Unit 6: Dynamic Planet: Plate Tectonics

Lecture 1

Objectives:

E3.3A - Explain how plate tectonics accounts for the features and processes (sea floor spreading, mid-ocean ridges, subduction zones, earthquakes and volcanoes, mountain ranges) that occur on or near the Earth's surface.

E3.3d - Distinguish plate boundaries by the pattern of depth and magnitude of earthquakes.

*Plate tectonics**

Review:

- Associated with Earth's rigid outer shell
  - Called the lithosphere
  - Consists of several plates
    - Plates are moving slowly
    - Largest plate is the Pacific plate
    - Plates are mostly beneath the ocean

*Plate tectonics**

- Asthenosphere
  - Exists beneath the lithosphere
  - Hotter and weaker than lithosphere
  - Allows for motion of lithosphere
- Plate boundaries
  - All major interactions among plates occur along their boundaries

*Types of Plate Boundaries**

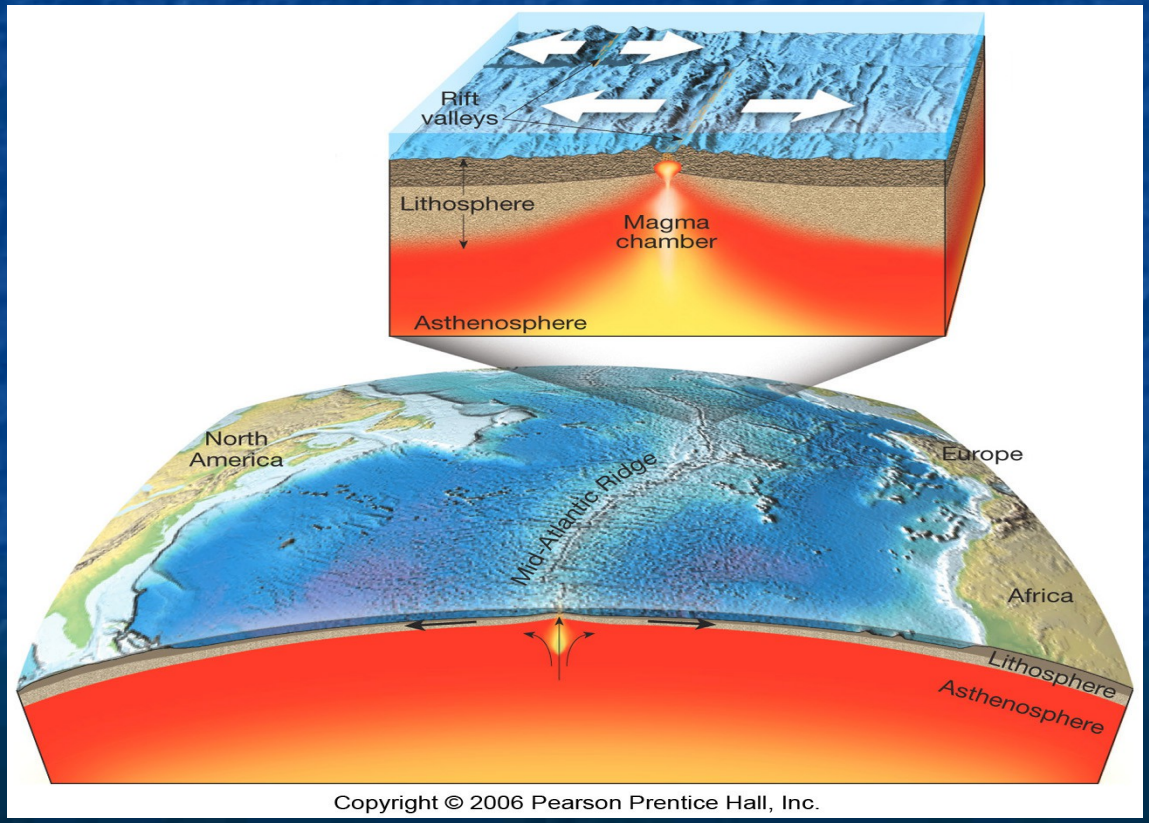
- Divergent plate boundaries
(constructive margins)

