

Earth's architecture: Structural geology

- Tectonic activity often deforms the rocks in the crust.
- That is how we get complex structures of mountains.



Deformation: Stress and strain

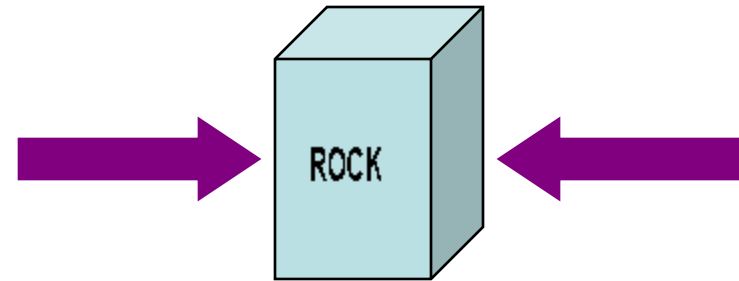
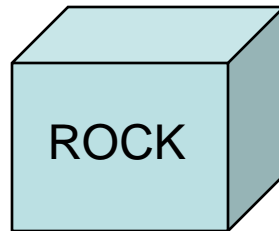
Some important terms:

Deformation: Any change in size, shape, orientation or position of a rock mass.

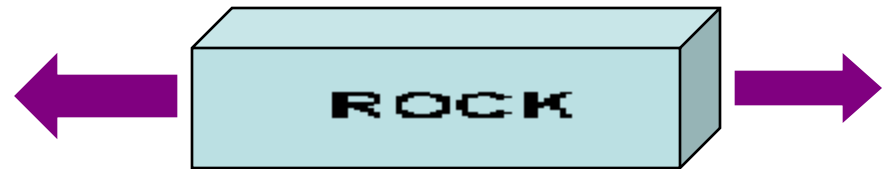
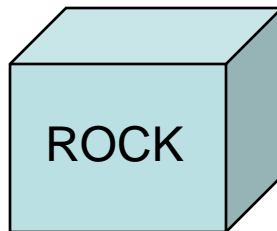
Stress: The amount of force applied to a given area.

Types of stresses:

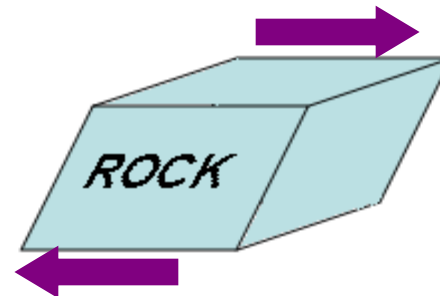
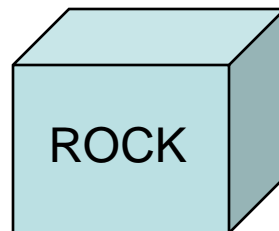
Compressional:



Tensional:



Shear:



Types of deformation

- Elastic deformation up to elastic limit
 - Springs back to original shape
- Brittle failure (it breaks)
 - Causes: 1. subjected to great stress that exceeds the yield point AKA elastic limit, OR
 - Subjected to sudden stress AKA “impact”
- Plastic deformation
 - Does not spring back ... keeps deformed shape
 - Demo Chewing gum
 - Cause can be high temperature – near melting or high pressure ... squeezed like a ball of clay

Factors affecting rock deformation

- Intensity of applied stress
- Heat –Temperature of the Rock
- Amount of Time the Stress is applied
- Rock Composition

