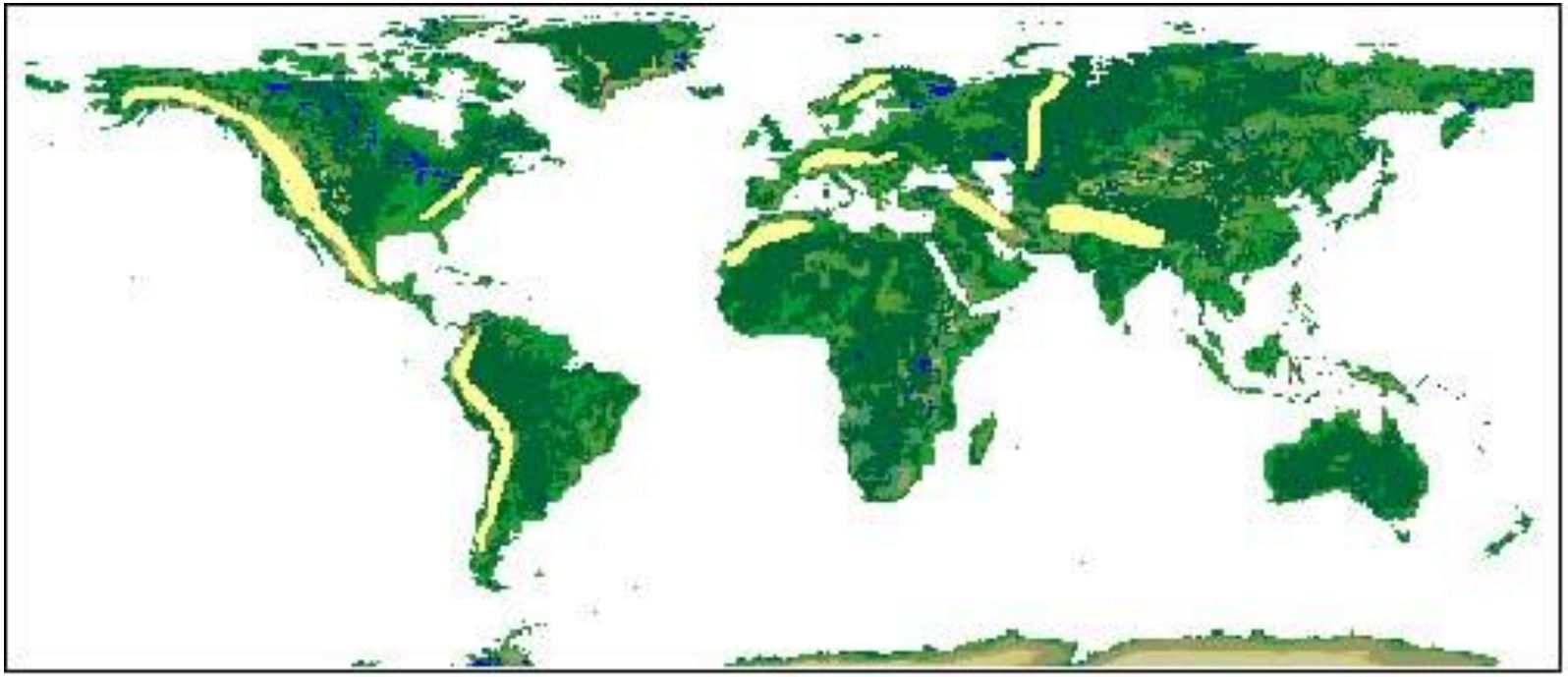
Mountain Building

- Folding
- Faulting
- Volcanoes

Introduction

- Most major global mountain ranges were formed by the collision of **<u>continental (tectonic) plates</u>**



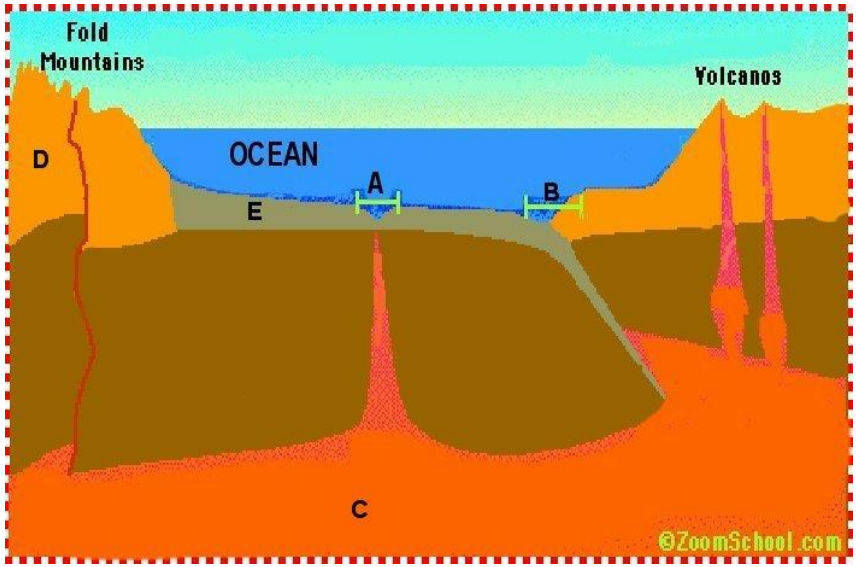
(i) Mountains by Folding

- **Fold mountains** are actually formed by crust which have been **uplifted** and **folded** (buckled or bent) by **compressional forces**.

