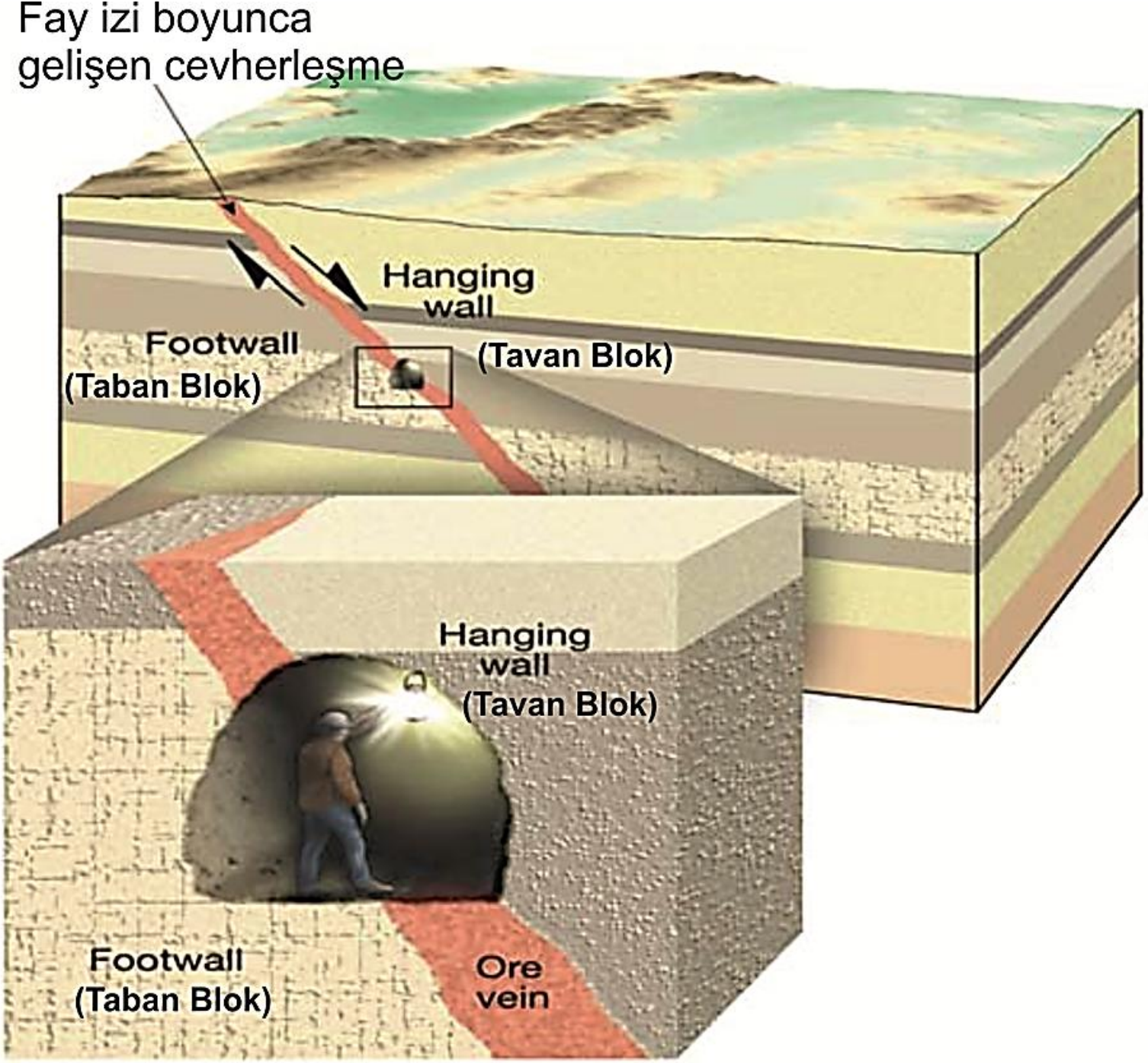

Fay izi boyunca
gelişen cevherleşme
Hanging
wall
(Tavan Blok)
Footwall
(Taban Blok)
Hanging
wall
(Tavan Blok)
Footwall
(Taban Blok)
Ore
vein

Criteria for the Recognition of Faults

Three basic criteria:

1. **Fault rocks**
2. **Effects on geological and stratigraphical units**
3. **Effects on topography (physiographic elements)**

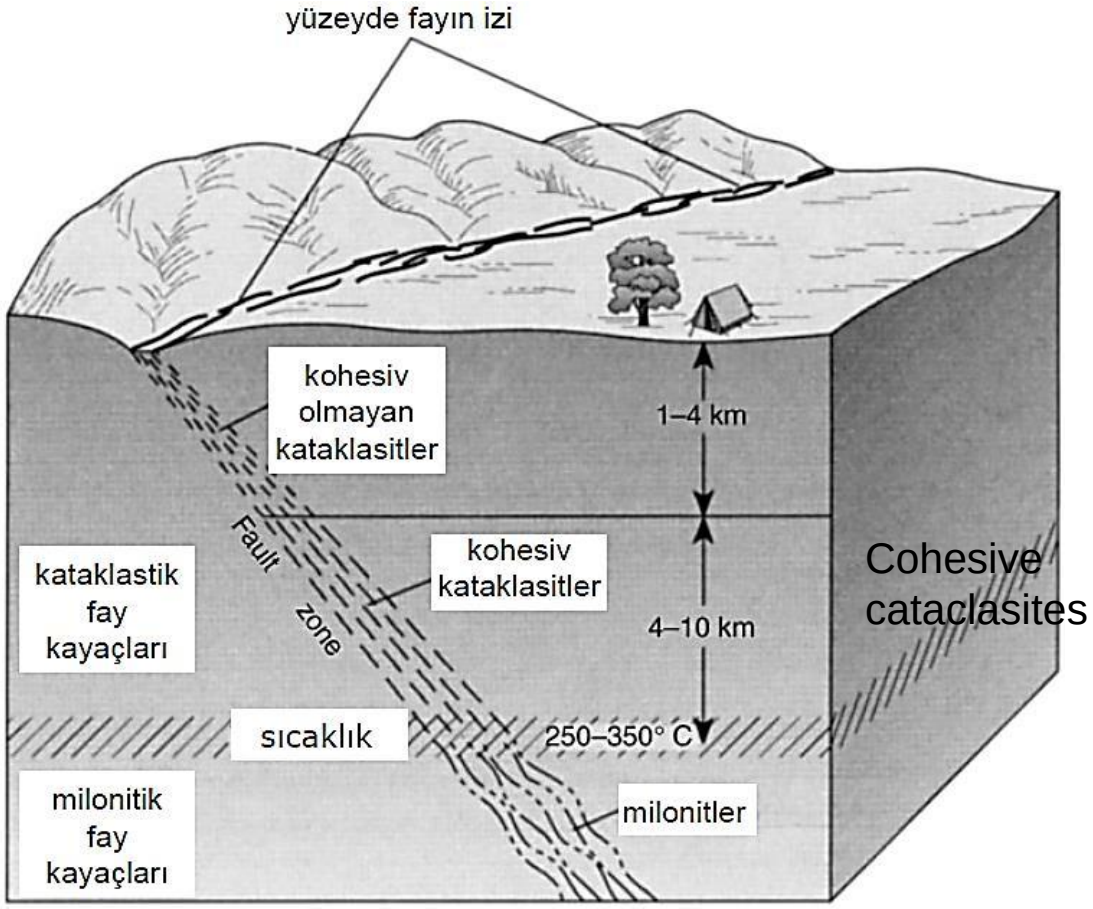
1. Fault rocks

Cataclastic Rocks, Fault Breccia, Mylonite

Non-cohesive cataclasites

Cataclastic fault rocks

Mylonitic fault rocks



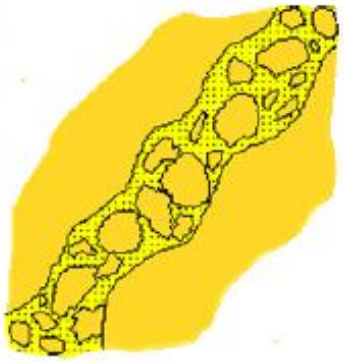
Cohesive cataclasites

A.

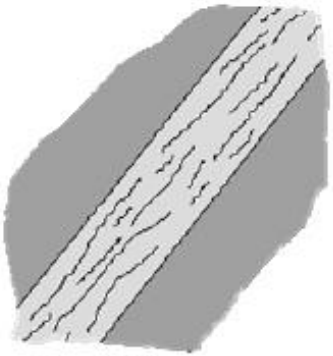
B.