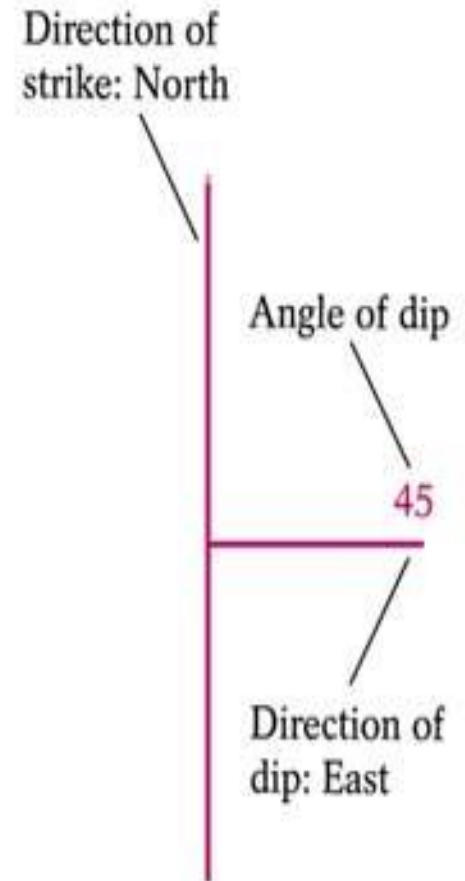
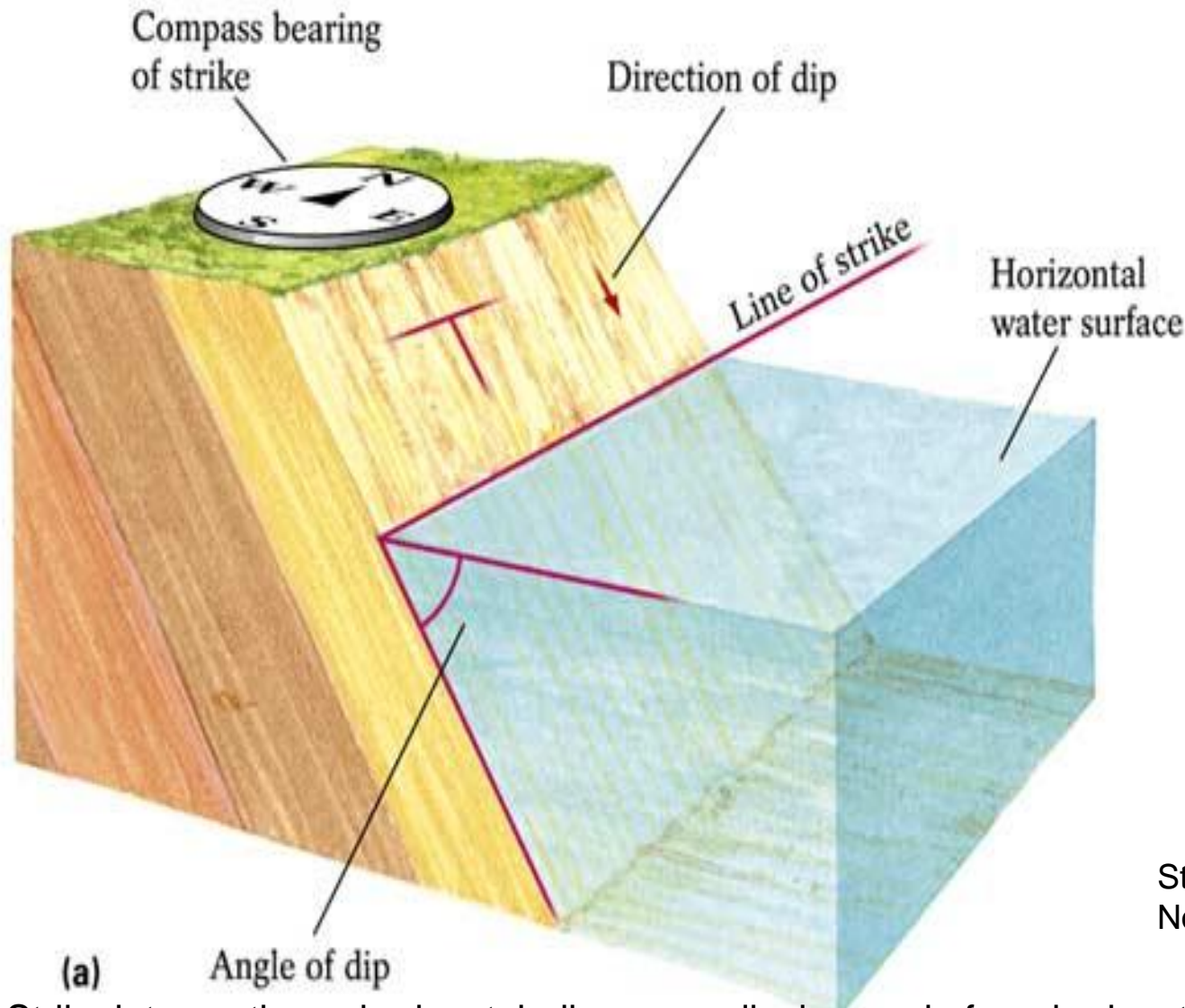
How does the rocks deform?

As stress is applied, the rocks could

-Break

-Flow / bend

Strike and Dip



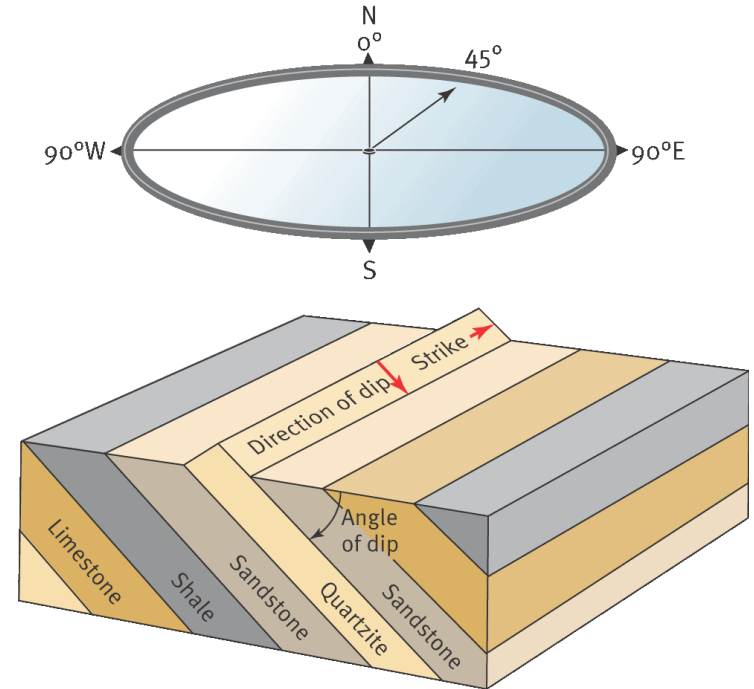
Strike is long line, dip is short line
Note the angle of dip given 45°

