Chapter 12.1 Evidence for Continental Drift

Continental Drift Theory – continents have not always been in their present locations but have drifted there over millions of years (Wegener)

1. Jigsaw Puzzle Fit

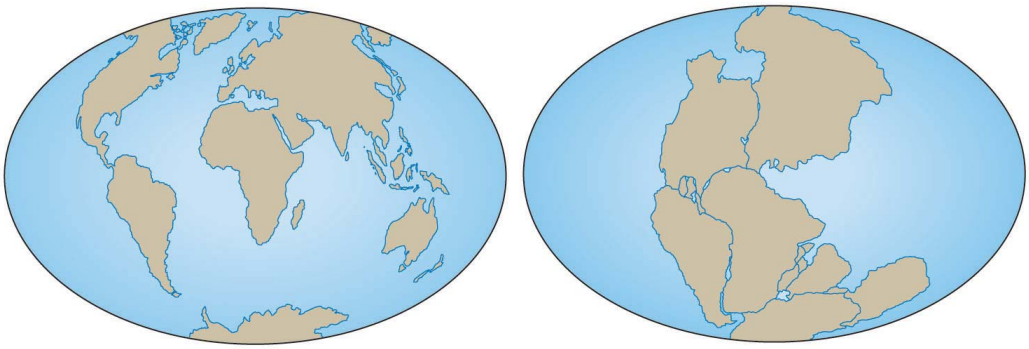


Figure 12.2 Wegener noted similar features in distant continents. These features matched across continents that appeared to fit together.

- Suggested at one time continents were joined as a supercontinent (Pangea)

2. Matching geological structures and rocks
   - Mountain ranges end on one continent at the coastline and seem to begin on another across the ocean
   - Similarities between rock structures and ages of rocks across oceans

3. Matching Fossils
   - Similar fossils occur in various locations around the world
     - *Mesosaurus* – only found in SE South America and SW Africa

- *Cynognathus and Lystrosaurus* – found across southern continents.
- *Glossopteris* – tropical fern found on South America, India, Africa, Australia and Antarctica

Figure 12.4 Alfred Wegener used the locations of similar fossils and rocks on separate continents to formulate his hypothesis that all continents were once joined. His hypothesis makes sense in light of the theory of evolution, which explains that members of the same species share the same ancestors.

4. Climatic Evidence for Continental Drift
   - Evidence of glaciers in now tropical areas (Paleoglaciation)
   - Coal deposits in Antarctica