- Convergent plate boundaries
(destructive margins)

*Types of Plate Boundaries**

- Divergent plate boundaries (constructive margins)
  - Two plates move apart
  - Mantle material upwells to create new seafloor
  - Ocean ridges and seafloor spreading
    - Oceanic ridges develop along well-developed boundaries
    - Along ridges, seafloor spreading creates new seafloor

Divergent boundaries are located mainly along oceanic ridges



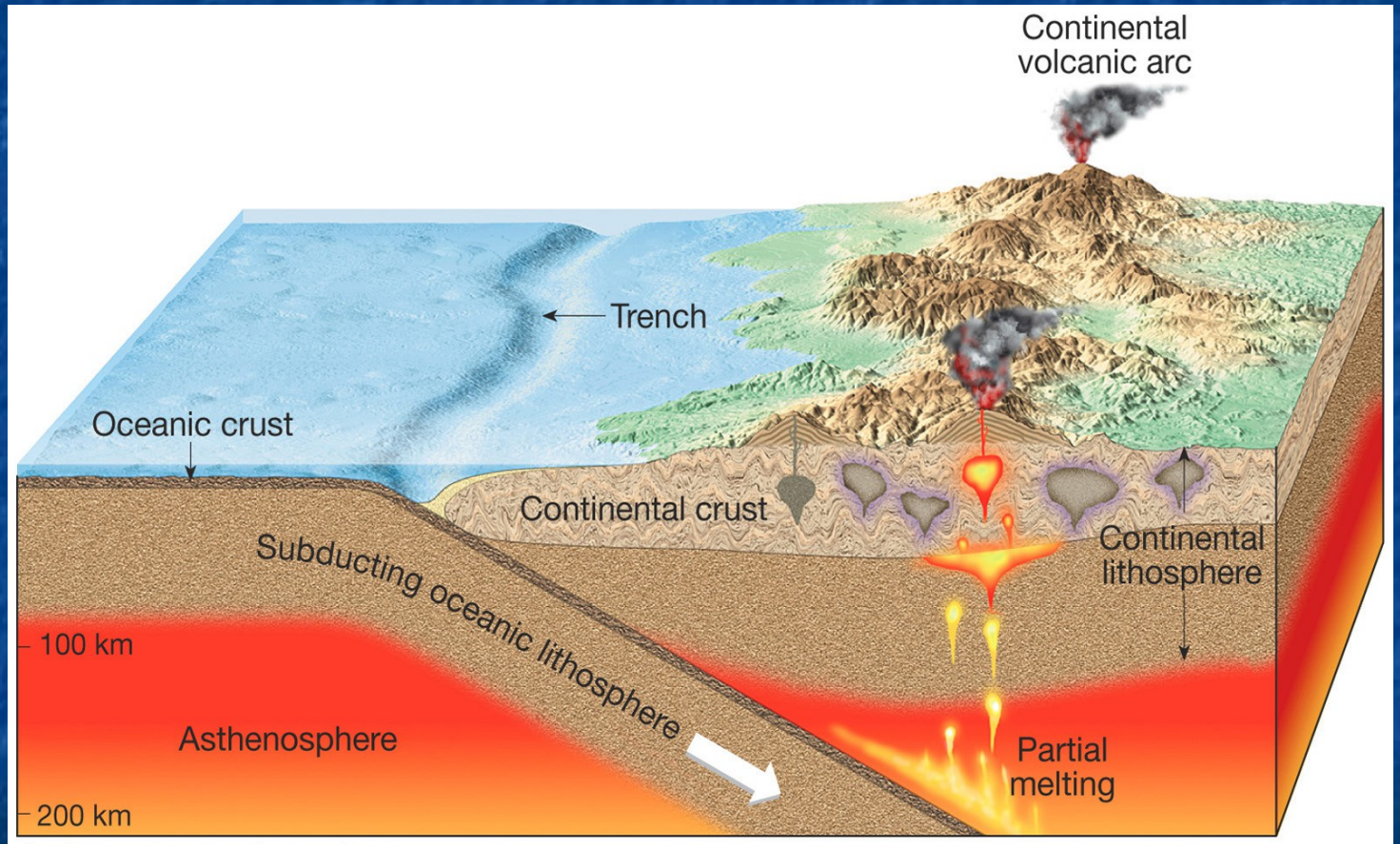
The East African rift – a divergent boundary on land