(b) Strike and dip symbol

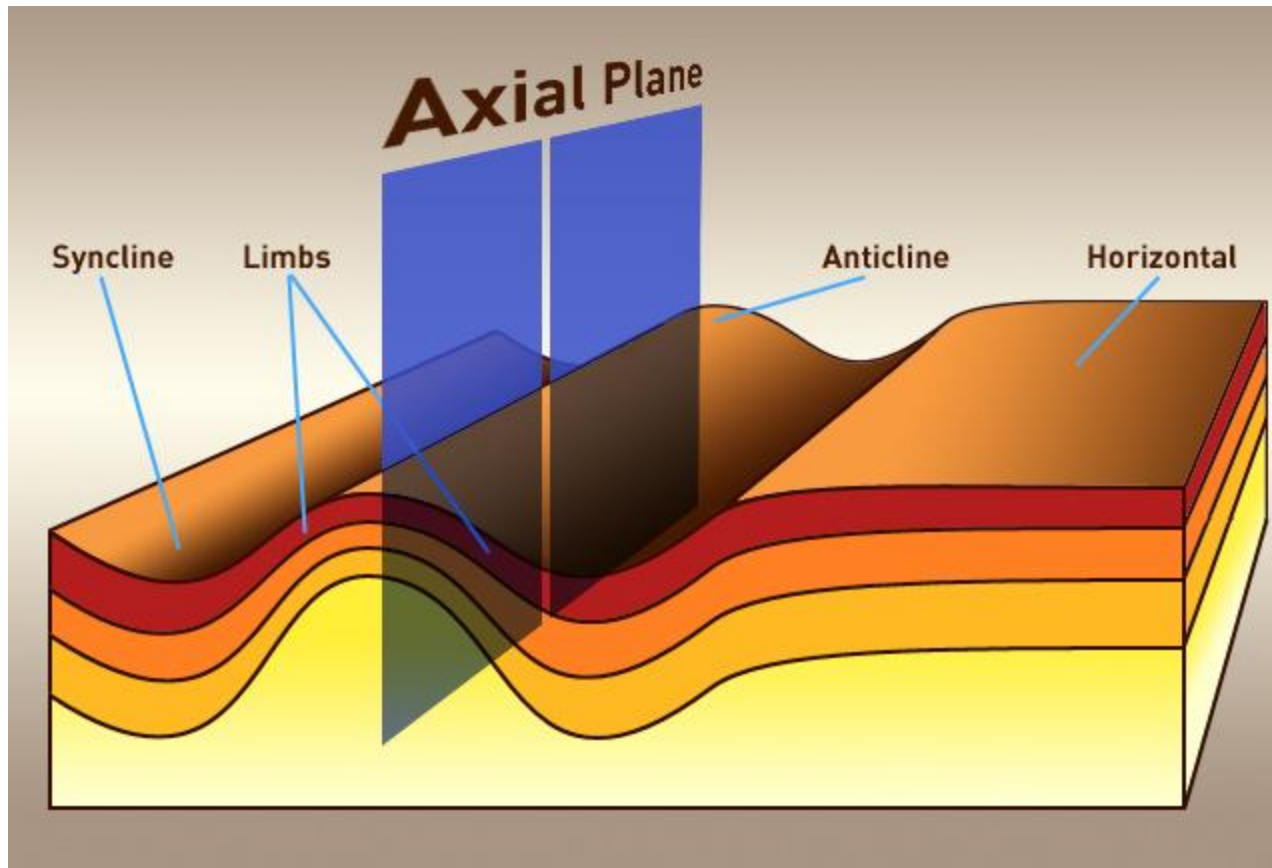
Strike intersection w horizontal, dip perpendicular, angle from horizontal down toward surface