Cataclastic rocks: **(A)** Megabreccia; **(B)** cataclasite

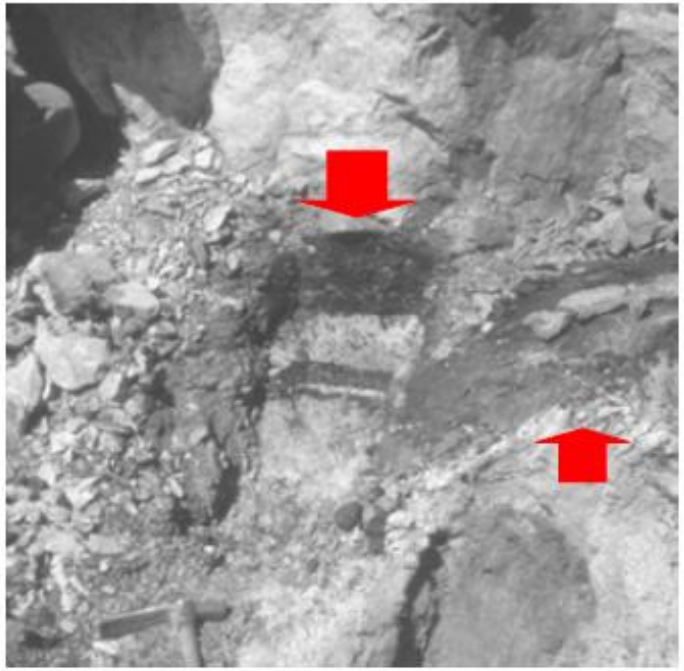
çimentolanmış fay breşi



breş

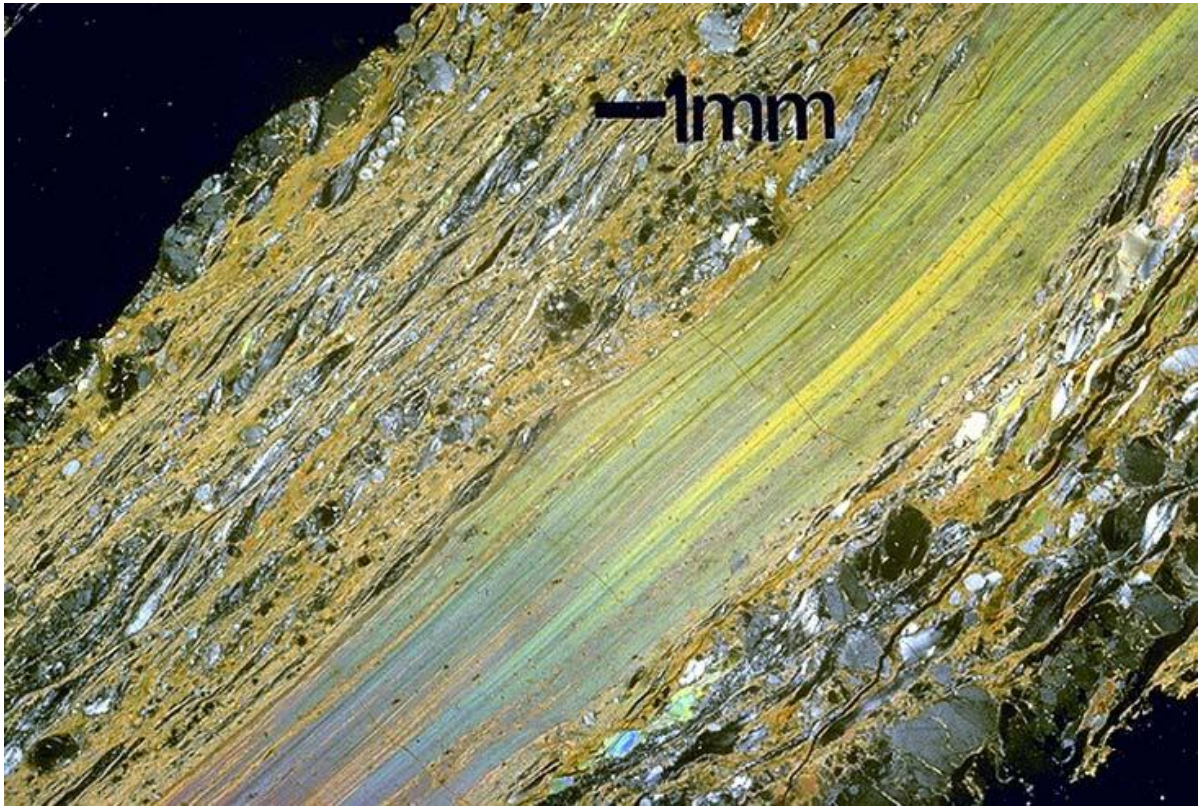


fay kili



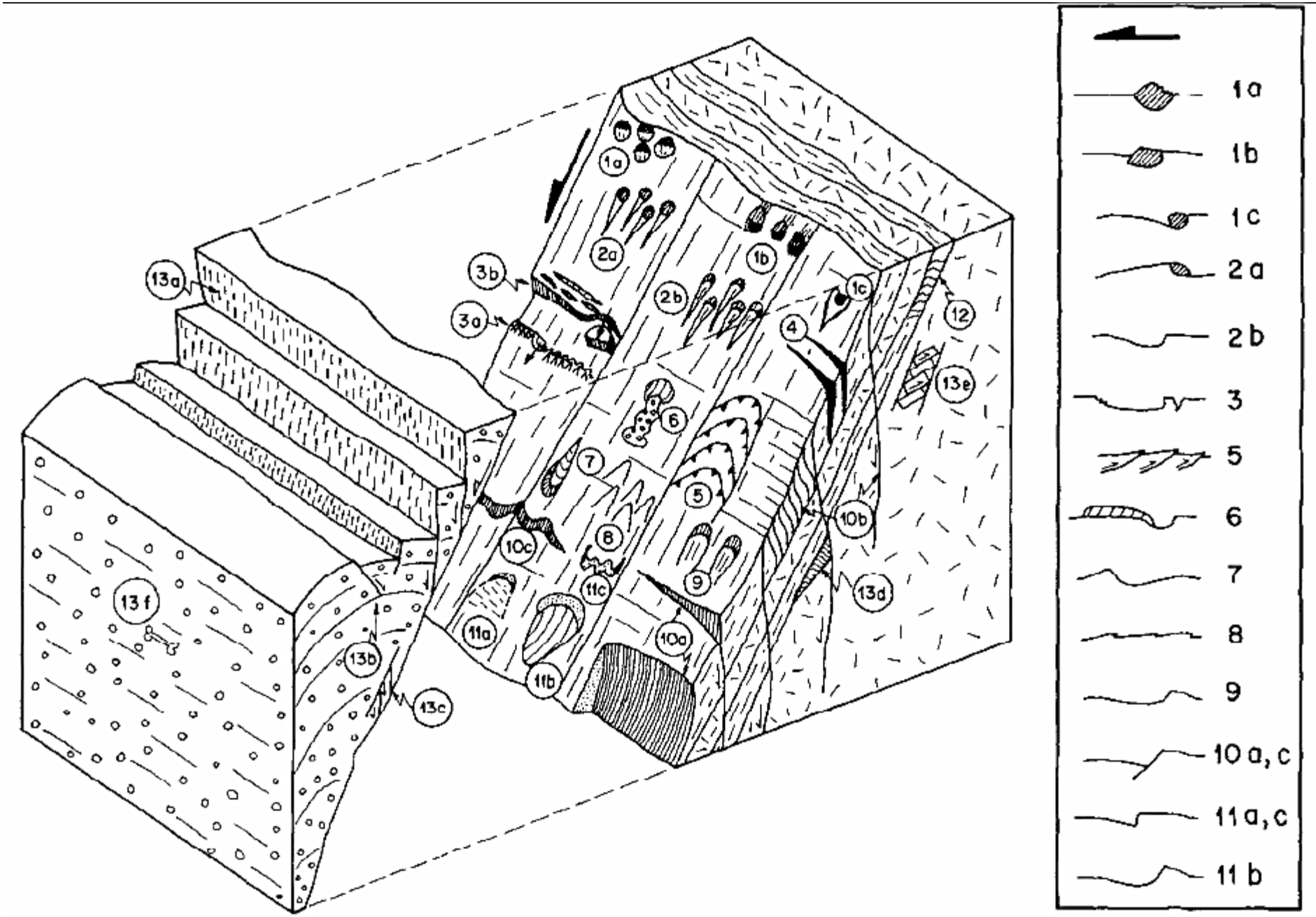
fay kili

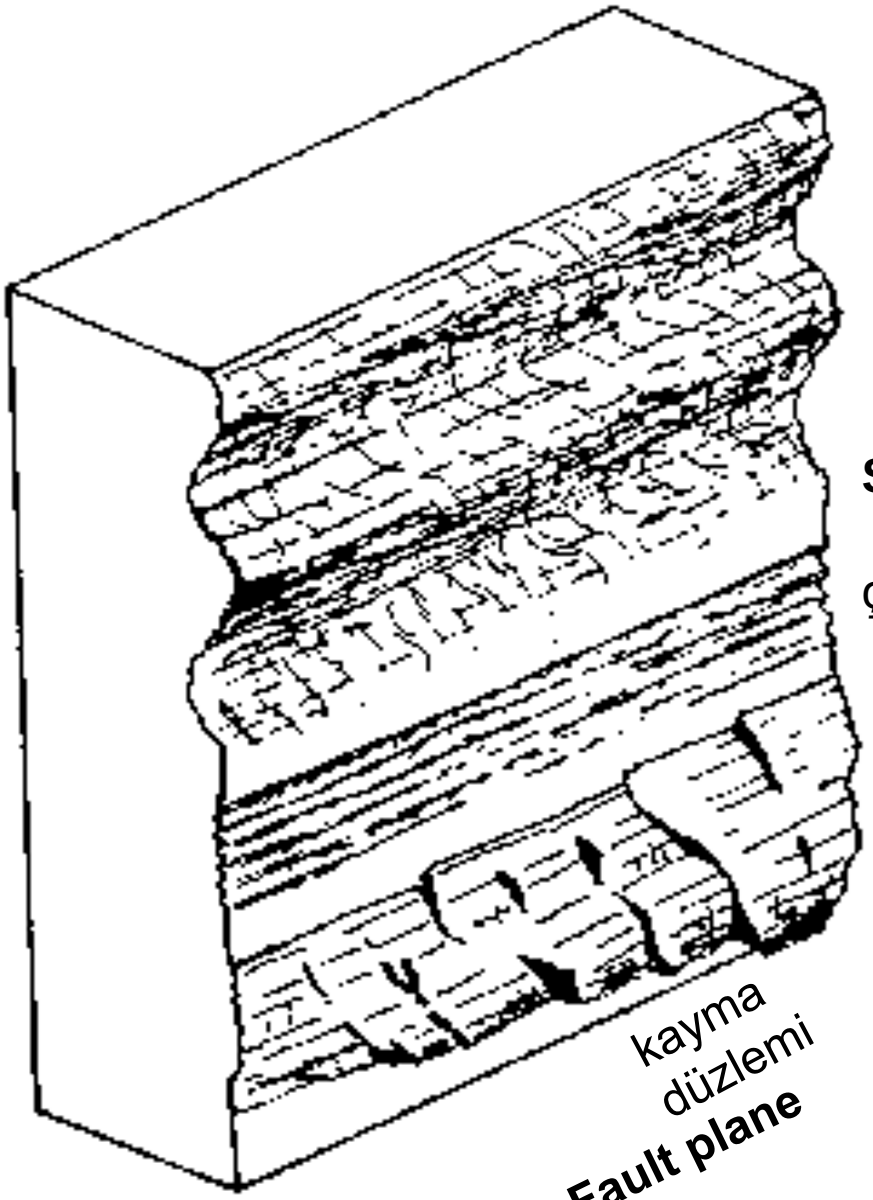
Cataclasite



Mylonite

Structures on the fault plane



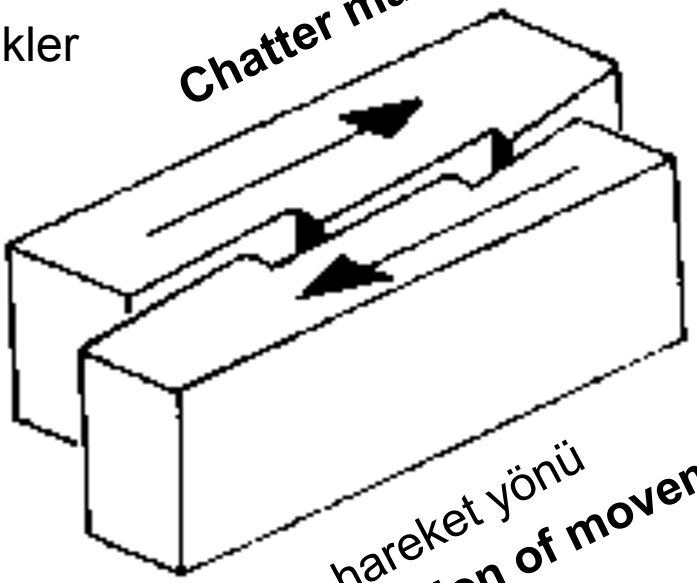


oluklar **grooves**

sırtlar **ridges**

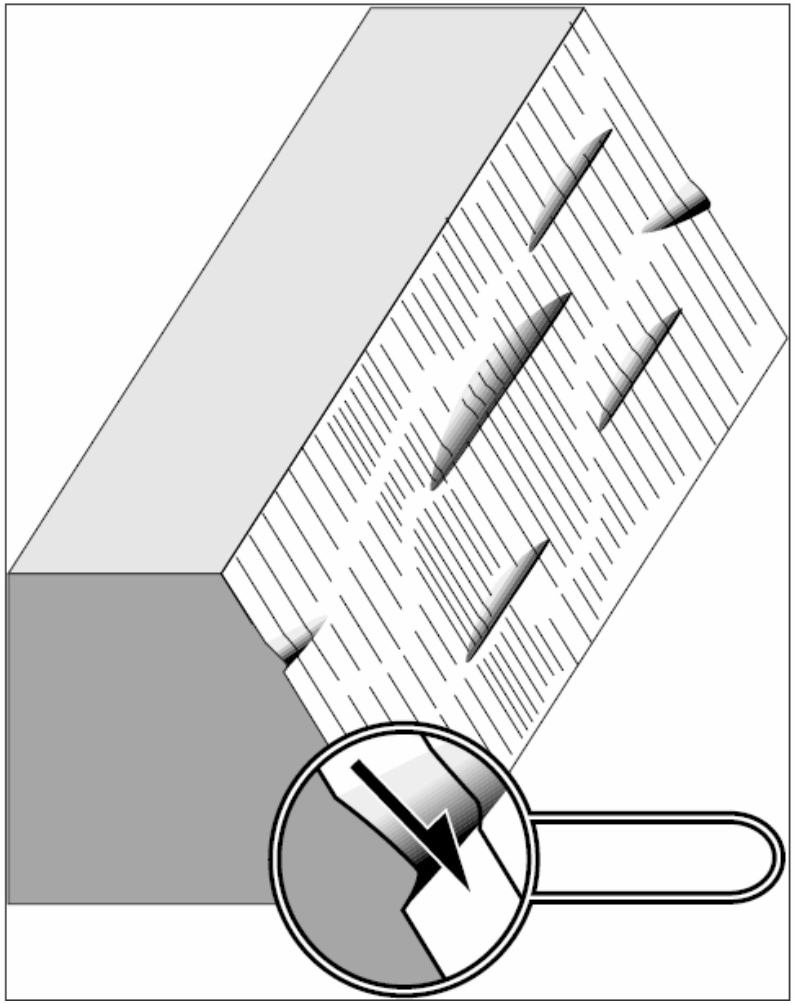
Striations/fault lines

çizikler



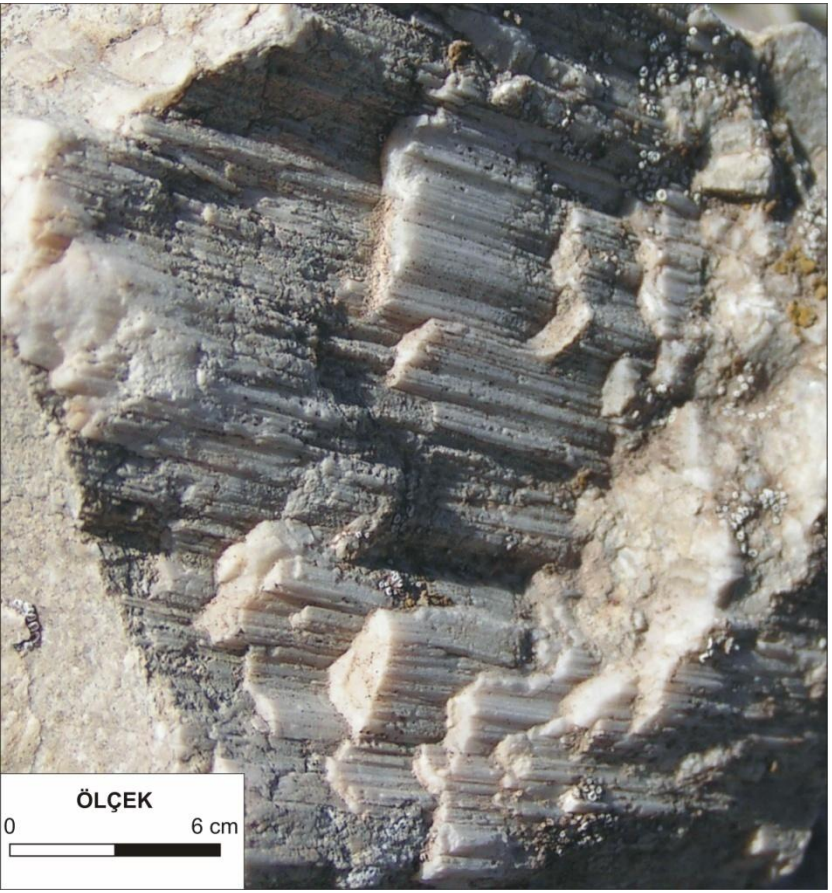
kayma düzlemi
Fault plane

hareket yönü
Direction of movement



Fault steps

Grooves and fault steps

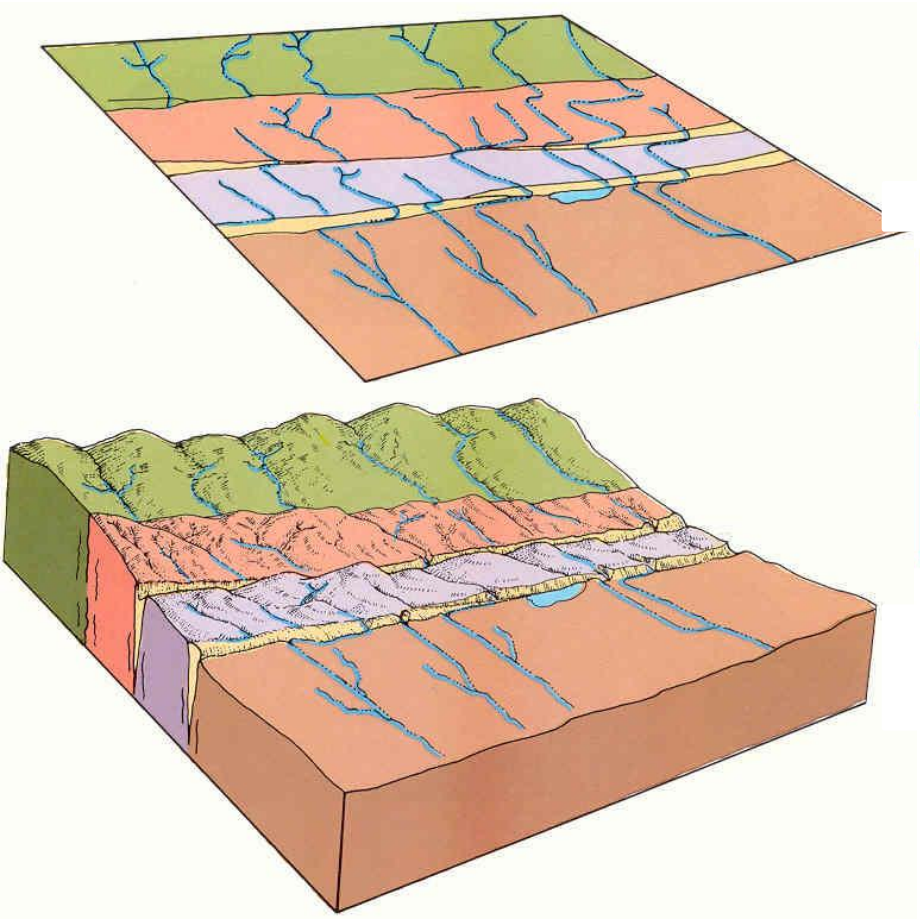


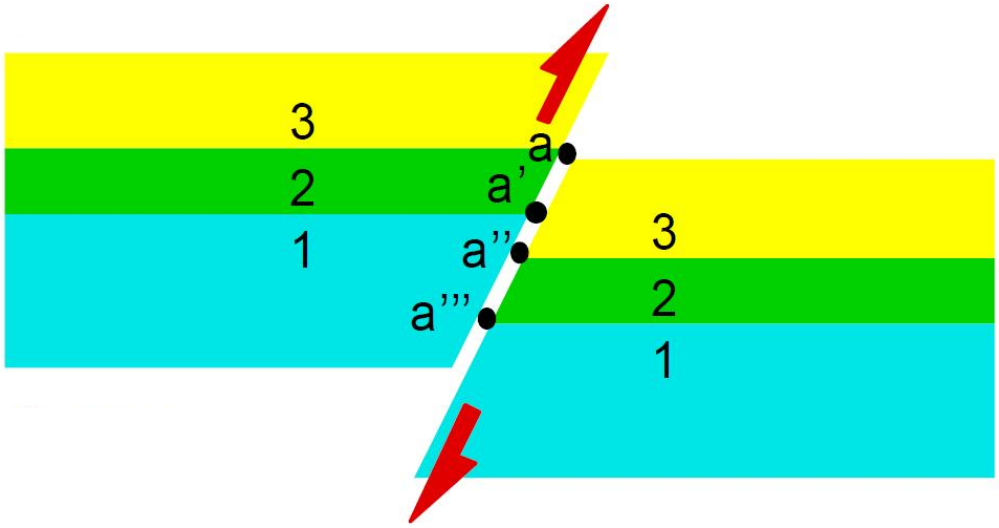
Chatter marks

Riedel fractures

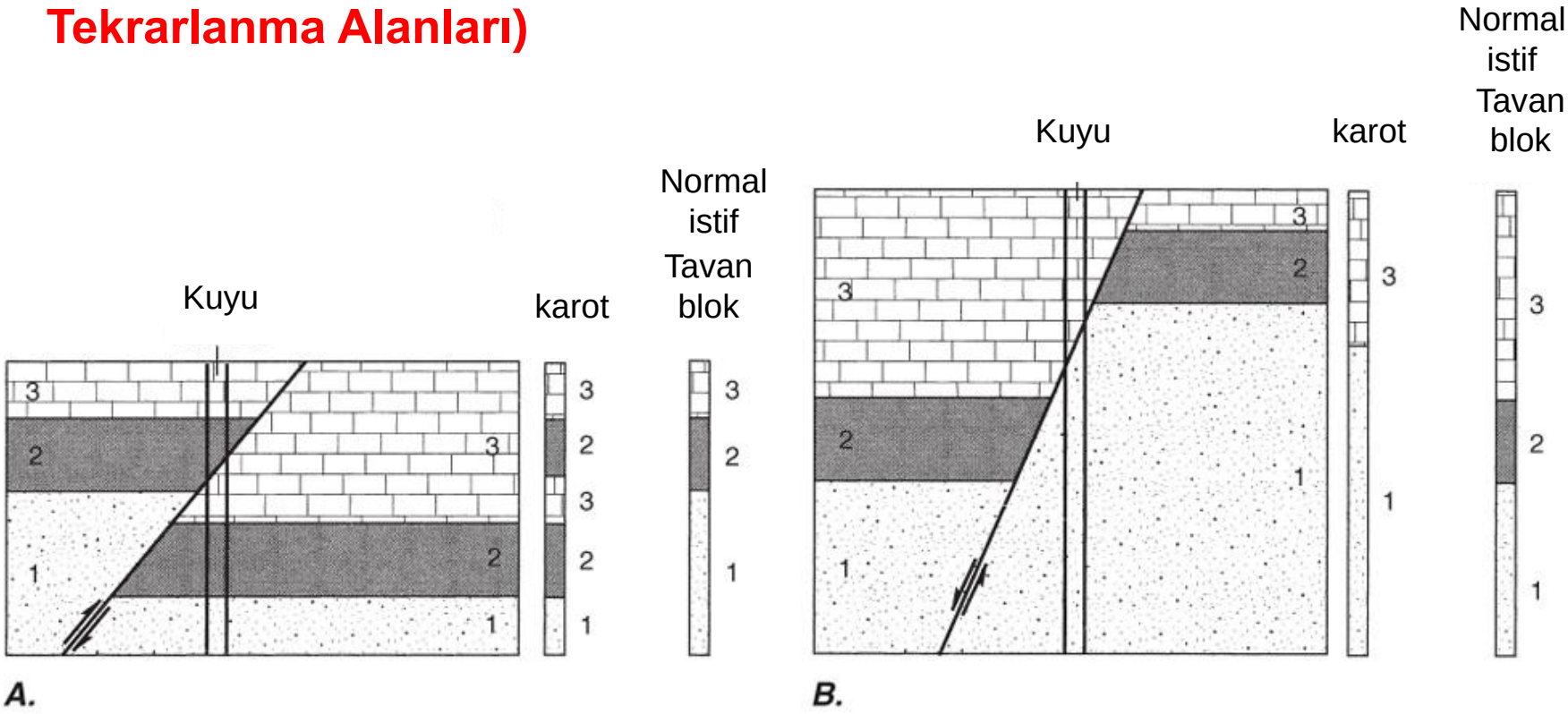
2- The effects on geological and stratigraphical units

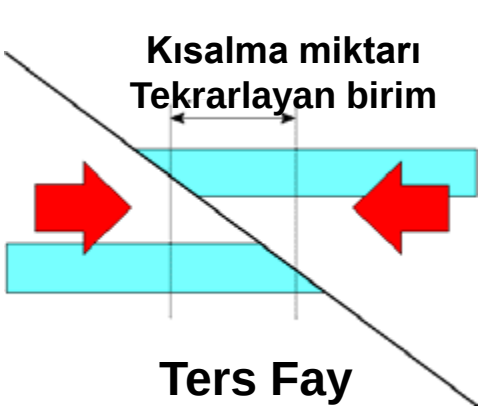
A – *Juxtaposition* (Yanyana gelme)

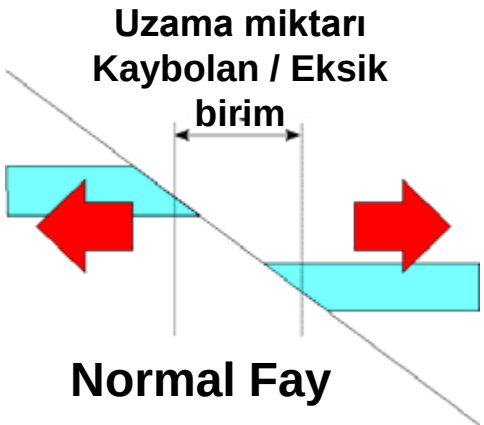




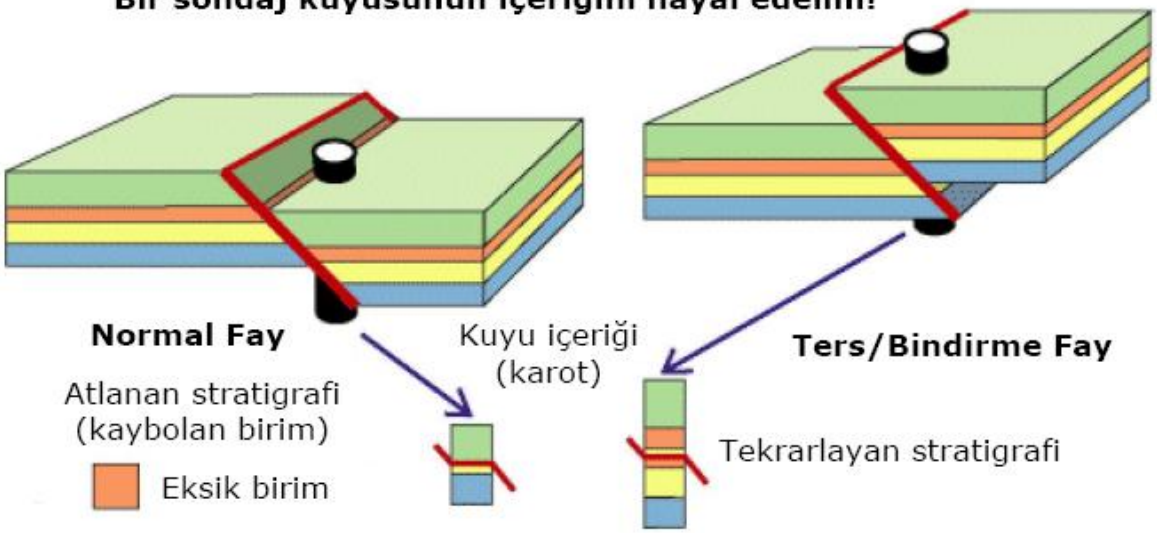
B – *Omission and Repetition of Strata* (Eksik/Kayıp ve Bindirme/ Tekrarlanma Alanları)



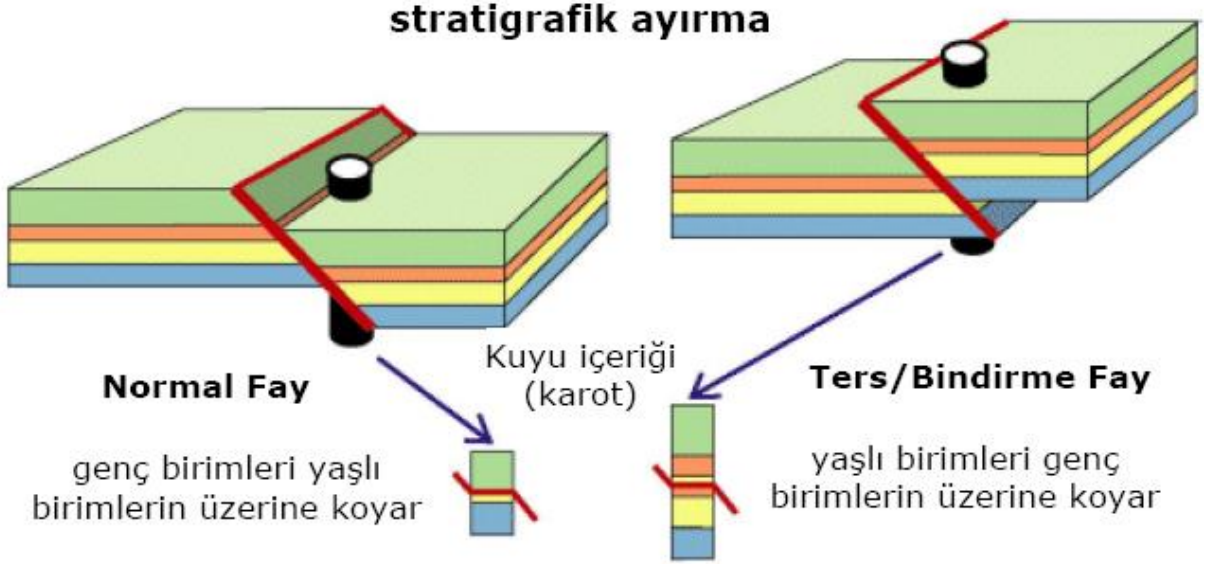




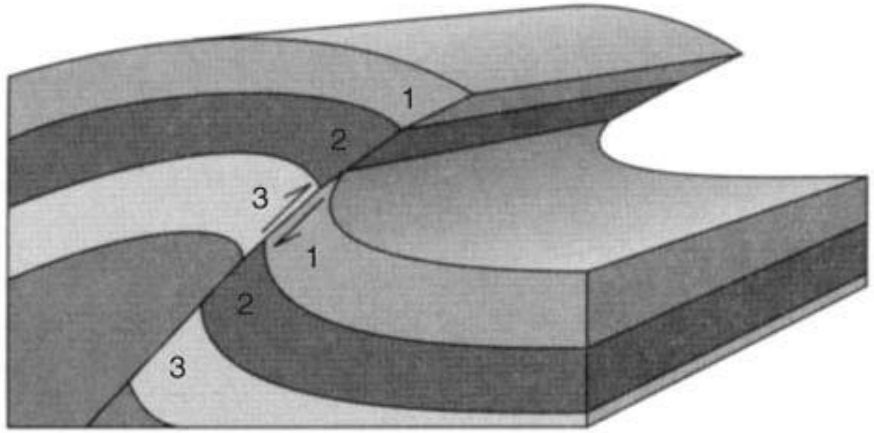
Bir sondaj kuyusunun içeriğini hayal edelim!



