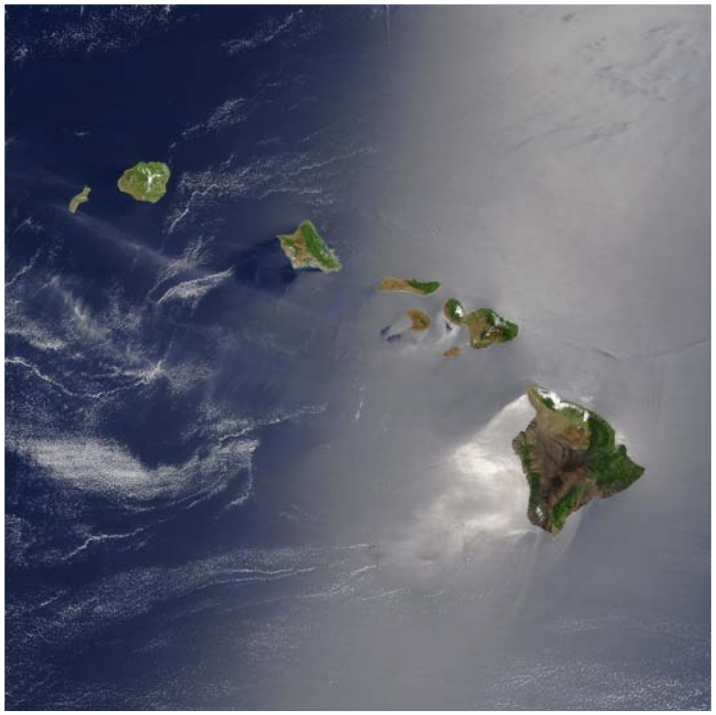
Mt. St. Helenes, Washington

# Volcanoes and Hazards

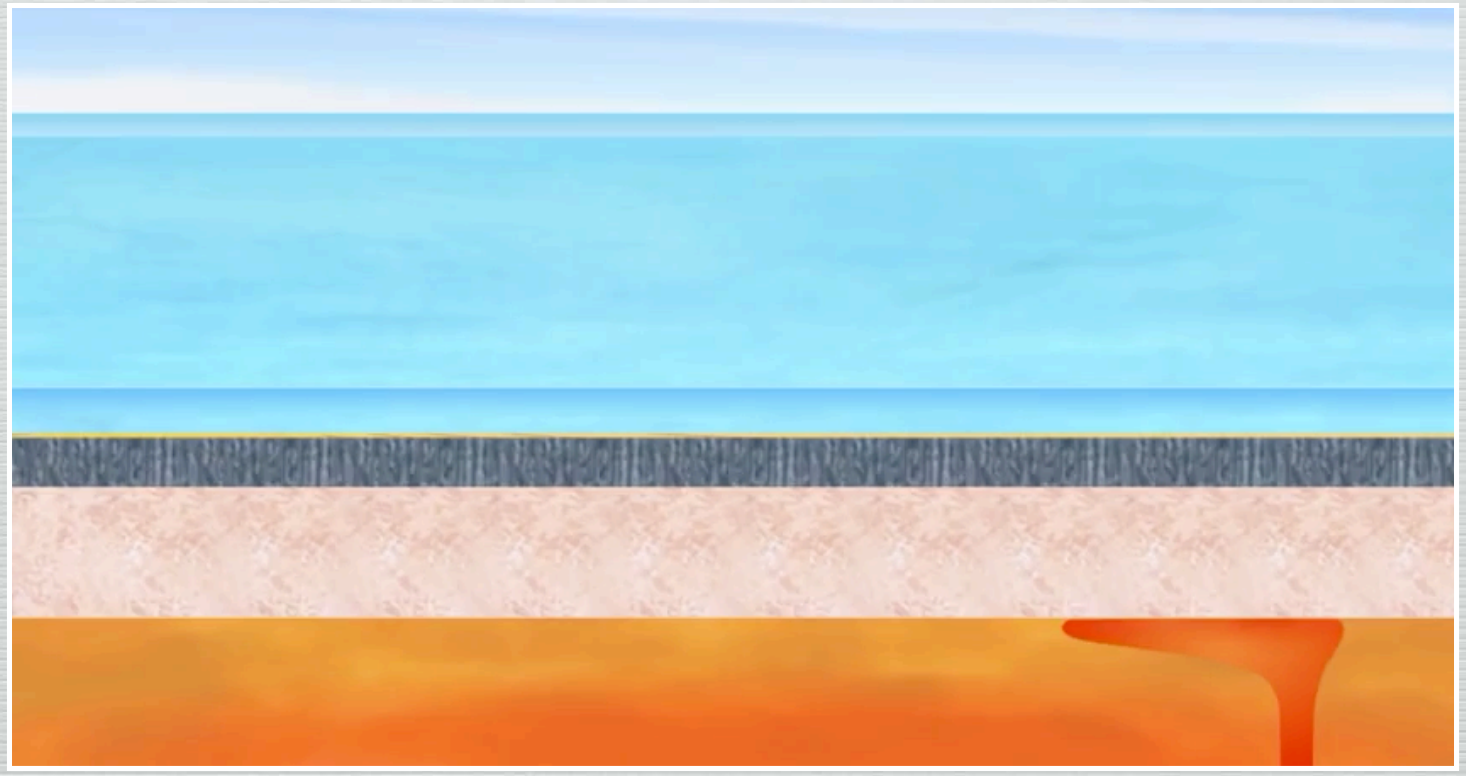
- Volcanoes are generally found at hotspots or where tectonic plates are diverging or converging