Terminology of Structure

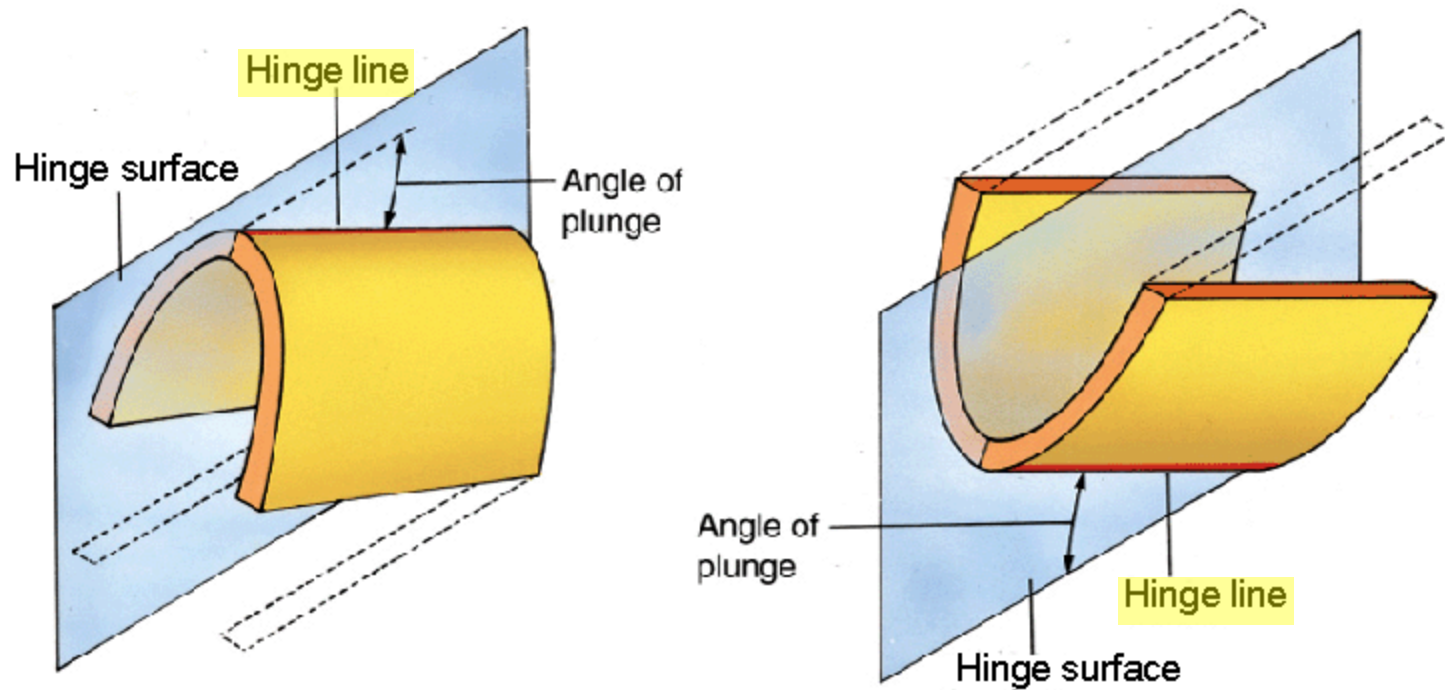
- **Strike**
 - Line representing the intersection of a planar feature with a horizontal plane
- **Dip**
 - Angle of a tilted bed relative to a horizontal plane



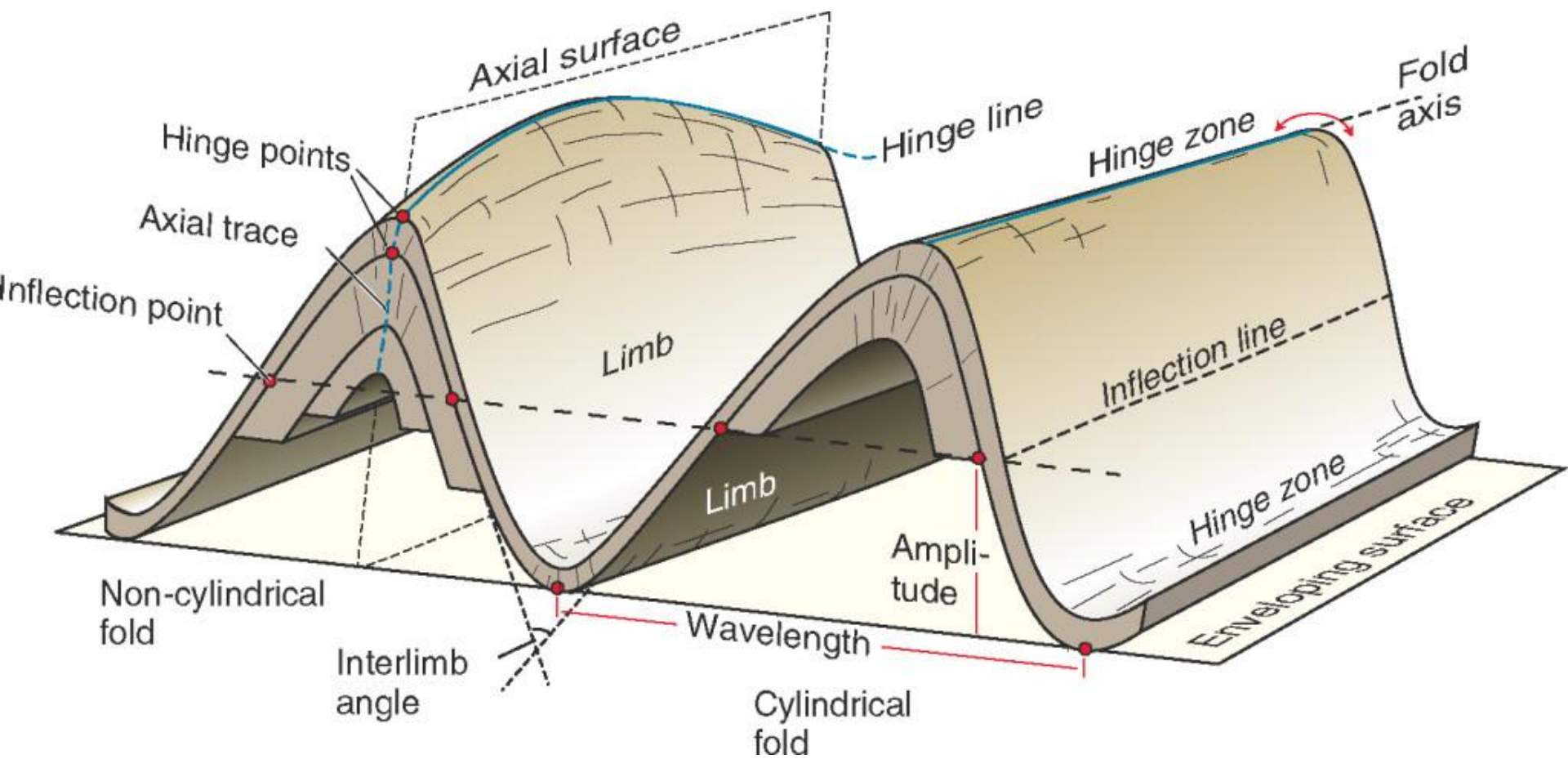
- The forces of plate movement can change a flat plain into anticlines, synclines, folded mountains, fault-block mountains, and plateau.