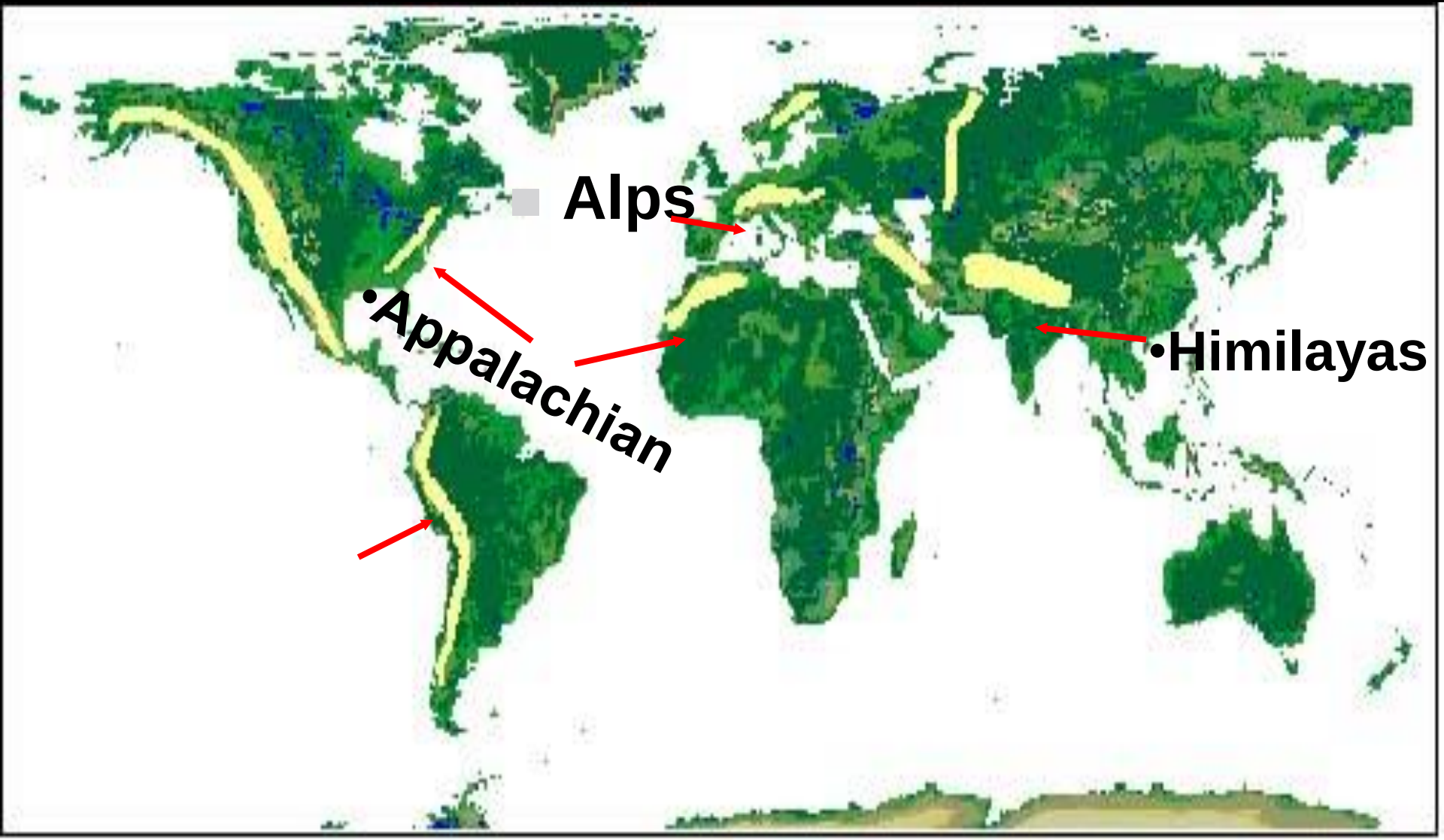
• Rock that is put under extreme pressure for long periods of time (thousands or millions of years) will fold like clay.

Mountains by Folding…cont'd

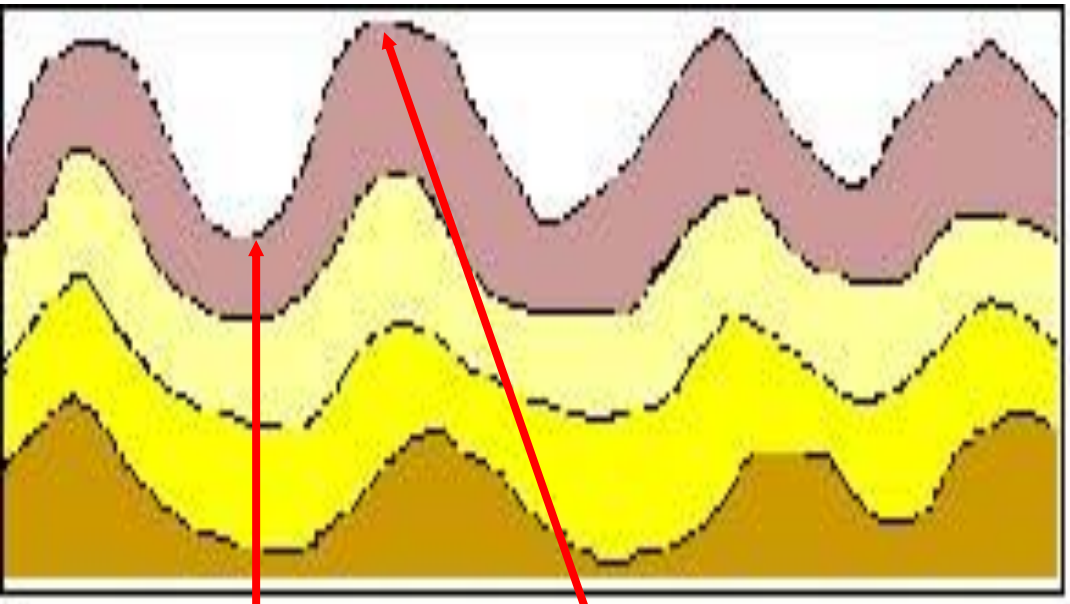
- Compressional forces occur along convergent plate boundaries where 2 plates move towards each other.
- Can happen between continental plates or between an oceanic and a continental plate.



Mountains by Folding…cont'd



Folding: Anticline/Syncline



- Folding bends many layers of rocks without breaking them.
- Often creating a series of peaks and valleys.

<u>Anticline</u> = Peak created by folding

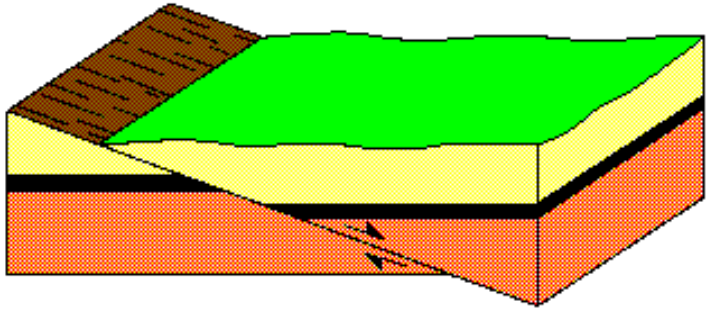
<u>Syncline</u> = Valley creating by folding

(ii) Mountains by Faulting

- **Fault lines** are cracks in the Earth's crust.