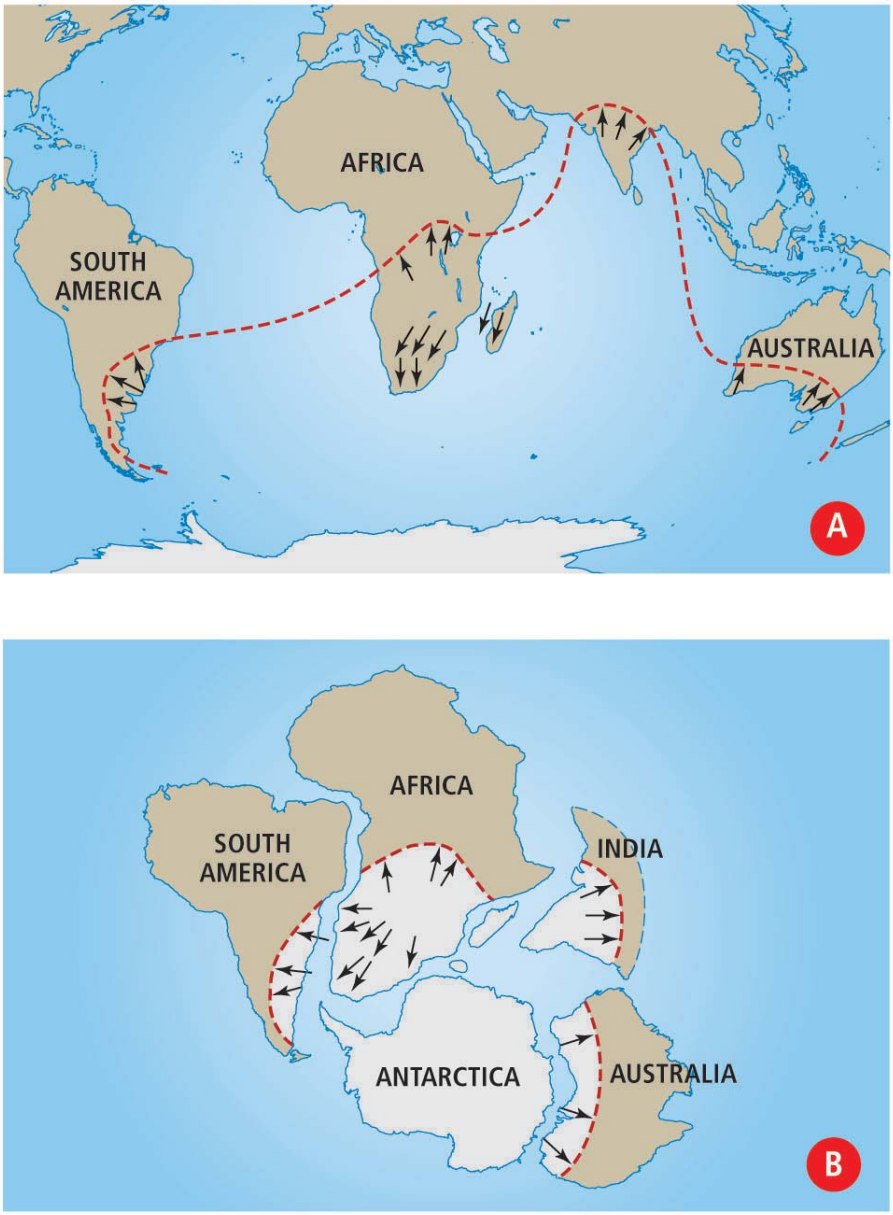


Figure 12.5 There seems to be no pattern to paleoglaciation found around the world (A). A pattern emerges when the continents are fitted together to form Pangaea (B).

How Can Continents Move?

- Discoveries made since Wegener:
  1. Tectonic Plates (moveable slabs of rock) make up the Earth's surface
     a. Earthquakes and volcanoes occur at boundaries between tectonic plates

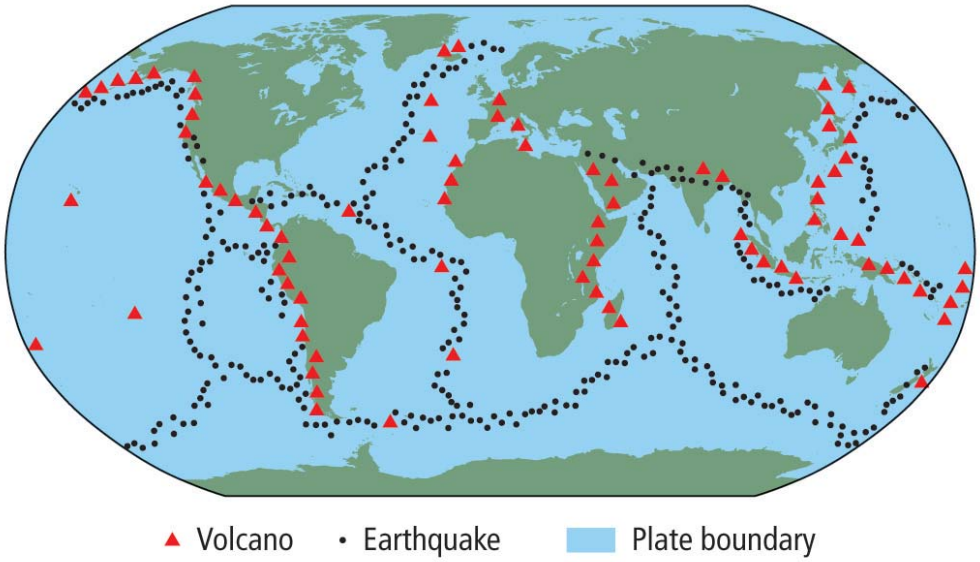


Figure 12.6 Earthquakes and volcanoes occur most often at the boundaries between tectonic plates.