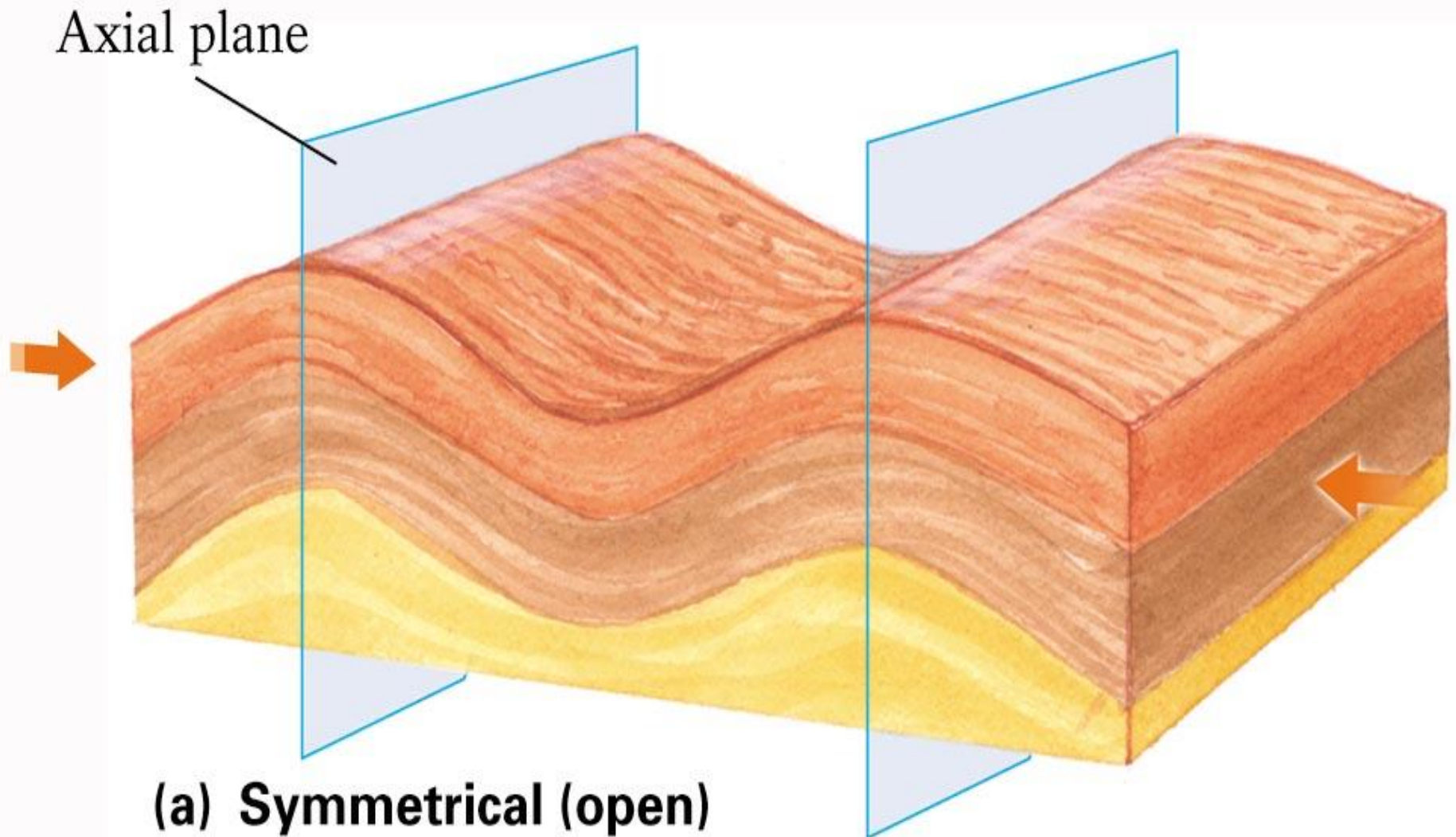
Fold Geometry



Hinge line: The locus of all points with maximum curvature (smallest radius of curvature)