  - Generally caused by **tensional forces.**
  - Plates or pieces of crust either (i) **move apart or (ii) slide away from each other** at faults.
  - **Hanging wall** drops below the **foot wall**.
  - This is called a **NORMAL FAULT.**

Foot wall

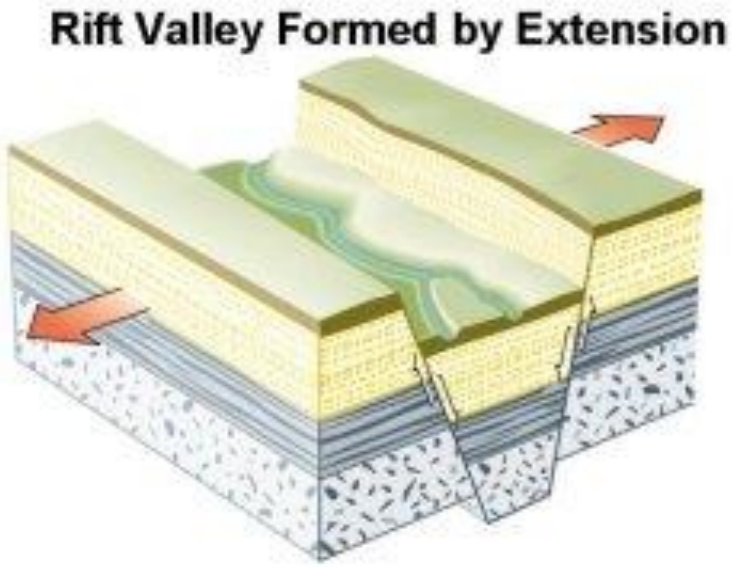


Hanging wall

tensional force

Rift Valleys

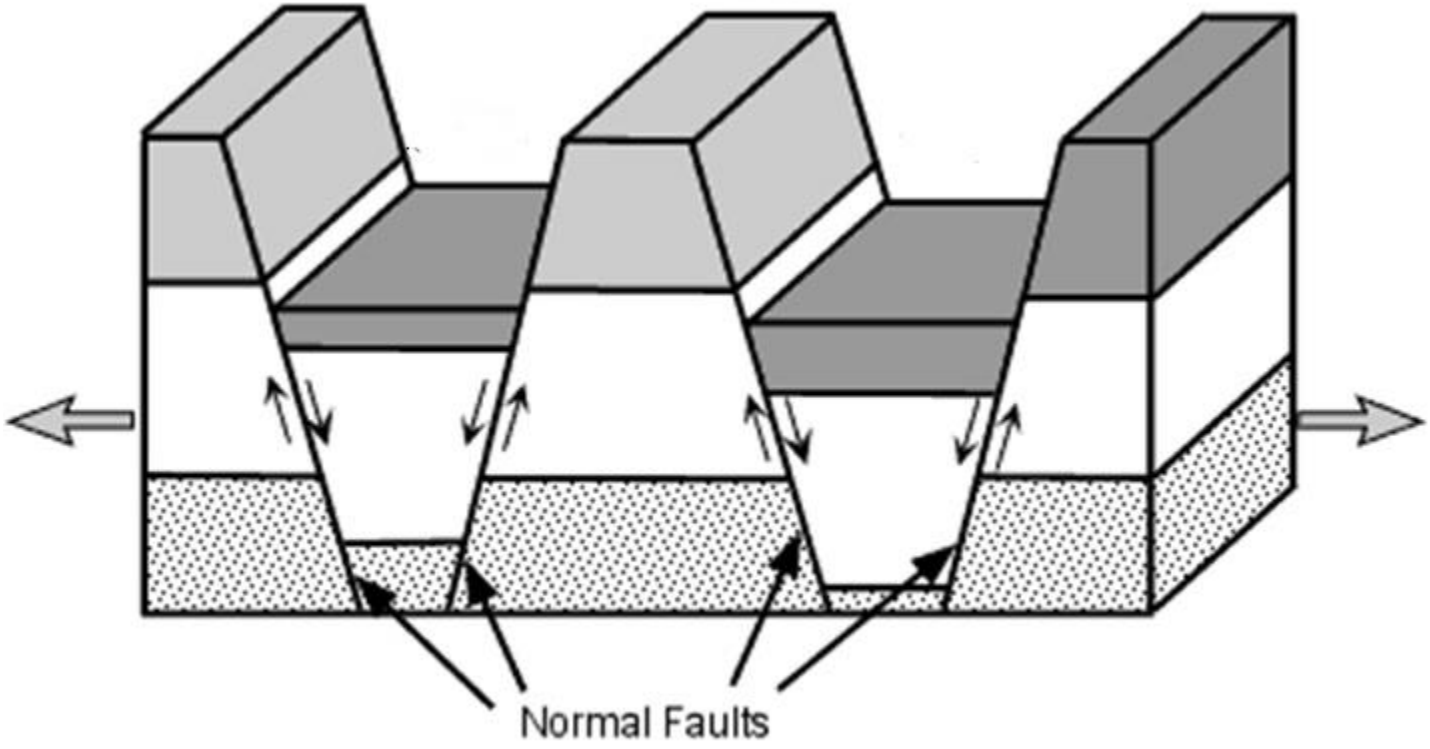
- Sometimes form when **many layers** of the Earth's crust are moved **vertically downward**.
- Occurs between two parallel fault lines.
- Occurs when the broken plate between 2 parallel faults drop as the broken plates move away from each other **(tensional force)**
- P. 14/15