*Types of Plate Boundaries**

Convergent plate boundaries
(destructive margins)

- Oceanic-continental convergence
  - Denser oceanic slab sinks into the asthenosphere
  - Pockets of magma develop and rise
  - Continental volcanic arcs form
  - Examples include the Andes, Cascades, and the Sierra Nevadan system

An oceanic-continental convergent plate boundary



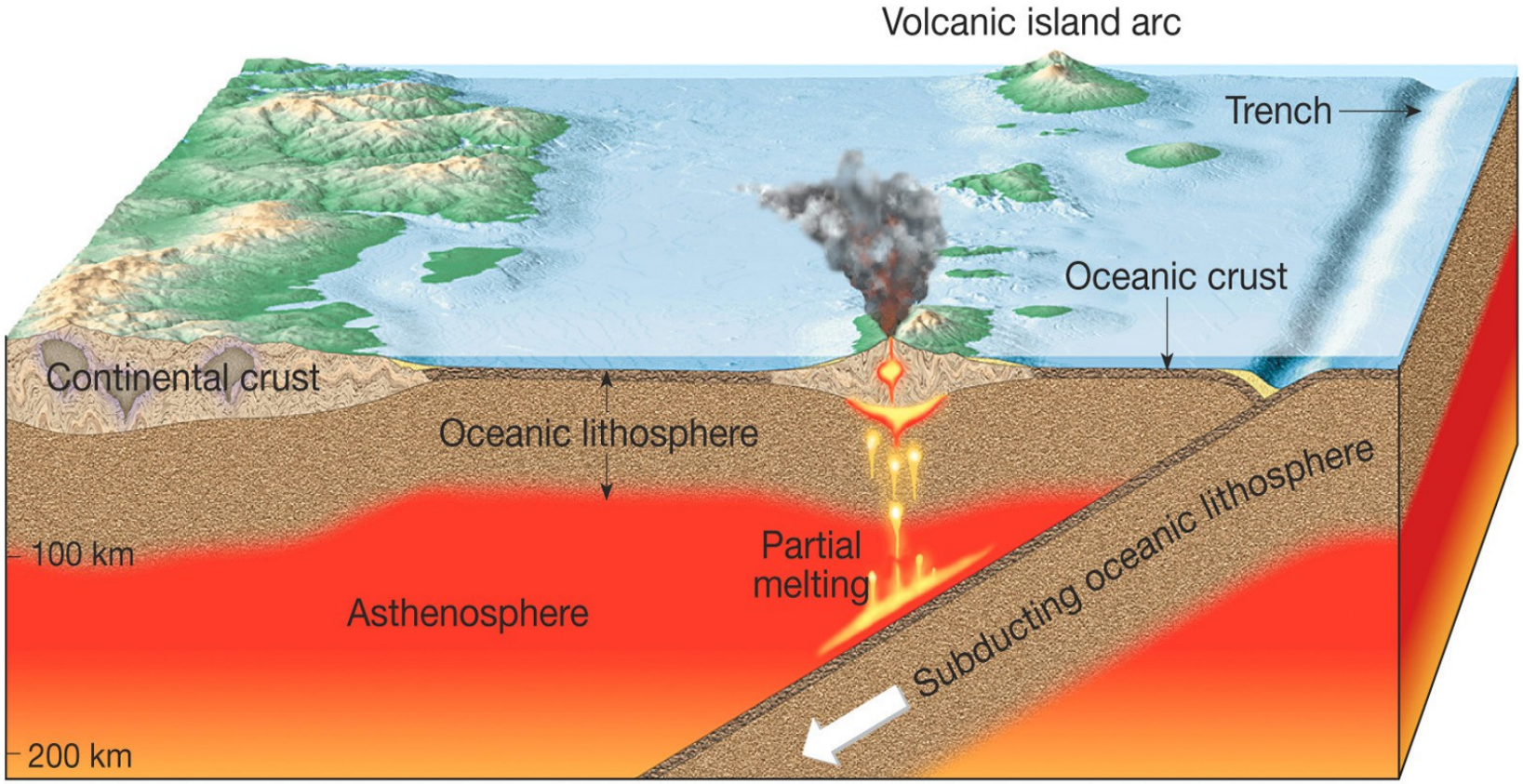
A. Oceanic-continental

Types of Plate Boundaries

- Oceanic-oceanic convergence

- Two oceanic slabs converge and one descends beneath the other
- Often forms volcanoes on the ocean floor
- Volcanic island arcs forms as volcanoes emerge from the sea
- Examples include the Aleutian, Mariana, and Tonga islands

An oceanic-oceanic convergent plate boundary



B. Oceanic-oceanic

Types of Plate Boundaries

Continental-continental convergence

- When subducting plates contain continental material, two continents collide
- Can produce new mountain ranges such as the Himalayas

