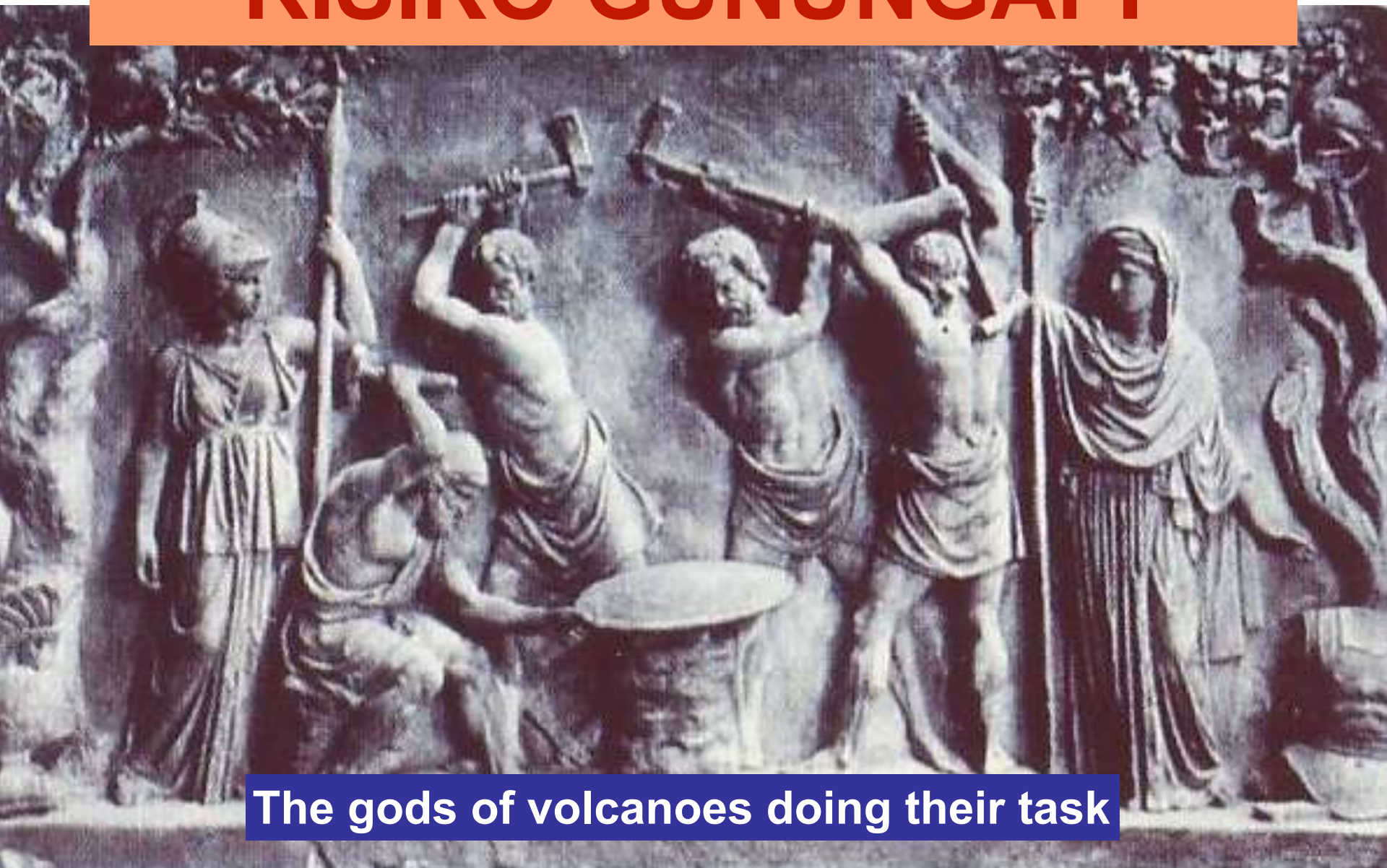
MENGENAL RISIKO GUNUNGAPI

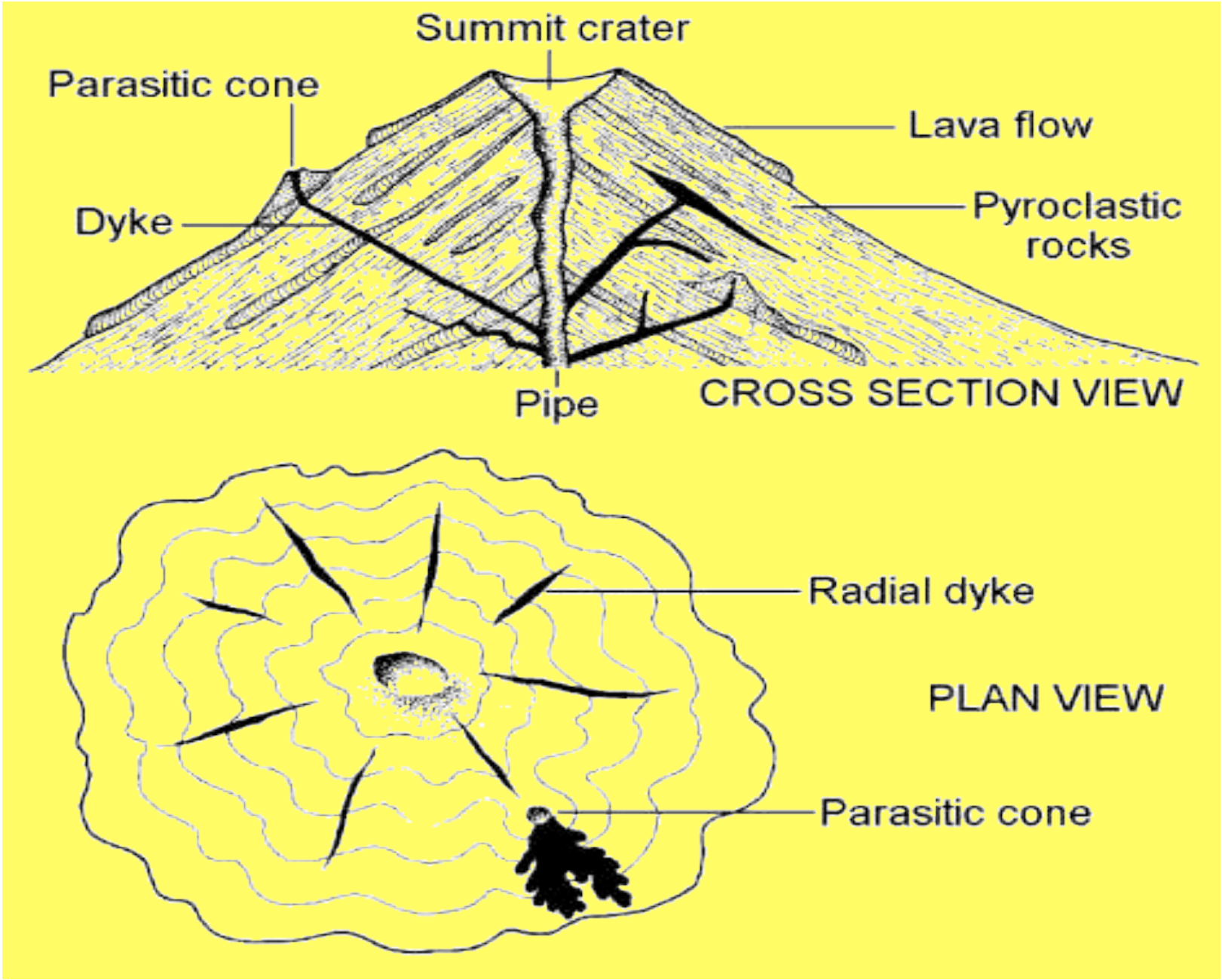


The gods of volcanoes doing their task

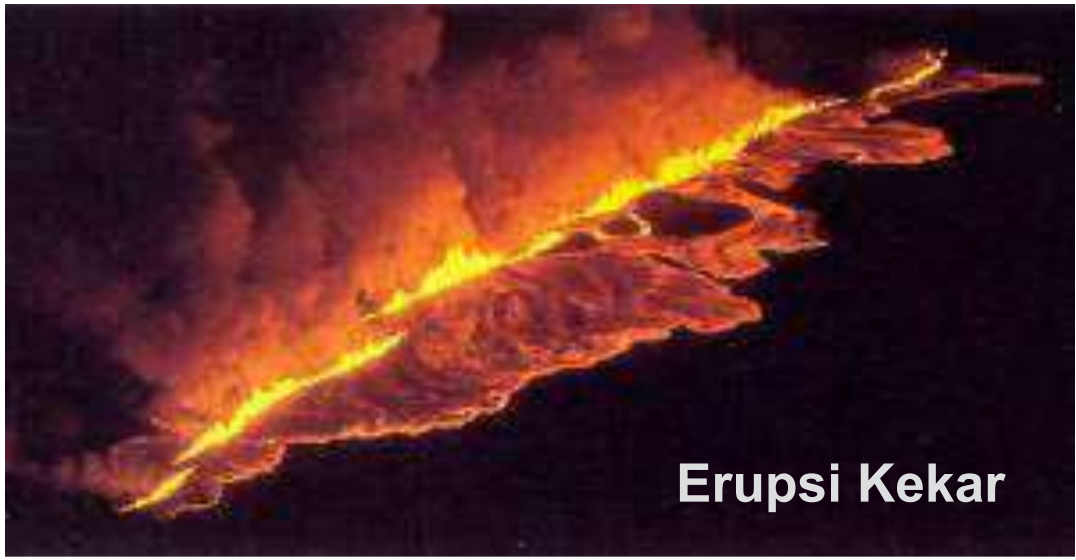
GUNUNGAPI

- **GUNUNGAPI merupakan lubang atau rekahan di permukaan bumi tempat magma, gas-gas dan fluida panas keluar ke permulaan atau ke dasar samudra**
- **Gununapi secara garis besar dapat diklasifikasi menjadi:**
  - **Tipe Sentral: ekspresi terpusat dalam satu lubang / pipa**
  - **Tipe Rekahan: ekspresi mengikuti rekahan, dapat lurus maupun melingkar**

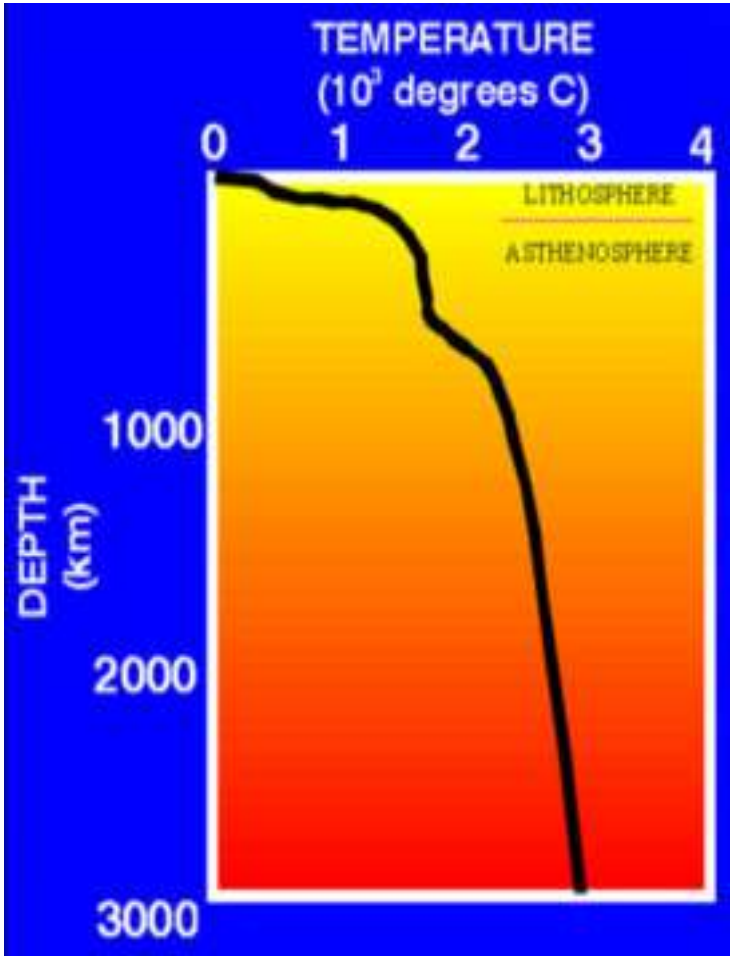
Posisi vein


Summit crater
Parasitic cone
Lava flow
Dyke
Pyroclastic rocks
Pipe
CROSS SECTION VIEW
Radial dyke
PLAN VIEW
Parasitic cone