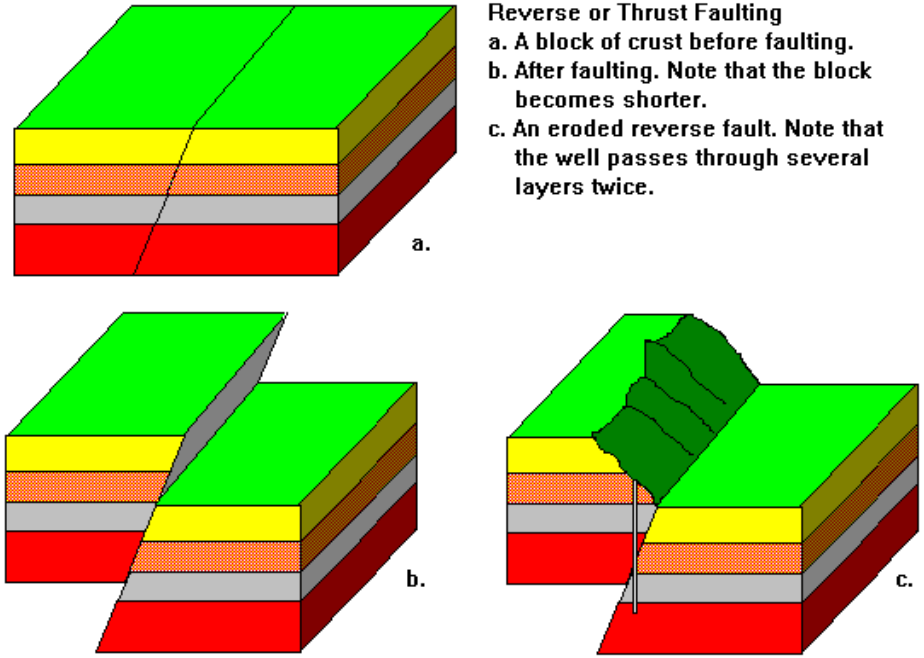
Fault Block Mountains

- Sometimes form when **many layers** of the Earth's crust are moved **vertically upward**.
- Generally between two parallel fault lines.
- Vertical force is **caused by the earth's internal pressure.**
- The mountains that are formed in this way are called **fault-block mountains**.
- P. 14/15