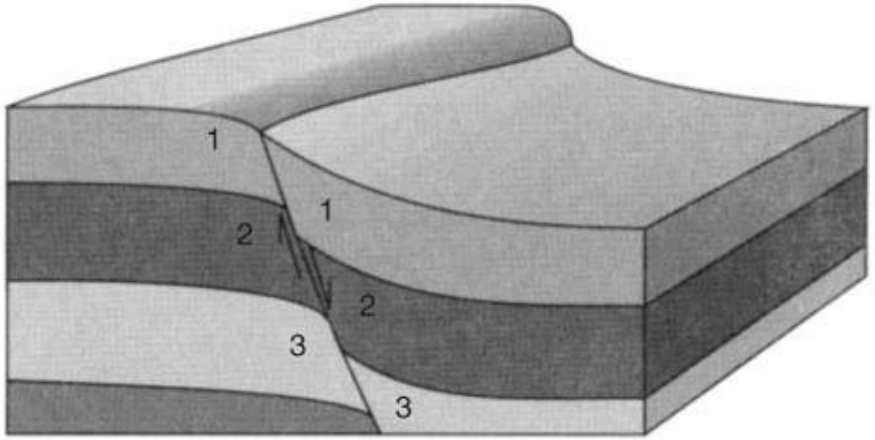
stratigrafik ayırma



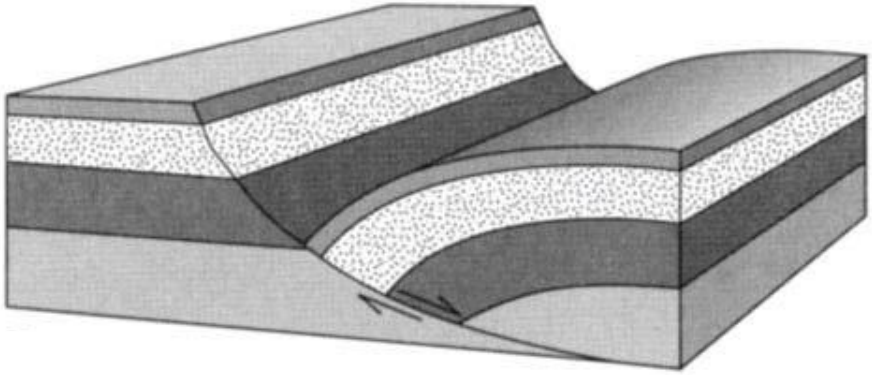
C – Drag Folds (Sürüklenme /Sürüme Kıvrımları)



A.



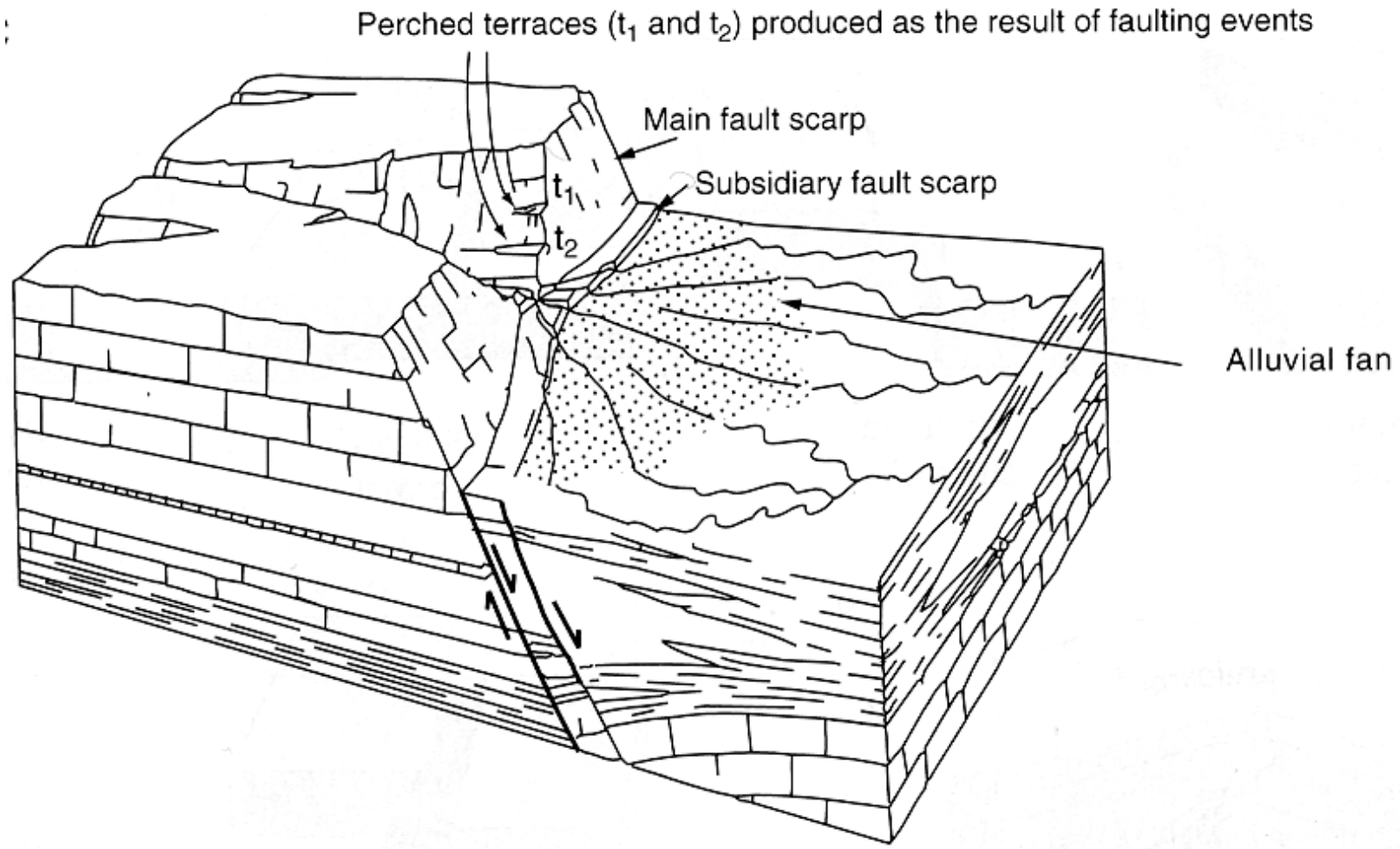
B.



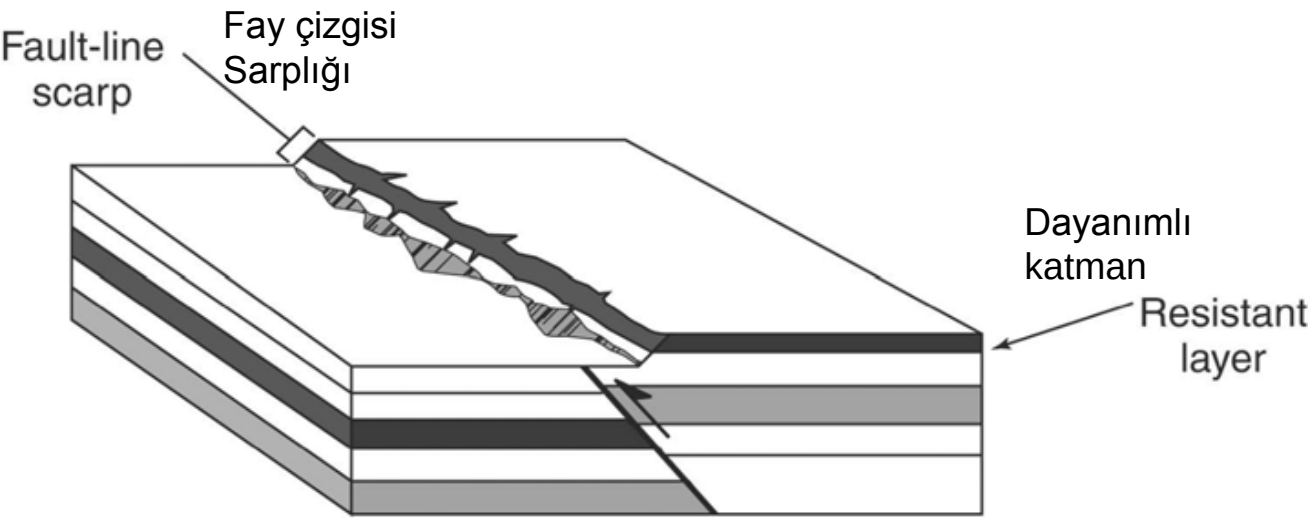
D – ‘Rollover’ Anticlinal (Ters Sürüme Kıvrımı)

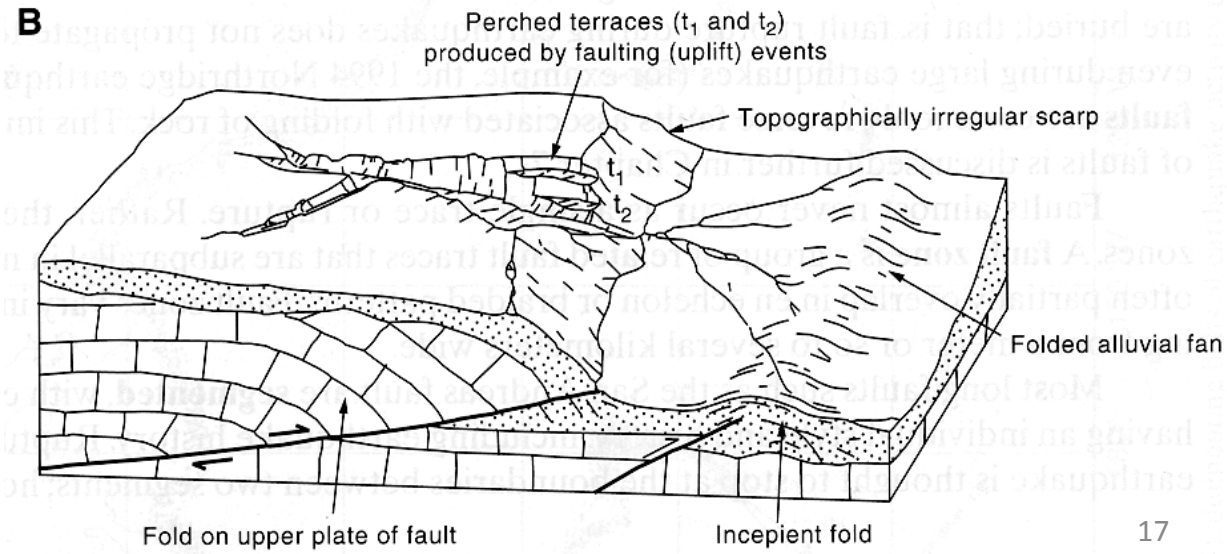
3- Effects on topography (physiographic elements)

A – Fault Scarp



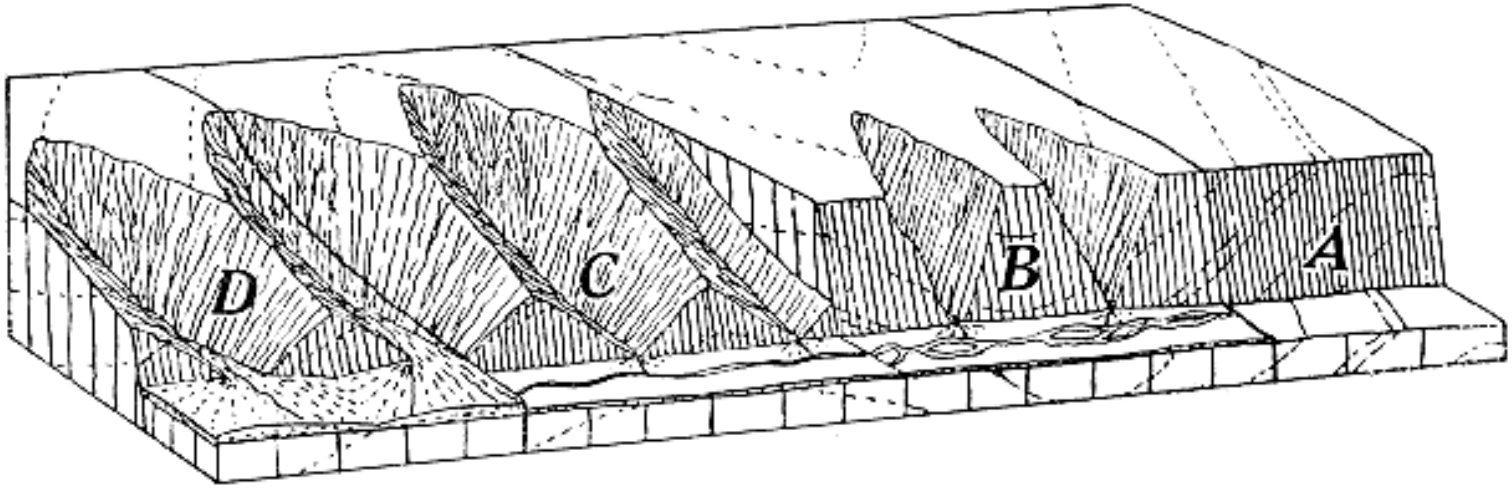
B – Fault Line Scarp

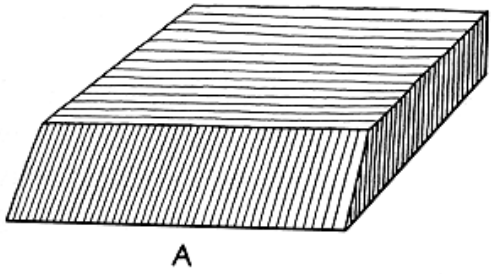


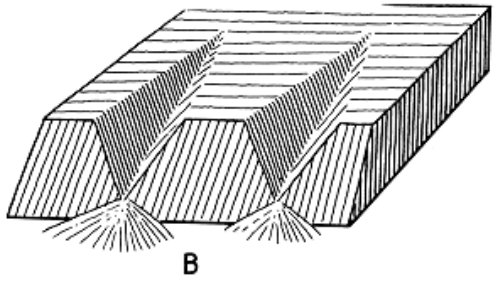


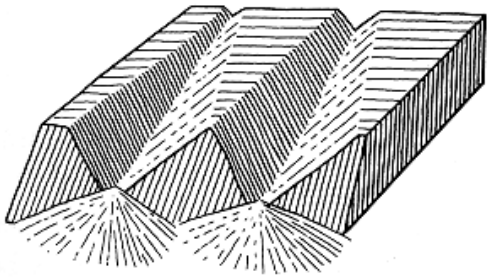
C – Triangular facets and alluvial fans

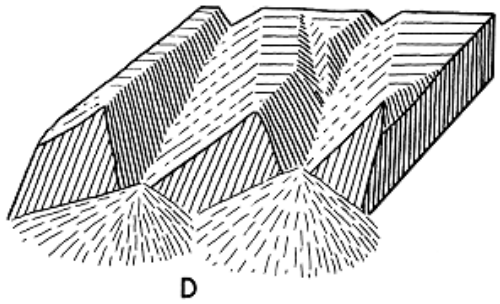
(Fay zonunda görülen üçgen yüzeyler ve sıralı birikinti konileri)

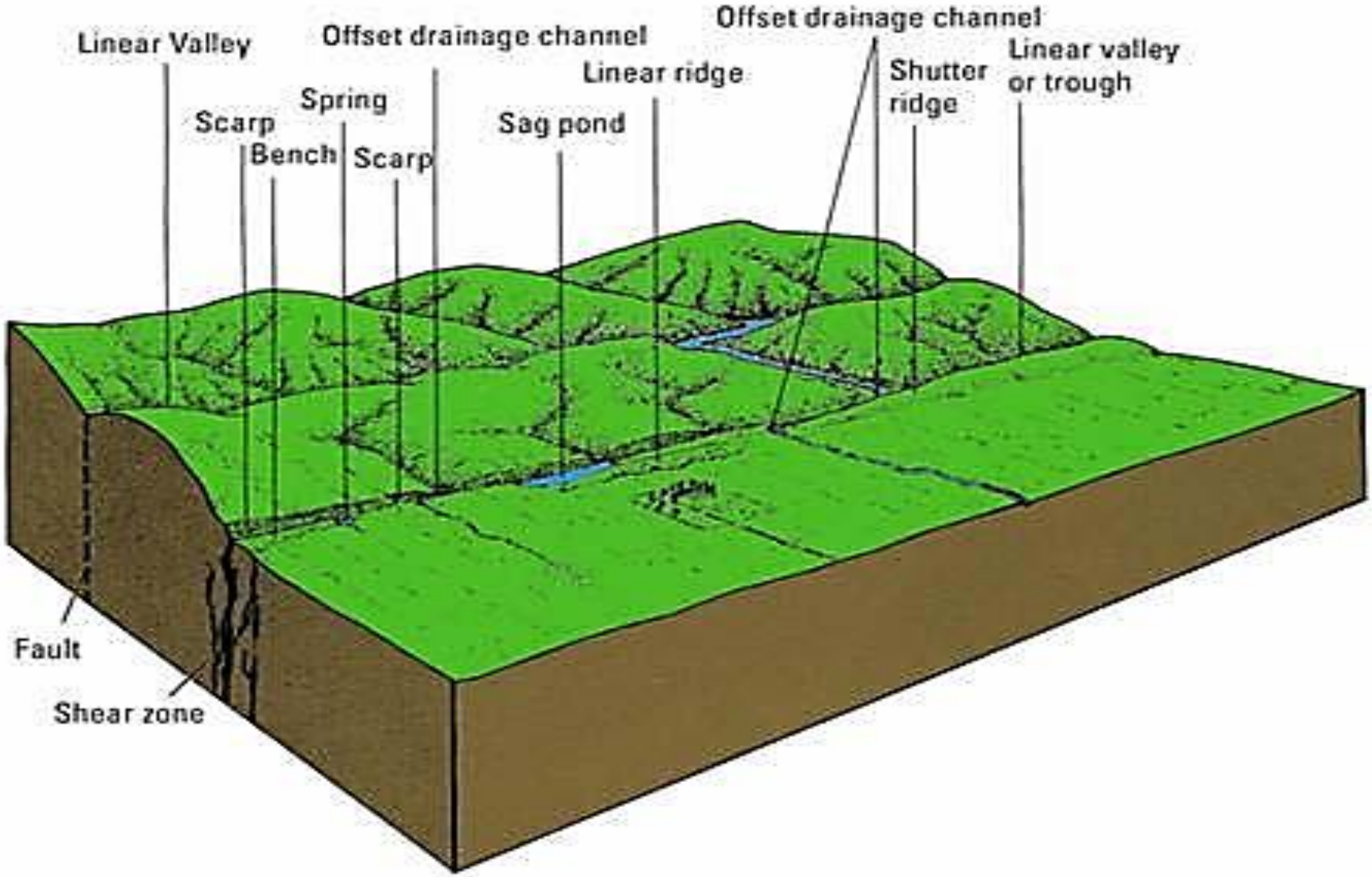











Linear Valley
Offset drainage channel
Offset drainage channel
Linear ridge
Shutter ridge
Linear valley or trough
Spring
Scarp
Bench
Scarp
Sag pond
Fault
Shear zone