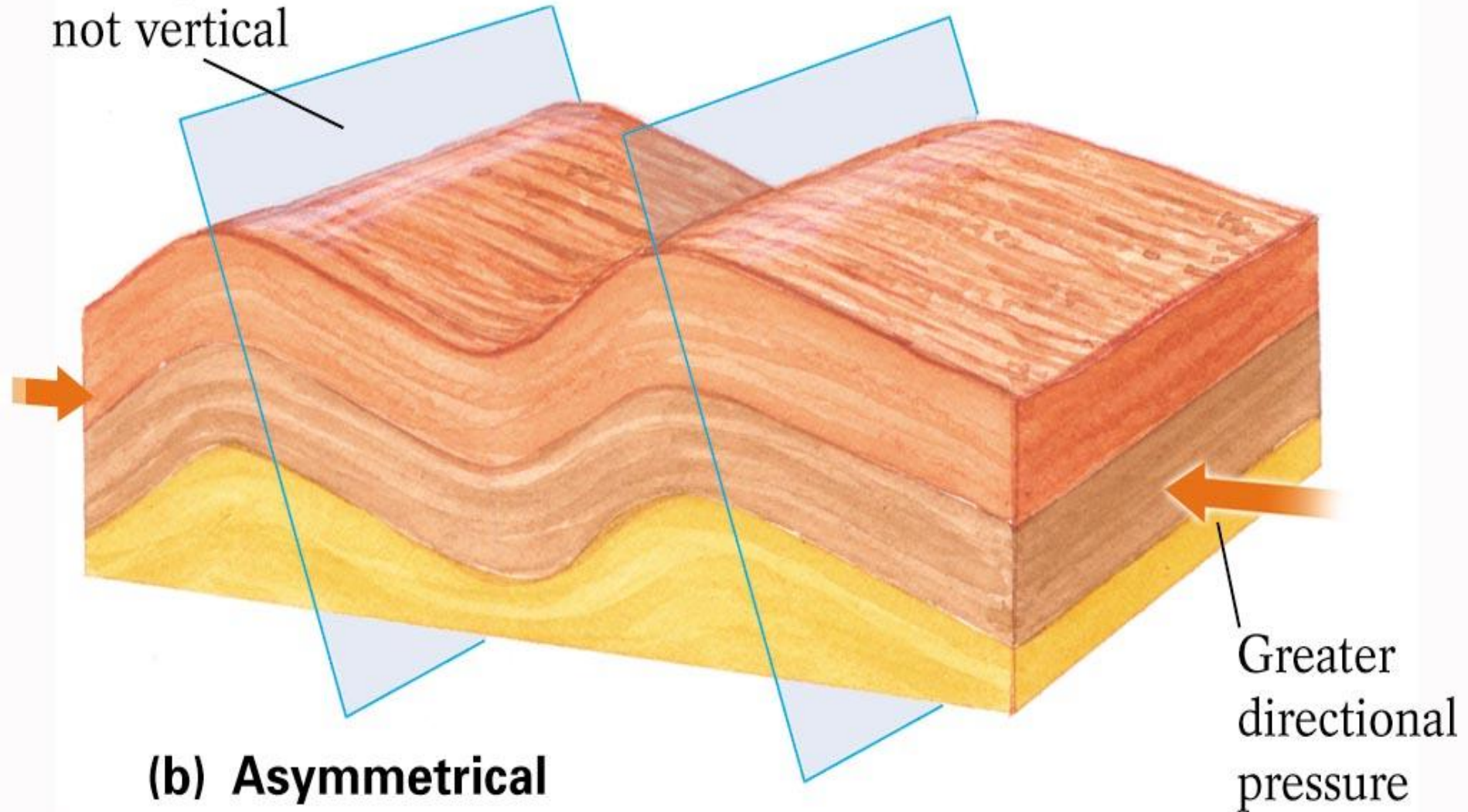


Various Folds



Various Folds (cont'd)

Axial plane is
not vertical



Faults

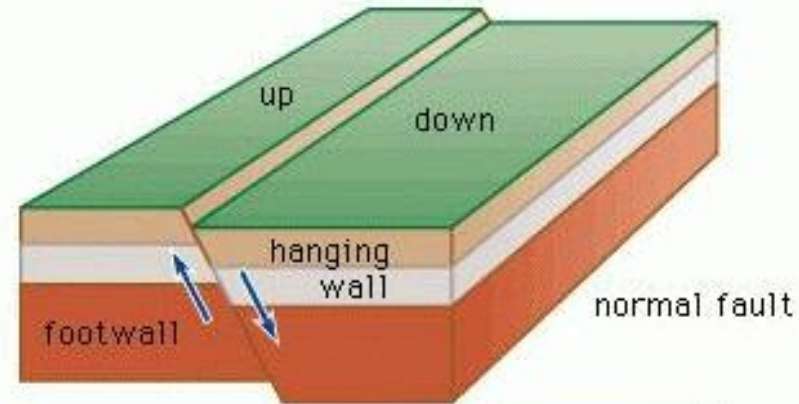
Fractures in the crust along which displacement has taken place.



Types of faults

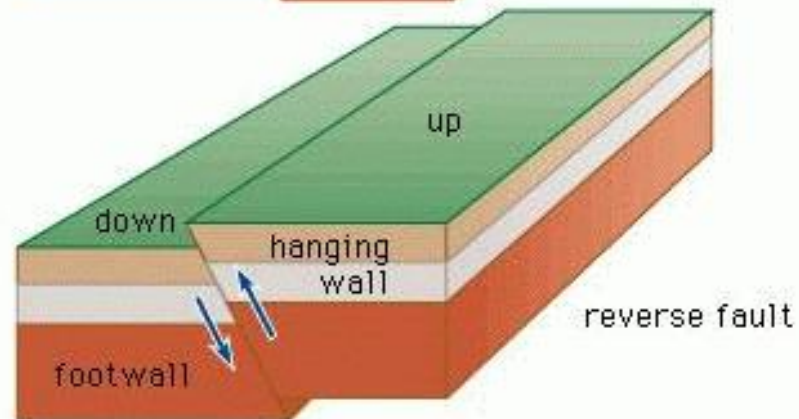
Normal fault:

- Hanging wall moves down relative to the footwall.
- Generated by extension.