  2. Mid-Atlantic Ridge – mountain range that runs along the middle of the Atlantic Ocean
     a. Youngest rock found closest to the ridge
     b. Rock becomes thicker farther from the ridge

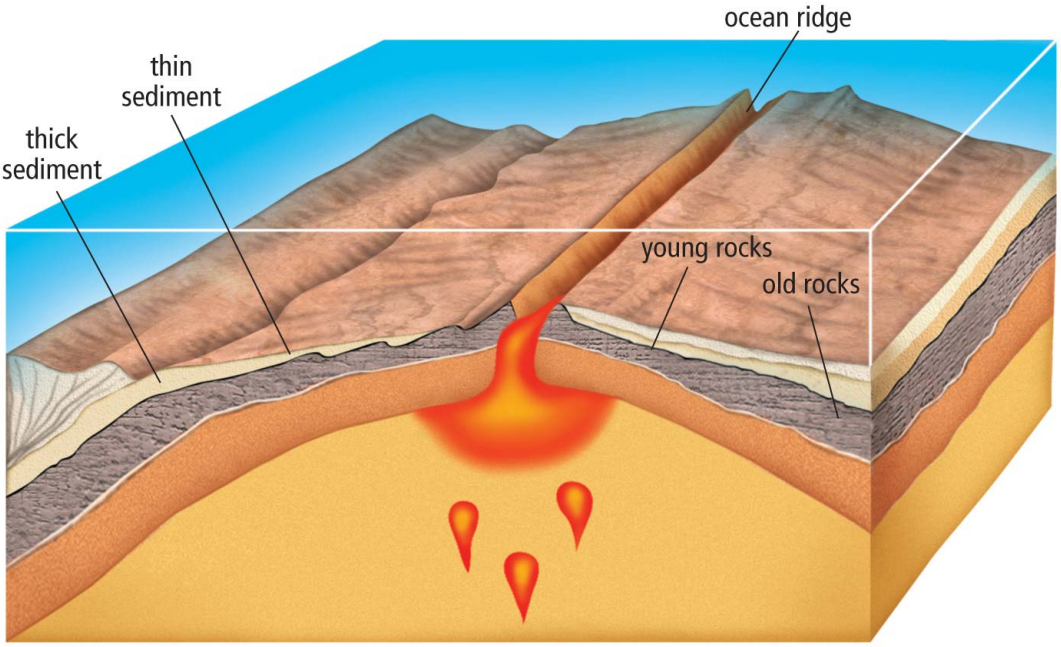
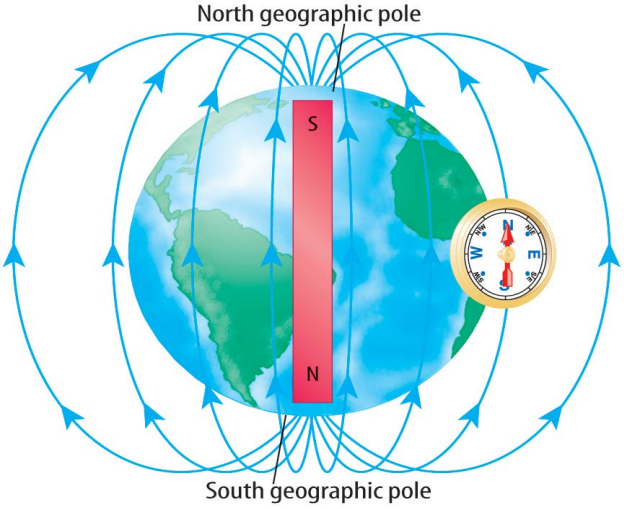


Figure 12.8 With increasing distance from the centre of a ridge, rocks on the sea floor are older and the ocean sediment is thicker.