Posisi vent dan tipe erupsi



Gradien Geotermal



- GEOTHERMAL: peningkatan temperatur seiring penambahan kedalaman
- Gradien geotermal rata-rata perubahan temperatur setiap penambahan kedalam
- Pada kedalaman 100 km, rata - rata gradien geotermal = $30^0C\ km^{-1}$
- Sumber panas berasal peluruhan elemen radioaktif
- Panas in yang menyebabkan terjadinya pelelehan batuan menjadi magma

Komposisi Magma

- **Variasi sifat magma dipengaruhi oleh:**
  - ***KANDUNGAN SILIKA***
    bervariasi antara 45% - 75%
  - ***KANDUNGAN GAS***
    sebagian besar terdiri dari: H_2O, CO_2, SO_2, H_2S
  - ***TEMPERATUR MAGMA SAAT ERUPSI***
    bervariasi mulai 1200^0C sampai 800^0C
- **Variasi sifat magma berakibat adanya perbedaan *KEKENTALAN* of the magma**

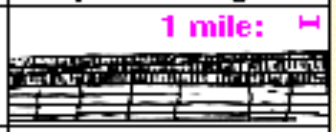
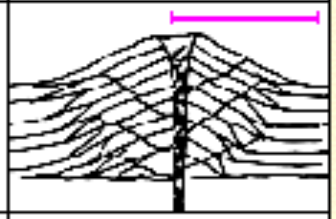
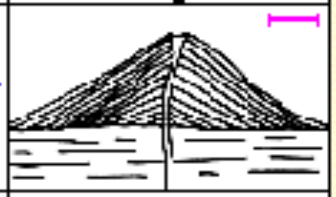
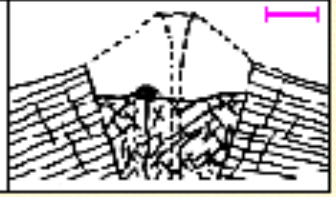
Kekentalan Magma

- **KEKENTALAN dipengaruhi oleh refers to the thickness or fluidity of a liquid**
  - **Liquid with HIGH viscosity are very thick, sticky**
  - **Liquid with LOW viscosity are very fluid**
- **Effect of various properties on magma viscosity:**
  - **Temperature: HIGH temperature = LOW viscosity (*i.e.* very fluid)**
  - **Silica Content: HIGH silica = HIGH viscosity**
  - **Volatile Content: HIGH volatiles = LOW viscosity**

    (However, high gas contents contribute to explosive eruptions)

Tipe-tipe Gunungapi

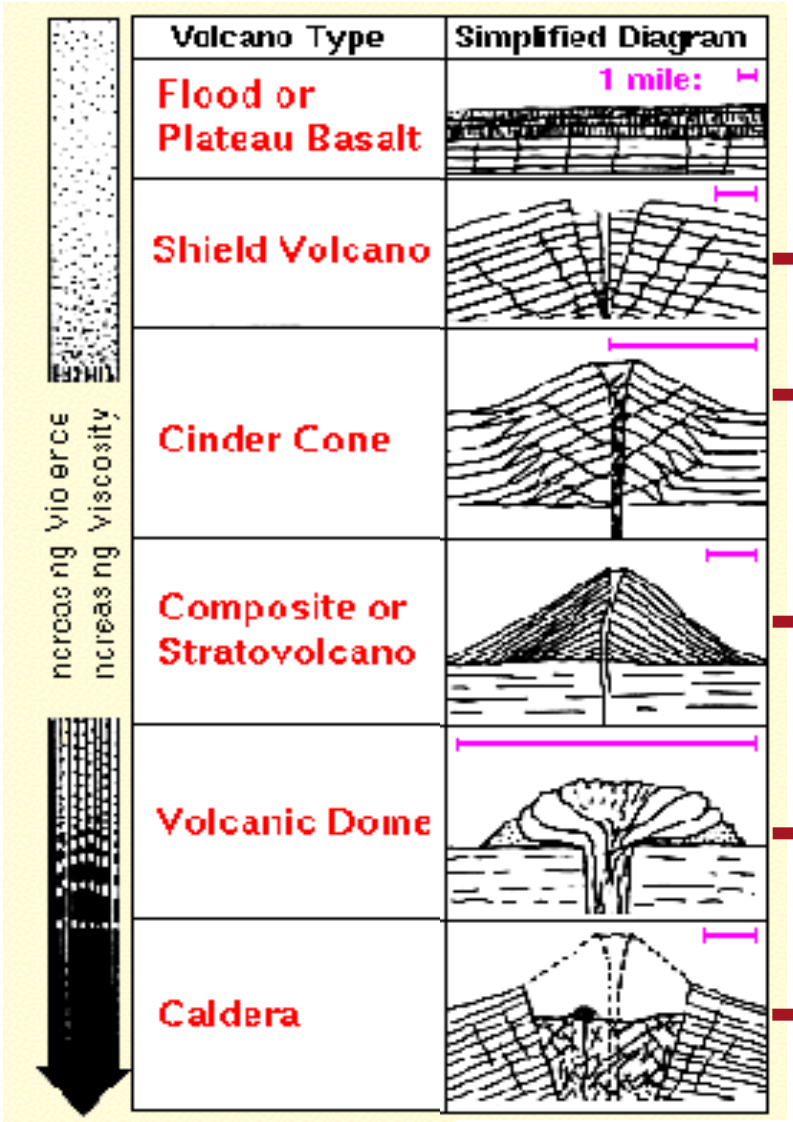
increasing violence
increasing viscosity

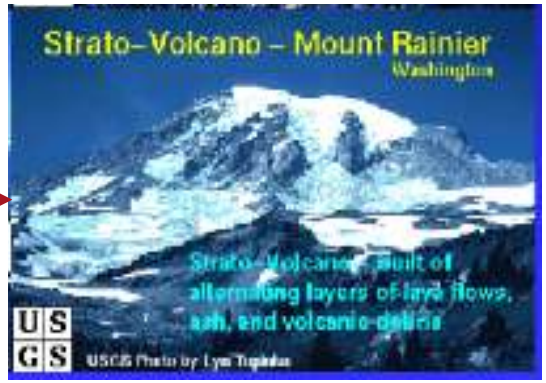
Volcano Type	Characteristics	Examples	Simplified Diagram
Flood or Plateau Basalt	Very liquid lava; flows very widespread, emitted from fractures	Columbia River Plateau	
Shield Volcano	Liquid lava emitted from a central vent; large; sometimes has a collapse caldera	Larch Mountain, Mount Sylvania, Highland Butte, Hawaiian volcanoes	
Cinder Cone	Explosive liquid lava; small; emitted from a central vent; if continued long enough, may build up a shield volcano	Mount Tabor, Mount Zion, Chamberlain Hill, Pilot Butte, Lava Butte, Craters of the Moon	
Composite or Stratovolcano	More viscous lavas, much explosive (pyroclastic) debris; large, emitted from a central vent	Mount Baker, Mount Rainier, Mount St. Helens, Mount Hood, Mount Shasta	
Volcanic Dome	Very viscous lava; relatively small; can be explosive; commonly occurs adjacent to craters of composite volcanoes	Novarupta, Mount St. Helens Lava Dome, Mount Lassen, Shastina, Moon Craters	
Caldera	Very large composite volcano collapsed after an explosive period; frequently associated with plug domes	Crater Lake, Newberry, Kilauea, Long Valley, Medicine Lake, Yellowstone	

USGS

Topinka, USGS/CVO, 1997, Modified from: Allen, 1975, Volcanoes of the Portland Area, Oregon, Ore-Bin, v.37, no.9

Tipe-tipe Gunungapi





Gunungapi Tameng

Gunungapi Tameng

Shield volcanoes are built from successive eruptions of very fluid lavas.

Relative age of lava flows can be determined by their color and amount of vegetation.

Dark lava flows are youngest.
Light lava flows are oldest.

The lava flows here are on the slopes of Mauna Loa, Hawai'i.

URL: http://comp.uark.edu/~sboss

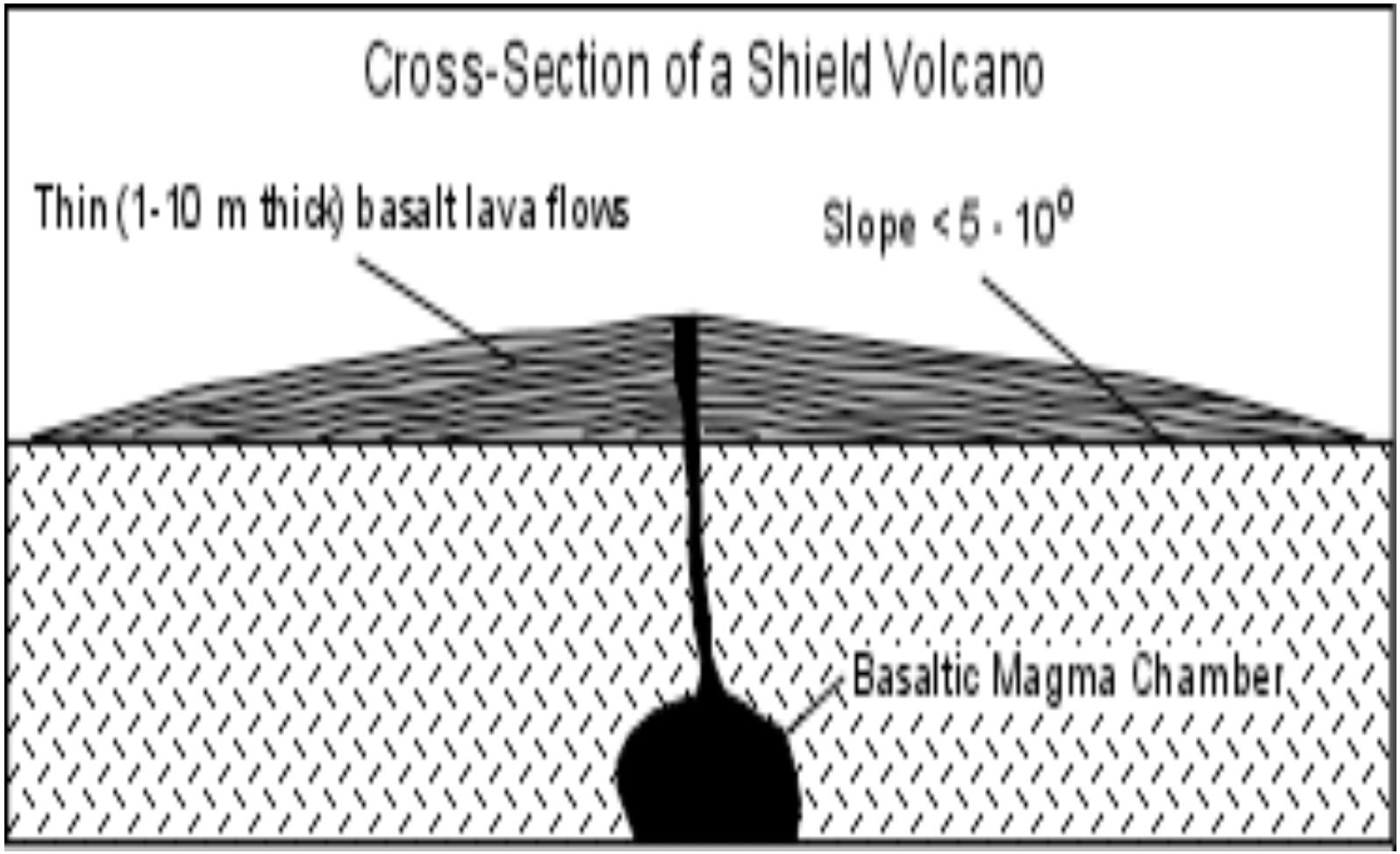
Gunungapi Tameng

These lavas are typical of those erupted by shield volcanoes.

- They are erupted at HIGH temperature (ca. 1200°C).
- They have LOW silica content (ca. 45%).
- They have HIGH volatile content.