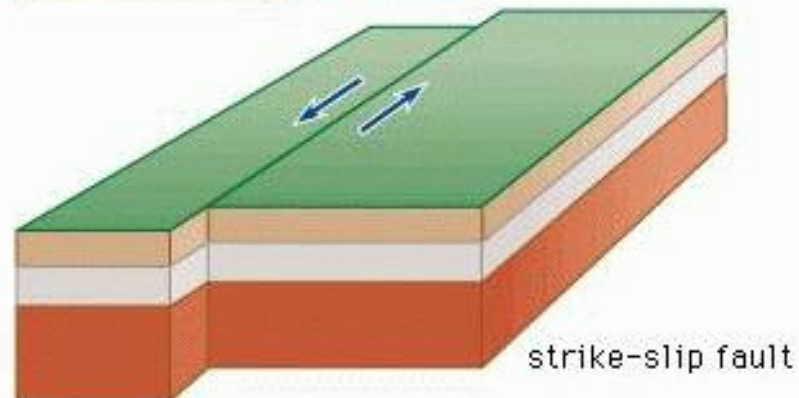
Reverse fault:

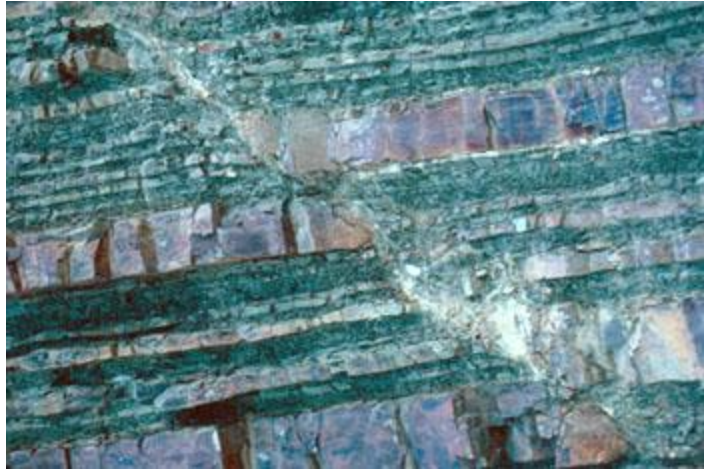
- Hanging wall moves up relative to the foot wall.
- Generated by compression.

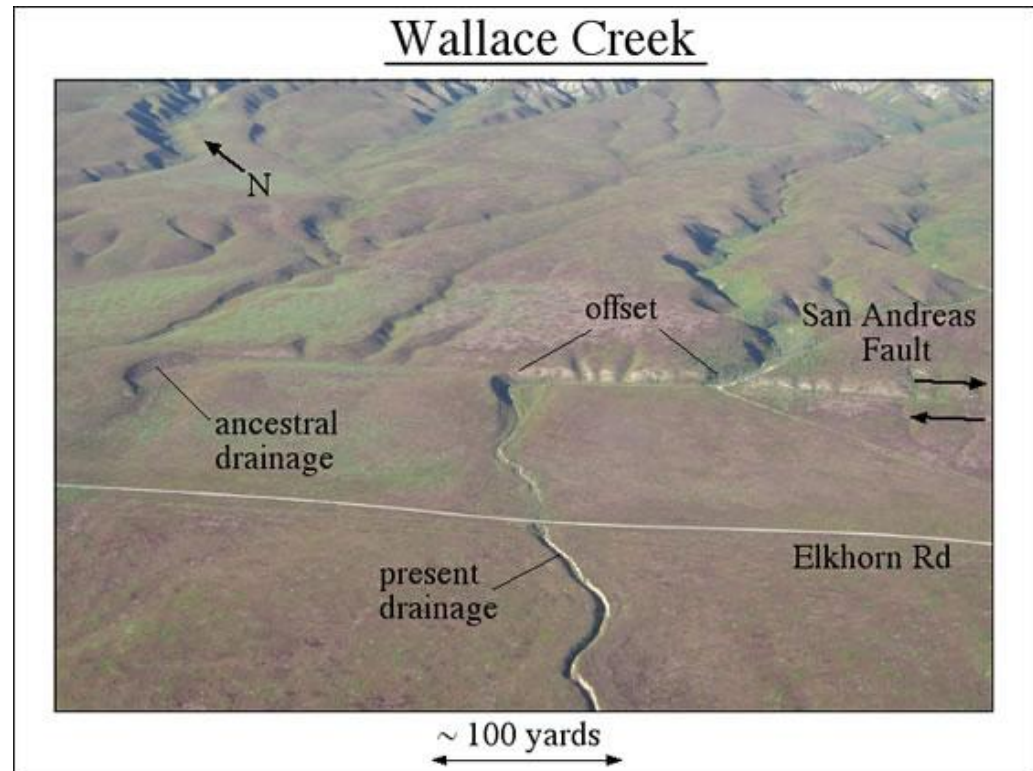
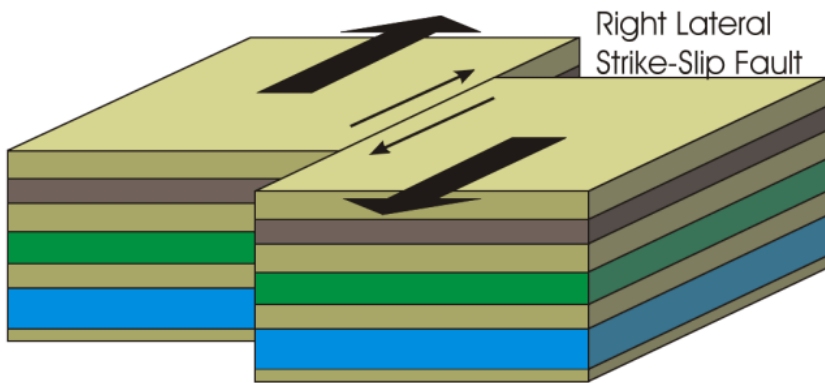