# Volcanoes and Hazards

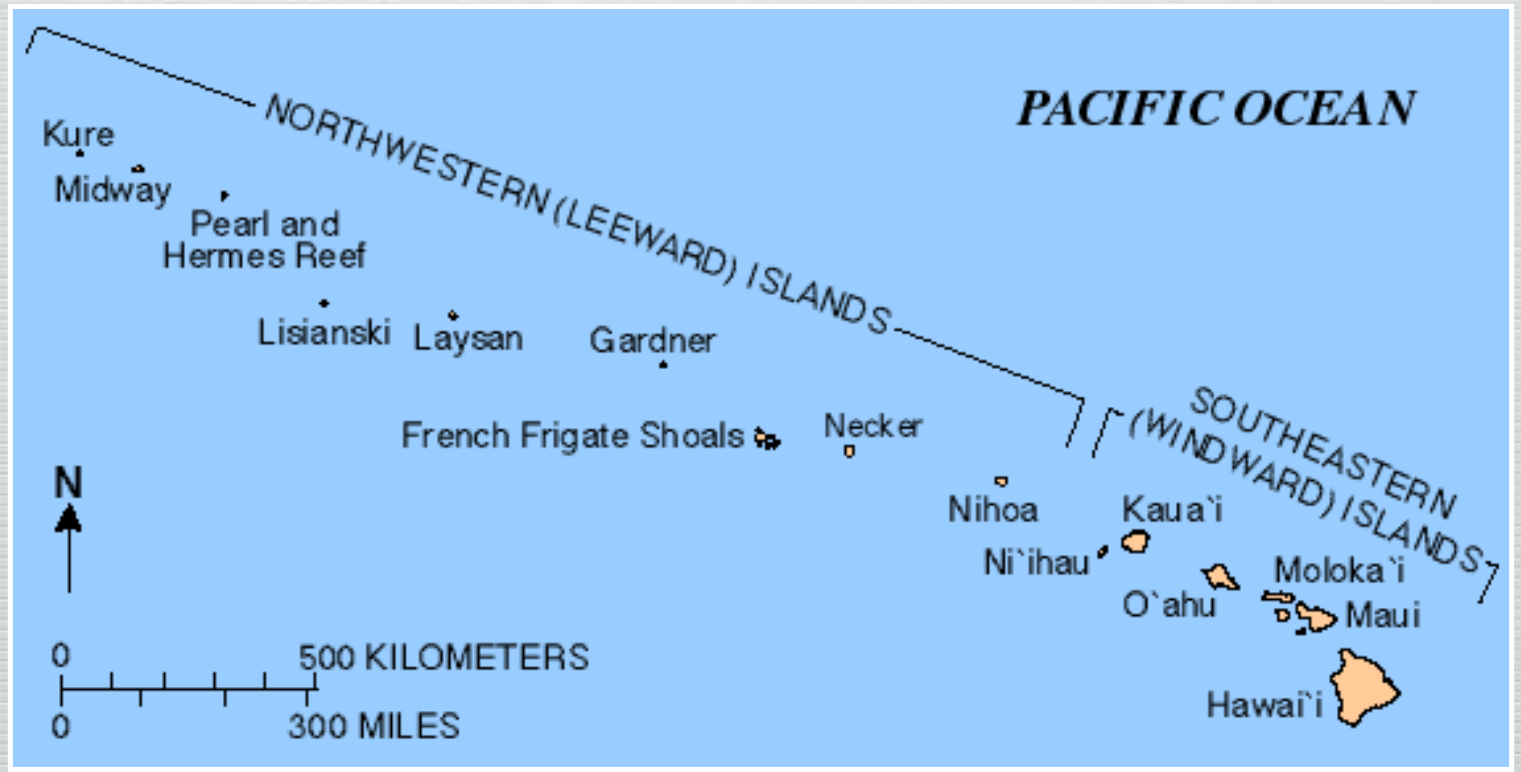
- Hotspots - thinner portions of the crust where rising convection currents deliver magma to the surface
    - Example: Hawaiian Islands



