Physical Geography I of the United States and Canada

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Physical Geography

The physical landscape (natural environment) sets the stage for human use (cultural landscape).

We need to be aware of:

- **geologic processes** (tectonic/gradational)
- **atmospheric processes** (weather/climate)
- **water resources** (surface/underground)
- **soils** (formation/fertility)
- **natural vegetation** (a result of all of above)

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Physical Geography

The region's physical characteristics affect:

- The continent's political boundaries
- Population growth and movements
- Technological innovation
- Urban growth and sprawl
- Resource use and misuse
- Food production
- Industrialization and de-industrialization

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Physical Geography

We need to be aware of the role of:

- **Plate tectonics and continental drift** as well as the various processes that shape the natural landscape.
- **The great range of latitude** – the Tropics to the Arctic - and its influence on climate formation.
- **Climate change**, especially past continental glaciation associated with the Ice Ages (global cooling) and global warming (present) for the future conditions.
- **Water** as the chief sculptor of landform features, and for the location, movement and well-being of people.
- **Human impact** on the natural landscape - people and their works.

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Definitions

Geography: study of people living on the surface of the earth.

Geology: the scientific study of the earth and its processes.

Geomorphology: the study of landforms.

Topography: the study of surface features of the landforms.

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Current Position of the Continents

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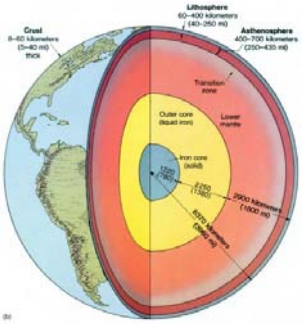
Cross-section of the Earth



Earth's interior is extremely hot and exerts great pressure on the lithosphere, causing the crust (which covers it) **to crack and break into large units called *plates*.**

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Plate Tectonics Theory

- **Dates from the 1960s**: postulated that the Earth's lithosphere (crust +upper mantle) is broken into sections now called ***plates***, which move (not drift) relative to each other by forces in the Earth's interior.
- The lithosphere is rigid.
- It is composed of an **oceanic crust** of denser rocks and a **continental crust** of less dense rocks.
- The rigidity of the lithosphere causes it to crack under pressure from internal forces.

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Plate Tectonics Theory

- The present day position of the continents is a result of a single huge landmass (**Pangaea**) being separated along the cracks **(plate boundaries)** and each segment being slowly repositioned **(shifted).**
- Movement of the plates continues to occur.

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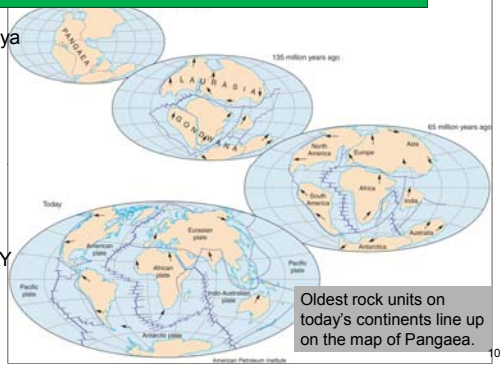
Continental Drift

225 mya



TODAY

Oldest rock units on today's continents line up on the map of Pangaea.

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Plate Tectonics Theory

- This movement creates gaps in the lithosphere allowing new crust to form: **spreading zones.**
- This movement also forces plates against each other where they collide, override each other and deform.
- Eventually, old crust returns to the earth's interior: **subduction zones.**
- This movement creates the phenomena that gives give us our present-day surface features.
- **This movement results in earthquakes and volcanic eruptions.**

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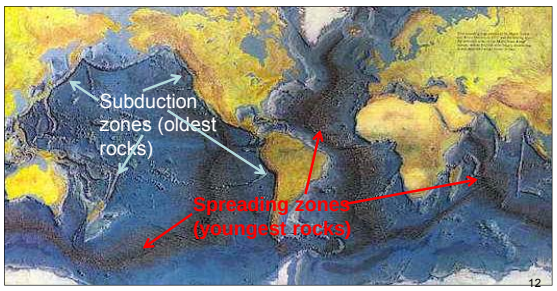
Earth's Surface without Water
showing features associated with **plate boundaries**



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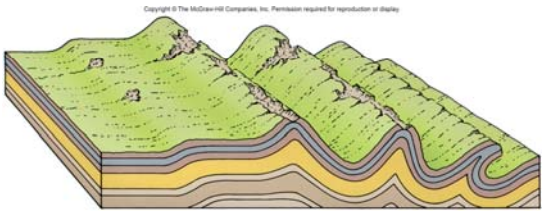
Folding

Folding is the crumpling of the surface upon impact (collision; mountain building).