These lavas have LOW viscosity (i.e. they are very fluid).

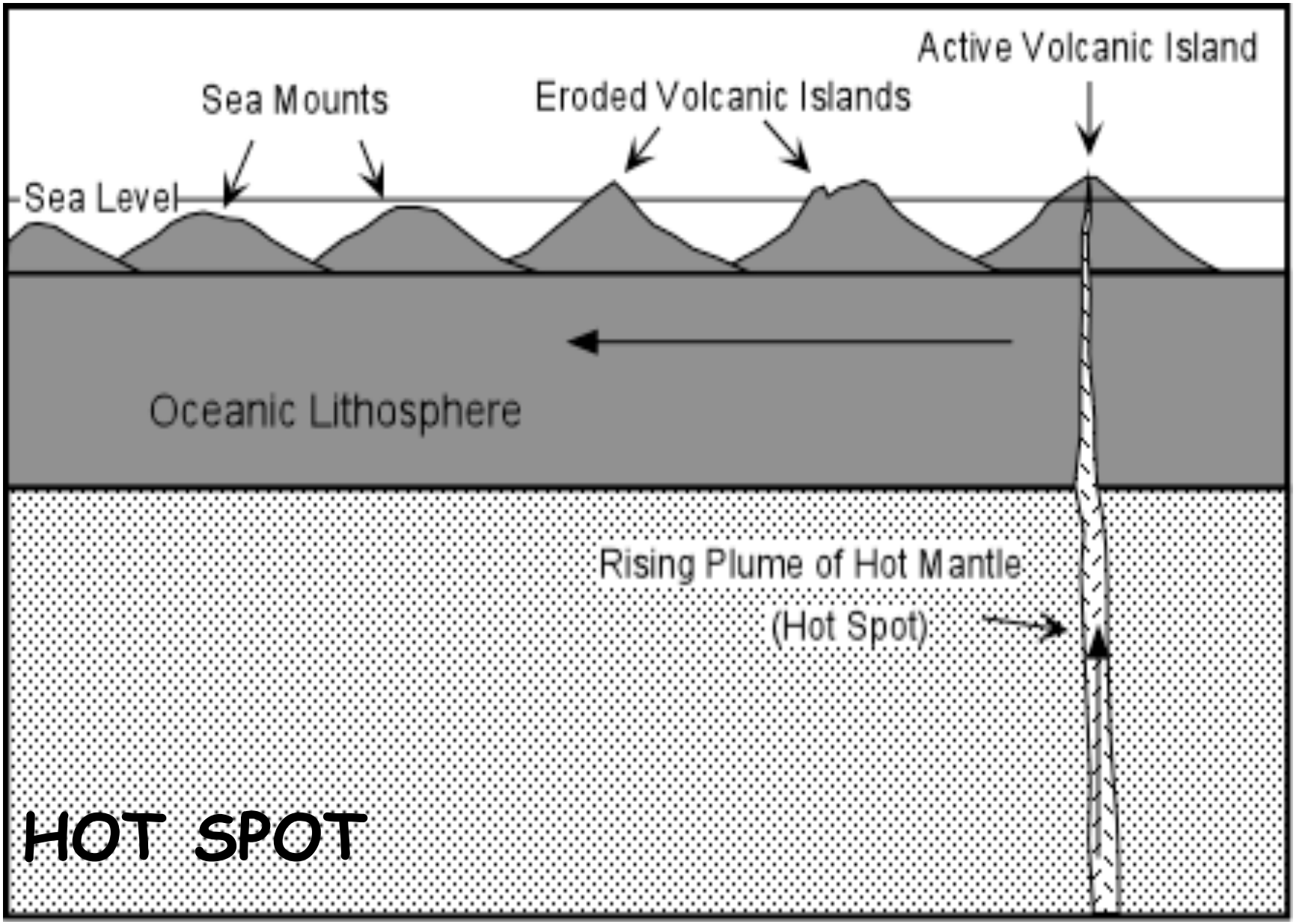
Gunungapi Tameng



Gunungapi Tameng

The Hawaiian Islands are a chain of shield volcanoes.

Gunungapi Tameng

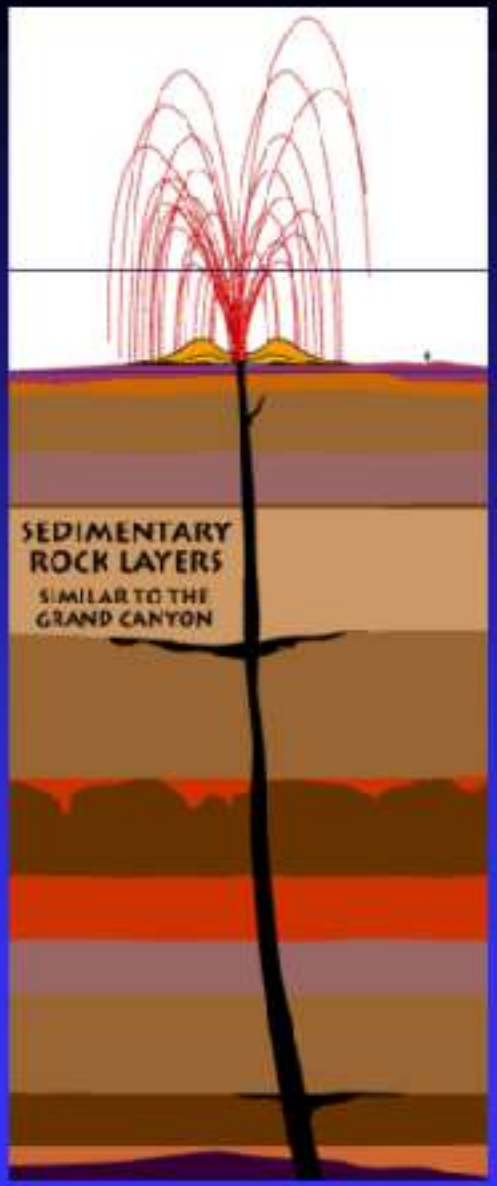


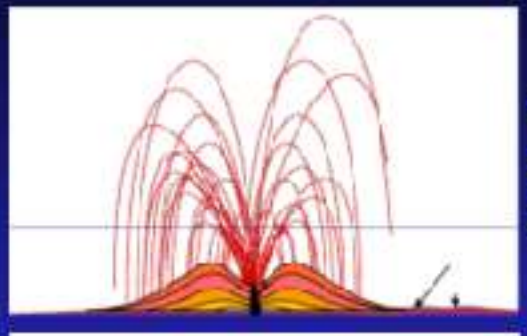
Gunungapi Kerucut Sinder

Gunungapi Kerucut Sinder

SUNSET CRATER, ARIZONA

http://www2.nature.nps.gov/grd/usgsnps/sunset/sunsetft5.htm





Lava fountains threw blobs of molten basalt hundreds of feet into the air.

Airborne molten globs cooled and solidified to form cinders before they reached the ground.

Most cinders fell very near the central vent, building a small cone.