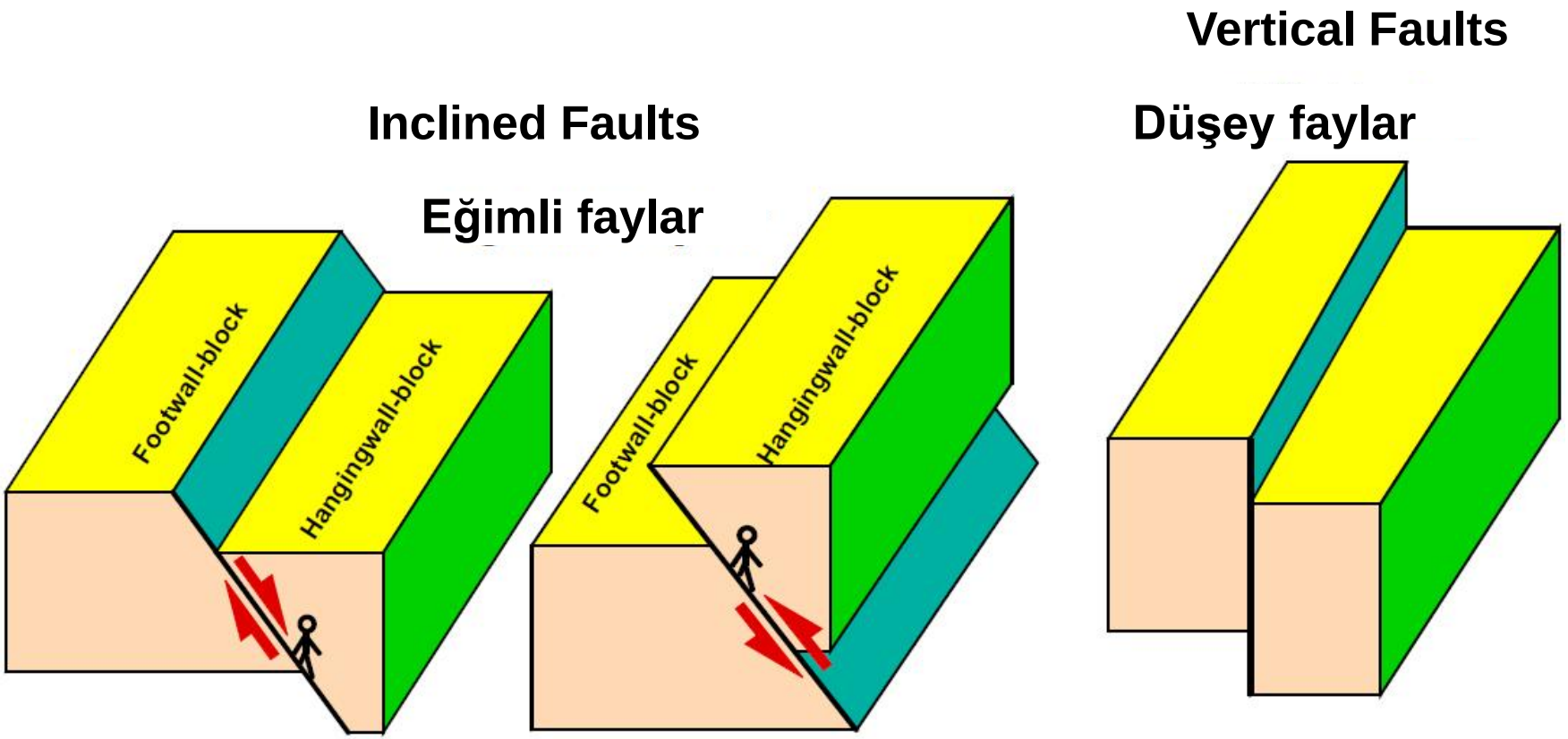
CLASSIFICATION OF FAULTS

Basically two criteria are used for the classification of faults:

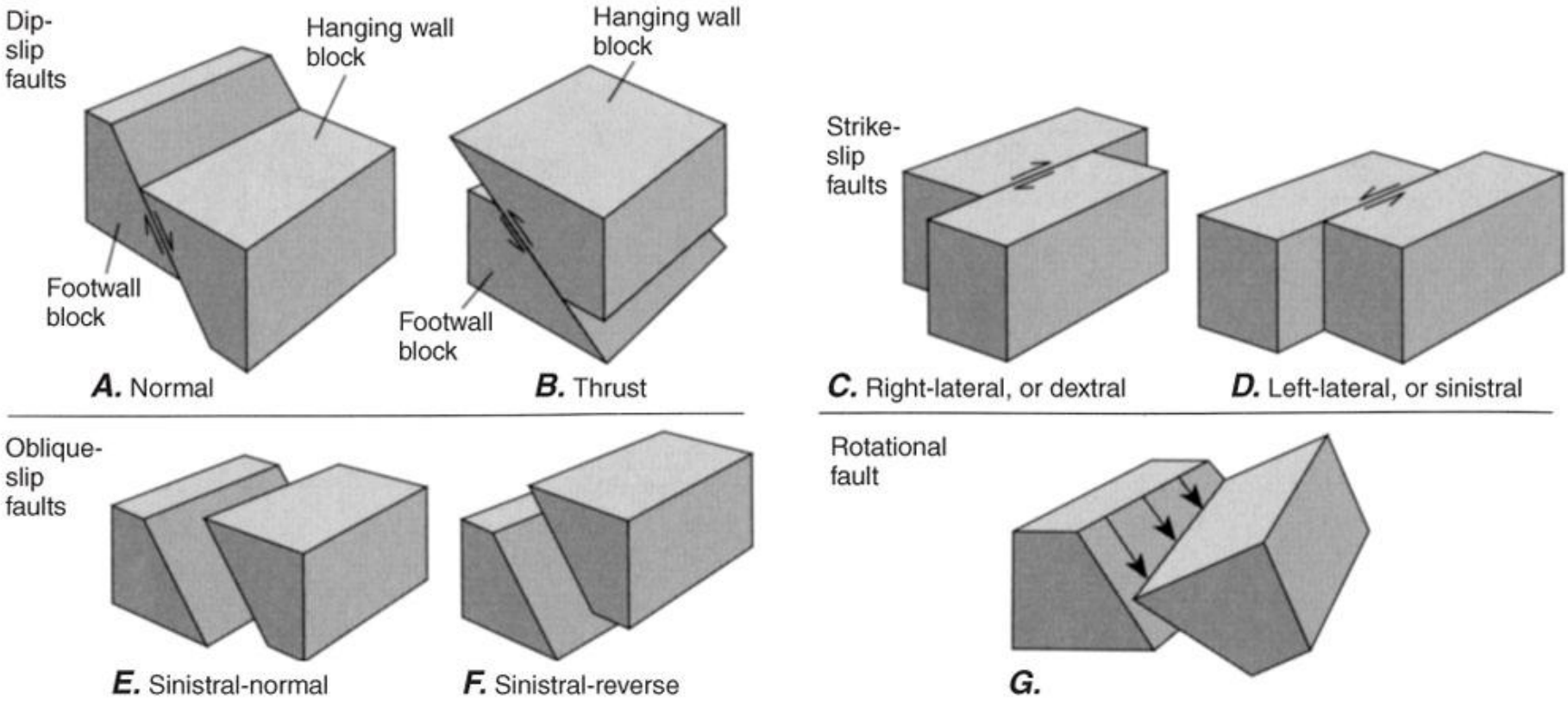
1) Position of the fault plane;

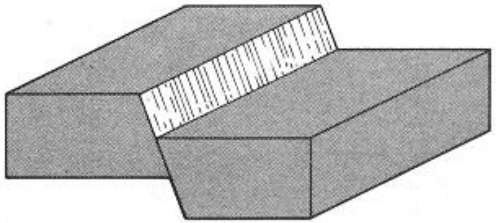
2) Slip direction.

1) Classification based on position of the fault plane

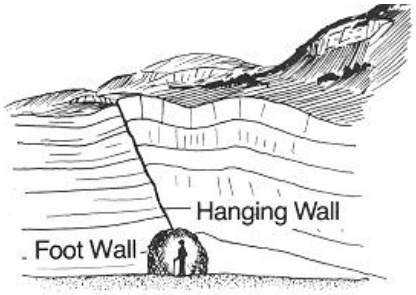


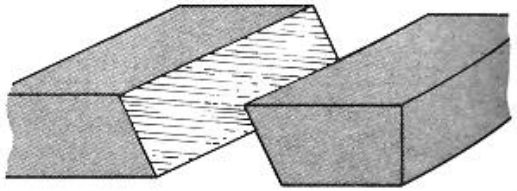
2) Classification based on slip direction



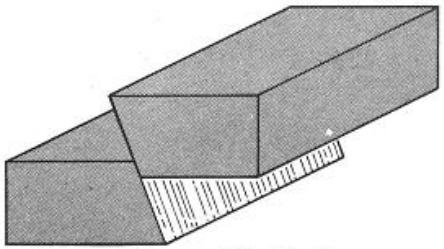


Normal-Slip Fault

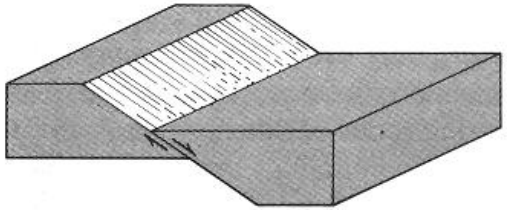




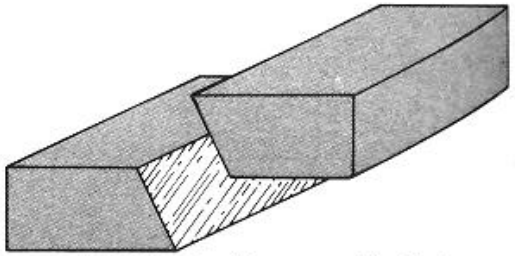
Normal Left-Slip Fault



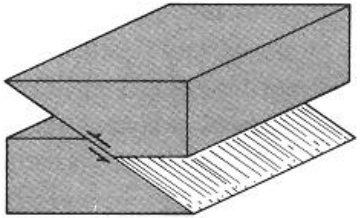
Reverse-Slip Fault



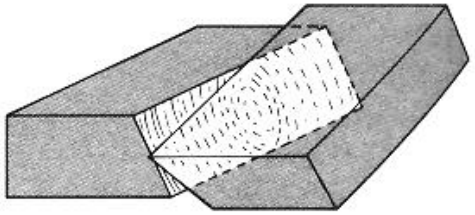
Low-Angle Normal Slip Fault



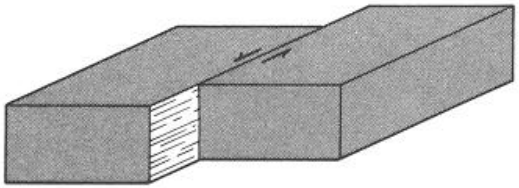
Left-Handed Reverse-Slip Fault



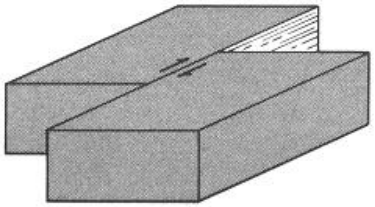
Thrust-Slip Fault



D. Rotational Fault



Left-Handed Strike-Slip Fault



Right-Handed Strike-Slip Fault

ANDERSON classification

Based on the principal stress directions

Principal stress (asal gerilme): stresses acting in the crust are divided into three normal stress (along the direction of which there is no shear stress) components:

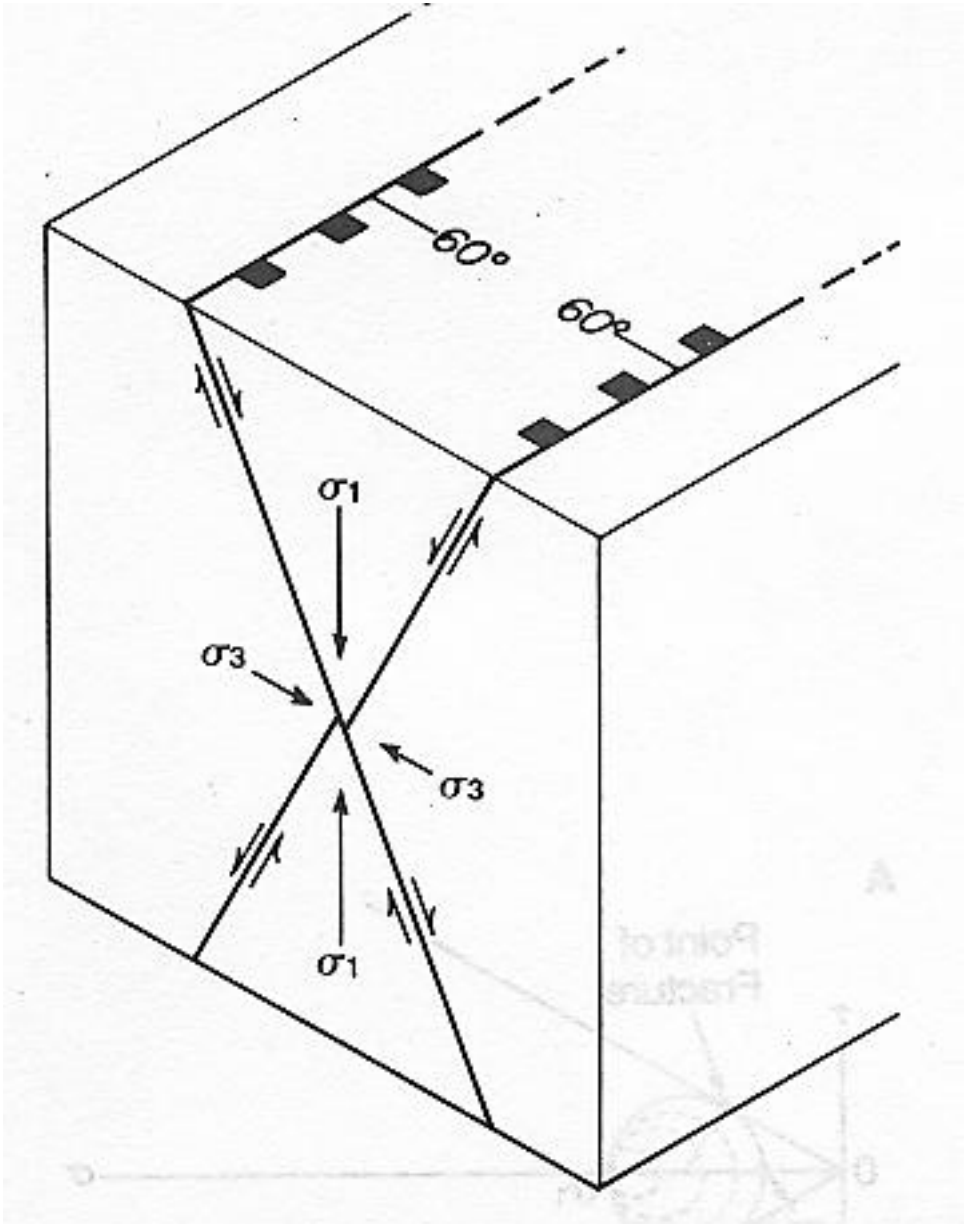
σ_1, the greatest compressive stress,

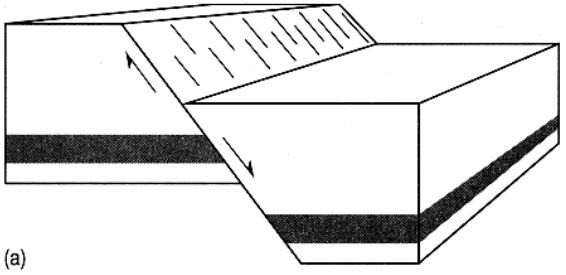
σ_2 the intermediate compressive stress, and

σ_3 the least compressive stress. So , in general $\sigma_1 > \sigma_2 > \sigma_3$.

All three stresses are considered to be perpendicular to each other, and one of them is vertical while the two others are horizontal.

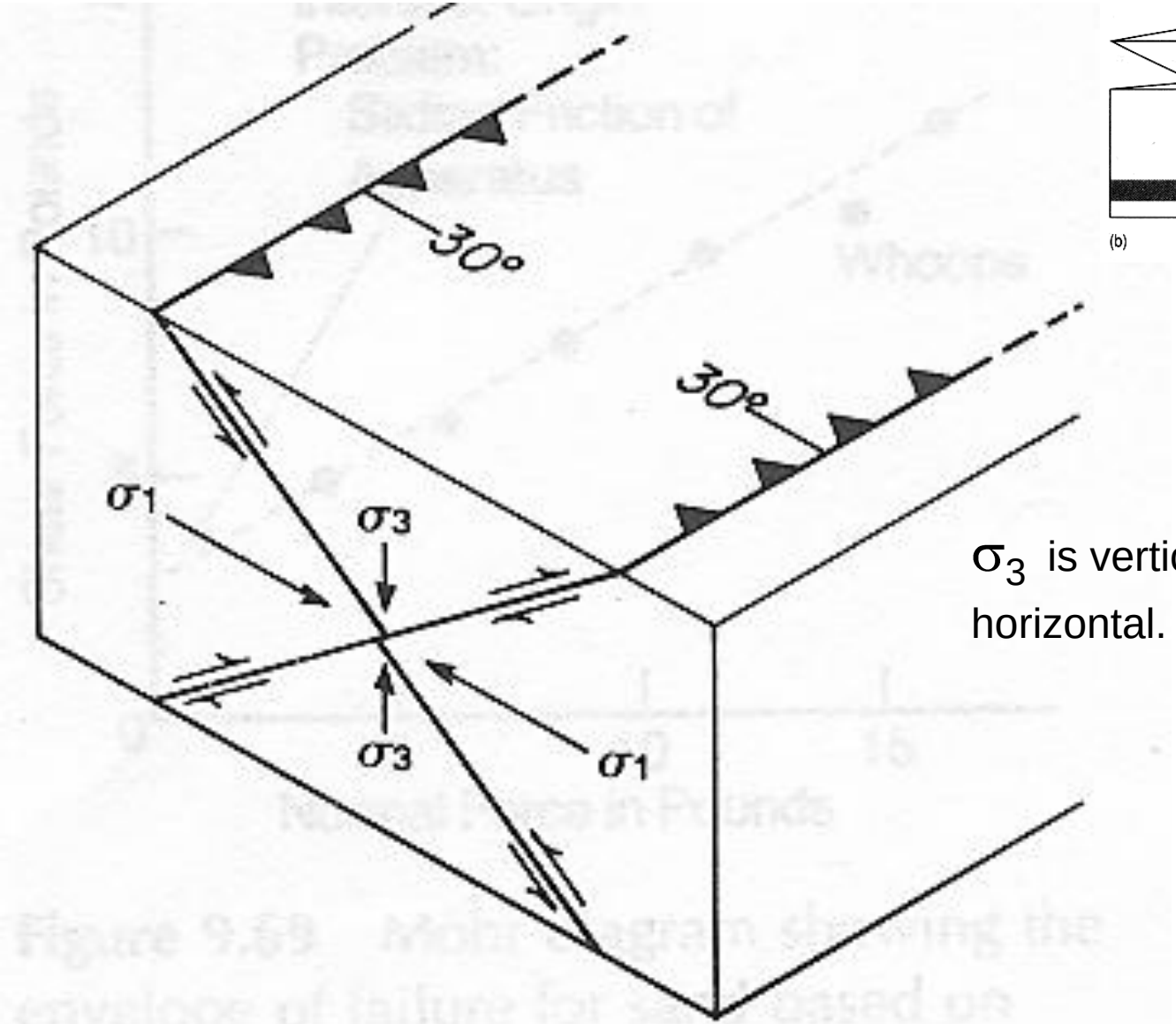
Normal faults

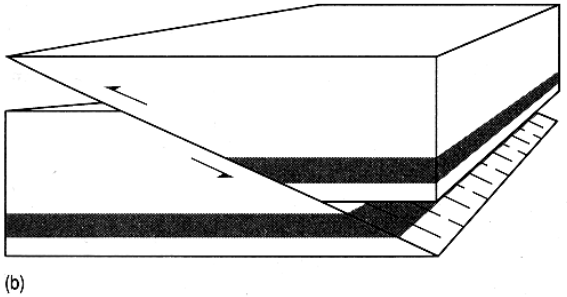




σ_1 is vertical, the two others are horizontal.

