

Deformation

- I. Deformation is a general term that refers to all changes in the original form and/or size of a rock body
 - A. Most crustal deformation occurs along plate margins
 - B. Deformation style result of strength of rock
 1. brittle, resulting in broken rock,
 2. or ductile, resulting in stretching, thickening, or folding
 - C. Factors that influence the strength of a rock
 1. Temperature
 2. confining pressure
 3. Rock type
 4. Time
- II. Folds—ductile deformation
 - A. Rocks bent into a series of waves
 - B. Most folds result from compressional forces which shorten and thicken the crust
 - C. Types of folds
 1. Anticlines and synclines
 - a. Anticline –arched rock layers, curved up in center
 - b. Syncline – bowed rock layers, curved down in center
 - c. Anticlines and synclines can be
 - 1) Symmetrical - limbs are mirror images
 - 2) Asymmetrical - limbs are not mirror images
 - 3) Overturned - one limb is tilted beyond the vertical
 - d. Monocline—single limb, often over a hidden fault
 - e. folds can be plunging, where axis dips into Earth
 2. domes and basins are regional, broad, gently dipping
 - a. Dome—Black Hills, South Dakota
 - 1) Circular, or slightly elongated
 - 2) Upwarped center
 - 3) Oldest rocks in core
 - b. Basin—Michigan Basin
 - 1) Circular, or slightly elongated
 - 2) Downwarped center
 - 3) Youngest rocks in core

III. Faults—brittle deformation

A. Faults are fractures (breaks) in rocks along which appreciable displacement has taken place

B. Types of faults

1. Dip-slip fault

a. Movement along the inclination (dip) of fault plane

b. Parts of a dip-slip fault

1) Hanging wall – the rock above the fault surface

2) Footwall – the rock below the fault surface

c. Types of dip-slip faults

1) Normal fault

a) Hanging wall block moves down

b) Associated with fault-block mountains

c) Prevalent at spreading centers

d) Caused by tensional forces

e) Basin and Range:

i. series of horsts and grabens

ii. offset characterized by scarp

2) Reverse and thrust faults

a) Hanging wall block moves up

b) Caused by strong compressional stresses

c) Reverse fault - dips greater than 45°

d) Thrust fault - dips less than 45°

2. Strike-slip faults

a. Dominant displacement is horizontal and parallel to the trend, or strike

b. Transform fault

1) Large strike-slip fault that cuts through the lithosphere

2) Often associated with plate boundaries

c. San Andreas fault in California is a strike-slip fault

IV. Joints

A. Fractures along which no appreciable displacement has occurred

B. Most are formed when rocks in the outer-most crust are deformed

C. Commonly occur in intersecting sets

D. Unique styles include

1. exfoliation joints in crystalline rock

2. columnar jointing in cooled lava flows or sills