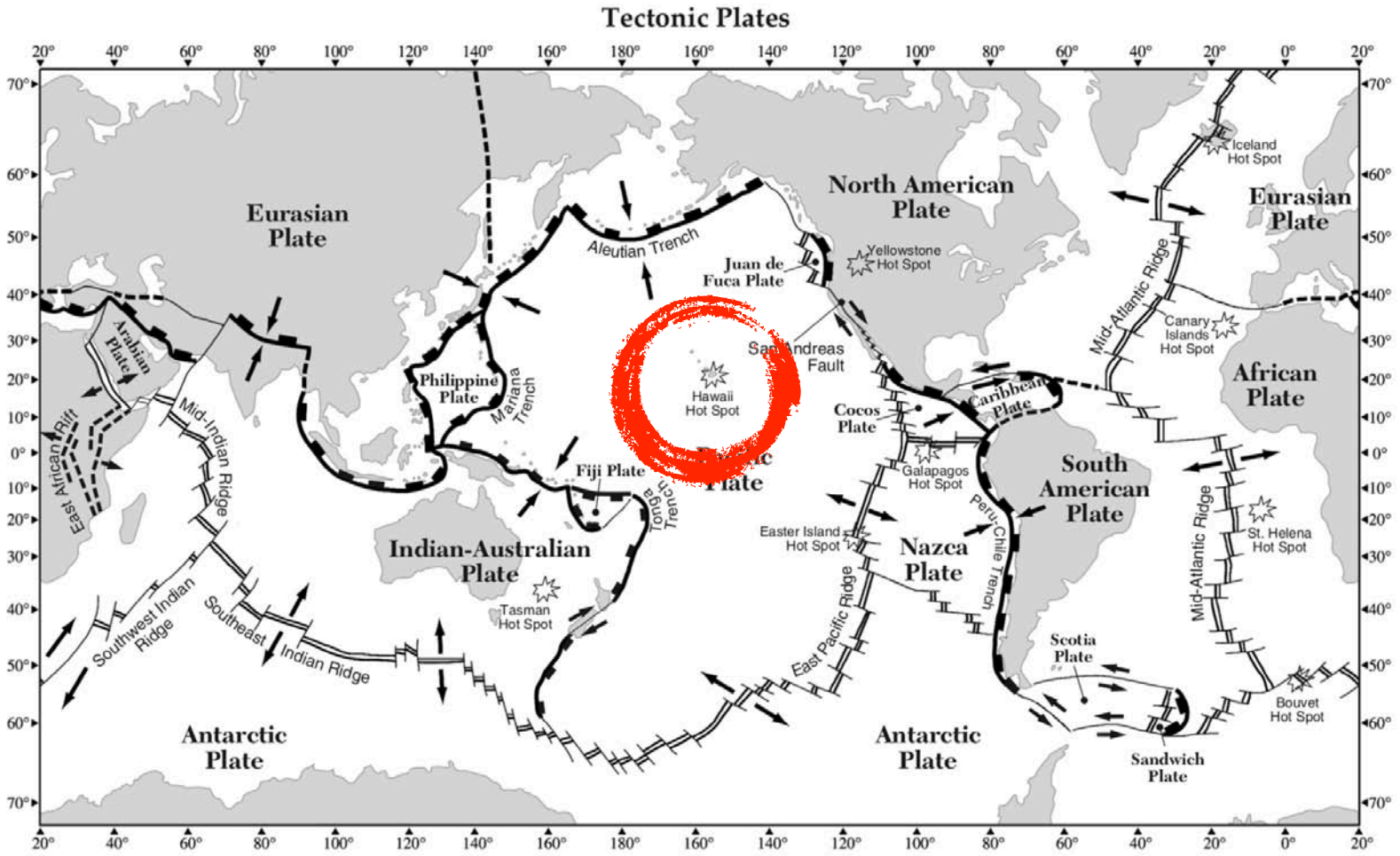
The Hawaiian Island Chain



The Hawaiian Island Formation




The Hawaiian Island Chain

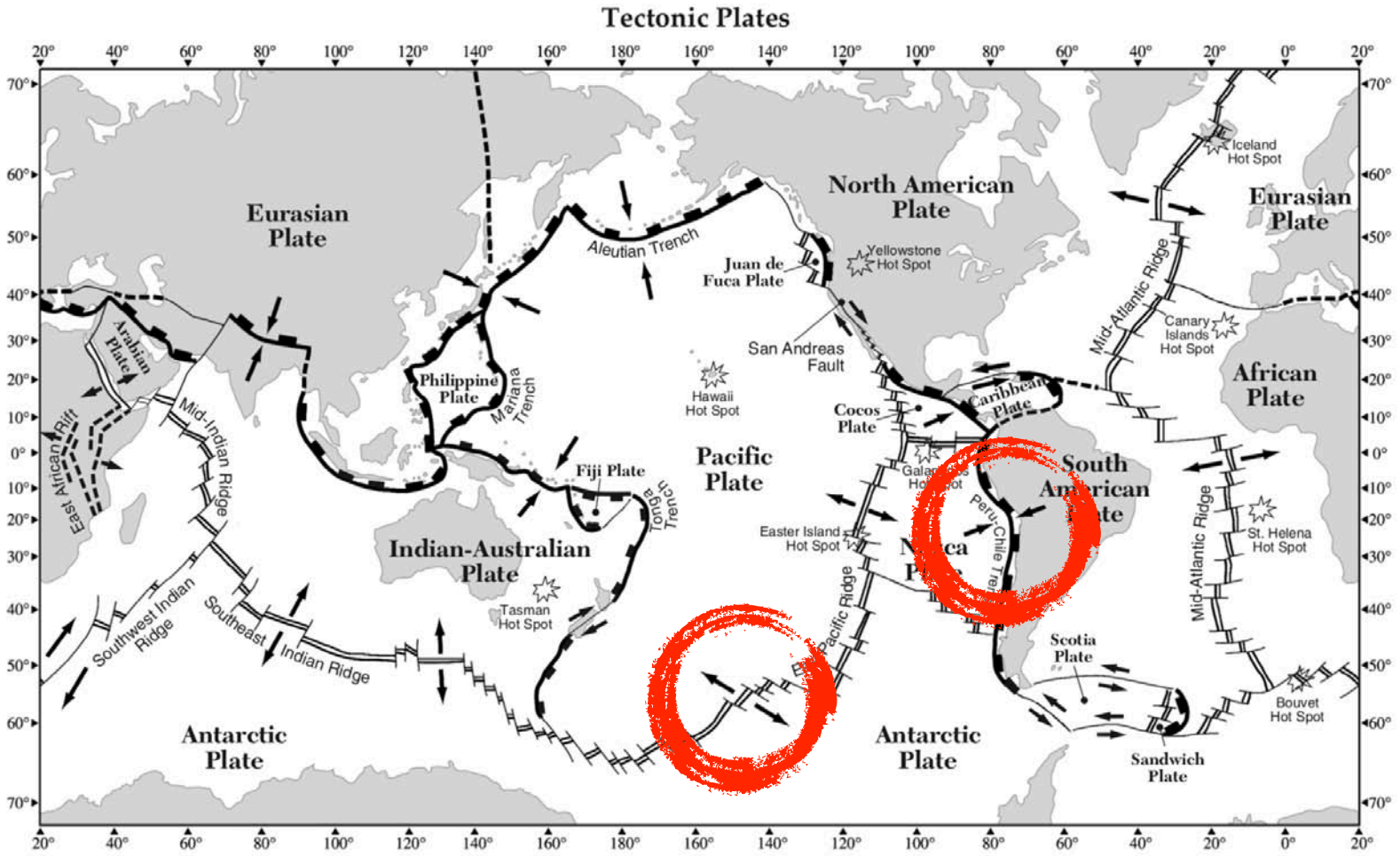

Tectonic Plates
Eurasian Plate
North American Plate
Eurasian Plate
African Plate
South American Plate
Antarctic Plate
Antarctic Plate
Indian-Australian Plate
Nazca Plate
Pacific Plate
Philippine Plate
Arabian Plate
Cocos Plate
Caribbean Plate
Scotia Plate
Sandwich Plate
Juan de Fuca Plate
Fiji Plate
Aleutian Trench
Mariana Trench
Tonga Trench
Peru-Chile Trench
East Pacific Ridge
Mid-Indian Ridge
Southwest Indian Ridge
Southeast Indian Ridge
Mid-Atlantic Ridge
Mid-Atlantic Ridge
East African Rift
San Andreas Fault
Hawaii Hot Spot
Yellowstone Hot Spot
Iceland Hot Spot
Canary Islands Hot Spot
Galapagos Hot Spot
Easter Island Hot Spot
St. Helena Hot Spot
Bouvet Hot Spot
Tasman Hot Spot

# Volcanoes and Hazards

- Converging and diverging tectonic plates

Convergent

Divergent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Mariana Trench
Tonga Trench
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Yellowstone Hot Spot