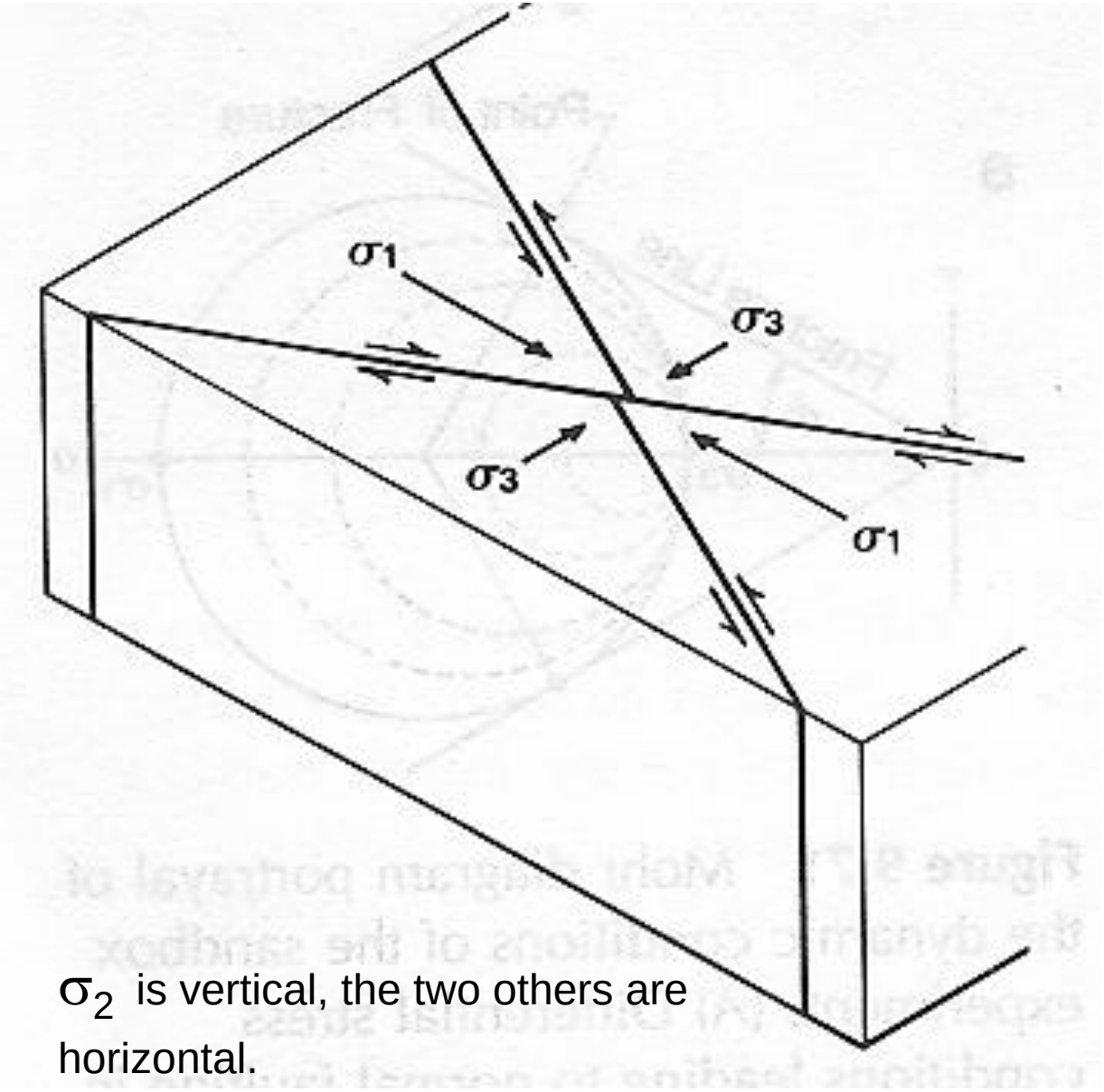
Reverse / thrust faults

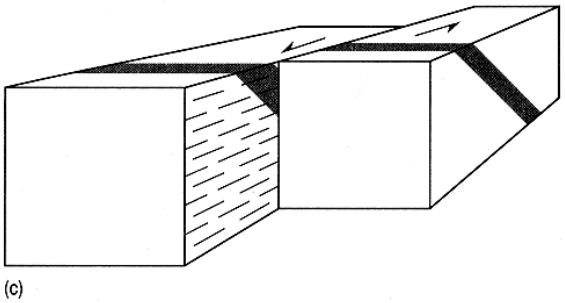




σ_3 is vertical, the two others are horizontal.

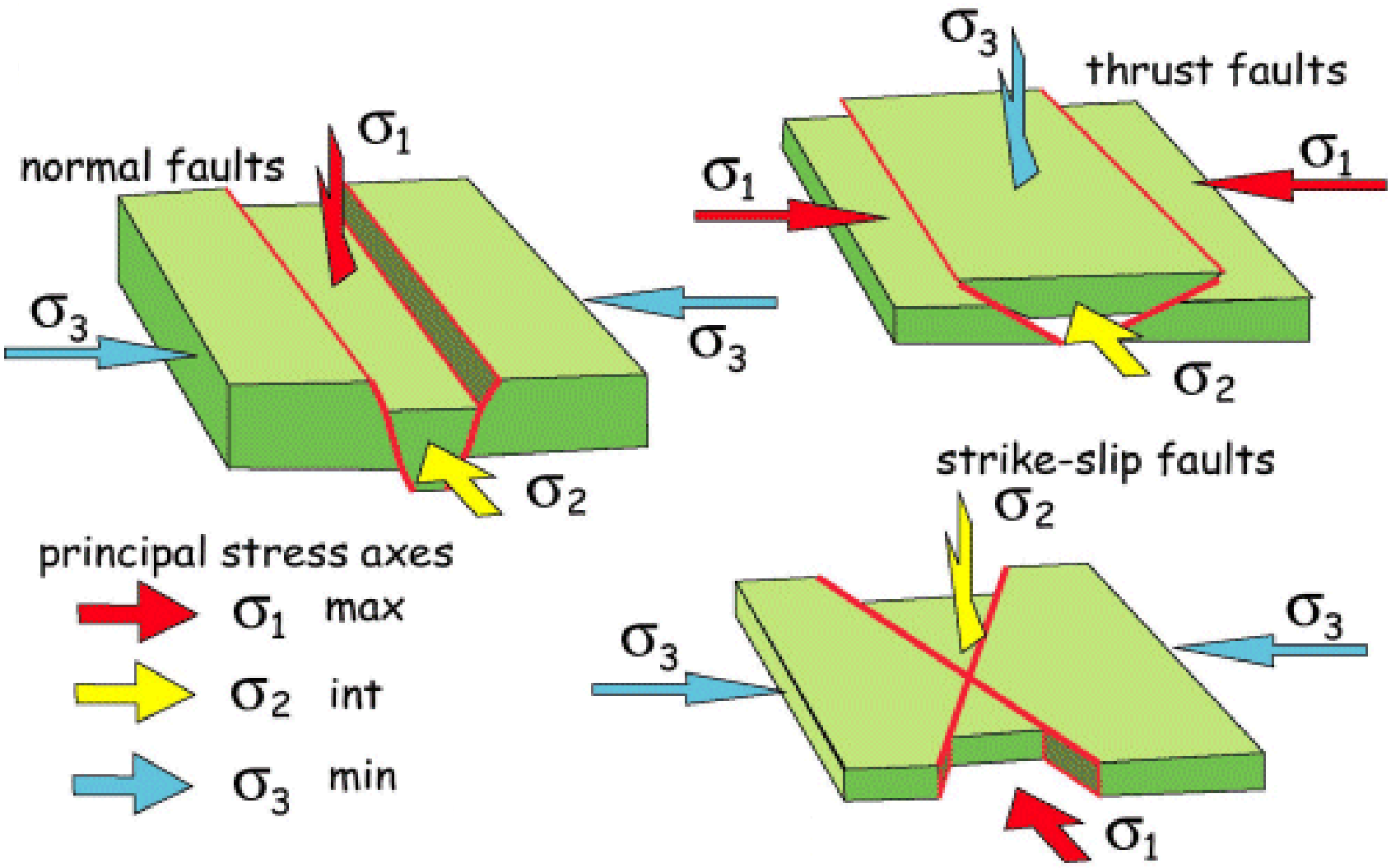
Strike-slip faults





σ_2 is vertical, the two others are horizontal.

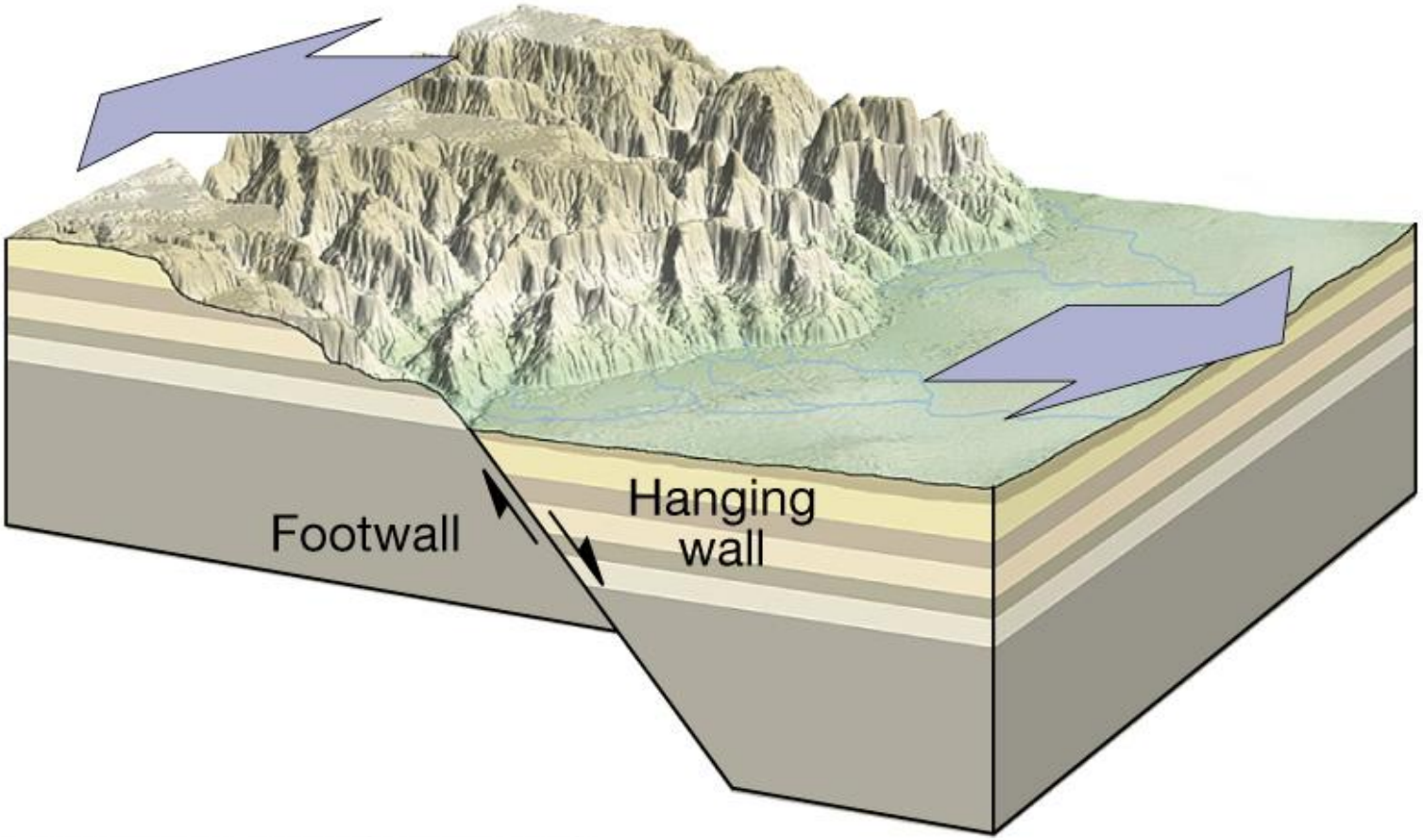
Faults and Principal Stress Directions

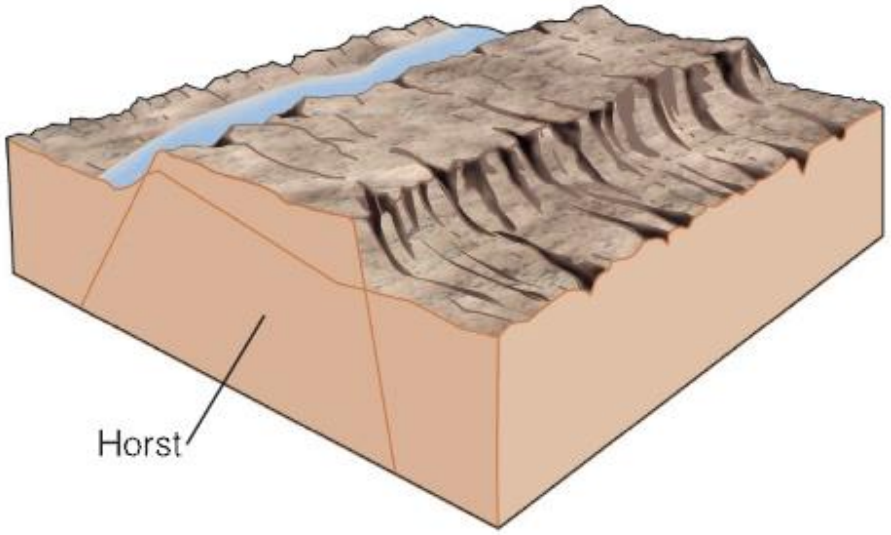


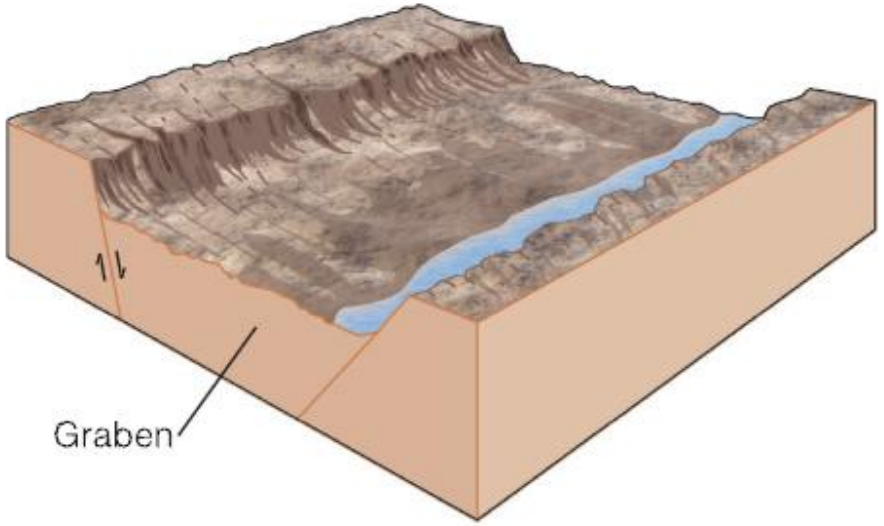
http://www.see.leeds.ac.uk/structure/faults/stress/stress.gif

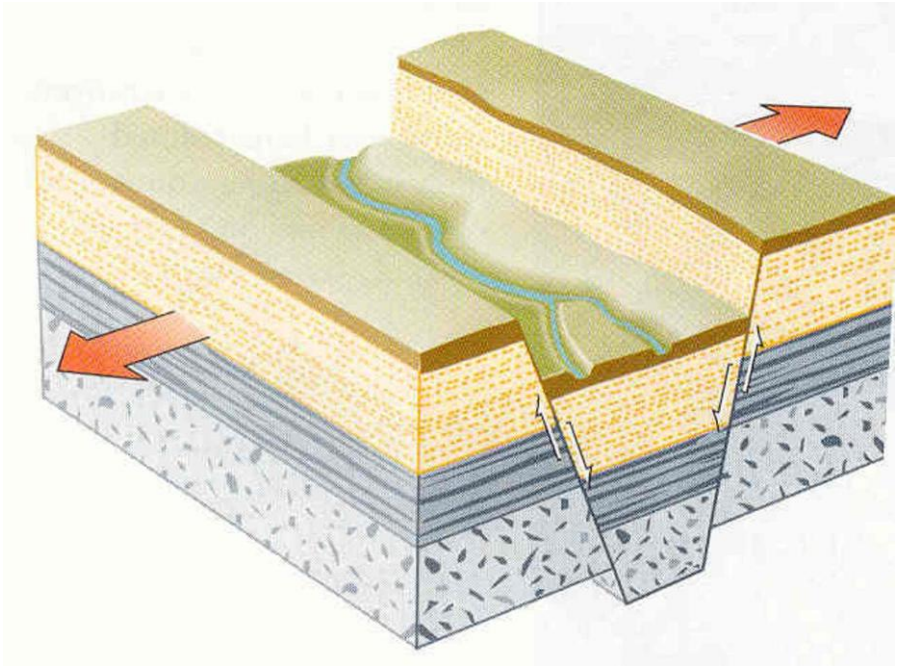
Normal Fault

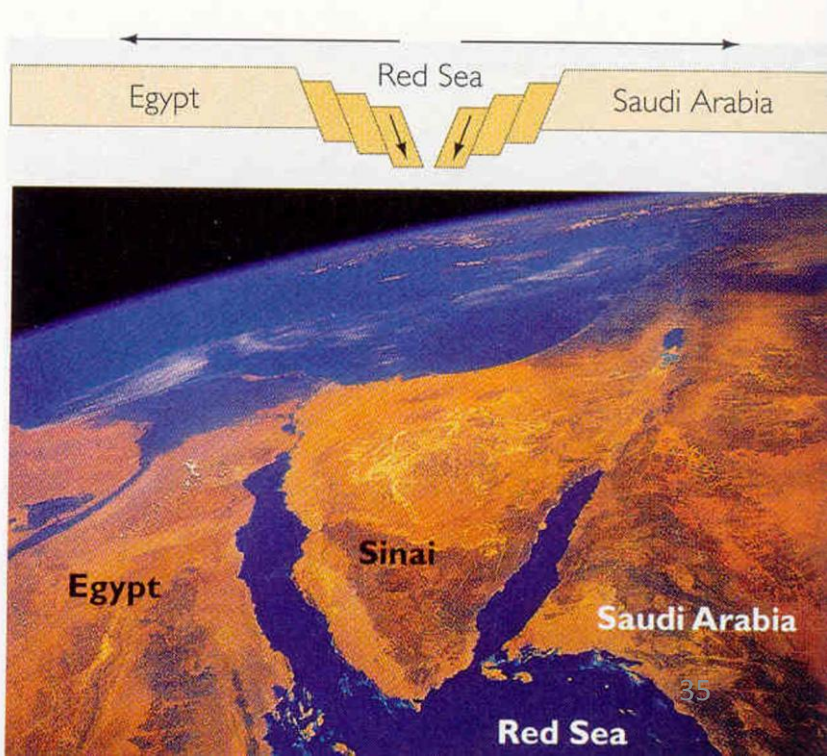
Dip amount of fault plane > 45^{o}, <90^{o} in general: 60^{o}