A continental-continental convergent plate boundary

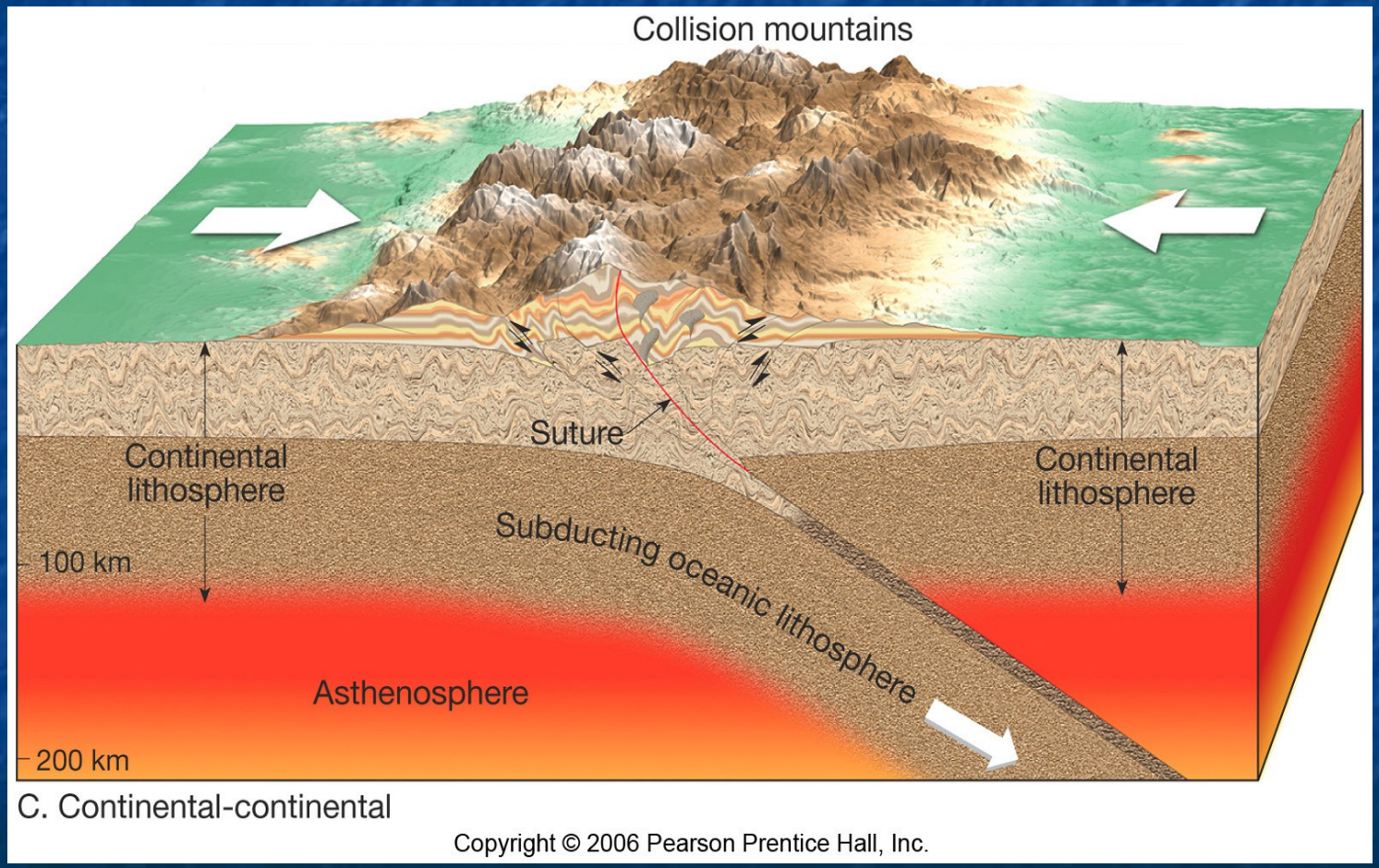
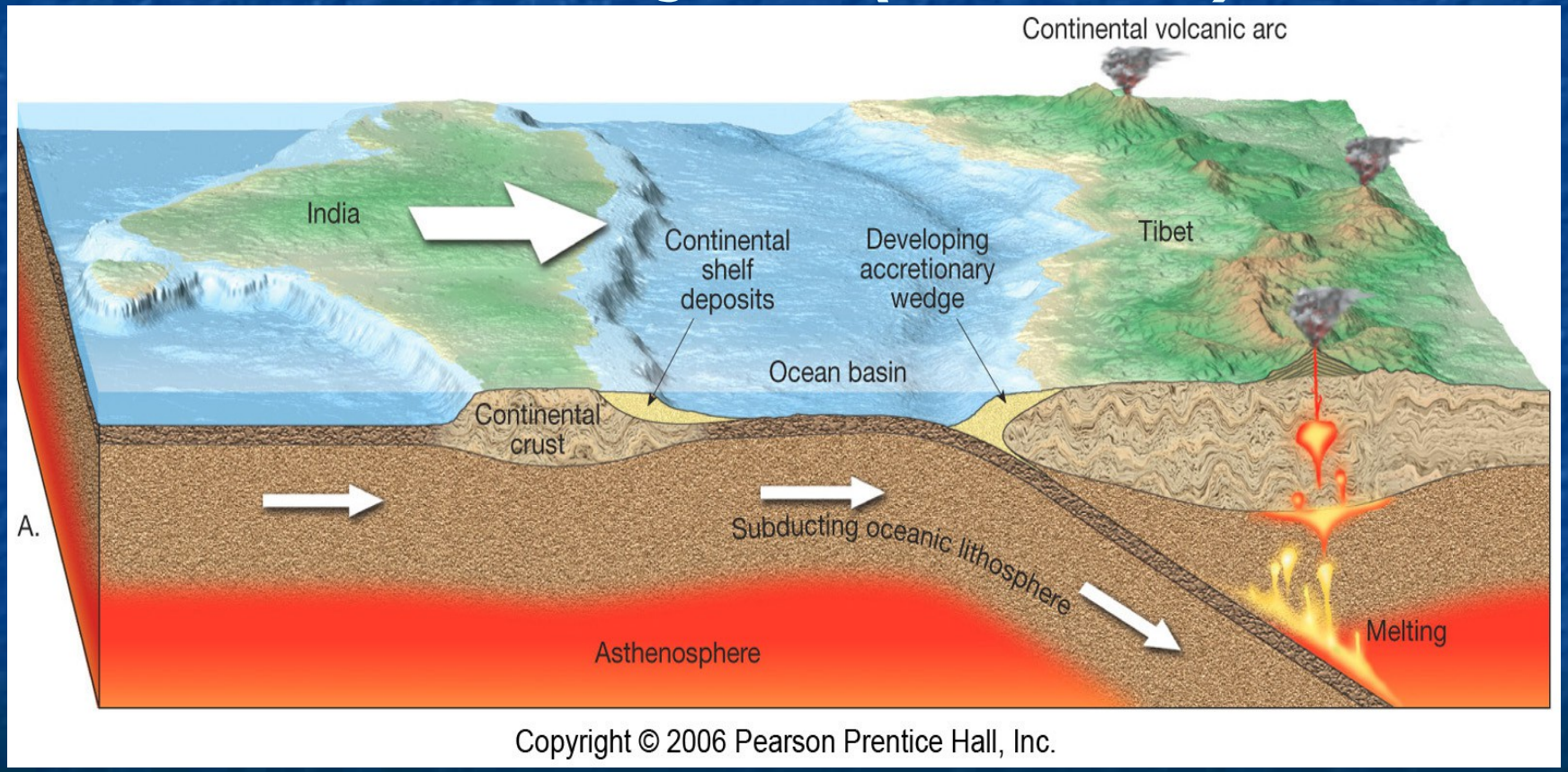