3. Paleomagnetism - Study of magnetic properties of ancient rocks
    a. Earth has a magnetic field which can completely reverse over thousands of years (magnetic reversal) – magnetic north and south switch



b. Magnetic Striping repeated on both sides of the Mid-Atlantic Ridge

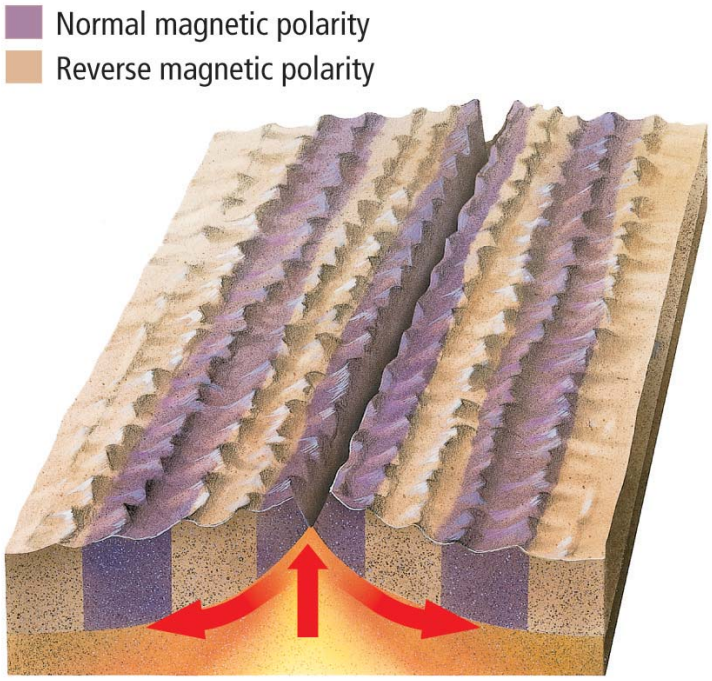


Figure 12.10 Over time, the orientation of Earth's magnetic field has reversed many times. Periods of normal polarity and reverse polarity can be detected by measuring the magnetic fields of rocks on the sea floor.

4. Sea floor spreading – magma rises and breaks through Earth's surface at a spreading ridge forming new sea floor. Process continues pushing older rock aside

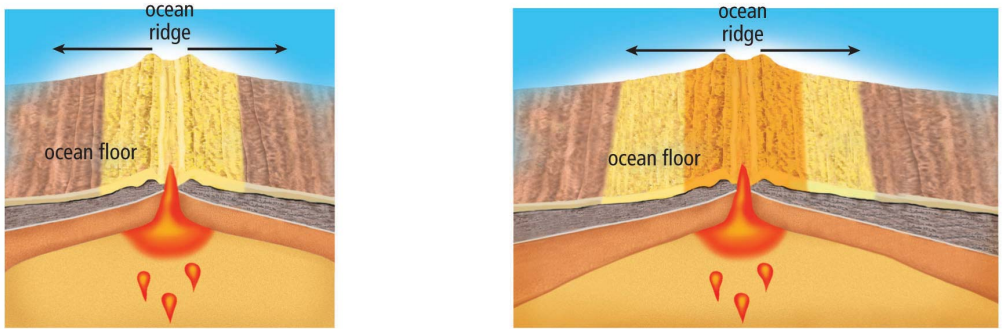


Figure 12.11 Convection currents under Earth's surface may cause magma to rise, which causes the sea floor to spread apart.

- Hot spots – an area where molten rock rises to Earth's surface
    - When a tectonic plate passes over a hot spot a chain of islands can occur (ex. Hawaiian Islands)