Block Mountains by Faulting

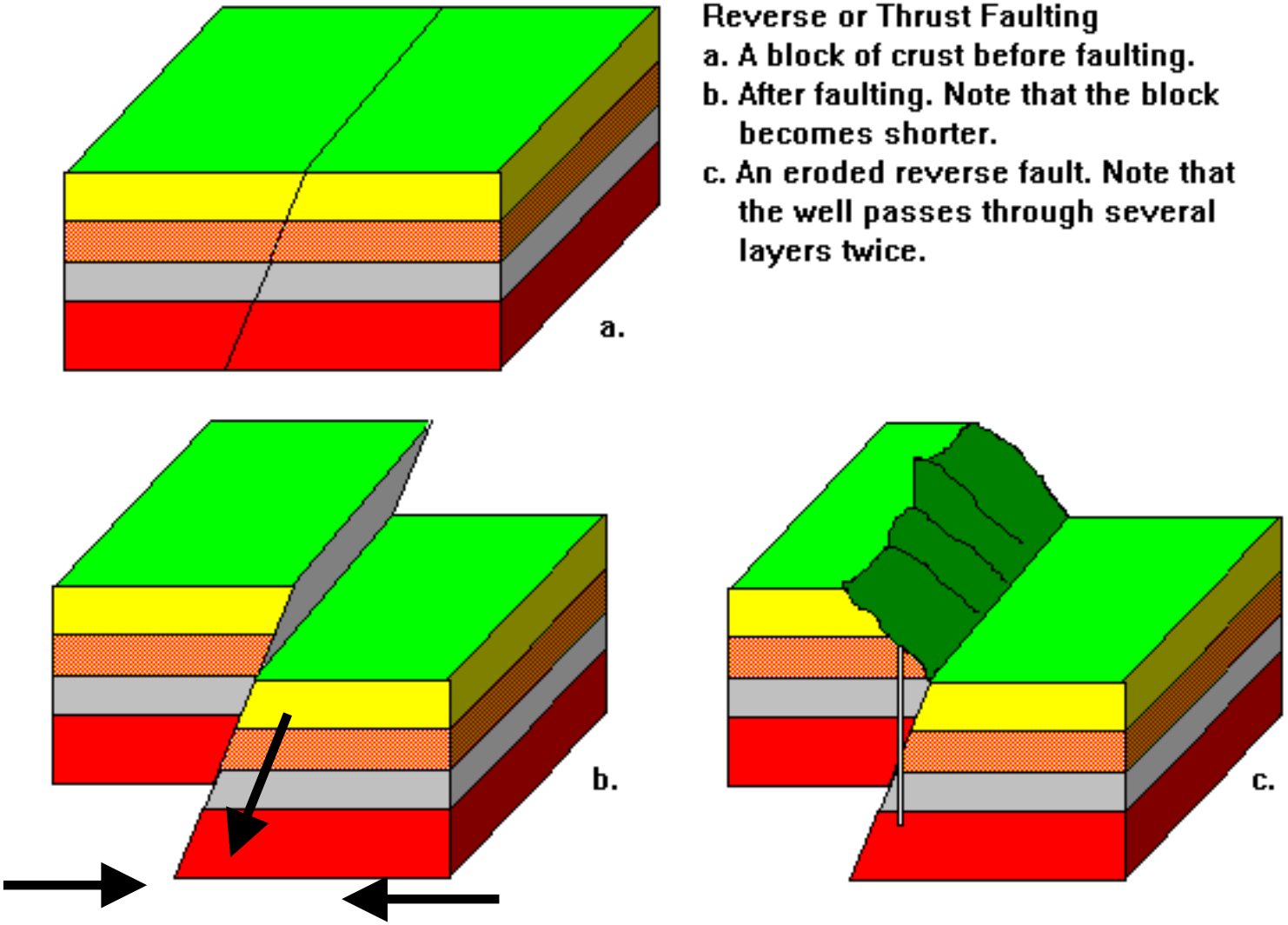


Reverse Faults



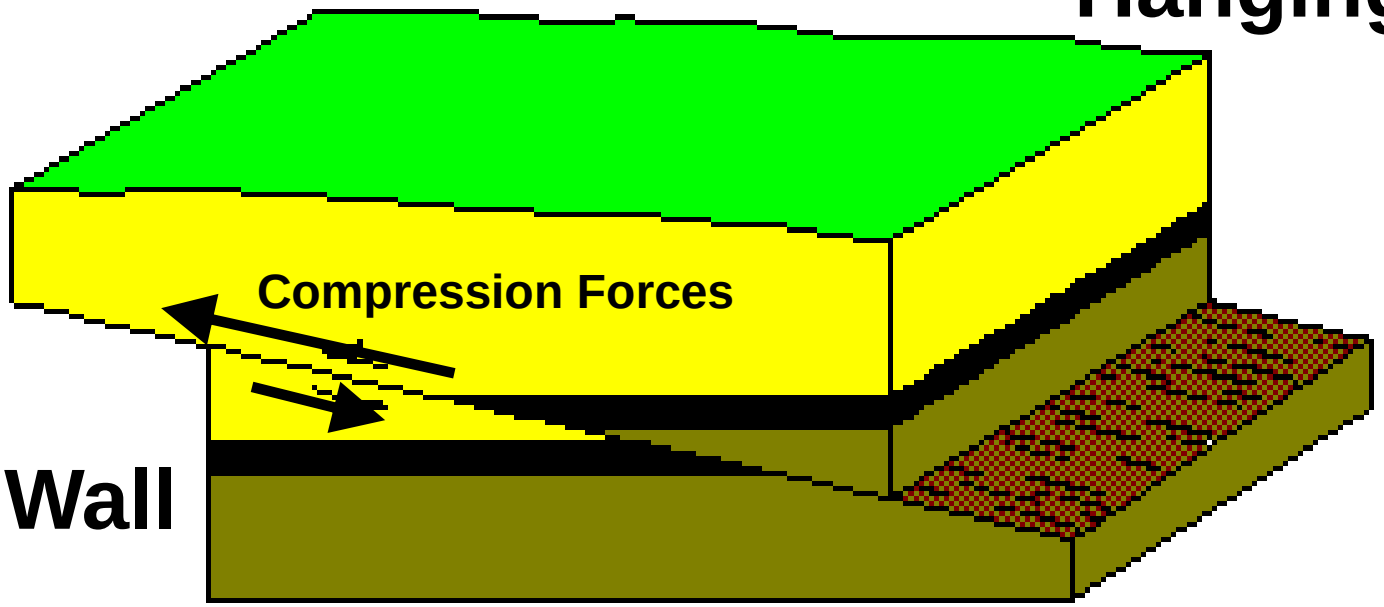
- Caused by **compressional forces (push)**
- Land moves together at fault line.
- **Foot wall** plate is **forced under or below** the hanging wall.
- Hanging wall may rise enough to form a mountain

Reverse Faults – Plate below



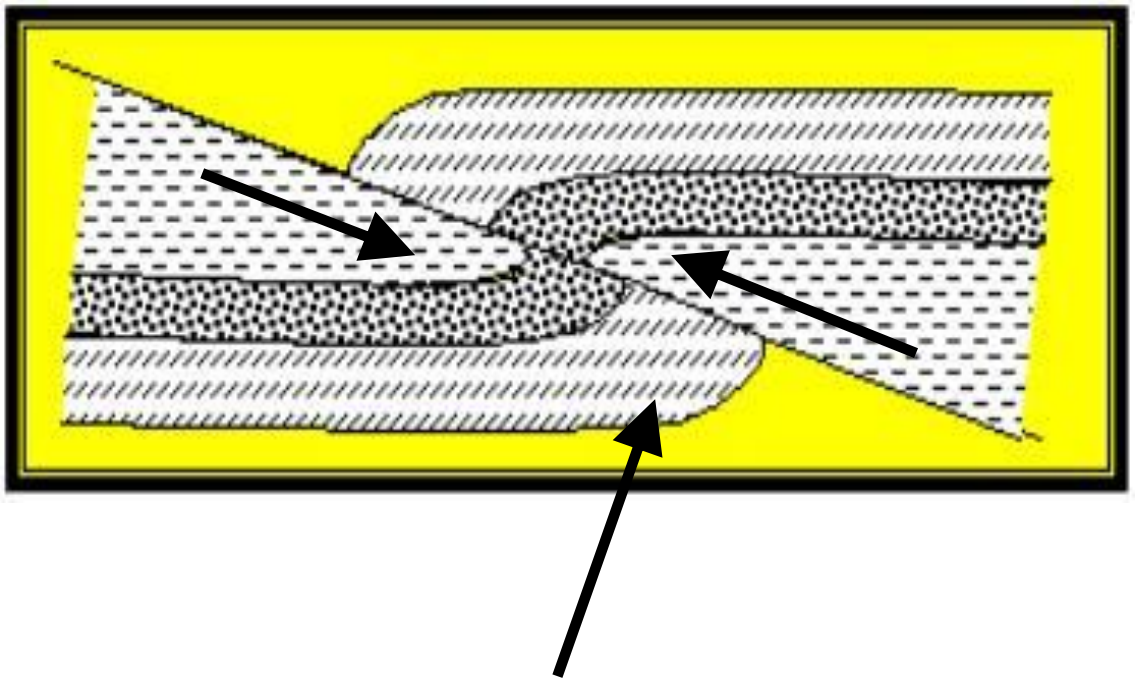
Reverse or Thrust Faulting
a. A block of crust before faulting.
b. After faulting. Note that the block becomes shorter.
c. An eroded reverse fault. Note that the well passes through several layers twice.

Reverse Faults



Overthrust Fault

- Caused by **compressional forces**
- Land moves together at fault.
- **Foot wall plate is forced under the hanging wall**.
- Rock layers at lower levels are pushed upward.



Folding occurs before being forced under

Tension or Compression??

Convergent plates	C
Subduction zones	C
Rift Valleys	T
Mountains by folding	C
Mountains due to normal fault	T
Sea Floor Spreading	T
Mountains due to reverse fault.	C

Tension or Compression?- cont'd

- Mountains by subduction (2 cont. plates) C
- Ridge zones, particularly ocean plates T
- Divergent plates T
- Fault Block Mountains T
- Mountains due to overthrust fault C
- Trenches due to subduction C

COMPRESSION FORCES – Recap!!

- Convergent plates – push together
- Subduction zones – plate pushed under
- Mountains by folding – bending/buckle
- Mountains by subduction (2 cont. plates)
- Mountains due to reverse fault.
- Mountains due to overthrust fault.
- Trenches due to subduction {diagram 1.9, p. 11}
- Volcanic Mountains by subduction (continental and ocean plate) {diagram 1.9, p. 11}

TENSION FORCES – Recap!!

- Divergent plates
- Ridge zones, particularly ocean plates
- Mountains due to normal fault
- Rift Valleys
- Block Mountains
- Sea Floor Spreading

(iii) Mountain Building…Volcanoes

Mountain Building

- In this lesson you will:
- 1.1.8 **Explain what causes a volcano to erupt.** (k)
- 1.1.9 **Describe the characteristics of an ash and-cinder cone, a shield cone, and a composite cone.** (k)
- 1.1.10 **Conclude how the location of active volcanoes is related to places where plates meet.** (a)

What are Volcanoes?

- Volcanoes are built by the **accumulation of their own eruptive products**:
  - lava, bombs (crusted over ash flows), and airborne ash and dust.
- A volcano is most commonly a **conical hill or mountain** built around a **vent** that connects with **reservoirs of molten rock** below the surface of the Earth.