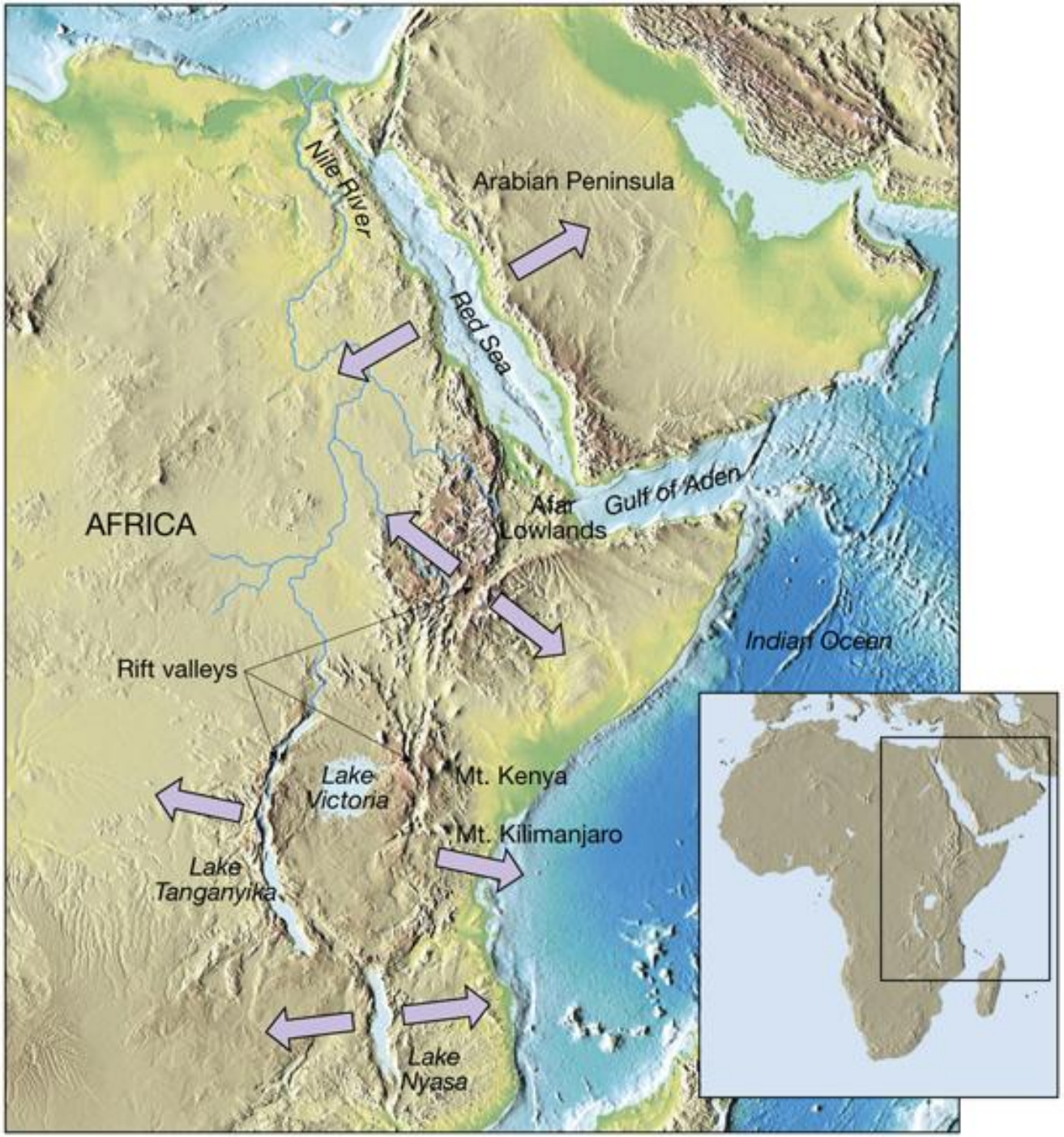



Horst


Graben



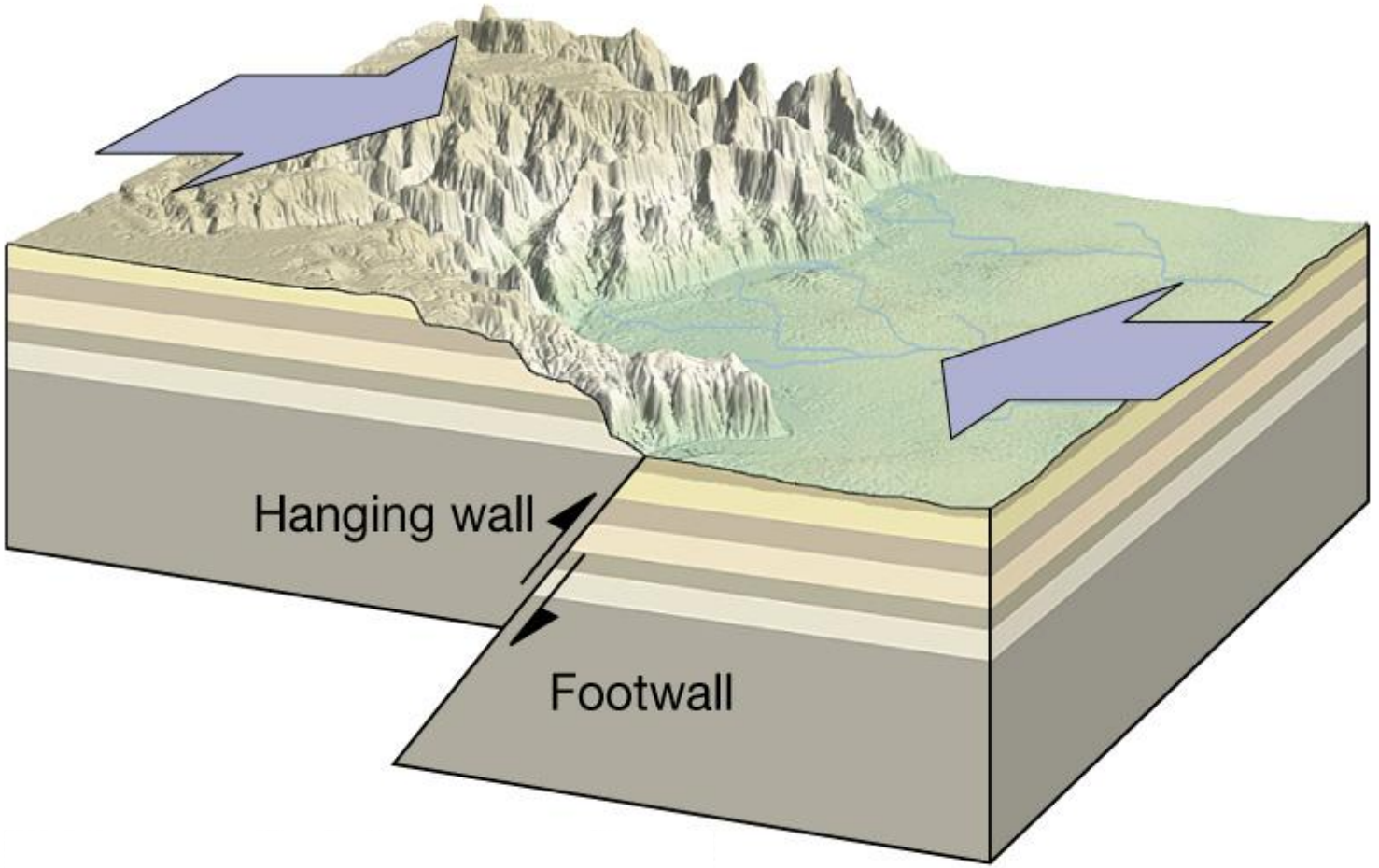

Egypt
Red Sea
Saudi Arabia
Sinai
Egypt
Saudi Arabia
Red Sea


Nile River
Arabian Peninsula
Red Sea
AFRICA
Afar Lowlands
Gulf of Aden
Indian Ocean
Rift valleys
Lake Victoria
Mt. Kenya
Mt. Kilimanjaro
Lake Tanganyika
Lake Nyasa

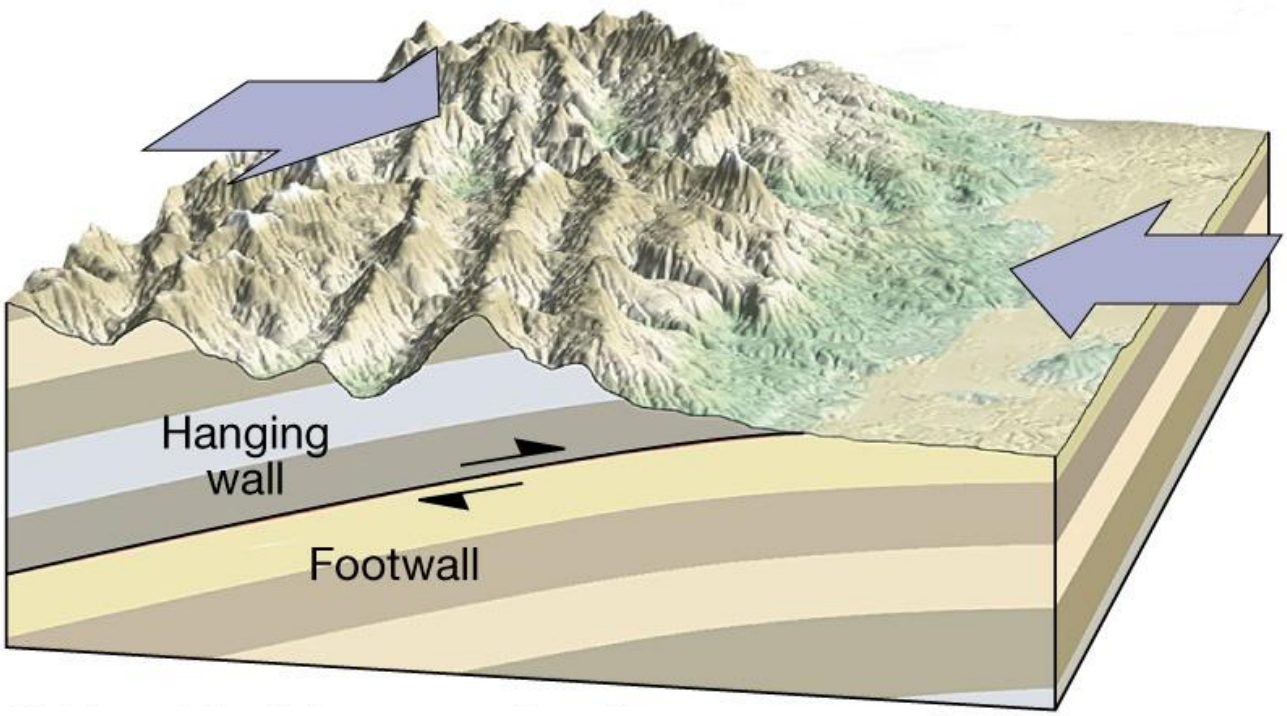
Reverse Fault

Dip amount of fault plane > 45^{o},

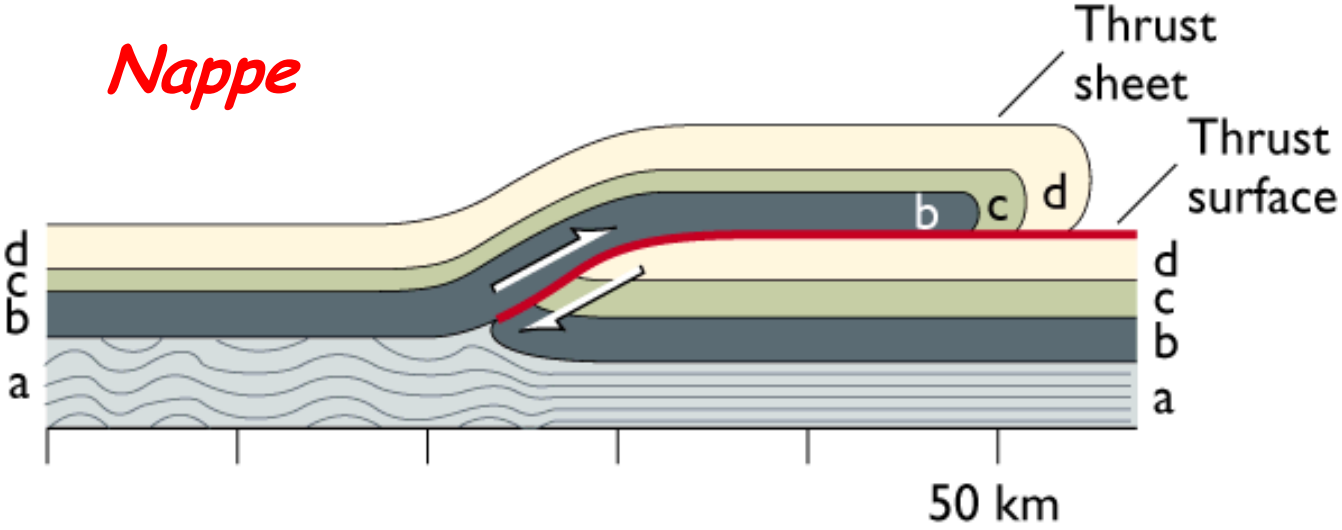
Low-angle reverse fault: ~30^{o} named as **Thrust fault**



Thrust Fault

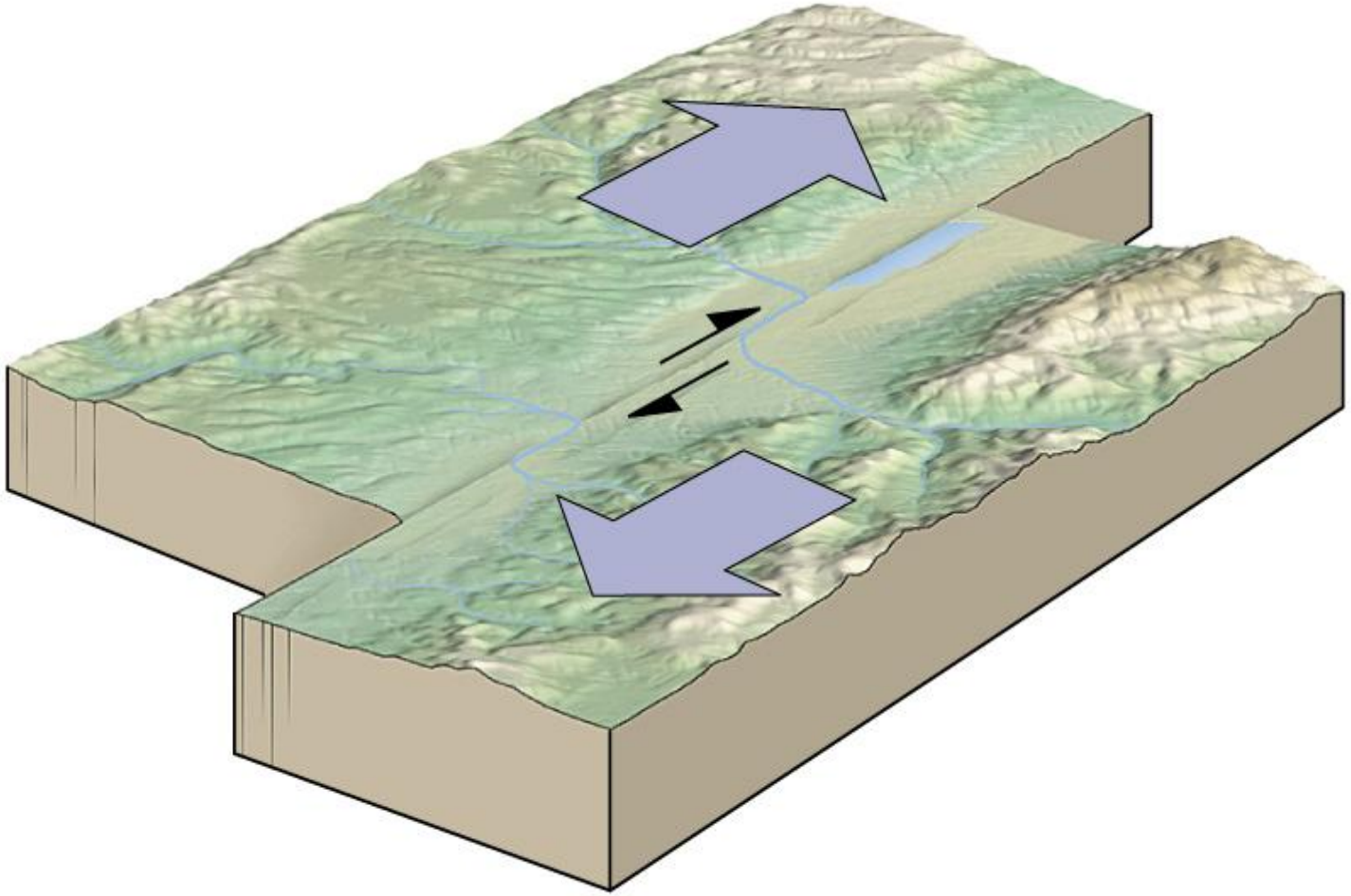


Nappe



Strike-slip fault

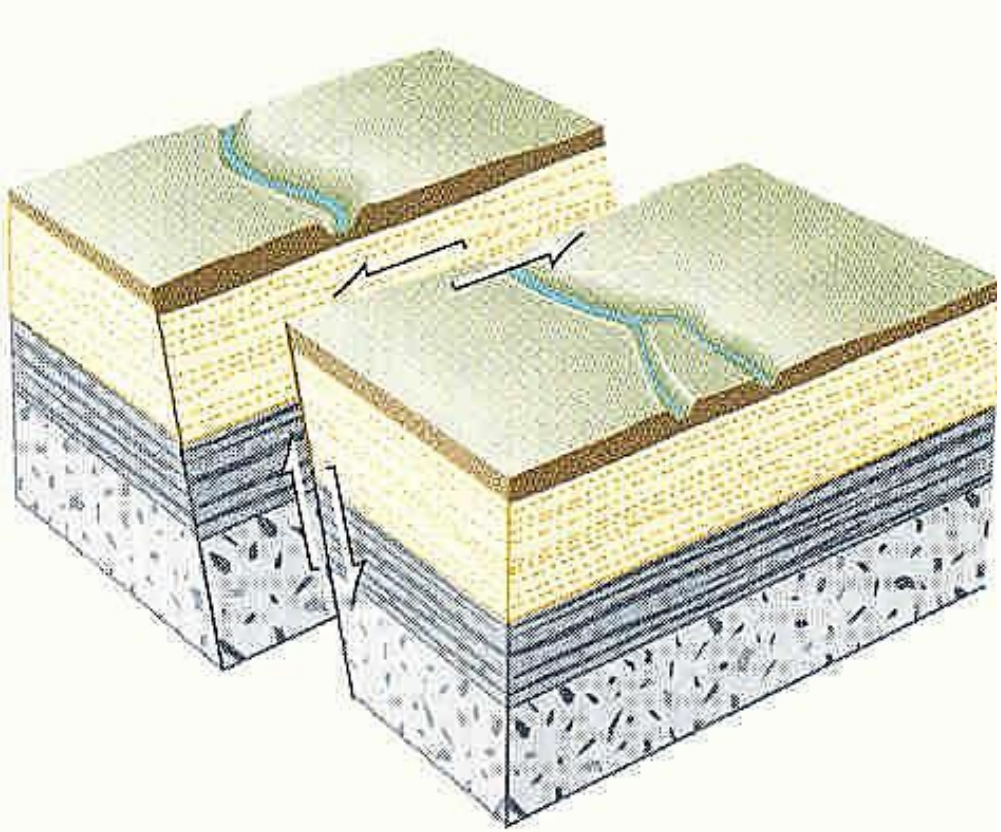
Movement vector is paralel to the strike of fault and perpendicular to the dip of fault plane.



www.geology.cwu.edu/facstaff/charlier/courses/g360/ppt/lecture18_**strikeslipfault1.ppt**

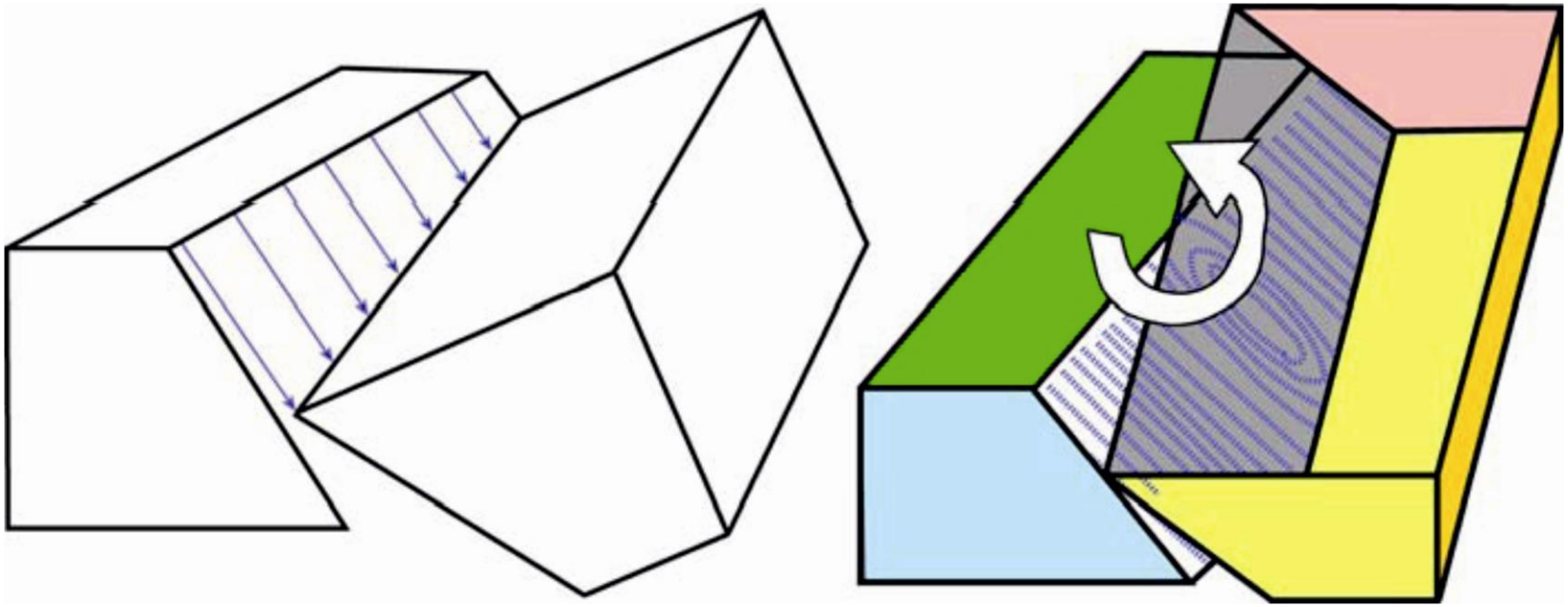
Oblique-slip fault

Movement vector is oblique to the strike of fault.