URL: http://comp.uark.edu/~sboss

University of Arkansas

Gunungapi Kerucut Sinder

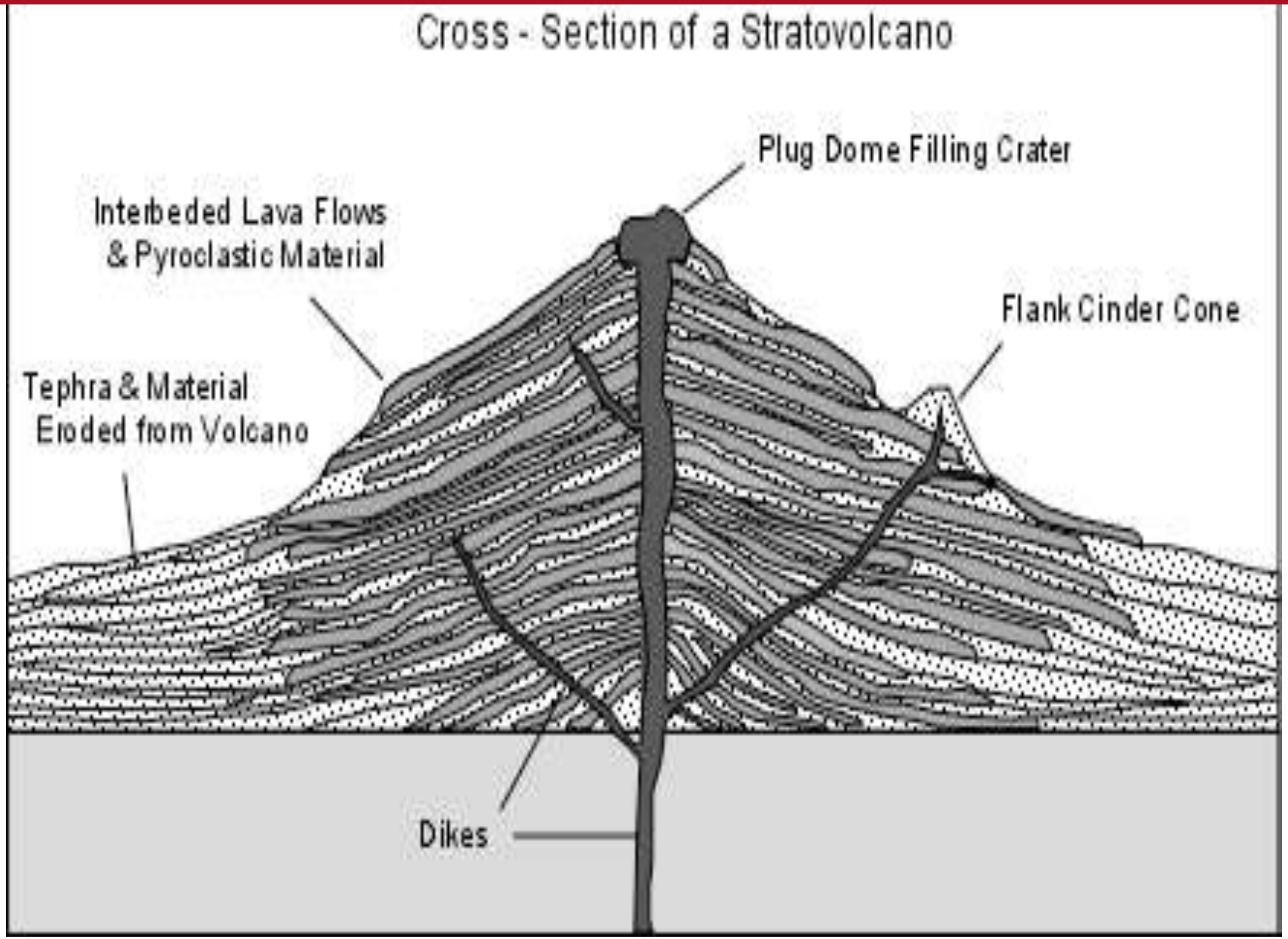
Gunungapi Strato

Mt St. Helens, Washington, USA

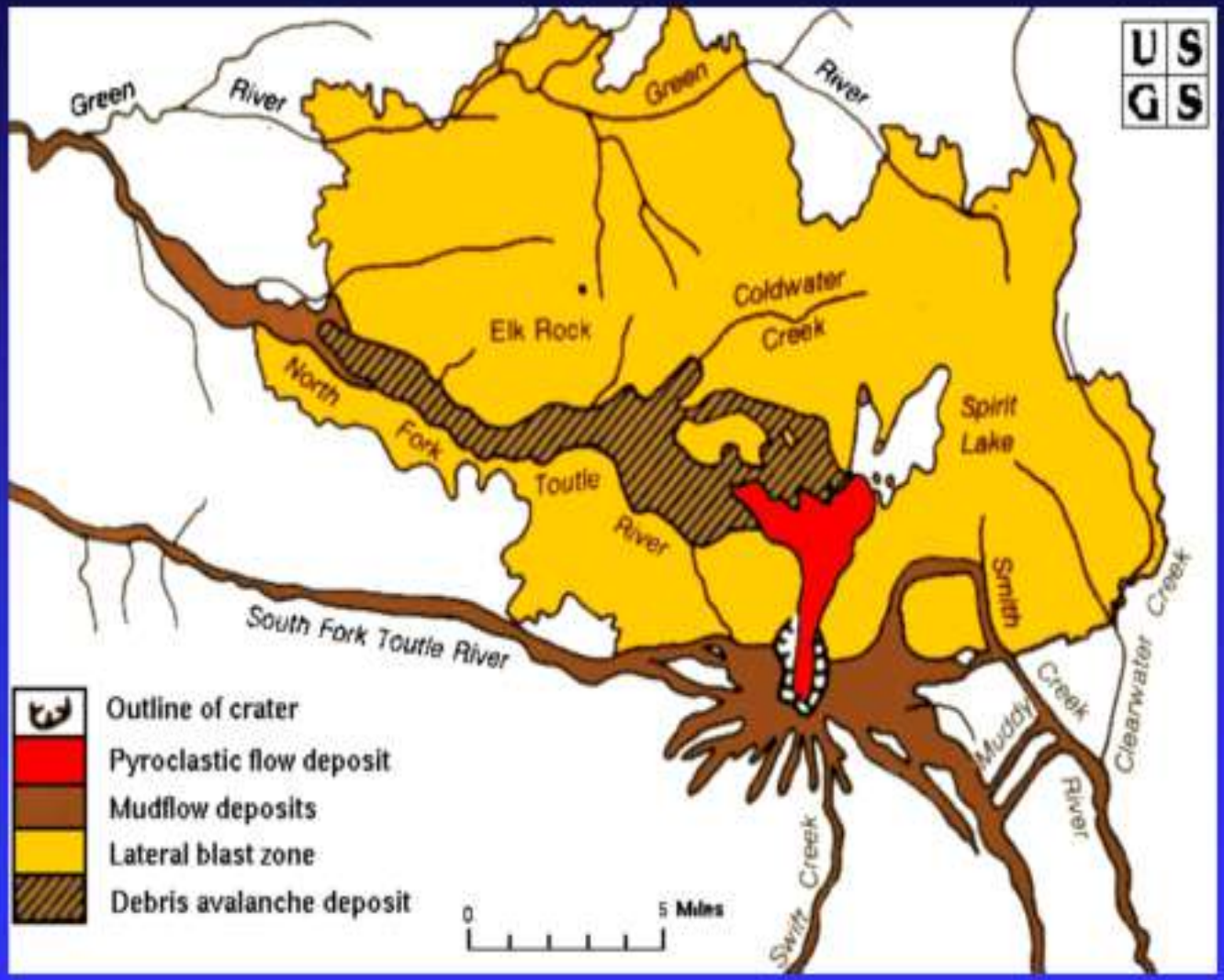
Gunungapi Strato

Stratovolcanoes form large, symmetrical, cone-shaped peaks - the classic volcano profile - from successive eruptions of lava and ash.

Gunungapi Strato



Gunungapi Strato



Gunungapi Strato

Gunungapi Strato

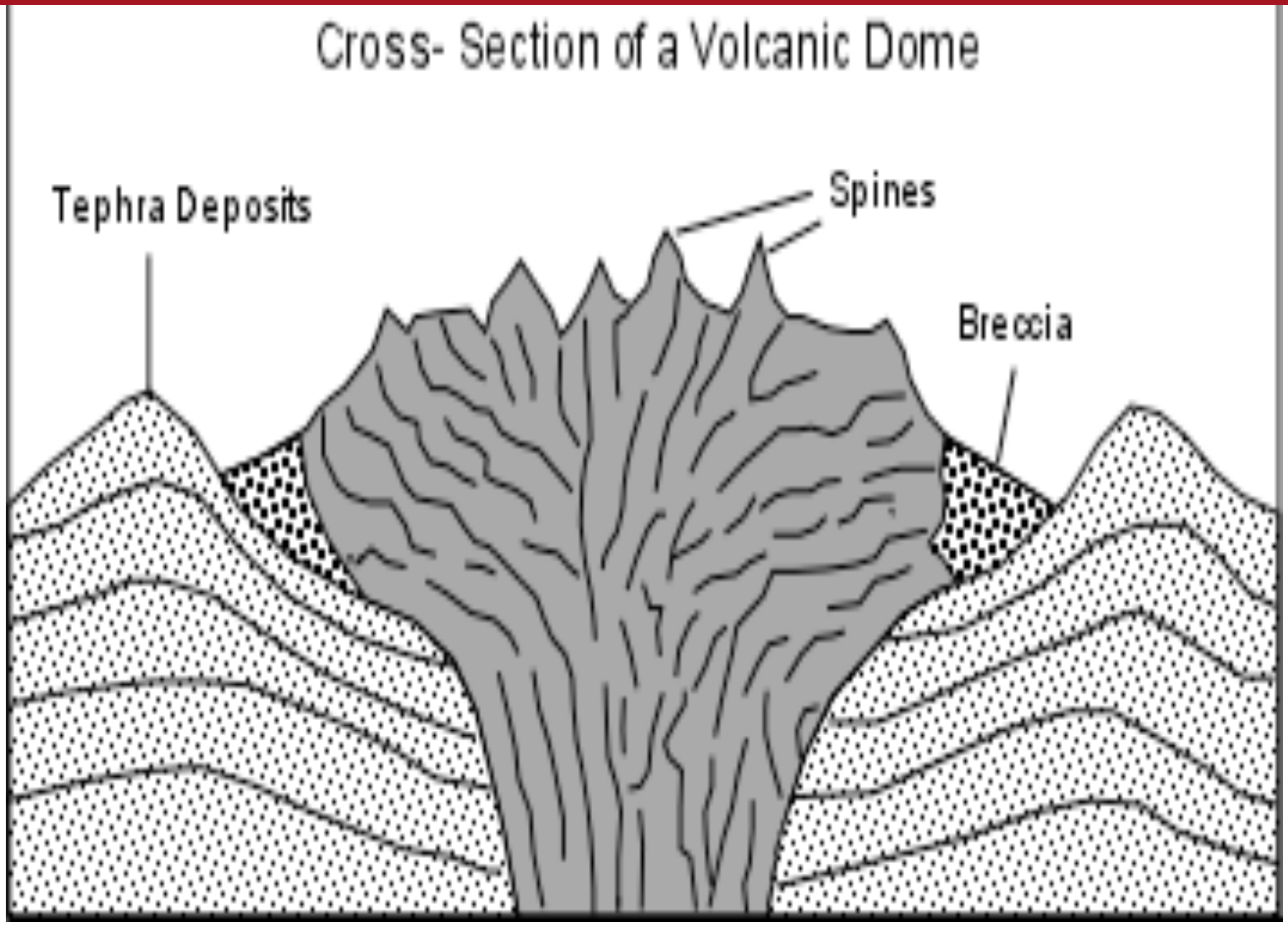
The "hill" in the background is a **LAVA DOME** in the crater of Mt. St. Helens. This lava is typical of those erupted by stratovolvanoes.

- It is erupted at LOW temperature (ca. 800°C)
- It has a HIGH silica content (ca. 60%)
- It has a HIGH volatile content (and is very explosive)

These lavas have very HIGH viscosity.