Strike-slip fault:

- Horizontal displacement.

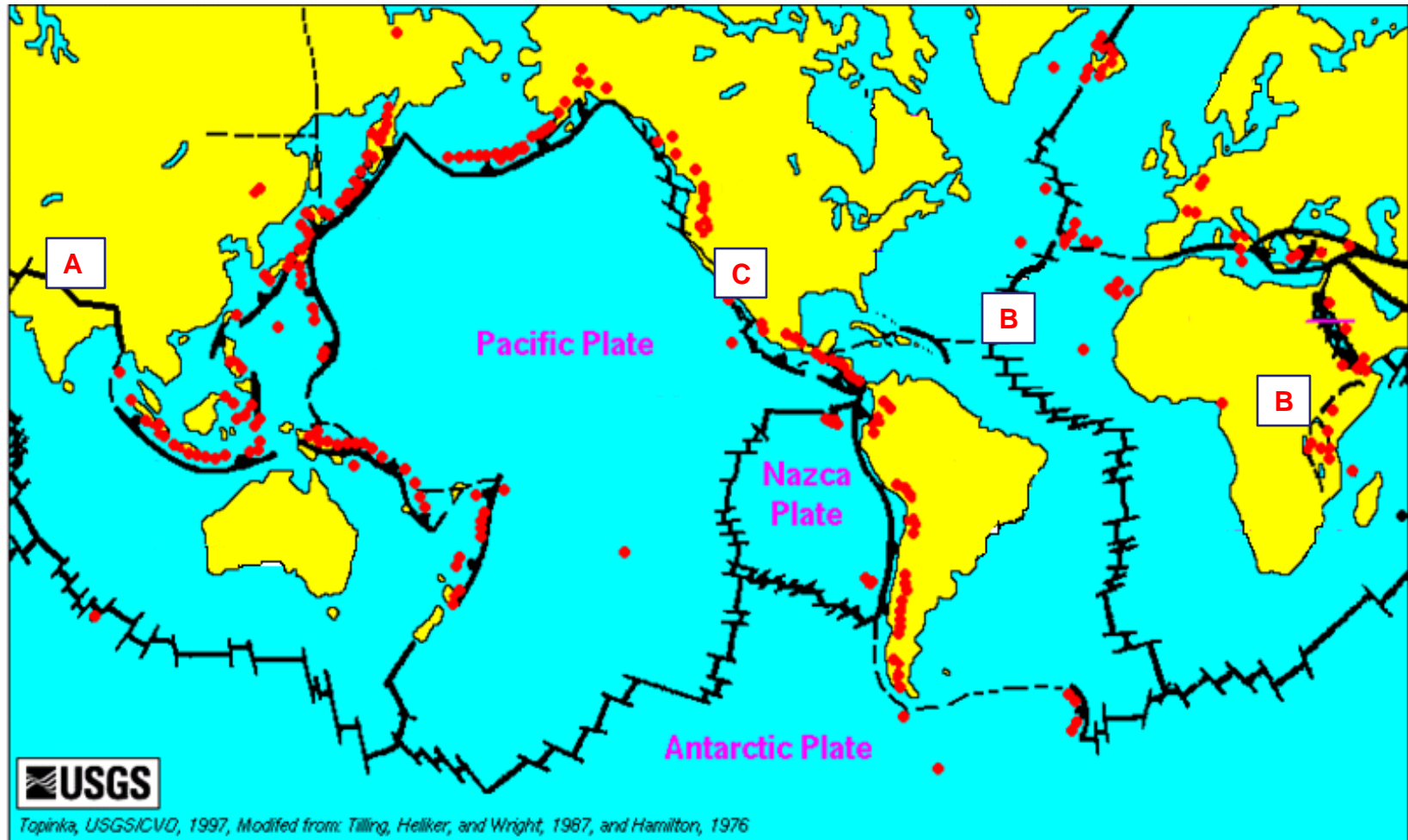






- San Andreas fault is a strike-slip fault with little up or down motion

Example



- A. Compression: Fold, Reverse fault
B. Extension: Normal fault
C. Shearing : Transform fault