(d) OBLIQUE-SLIP FAULT

Rotational faults



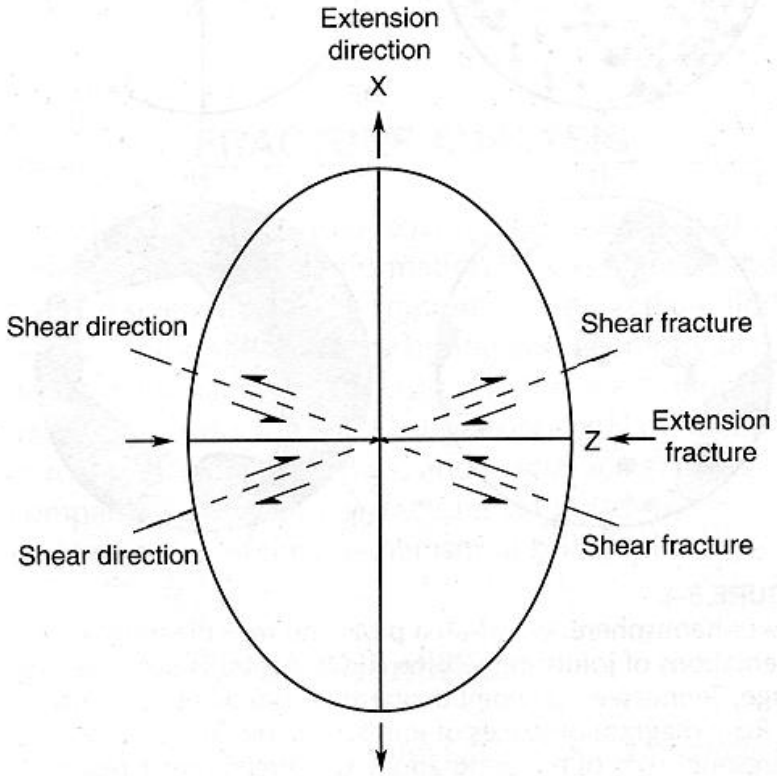
JOINT is a fracture/structural plane along which no considerable amount of movement is visible.

Types of joints

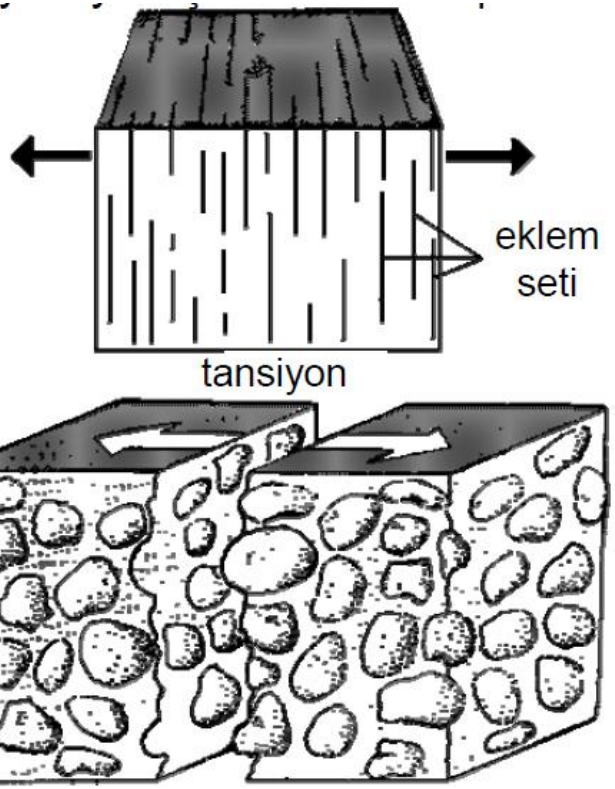
1- Tectonic joints
2- Non-tectonic joints

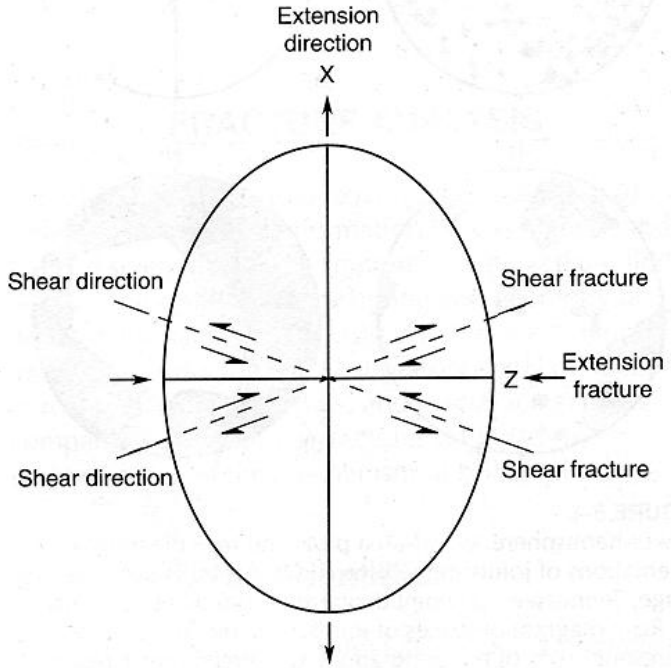
1- Tectonic joints

(a) Extensional joints; (b) Shear joints; (c) Tension gashes



(a) Extensional joints

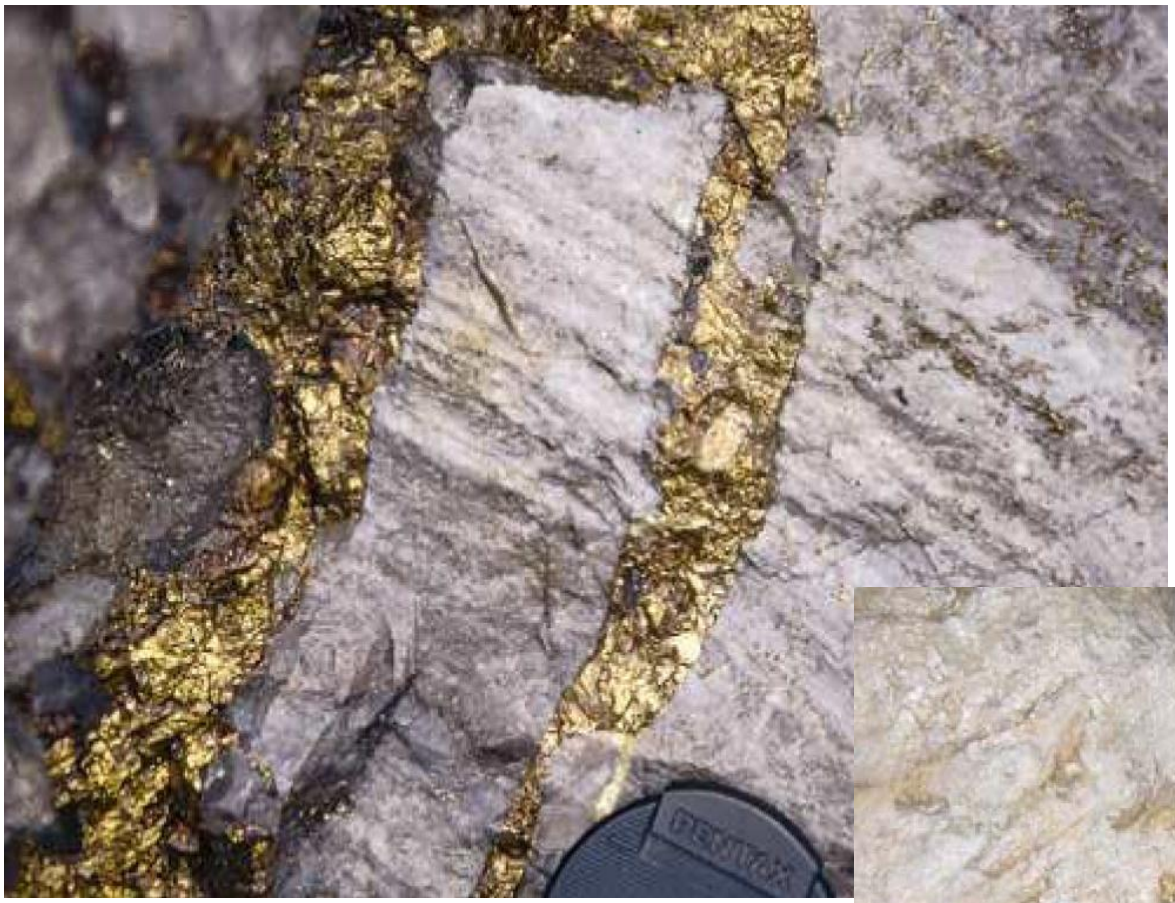


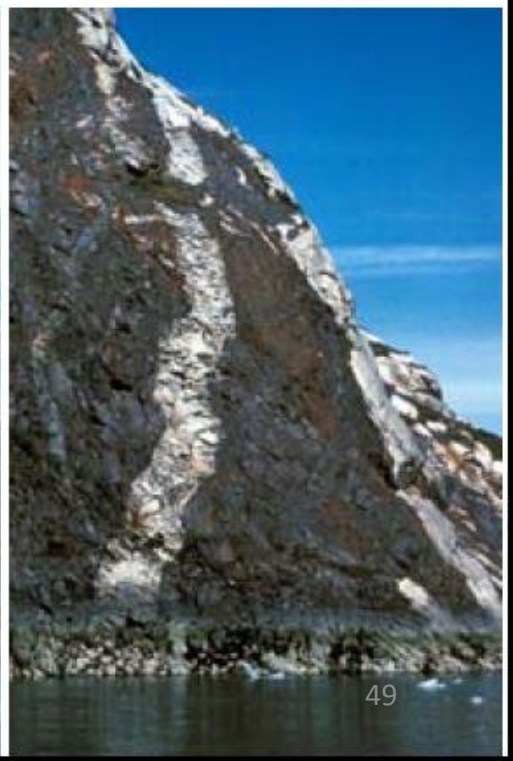


(a) Extensional joints

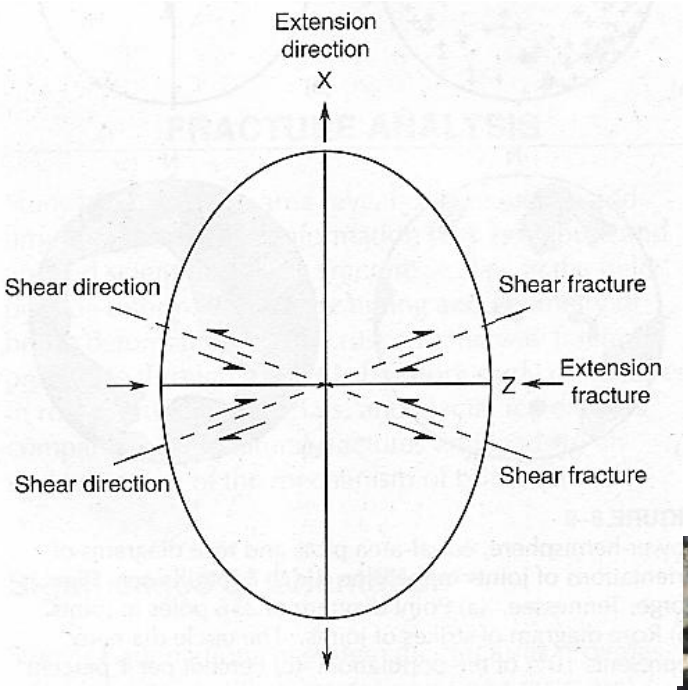
Orthogonal joints

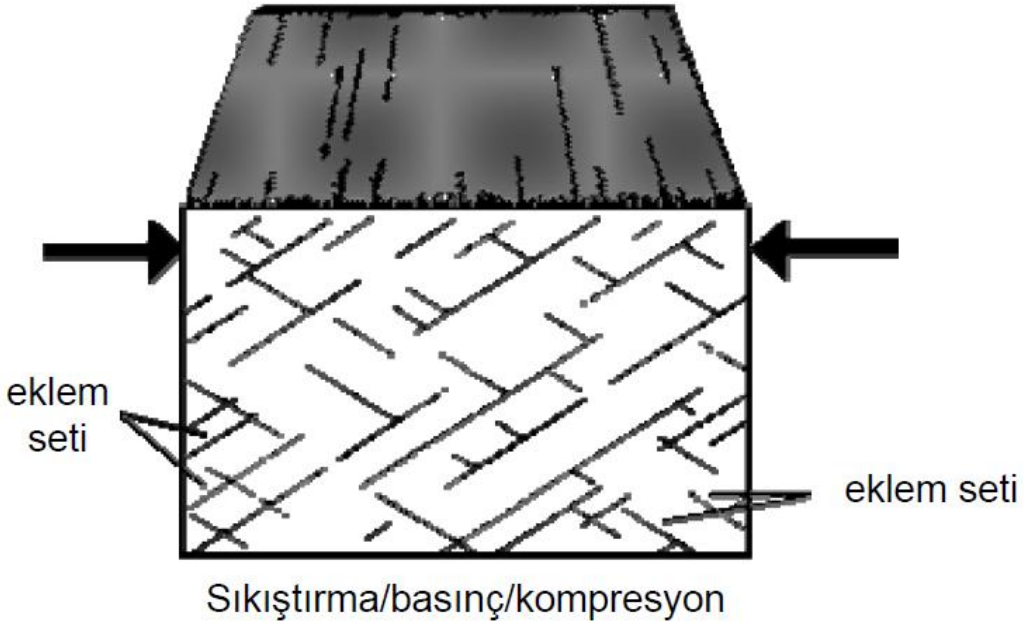
If the space of extensional joints are filled by calcite, quartz or some other minerals, they are named as **veins**.