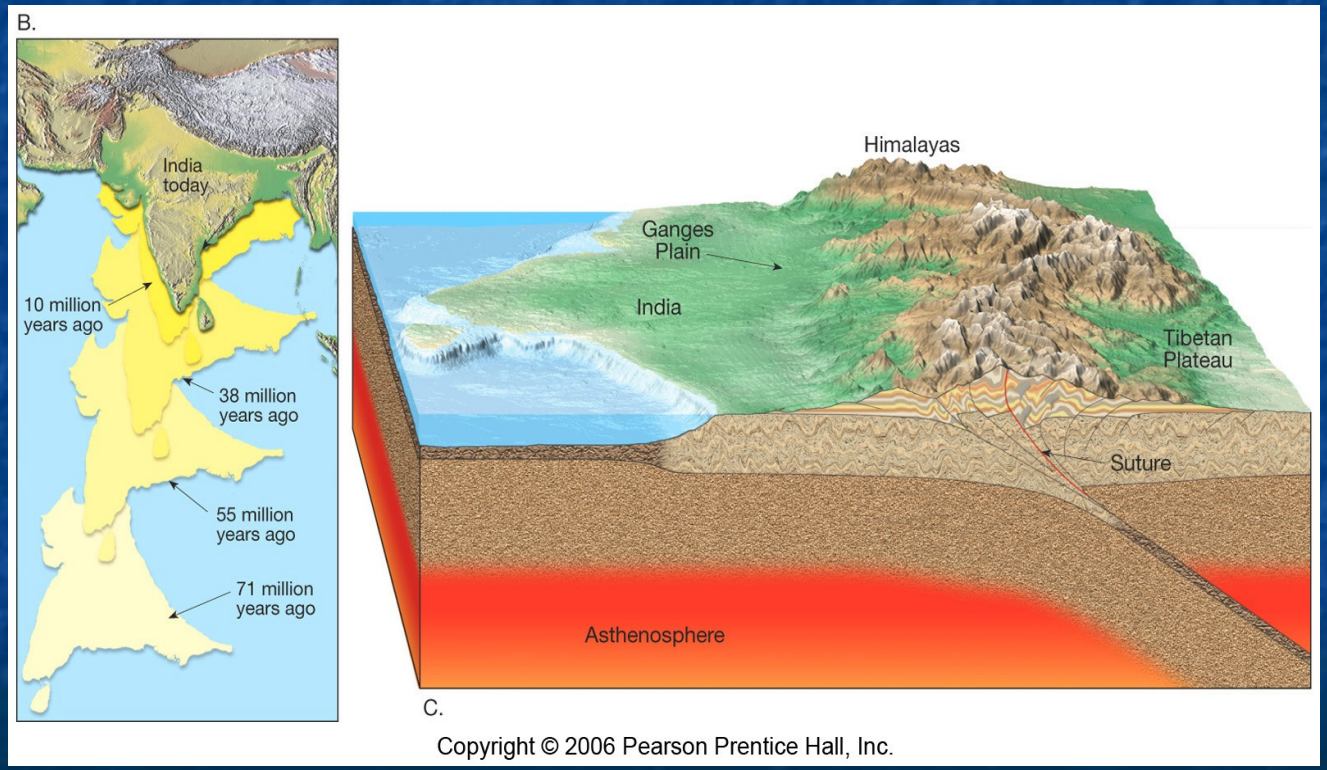