What causes them to erupt?

- Driven by **buoyancy and gas pressure**.

1) **Molten rock**, which is lighter than the surrounding solid rock, forces its way upward and may ultimately break though zones of weaknesses in the Earth's crust.
2) If so, an **eruption** begins:

   a) The molten rock may **pour from the vent** as non-explosive lava flows or,
   b) it may **shoot violently into the air** as dense clouds of lava fragments.

- **Molten rock below the surface** of the Earth that rises in volcanic vents is known as ***magma***.
- **After it erupts** from a volcano it is called ***lava***.

3 types of volcanoes

- Ash and cinder cone
- Shield cone
- Composite cone

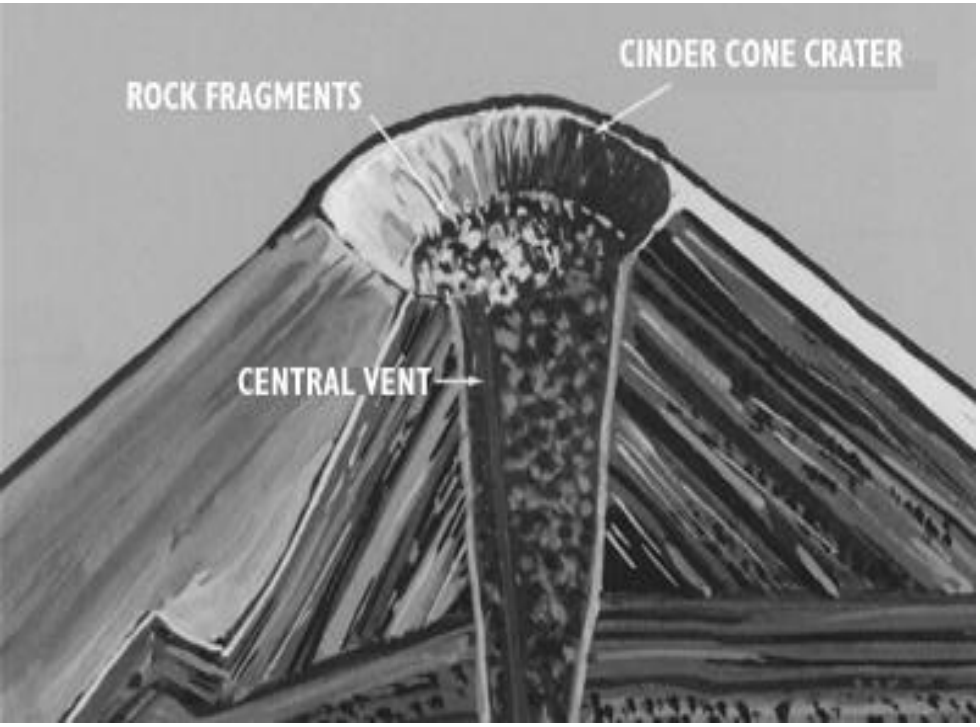
Ash & Cinder Cones

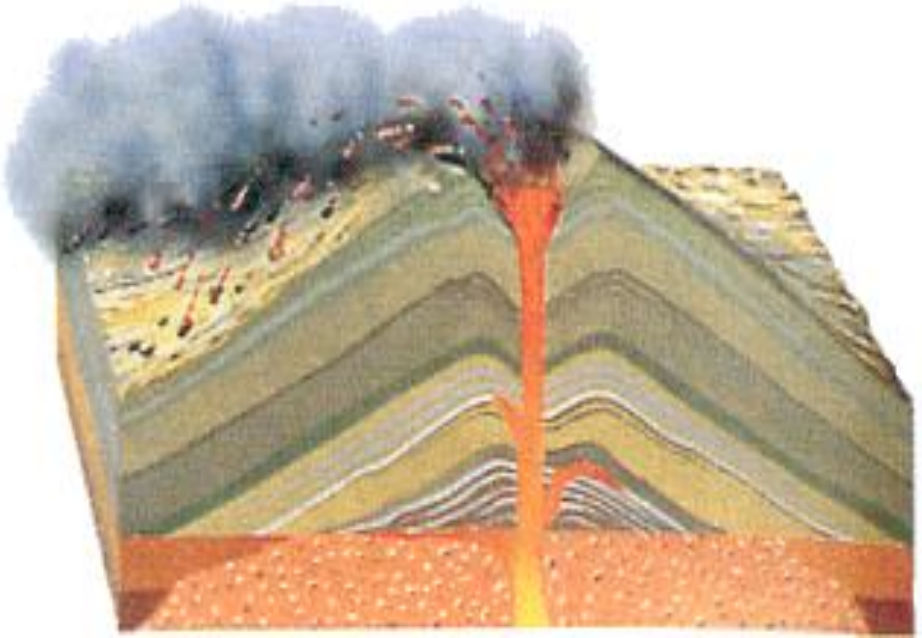
- Built from particles and blobs of congealed lava ejected from a **single vent**.
- As the gas-charged lava is blown violently into the air, it breaks into small fragments that solidify and fall as **cinders** around the vent to **form a circular or oval cone**.
- Most cinder cones have a **bowl-shaped crater** at the summit and rarely rise more than a thousand feet or so above their surroundings.
- Cinder cones are numerous in western North America as well as throughout other volcanic terrains of the world.

Ash & Cinder Cones…Summary

- Cone shaped
- Symmetrical
- Steep sides
- Violent eruptions
- Layers of ash & cinder
- Single central vent
- Crater at summit