Hawaii Hot Spot
Iceland Hot Spot
Canary Islands Hot Spot
St. Helena Hot Spot
Bouvet Hot Spot
Easter Island Hot Spot
Tasman Hot Spot
Mid-Atlantic Ridge
Mid-Atlantic Ridge
Pacific Ridge
Mid-Indian Ridge
Southwest Indian Ridge
Southeast Indian Ridge
East African Rift

# Volcanoes and Hazards

- Types of Volcanoes:
    - Composite Volcano [stratovolcano] - tall cone shaped volcano composed of lava flows and other ejecta in alternating layers
        - Most deadly with violent eruptions

Composite Volcano [stratovolcano]

# Volcanoes and Hazards

- Pyroclastic Flow - lateral flow of hot gases, volcanic fragments, ash, and glass shards that can move at speeds of 100 m.p.h. down the slopes of the volcano


GVM

# Volcanoes and Hazards

- Types of Volcanoes [continued]:
    - Shield Volcano - large volcano with broad sloping sides created from a low viscosity lava flow
        - Usually occur around hotspots with non-explosive eruptions

Shield Volcano

# Volcanoes and Hazards

- Types of Volcanoes [continued]:
    - Cinder Cones - a cone formed around a volcanic vent by fragments of lava thrown out during eruptions
        - Usually smaller with short lived eruptions

Cinder Volcano

# Volcanoes and Hazards

- Types of Volcanoes [continued]:
    - Extinct Volcano - volcanoes that are unlikely to erupt again due to a lack in lava supply

Extinct Volcano - Shiprock, New Mexico

# Volcanoes and Hazards

- Predicting eruptions have been sought after by volcanologists since volcanoes were studied
- In 1991, USGS was asked to monitor Mount Pinatubo and used the many signs volcanoes give off prior to an eruption in the hope of minimizing damage to lives and personal property

Mount Pinatubo, Philippes

Mount Pinatubo, Philippes

Mount Pinatubo, Philippes

# Volcanoes and Hazards

- Tools used in monitoring:
    - Seismometer measurements of earthquakes
    - Radiocarbon dating of past eruptions
    - Gas readings of sulfur dioxide
    - Tiltmeters and lasers to show inflating

# Volcanoes and Hazards

- Emergency Preparedness:
    - What do you do if there is an impending volcanic eruption?

**EVACUATE**