Figure 8.14 C

The collision of India and Asia produced the Himalayas (before)



The collision of India and Asia produced the Himalayas (after)

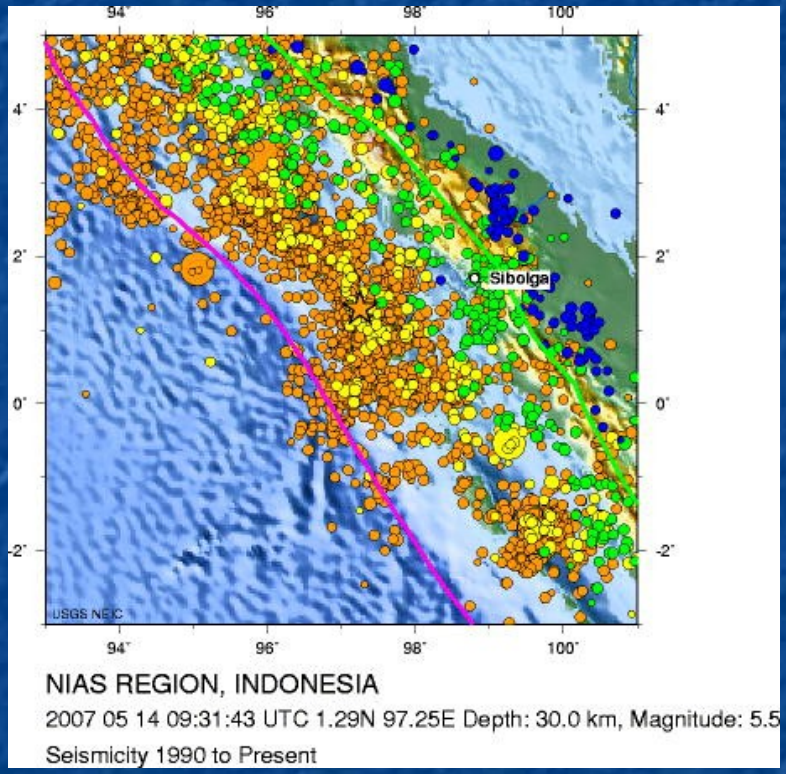


*Types of Plate Boundaries**

Transform fault boundaries

- Plates slide past one another
  - No new crust is created or destroyed
- Transform faults
  - Most join two segments of a mid-ocean ridge
  - Aid the movement of oceanic crustal material

Earthquakes and Plates



- Earthquakes show movement of the plate at it's boundaries.
- The depth of the quakes show how deep the plate is subducting under the other.
- Most plates drive between 20-75 degrees.