Ash & Cinder Cones





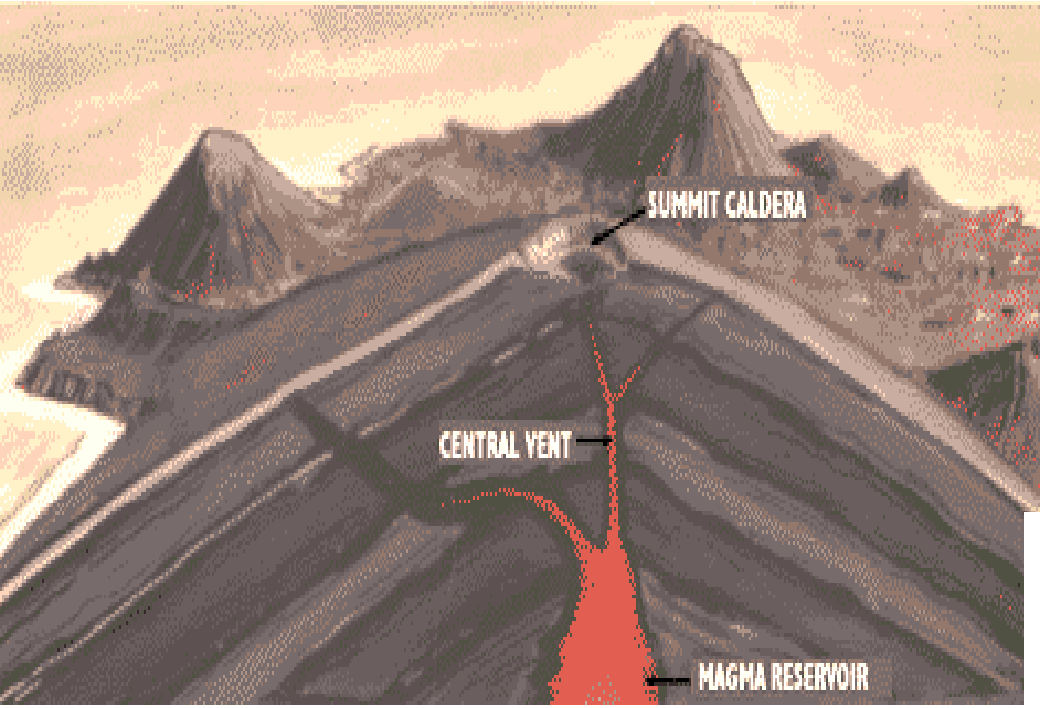
Shield Cones

- Shield volcanoes are **built almost entirely of fluid lava flows**.
- Flow after flow pours out in all directions from a central summit vent, or group of vents, building a **broad, gently sloping cone with a flat, dome-like shape**, with a profile much like that of a warrior's shield.
- They are built up slowly by the accretion of thousands of highly fluid lava flows that **spread widely over great distances**, and then cool as thin, gently sloping sheets.

Shield Cones…Summary

- Shield - shaped
- Flat, Shallow sides
- Non-violent slow emissions of lava
- Layers of lava
- No one single vent
- Covers large area

Shield Cones



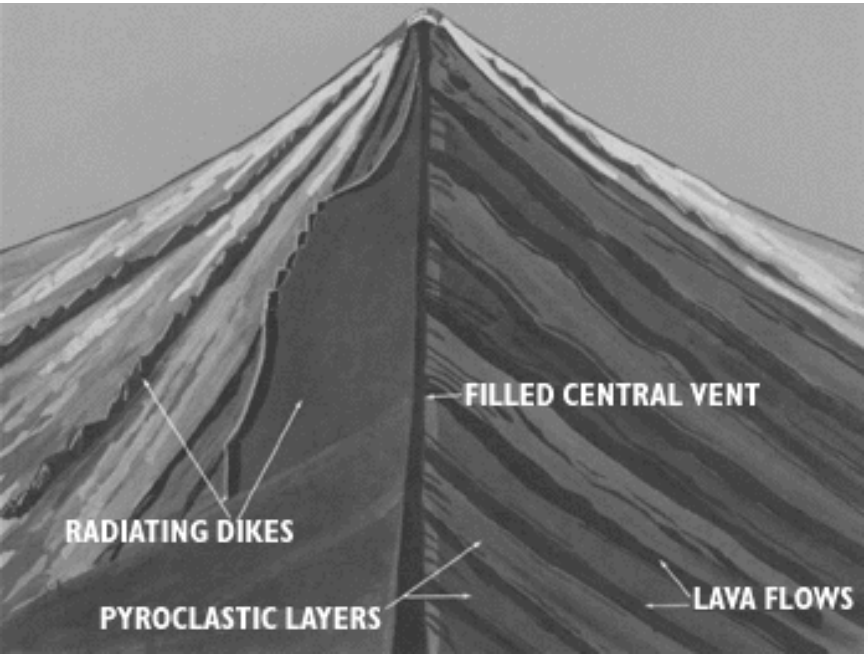
Composite Cones

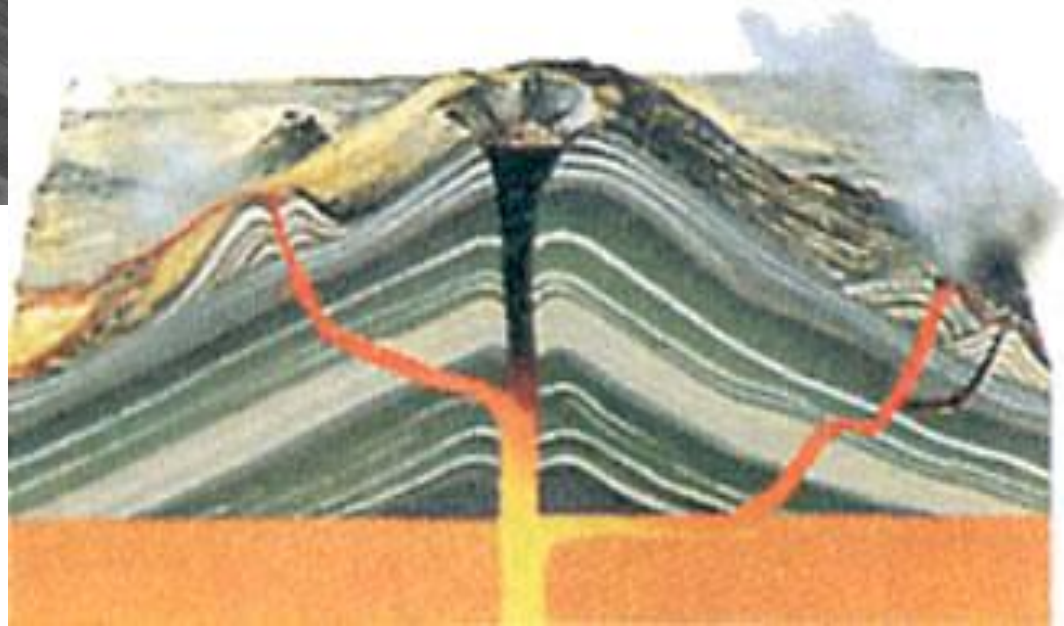
- The essential feature of a composite volcano is a **conduit system** through which magma from a reservoir deep in the Earth's crust rises to the surface.
- The volcano is built up by the accumulation of material erupted through the conduit and increases in size as lava, cinders, ash, etc., are added to its slopes.