Forces at work: Compression, bending, breaking

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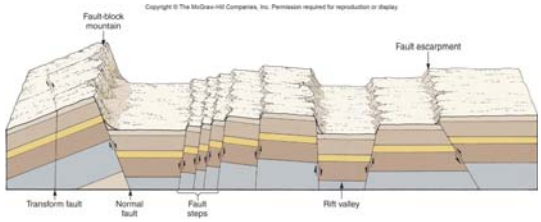
Faulting

Release of stress (pressure) is faulting.
Earthquakes are a result of the process.



Forces at work: movement, tension, shearing, breaking

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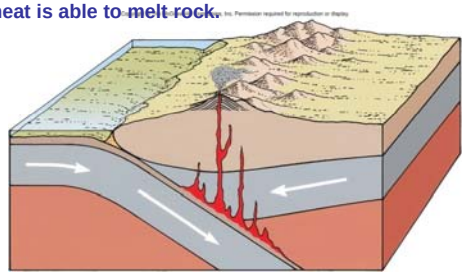
Volcanism

Volcanism is when the combination of great pressure and heat is able to melt rock.



Forces at work: melting, movement of molten material (oozing), build-up of gasses under pressure (explosion).

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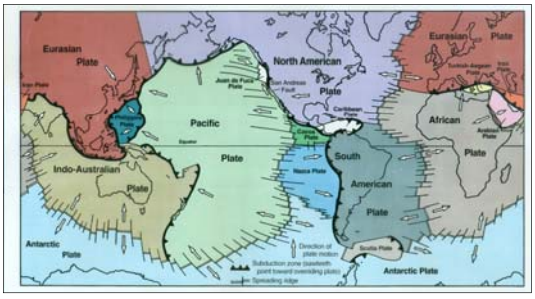
Location of the Earth's Plates and their directions of movement



The San Andreas fault is the most famous fault line of North America.

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Plate Tectonics and North America

- **The North American plate is moving toward the west and meeting resistance from the Pacific, Juan de Fuca and Cocos plates.**
- **Western North America's surface features are younger and steeper (angular) than the Eastern North America.**
- **Eastern North America's features are older and more worn down (rounded).**
- Earthquakes are more common in the west.
- Today, volcanic activity is exclusively a western phenomena.

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Plate Tectonics and North America

- **The western coast has little or no coastal plain while the eastern coast has a wide extensive coastal plain.**
- **The western coast exhibits relatively few coastal marshes, swamps and barrier islands, while the eastern coast has a good supply of each.**
- **The western coast has fewer inlets and estuaries** (important as safe, natural anchorages) **than the eastern coast.**

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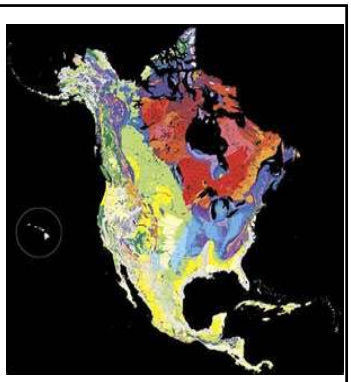
Geologic Map of North America

The geology of North America is varied and very complex.

The continent's **paleogeography** has changed many times.

This can be seen in its rock record.



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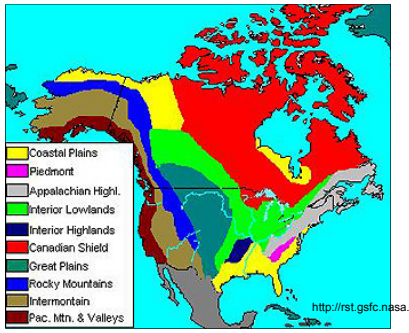
Physiographic Regions of North America



http://rst.gsfc.nasa.gov/Front/tofc.html

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Physiographic Regions

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Physiographic Regions of the Conterminous U.S. (lower 48 states)

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Physiographic Regions of Canada

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GEOLOGIC PROCESSES

TECTONIC (building)

1. Folding
2. Faulting
3. Volcanism

NATURAL PROCESSES

1. Mass movements (gravity)
2. Earthquakes (tension release)
3. Volcanism (heat, pressure)
4. Subsidence (sinking)

GRADATIONAL

1. Mechanical and chemical weathering (in place)
2. Mass wasting (by gravity)
3. Agents of Erosion
   (erode → transport → deposit)
   (take → move → place)
   - Running water
   - Moving ice
   - Wind
   - Wave action
   - Longshore currents

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Topographical Units

All the geological processes, combined with various atmospheric processes, give us landforms within physiographic regions:

1. Mountains
2. Plains
3. Hills
4. Plateaus
5. Coastlines

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Rocky Mts., Banff NP, Alberta

