10.2 Plate Tectonics

10.2 The Theory of Plate Tectonics

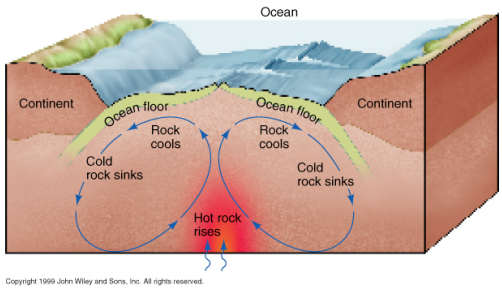
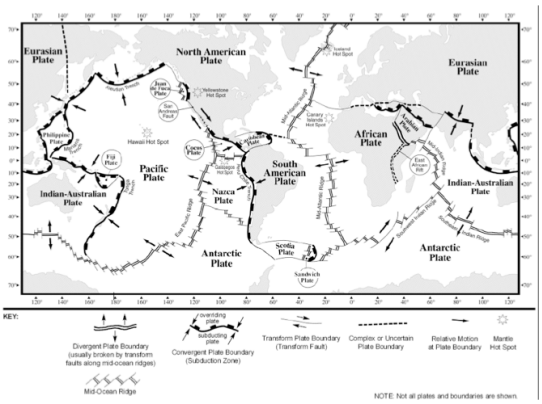


Plate Tectonics

- study of the formation and movement of plates
- lithosphere
  - solid layer composed of crust and upper portion of mantle
  - rigid, but broken into moveable pieces (called plates)
  - moves a few cm a year
  - largest plate is the Pacific plate
  - plates mostly beneath of the ocean
- asthenosphere
  - solid plastic layer beneath the lithosphere
  - hotter and weaker than lithosphere
  - partially melted rock allows for motion of the lithosphere

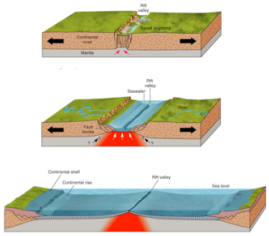
Plate Boundaries

- 15 major plate boundaries
- not always easy to identify because they do not always follow continent or ocean boundaries
- plates include both oceanic and continental crust
- 3 types
  - divergent, convergent, transform



Divergent Boundaries

- plates move away from each other
- magma rises from asthenosphere to fill crack between plates
- magma cools and hardens producing new rock
- found mostly on ocean floor (sea-floor spreading)
- ex. Mid-Atlantic ridge



Convergent Boundaries

- two plates moving toward each other, or collide
- oceanic-continental
  - continental plate floats (lighter, less dense) while the oceanic plate sinks, or subducts
  - subduction zone - region where one plate moves under another
  - deep-ocean trenches form
  - magma rises and forms volcanic mountains
  - ex. Andes in S. America, Cascades in Washington/ Oregon (Mt. St. Helens), Sierra Nevadas in California

oceanic-continental

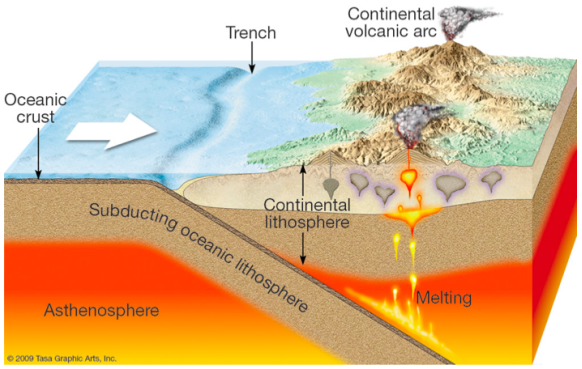
- continental-continental
  - neither plate subducts
  - colliding edges crumple and thicken causing uplift that forms mountain ranges
  - ex. Alo, Appalachians, and Himalayas

continental-continental

- oceanic-oceanic
  - one plate subducts under the other forming a deep-ocean trench
  - forms an island arc (chain of volcanoes)
  - ex. Alaskan peninsula, Philippines, Japan

oceanic-oceanic

10.2 Plate Tectonics



TRANSFORM BOUNDARIES

- plates slide past each other
- no destruction or construction of lithosphere
- fracture zone - linear breaks in ocean crust
- fault - break/crack in Earth's crust along which movement has occurred
- ex. San Andreas fault - Pacific plate is moving NW past the N. American plate

CAUSES OF PLATE MOTION

- not fully understood what drive plate tectonics
- convection - movement of heated materials due to differences in density that are caused by differences in temperature
  - heated material rises and expand, pushing old material aside and driving plates apart
  - as materials cool, they contract and sink, pulling plates together
- ridge push - asthenosphere moves away from sinking material and pushes on the bottom of the plate
- slab pull - sinking plates pull the rest of the plate along behind it

REVIEW QUESTIONS

1. What is plate tectonics?
2. How many plate boundaries are there?
3. What are the 3 major plate boundary types?
4. What causes the plates to move apart at a divergent boundary?
5. What forms at continental-oceanic and oceanic-oceanic boundaries?
6. What forms at continental-continental boundaries?
7. What is a fault? At what type of plate boundary would you find a fault?
8. What are 3 possible causes of plate motion?