Composite Cones….Summary

- Shape not as steep as ash & cinder
- Non-violent slow emissions of lava one time and violent ash eruptions next time
- Layers of alternating lava & ash/cinder
- Weak sections may form in the side of the cone.
- Lava flows out of these forming smaller cones

Composite Cones





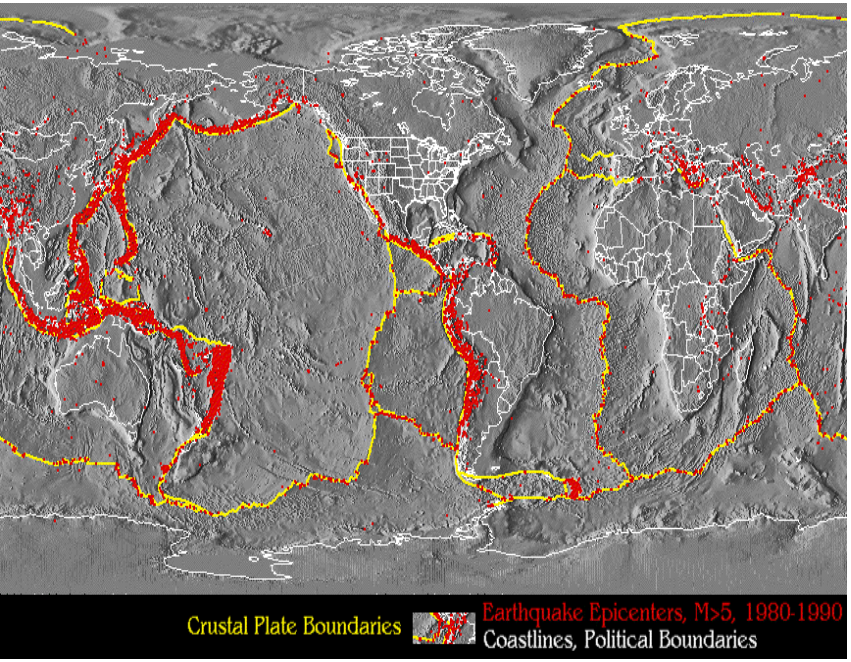
Volcanoes

MUST READ!!!

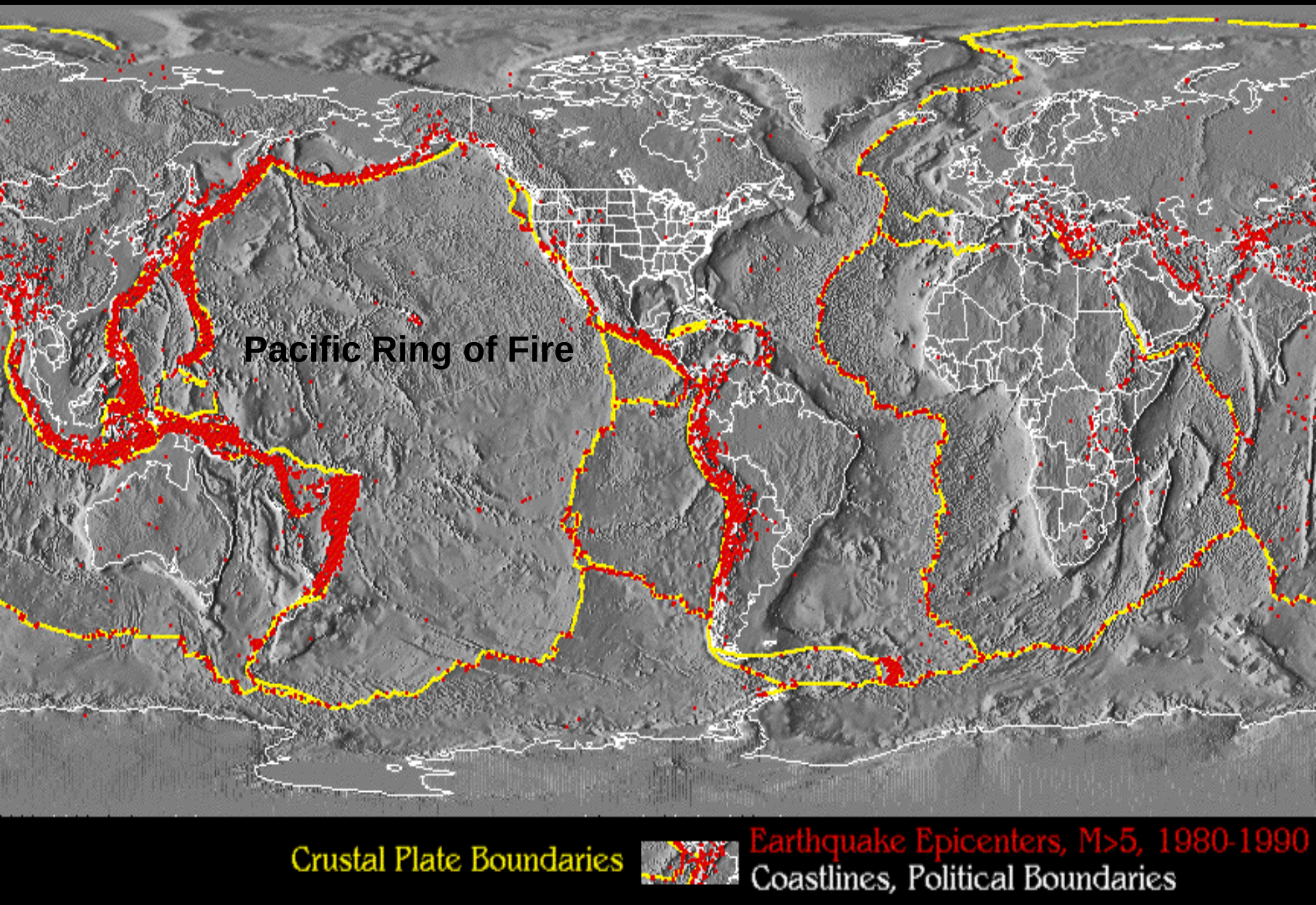
Textbook

P. 14-16

Pacific Ring of Fire



- Volcanoes occur all around the **Pacific Ocean**, at the tectonic plate boundaries.
- Pattern known as the **Pacific Ring of Fire**


Pacific Ring of Fire
Crustal Plate Boundaries
Earthquake Epicenters, M>5, 1980-1990
Coastlines, Political Boundaries