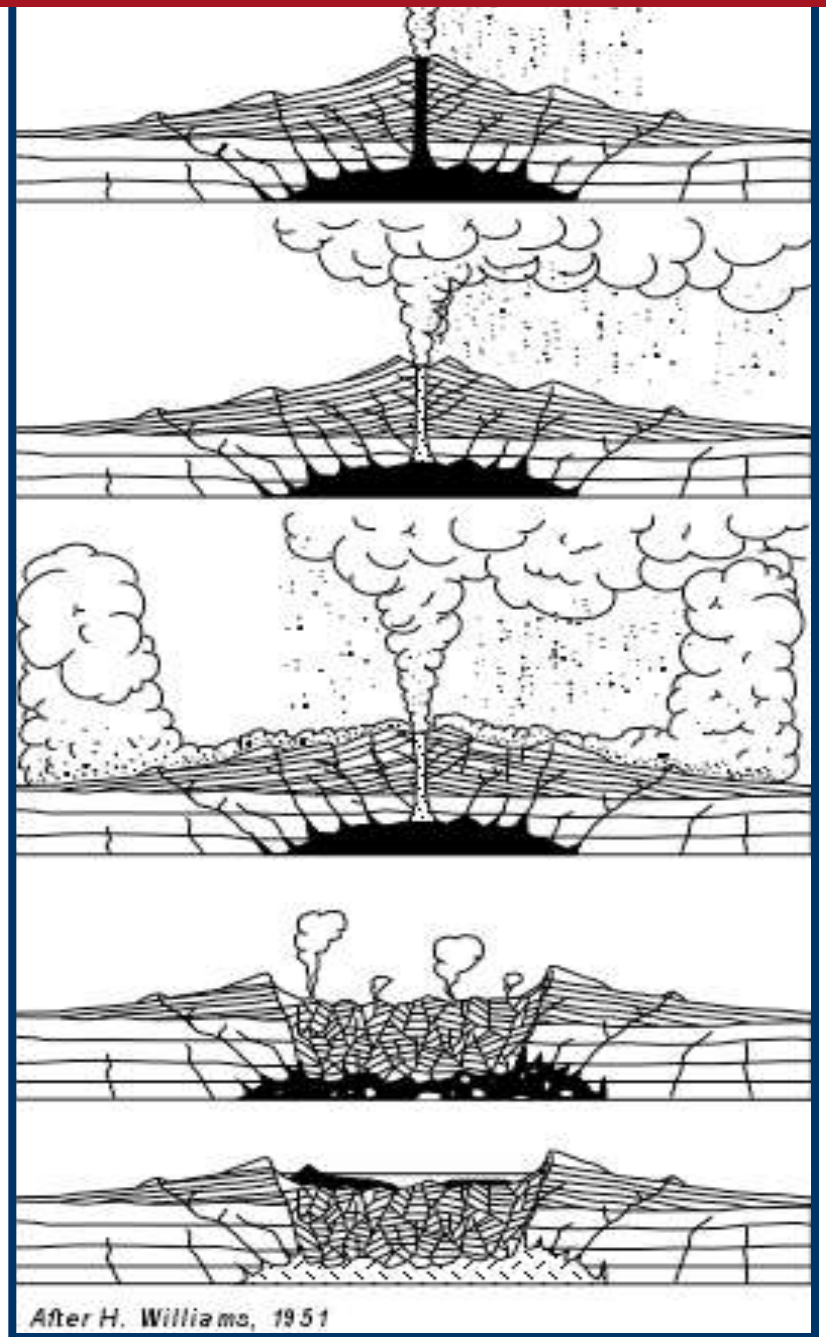
Lava Dome Volcanoes

Gunungapi Kubah



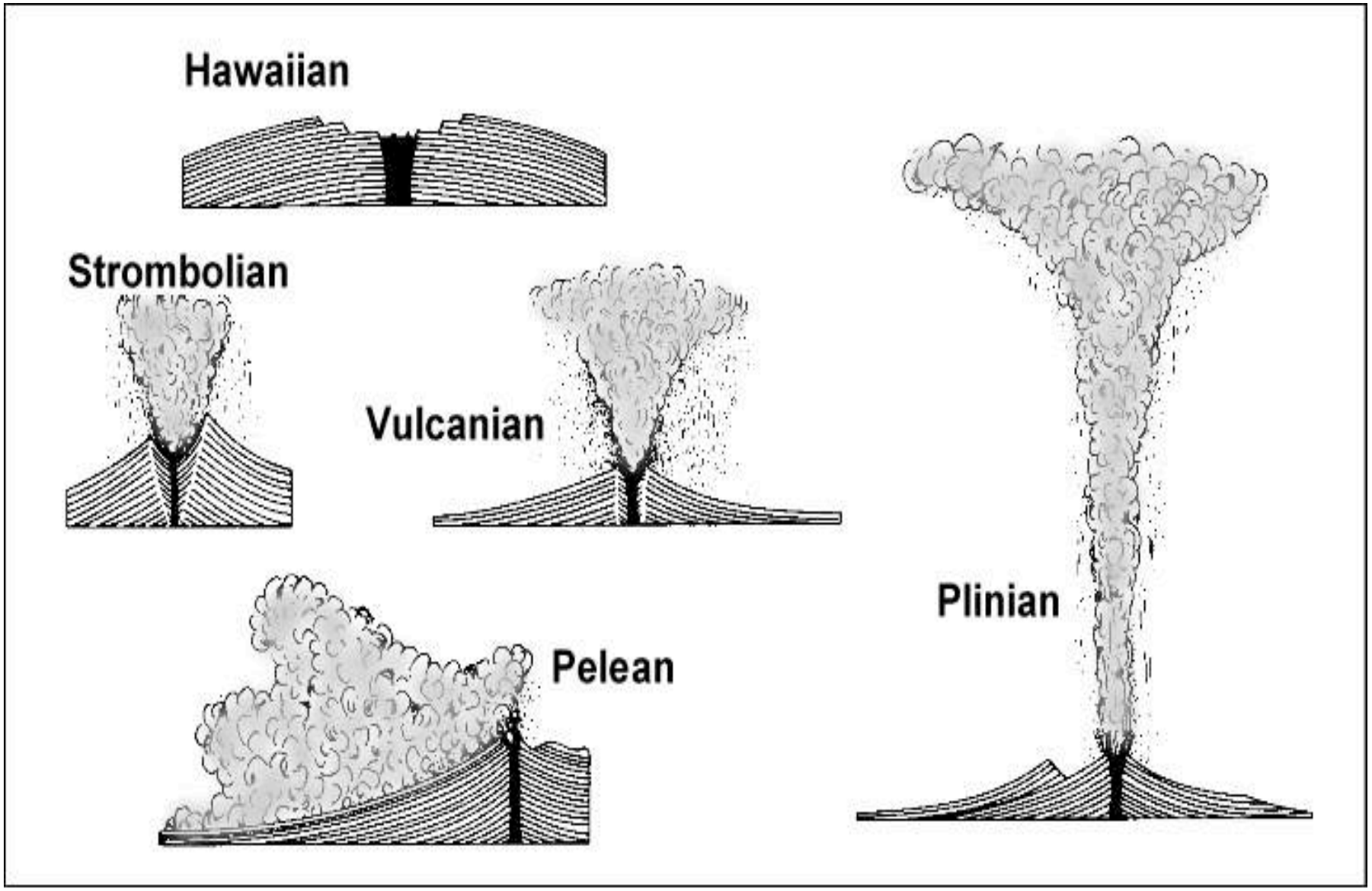
Kaldera Gunungapi

Kaldera Gunungapi



Pembentukan Kaldera

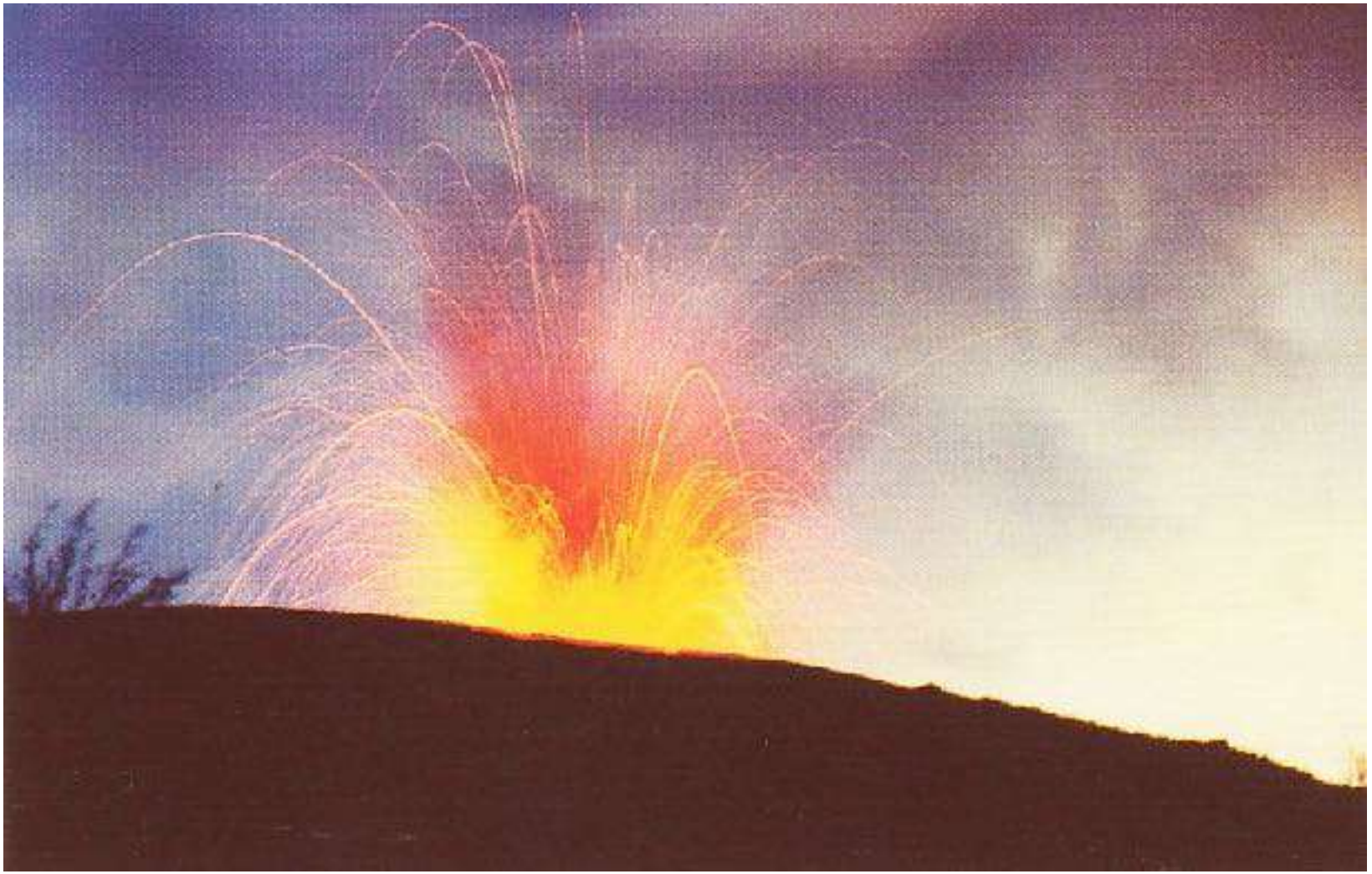
Tipe-tipe Erupsi



Tipe-tipe Erupsi

HAWAIIAN-HAWAI

Tipe-tipe Erupsi



STROMBOLIAN - ANAK KRAKATAU

Tipe-tipe Erupsi

VULCANIAN DOME - MERAPI

Tipe-tipe Erupsi

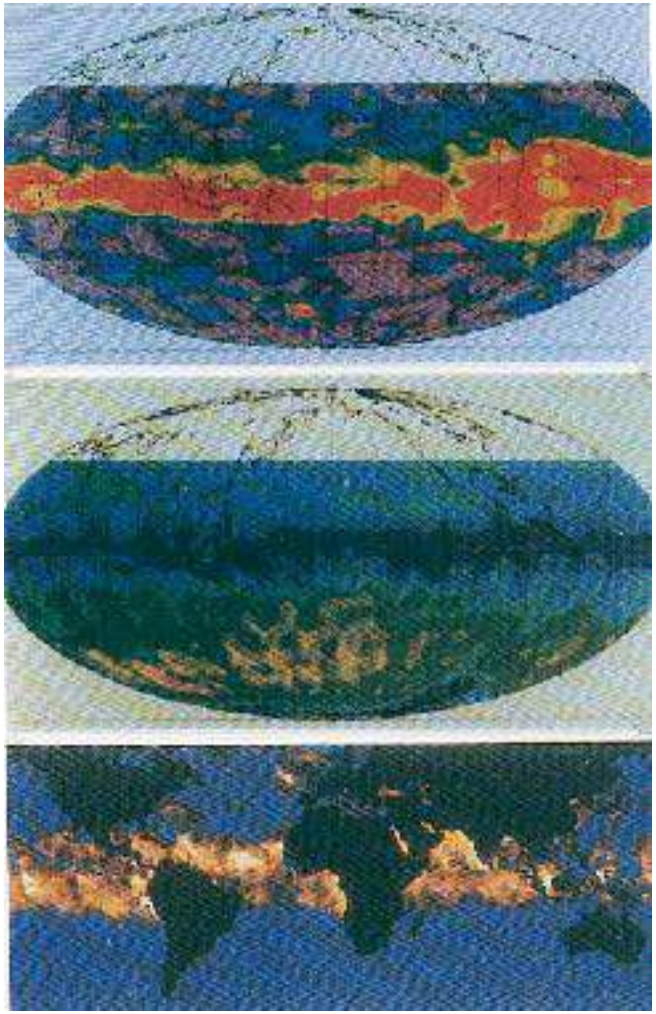
VULCANIAN - PAPANDAYAN
GAMALAMA

Tipe-tipe Erupsi