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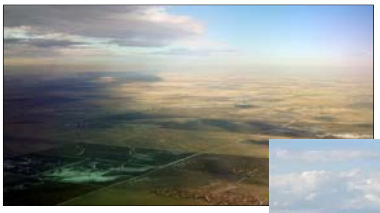
Great Plains, North Dakota



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Hilly Areas

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Colorado Plateau
Grand Canyon NP, Arizona

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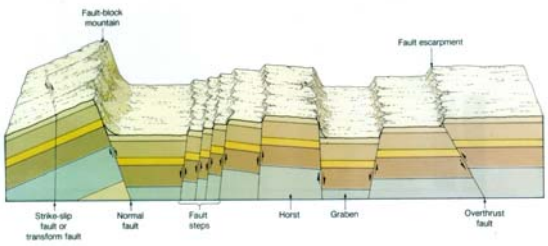
Fault-block Mountains and Associated Features



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Basin and Range, Nevada

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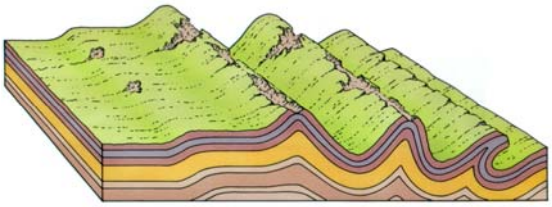
Folded Mountains



In folding, lateral tectonic forces cause the outer layers of the lithosphere to compress and form a wave-like surface ("folded mountains").

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Rounded peaks of the Southern Appalachian Mts., NC

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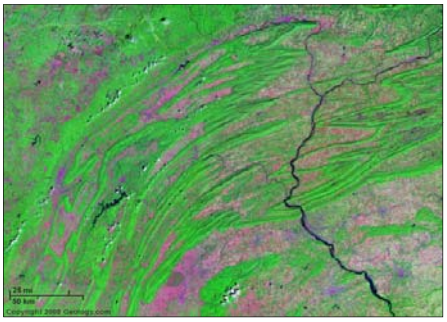
Folded Appalachians
in central Pennsylvania



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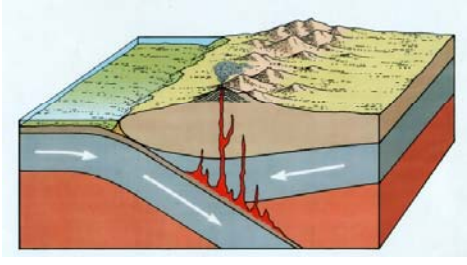
Volcanism and Subduction Zones



Subduction is a tectonic process in which one plate is overridden by another.

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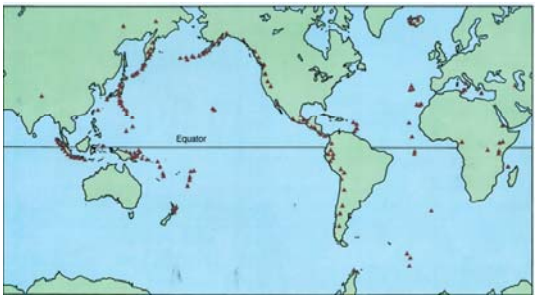
Locations of historically recent Volcanic Activity



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Pacific Northwest Volcanic Zone

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Mt. Saint Helens, WA
(eruption of 1980)

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West Coast Volcanic Zone


Mt. Rainier, WA


Mt. Shasta, CA


Crater Lake, OR

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Hawaii Volcanoes

The volcanic activity of Hawaii is related to a "hot spot" not a plate boundary.


Kilauea (active)


Diamond Head (extinct)

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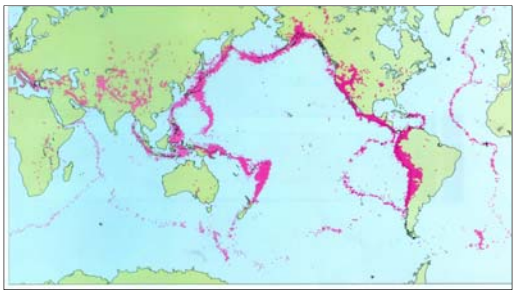
Geography of Earthquakes



Purple dots shows epicenters of major quakes. (Note the relationship to plate boundaries.)

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Rocky Coast
Maine

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Sandy Coast
Northeastern U.S.

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Coastal Plain and Barrier Islands
North Carolina

Coastal Plain
South Carolina

Coastal Plain of Texas

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Central California Coast

<<Rugged, mountain-fringed coastal area of central California at Big Sur south of Monterrey.

^^Entrance to San Francisco Bay

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Pacific Northwest Coastline

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Ports of California

Port of Los Angeles / Long Beach (man-made)

Ports within San Francisco Bay (natural)

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Coast of Alaska

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