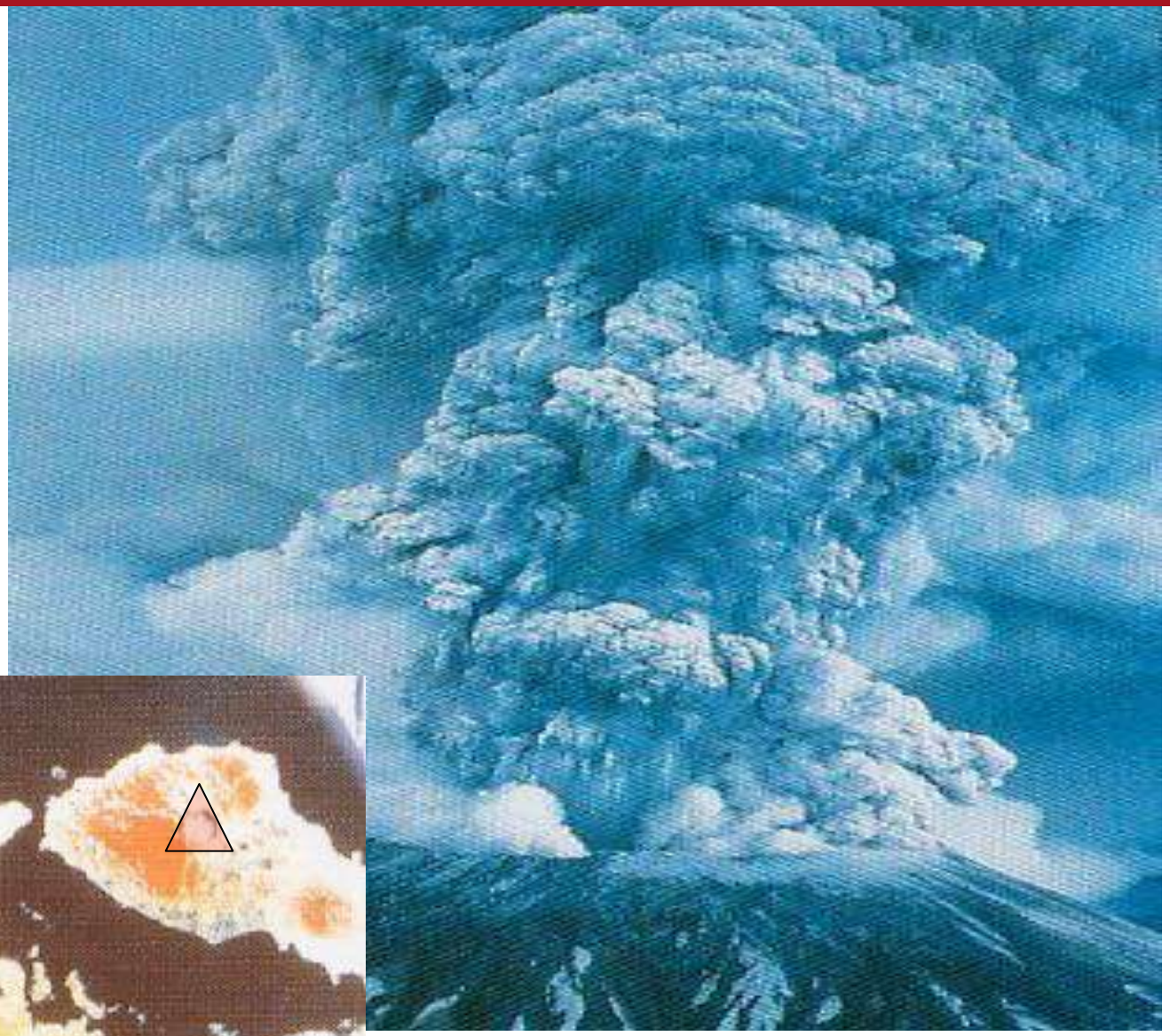
PELEEAN - ST HELLENS

Tipe-tipe Erupsi

PLINIAN PINATUBO

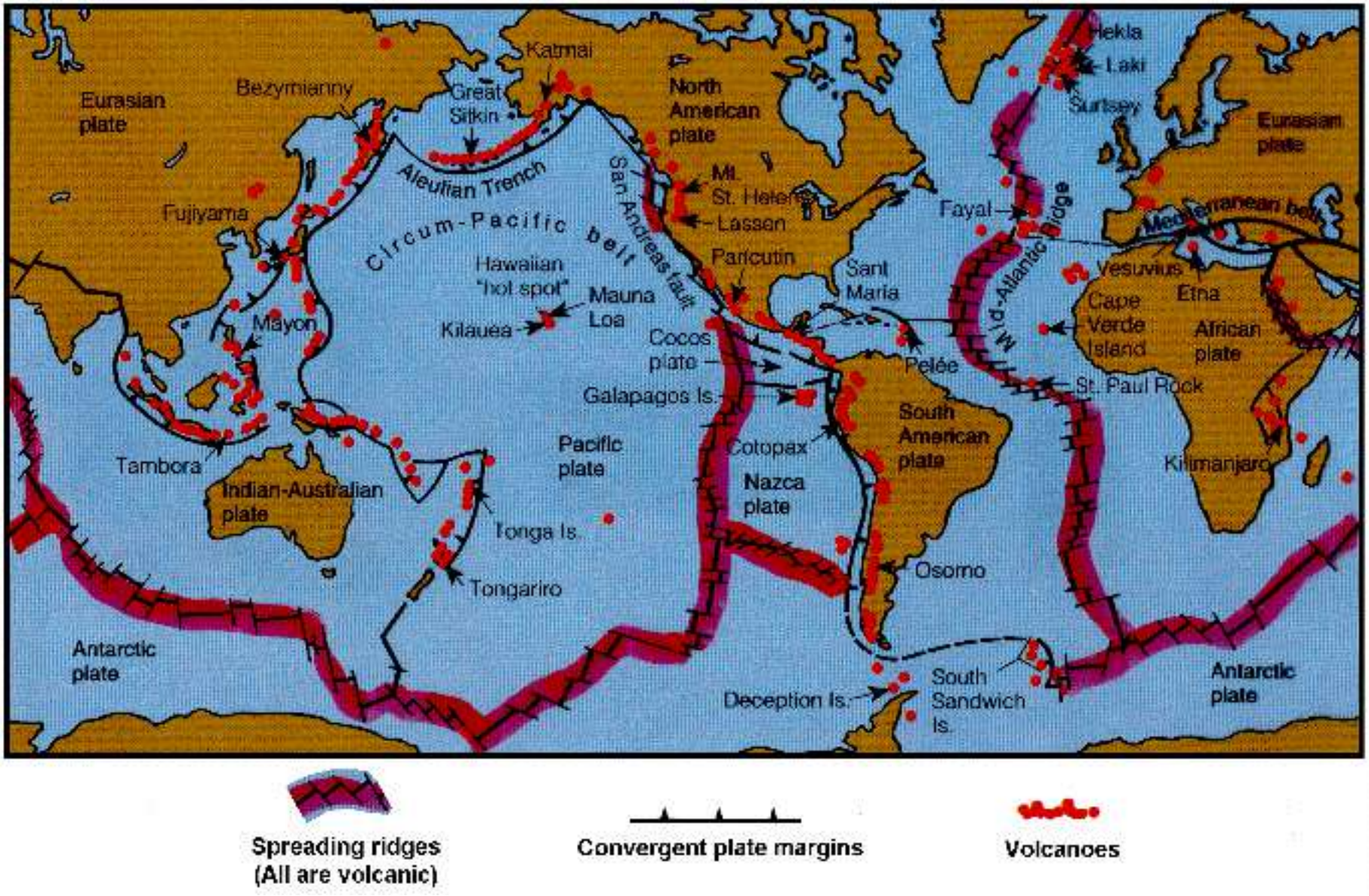


Tipe-tipe Erupsi

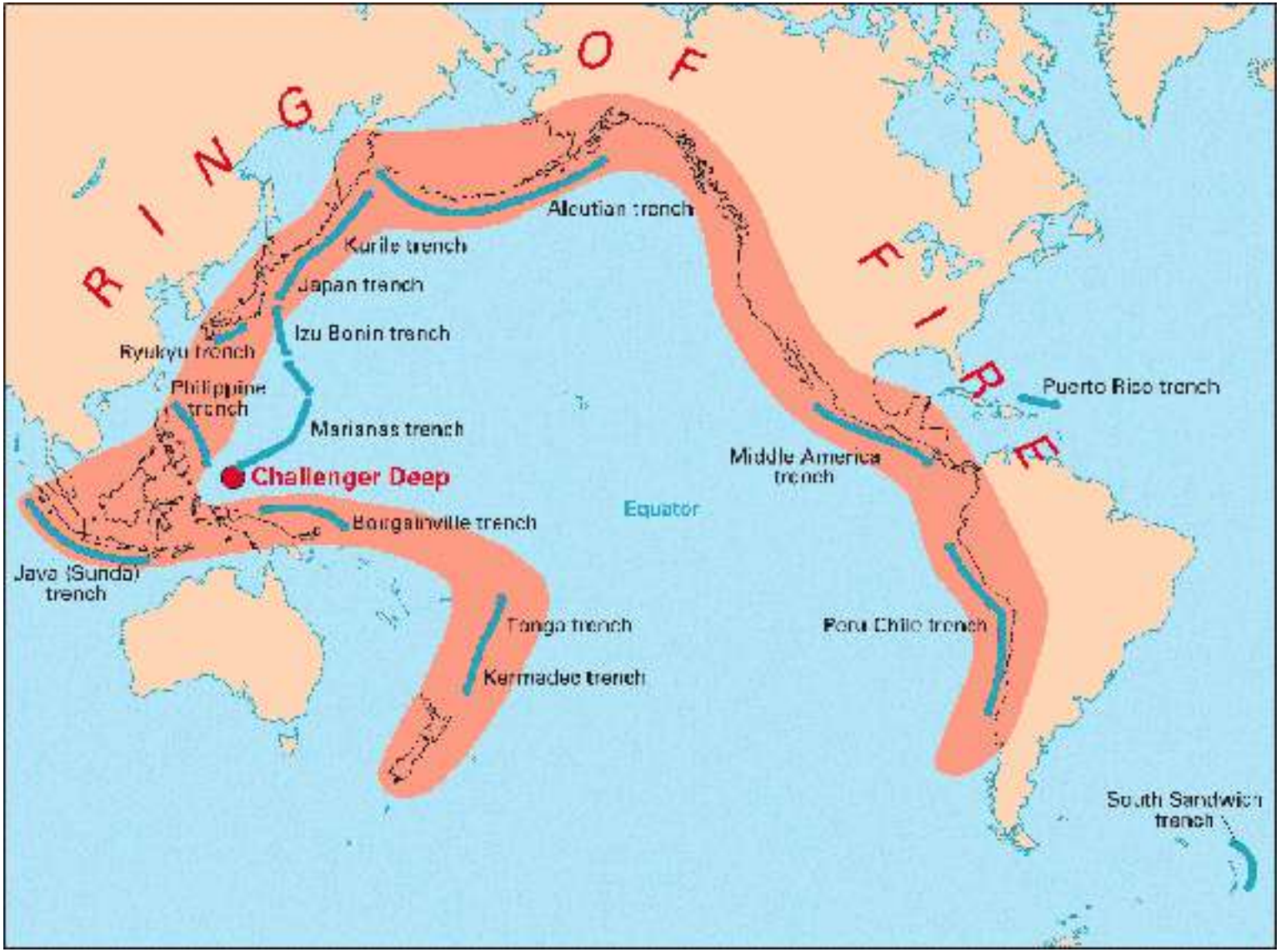


PLINIAN - TAMBORA

Sebaran Gunungapi Global



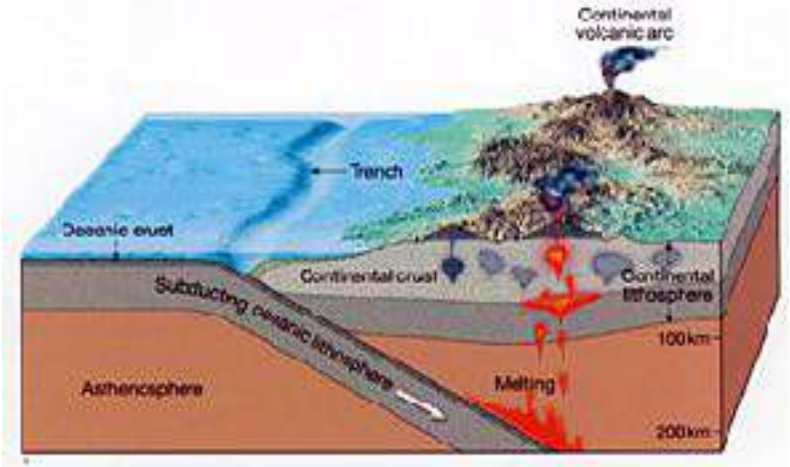
Sebaran Gunungapi Global



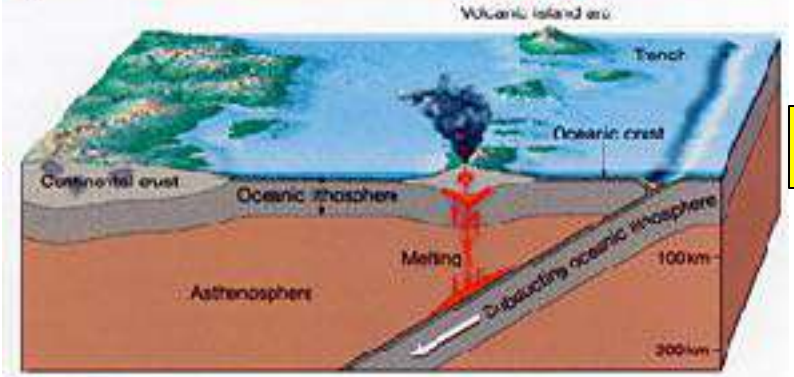
from: http://www.geo.lsa.umich.edu/~crlb/COURSES/270

Most subduction zones are in the "Ring of Fire" (so-called because of volcanism of the Pacific)

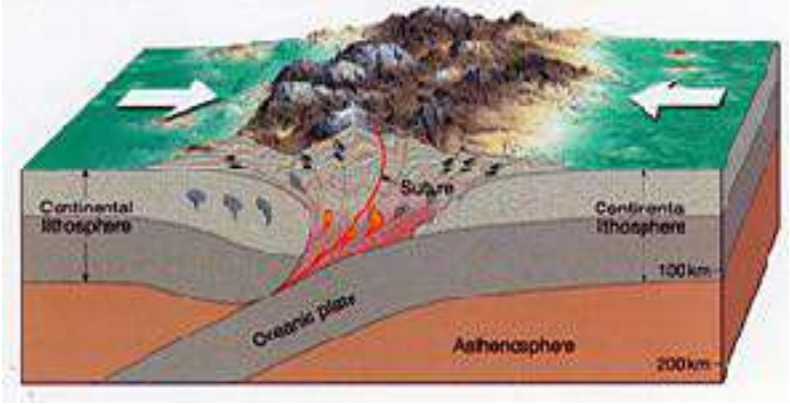
Volcanism & Plate Tectonics



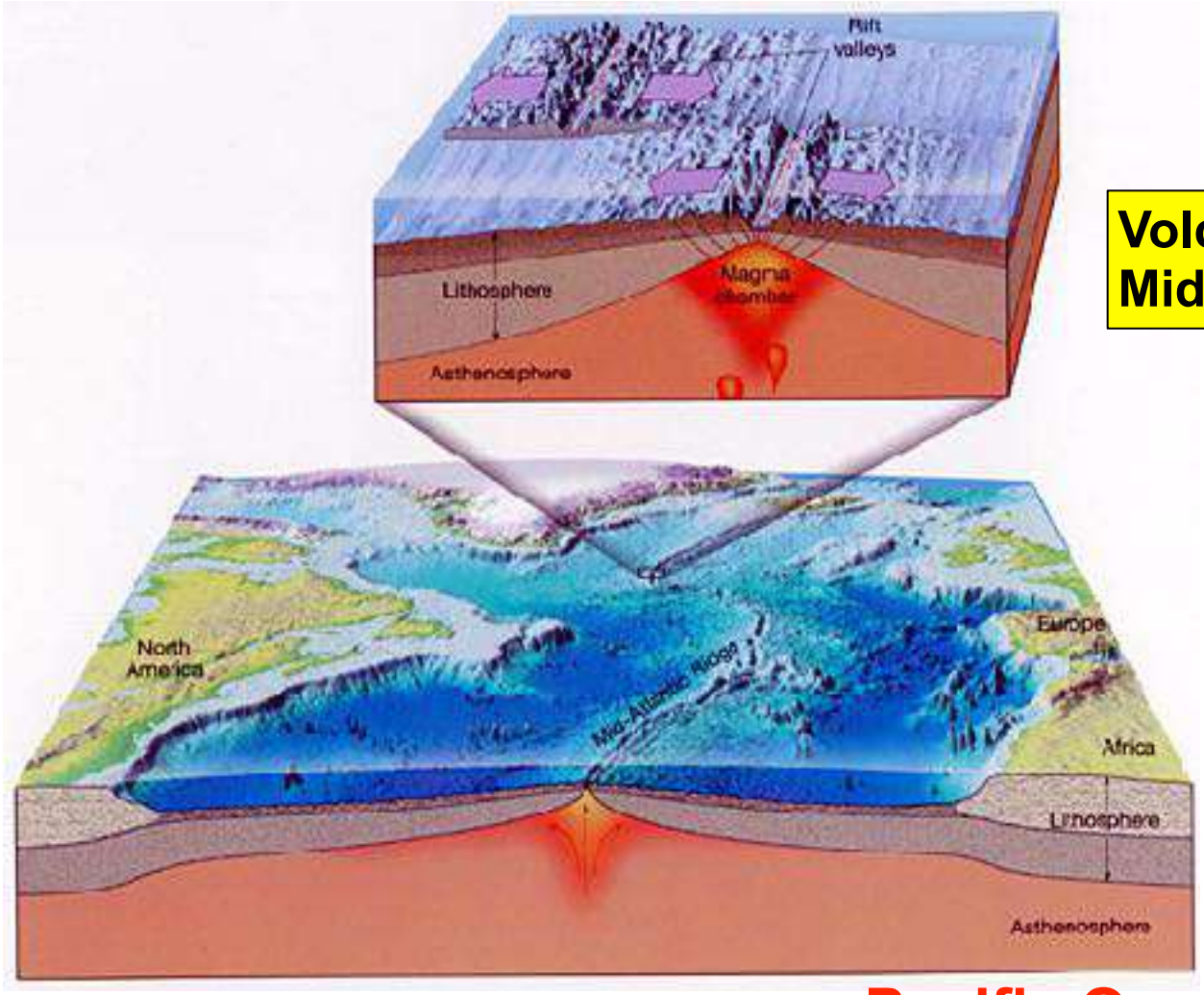
Volcanism in continental



Volcanism in islands arc



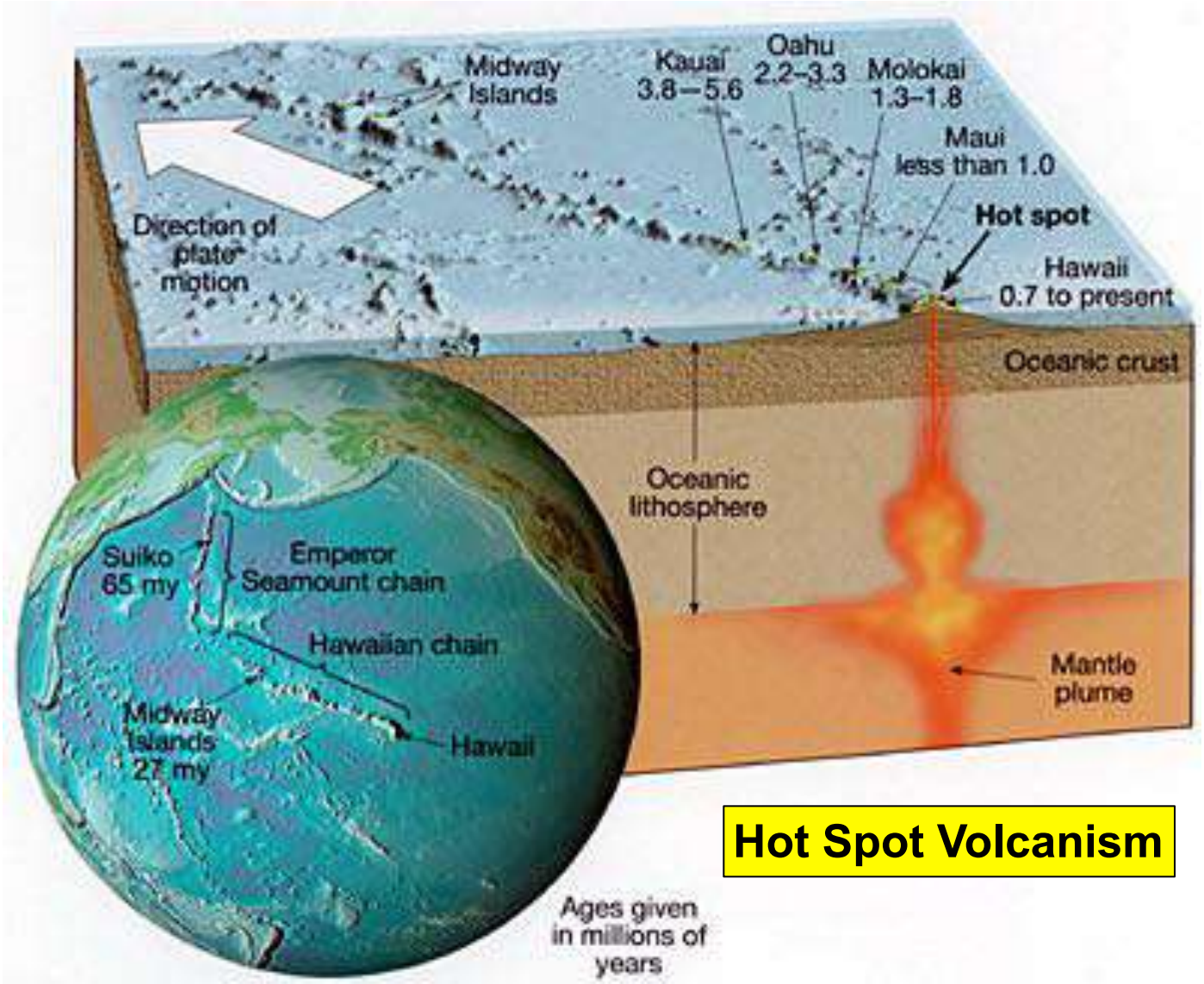
Volkanisma & Tektonik Lempeng



Volcanism in Mid Oceanic Ridge

Pacific Ocean

Volkanisma & Tektonik Lempeng



Hot Spot Volcanism

Classification of Volcanic Environment

"Continental" Volcanic Environment

USGS Topinka, USGS/CVO, 2000, From Tilling, 1987, Volcanoes

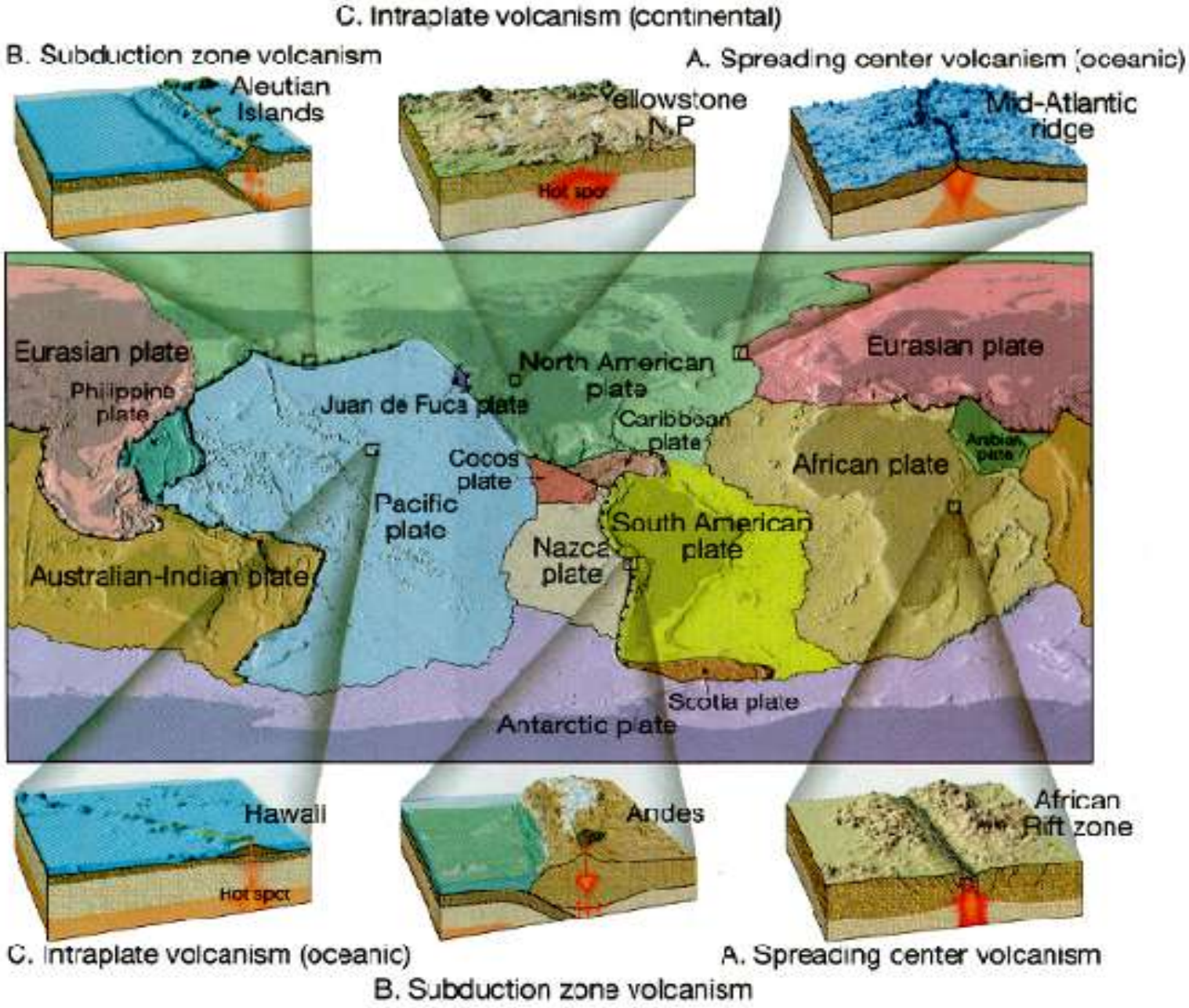
"Island-Arc" Volcanic Environment

USGS Topinka, USGS/CVO, 2000, From Tilling, 1987, Volcanoes

"Oceanic" Volcanic Environment

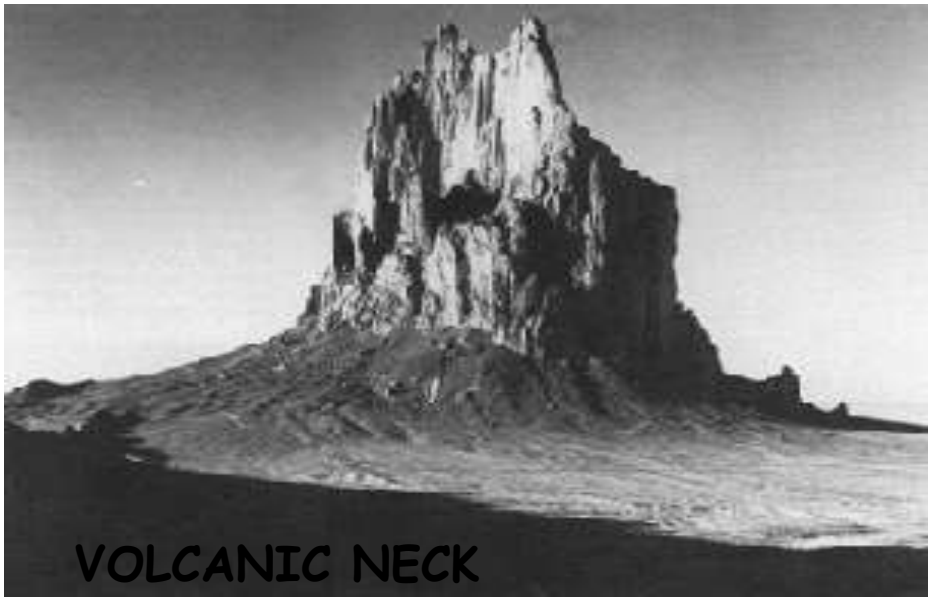
USGS Topinka, USGS/CVO, 2000, From Tilling, 1987, Volcanoes

Types and Zones of Volcanism



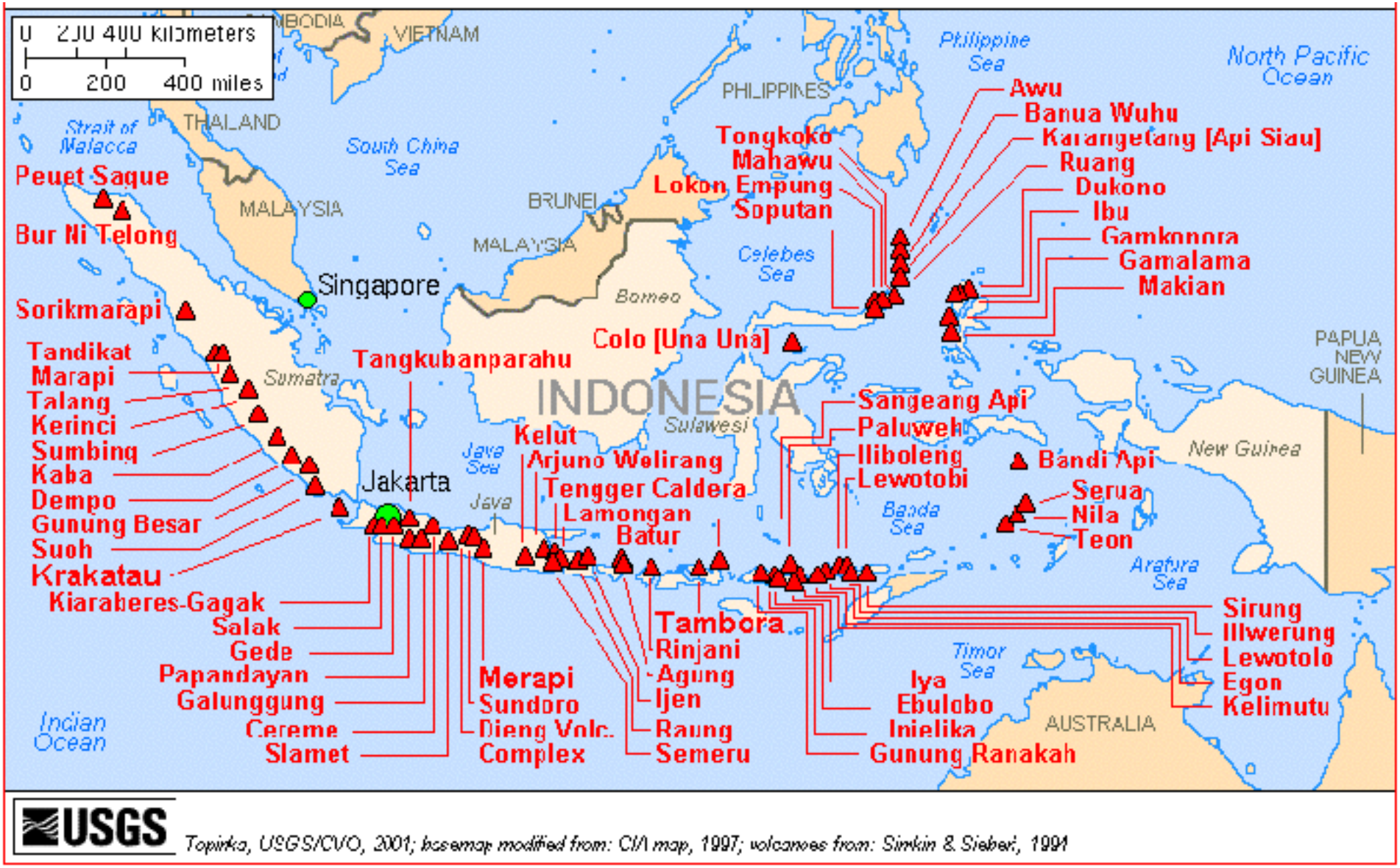
Finally . . .

Rest in Peace



Major Volcanoes of Indonesia

(with eruptions since 1900 A.D.)

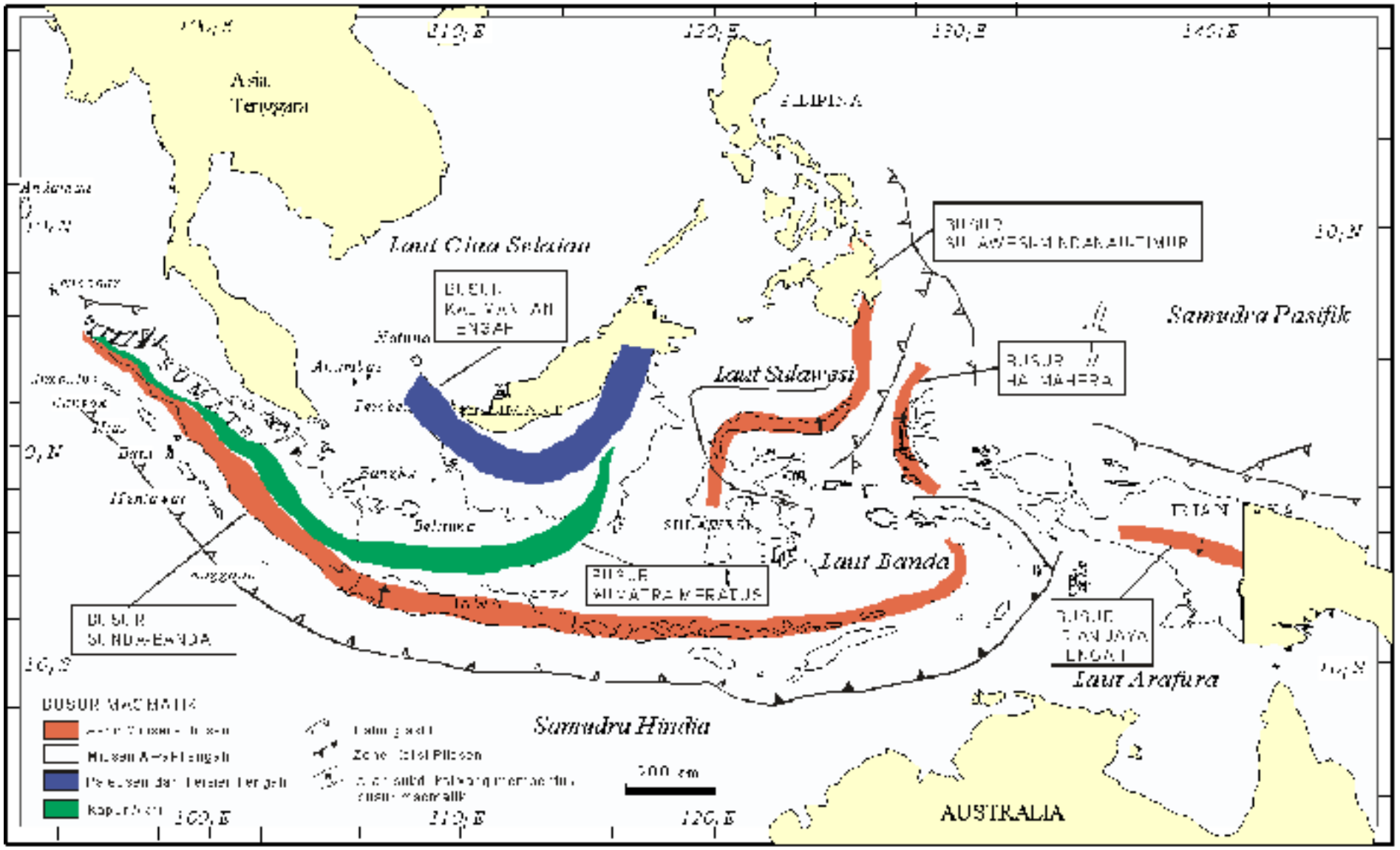


USGS

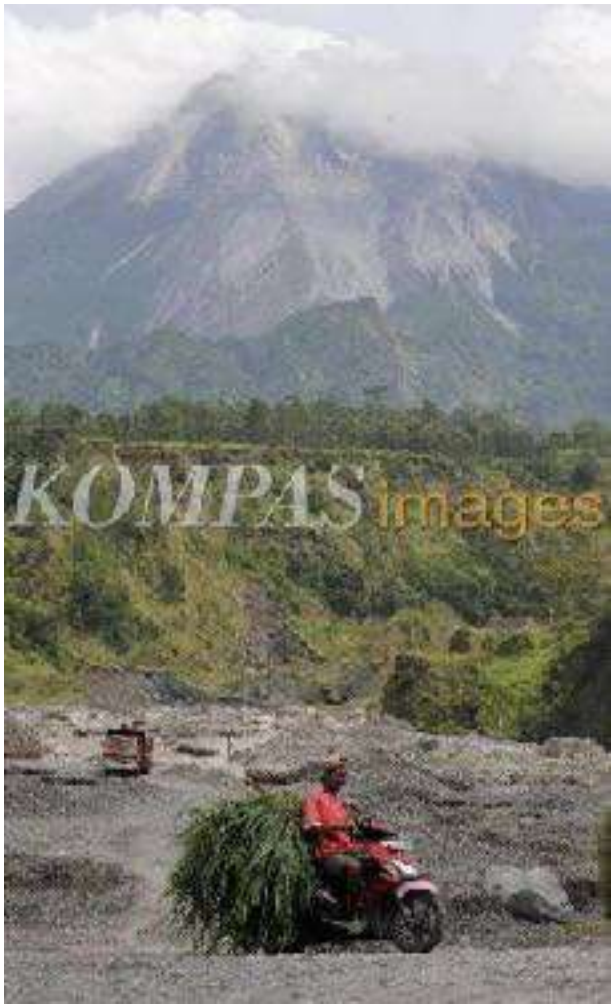
Topinka, USGS/CVO, 2001; basemap modified from: CIA map, 1997; volcanoes from: Simkin & Siebert, 1994

Distribution of Magmatic Arcs of Indonesia

(source: Carlile & Michell, 1994)

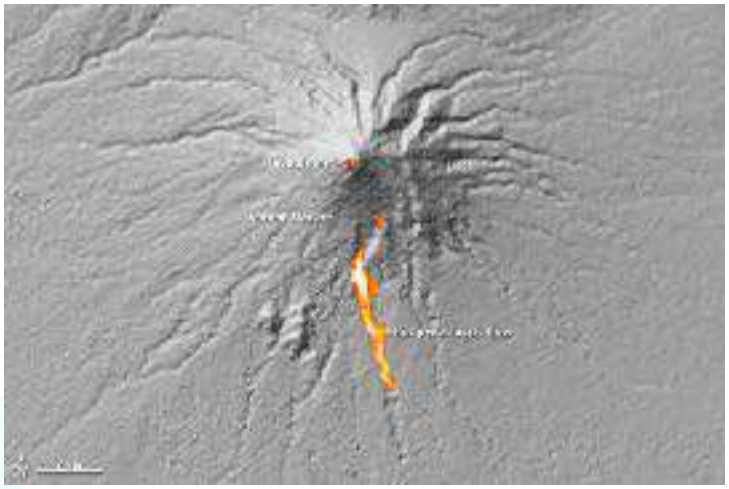


MERAPI 2010



LAVA FLOW & DOME 2010

AWAN PANAS ALIRAN/GUGURAN (Pyroclastic Flow)



AWAN PANAS LETUSAN : EXPLOSIF

AKIBAT TERJANGAN AWAN PANAS