PENTAX

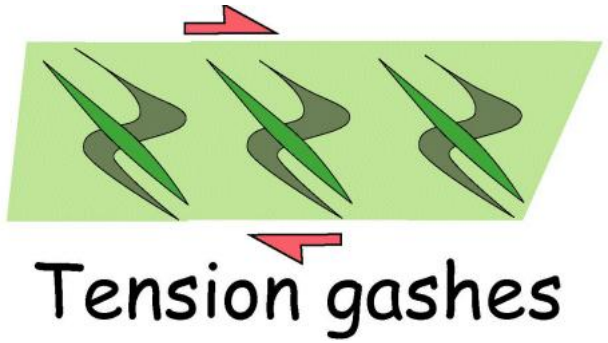


(b) Shear joints

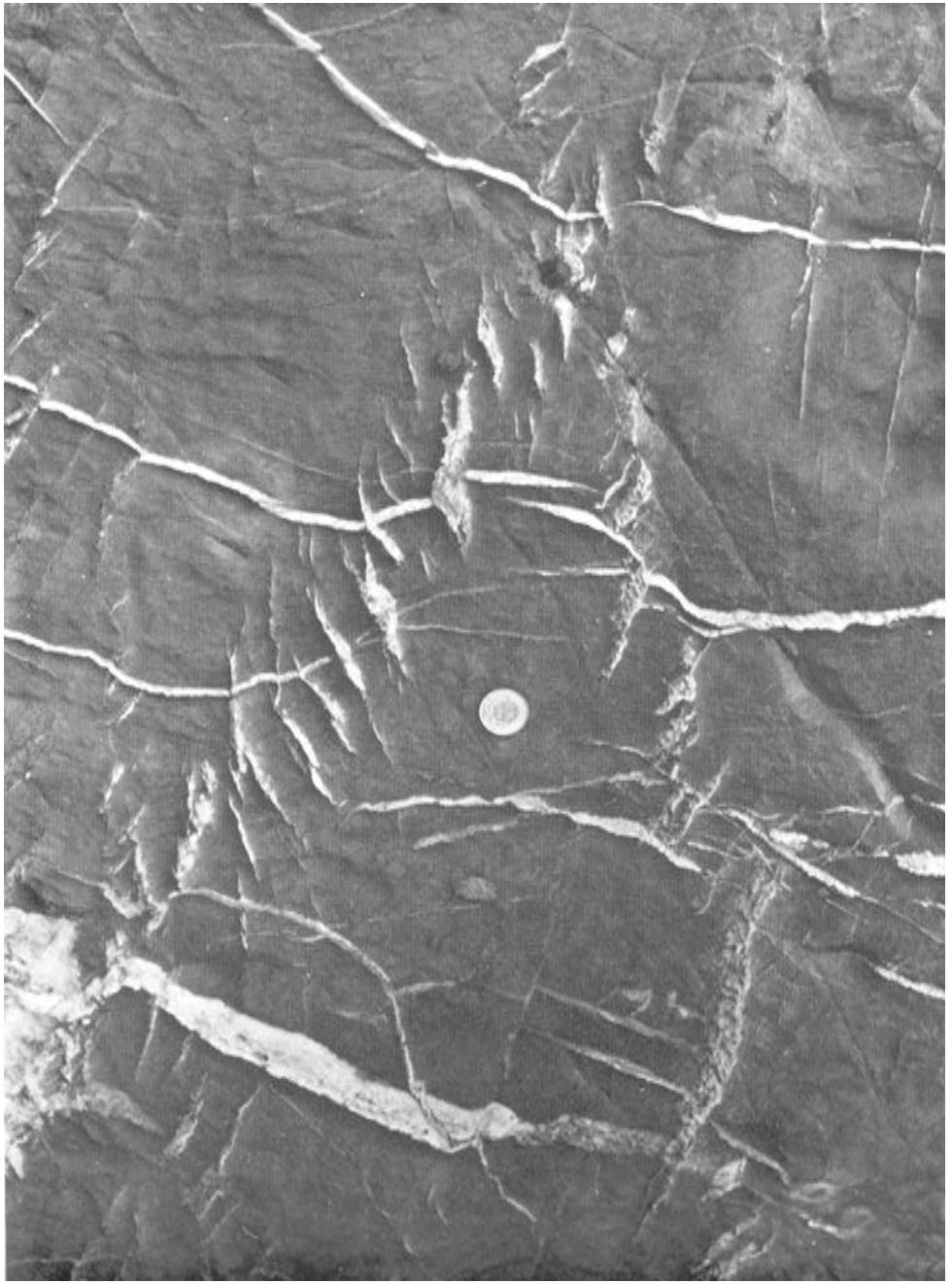


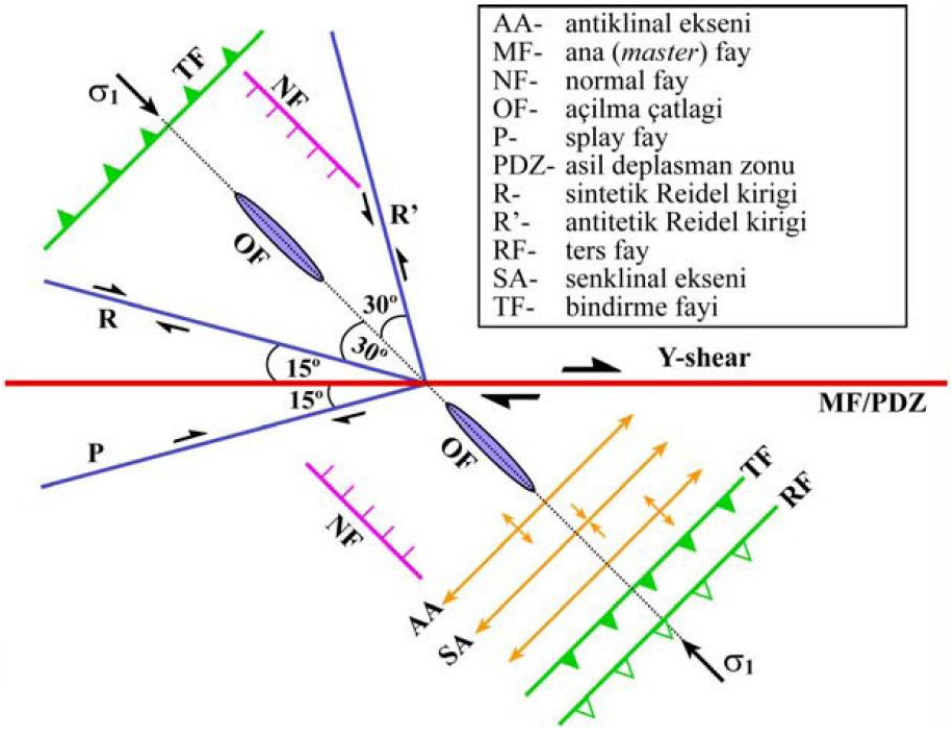


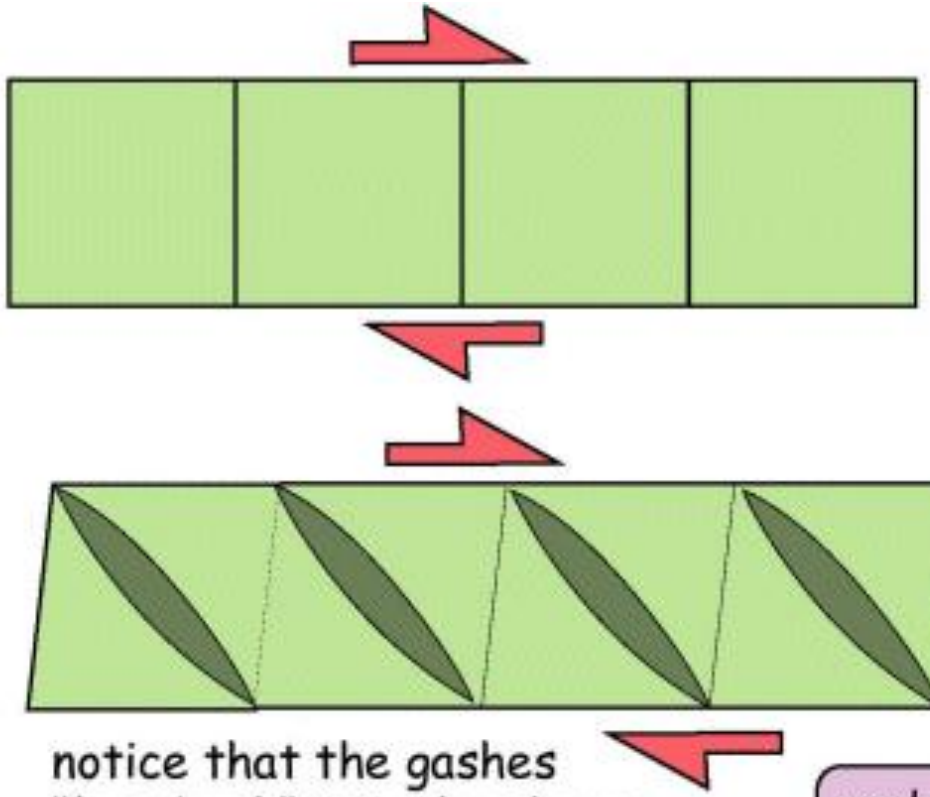
(c) Tension gashes



Tension gashes are a special type of vein that can form rather in spectacular patterns.





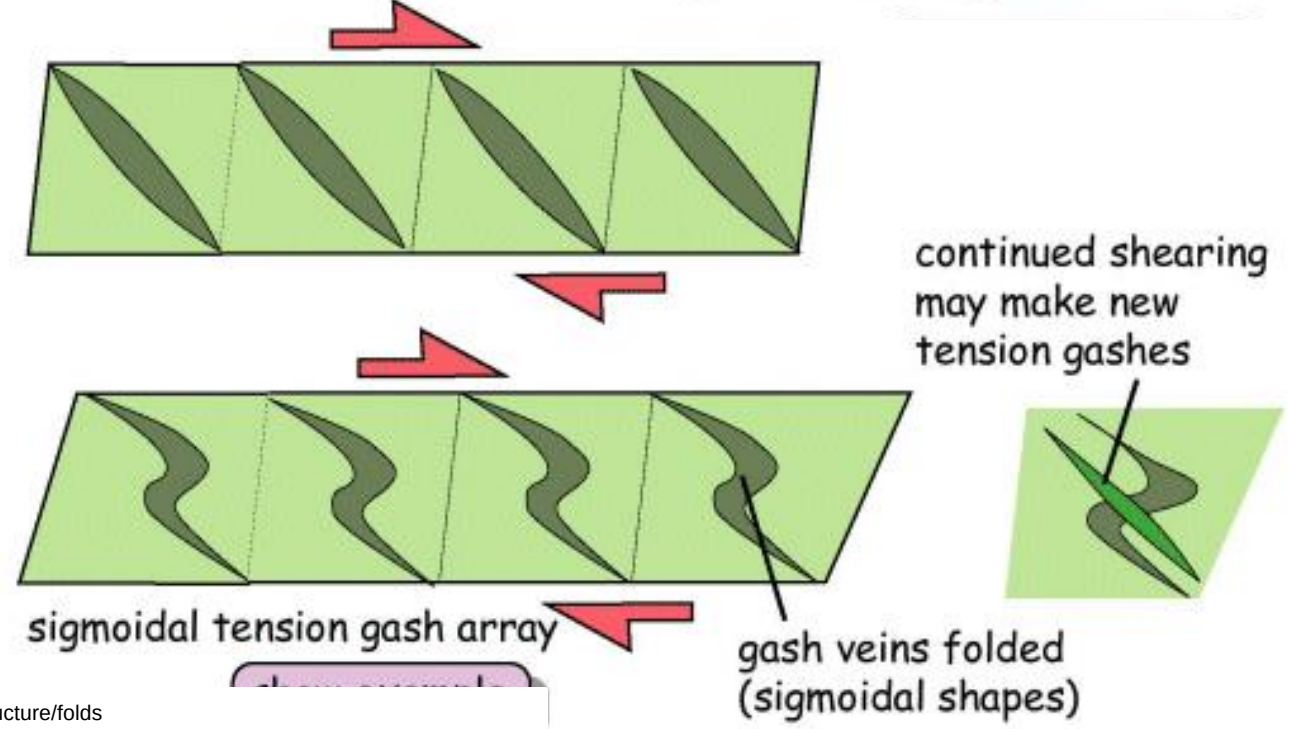


en echelon
tension gash array

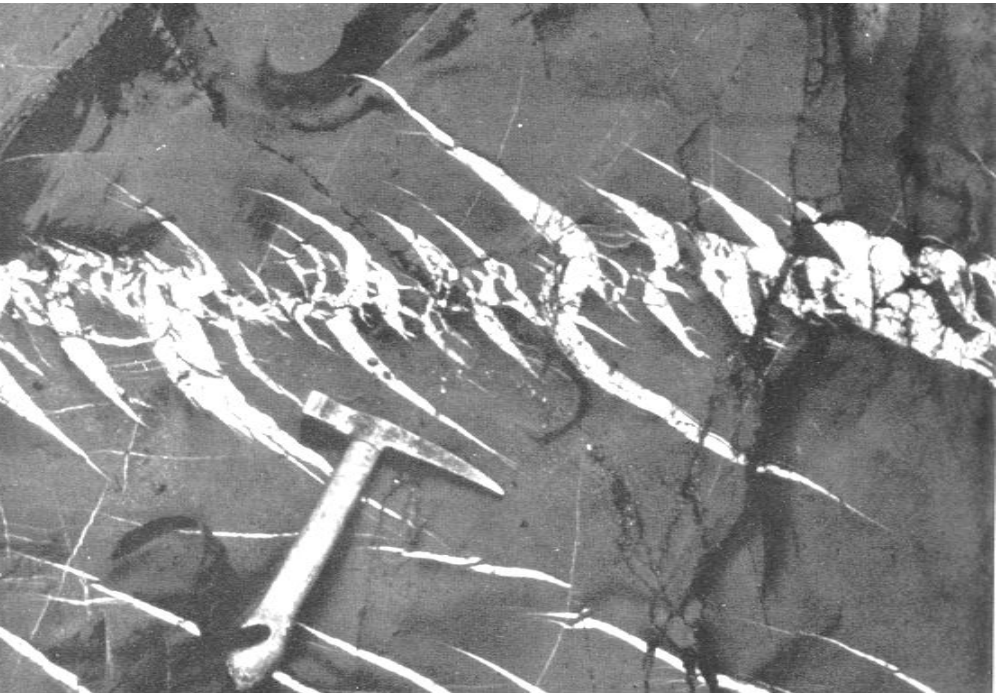
notice that the gashes
"lean back" into the shear

and if shearing continues.....

http://www.see.leeds.ac.uk/structure/folds

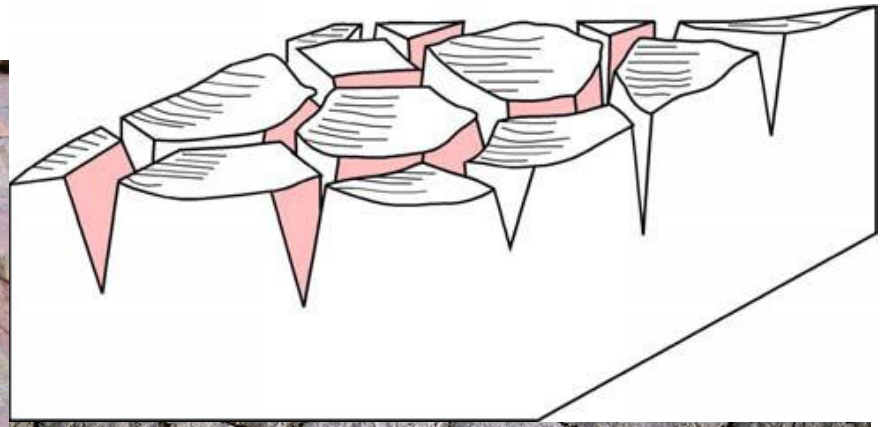


http://www.see.leeds.ac.uk/structure/folds

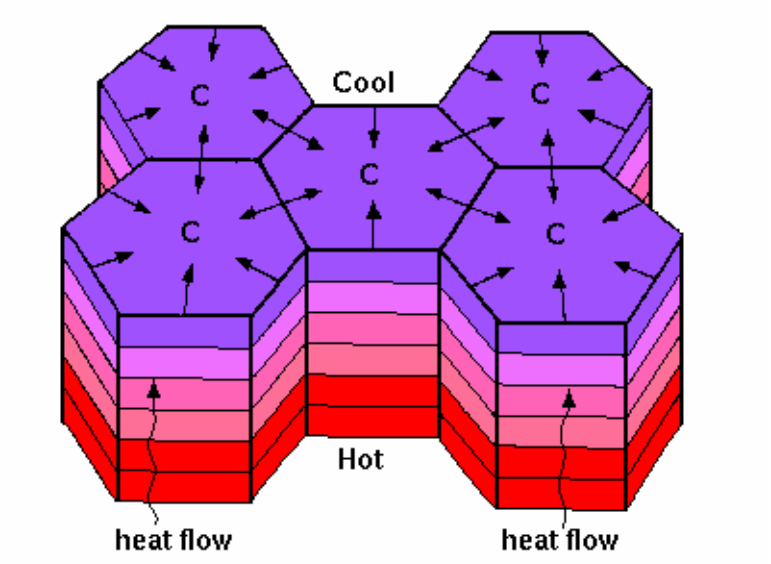


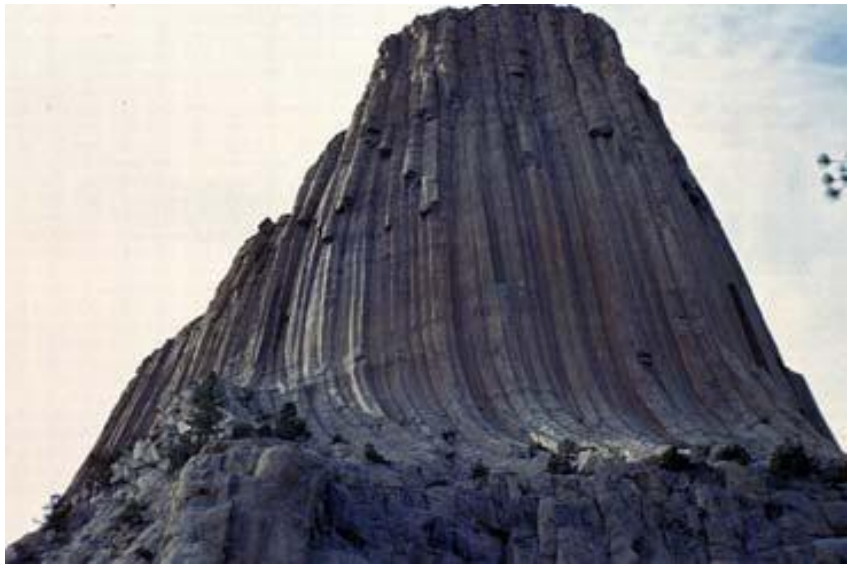
2- Non-tectonic joints

(a) Mud cracks (kuruma çatlakları)



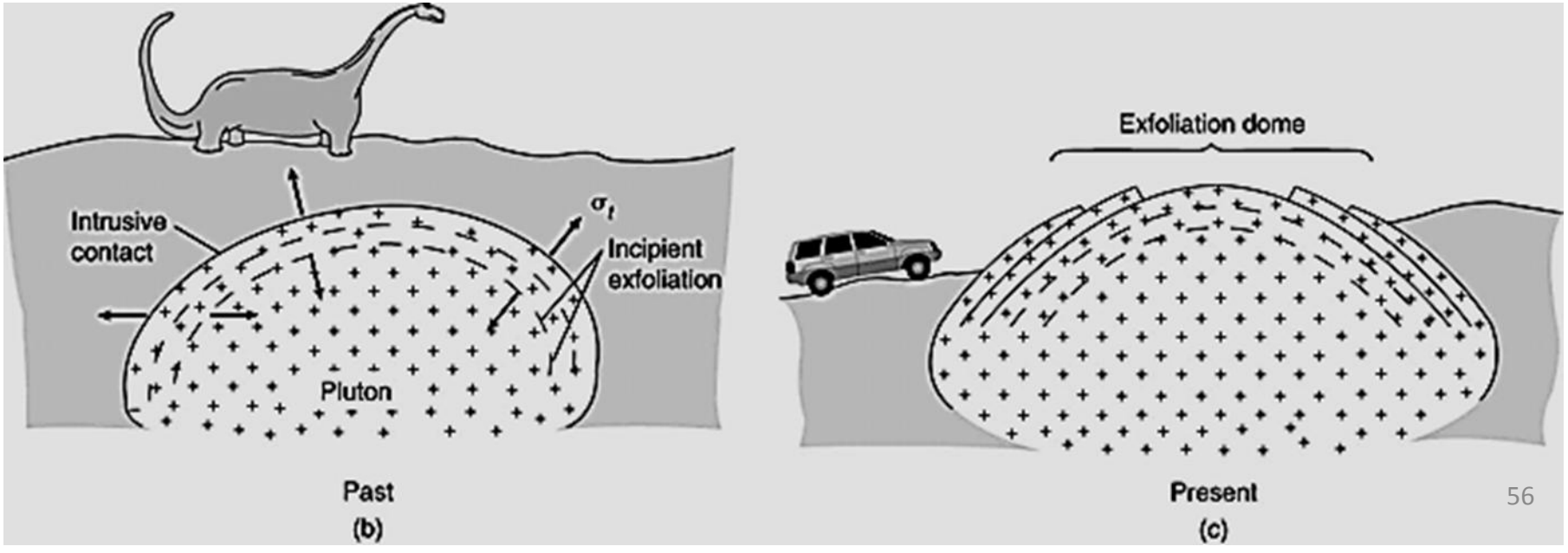
(b) Cooling joints (columnar joints) (soğuma çatlakları)





(b) Sheet joints

Formed by pressure release



UNCONFORMITIES

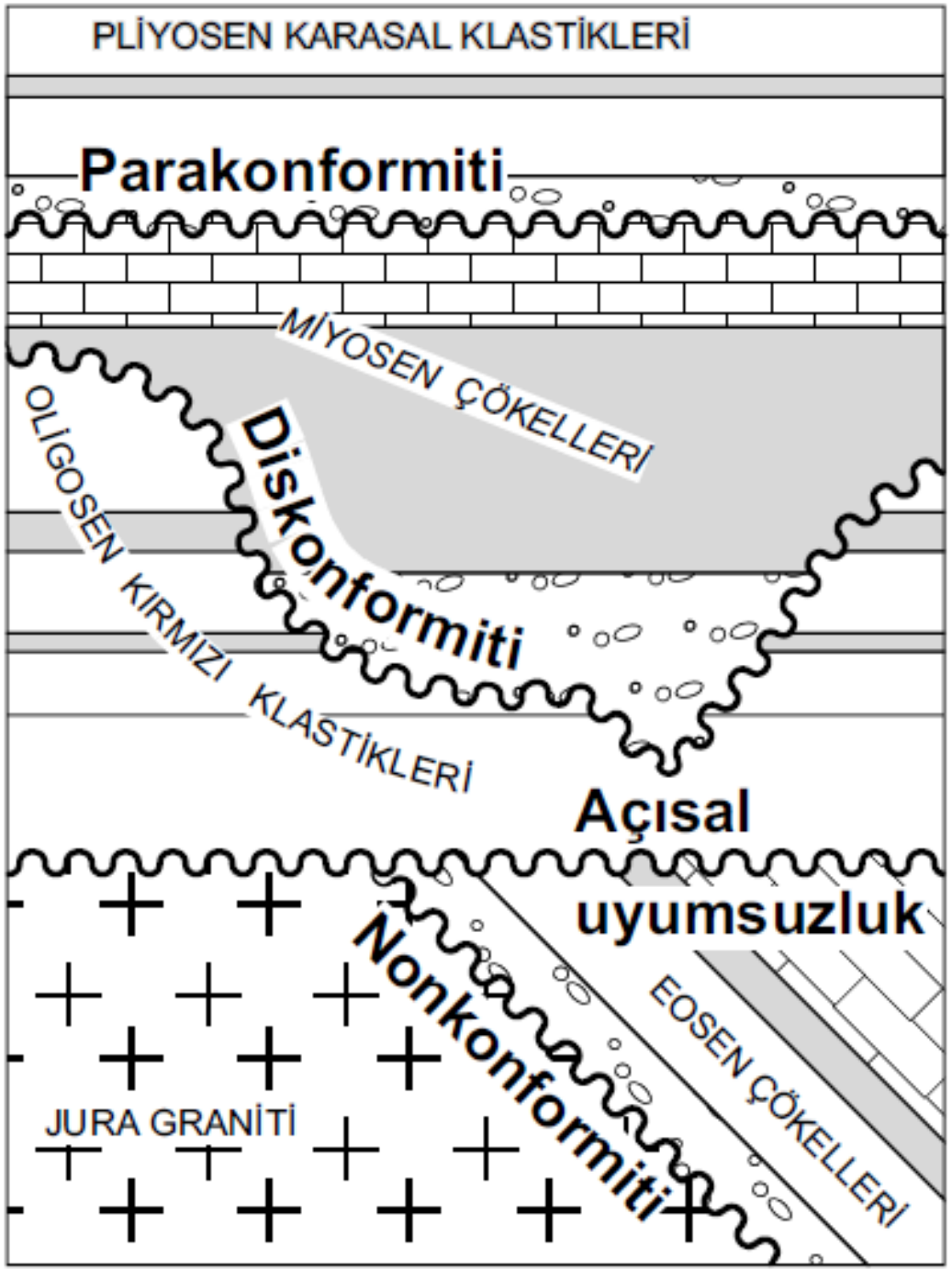
Representing times of nondeposition, erosion or both.

Paraconformity

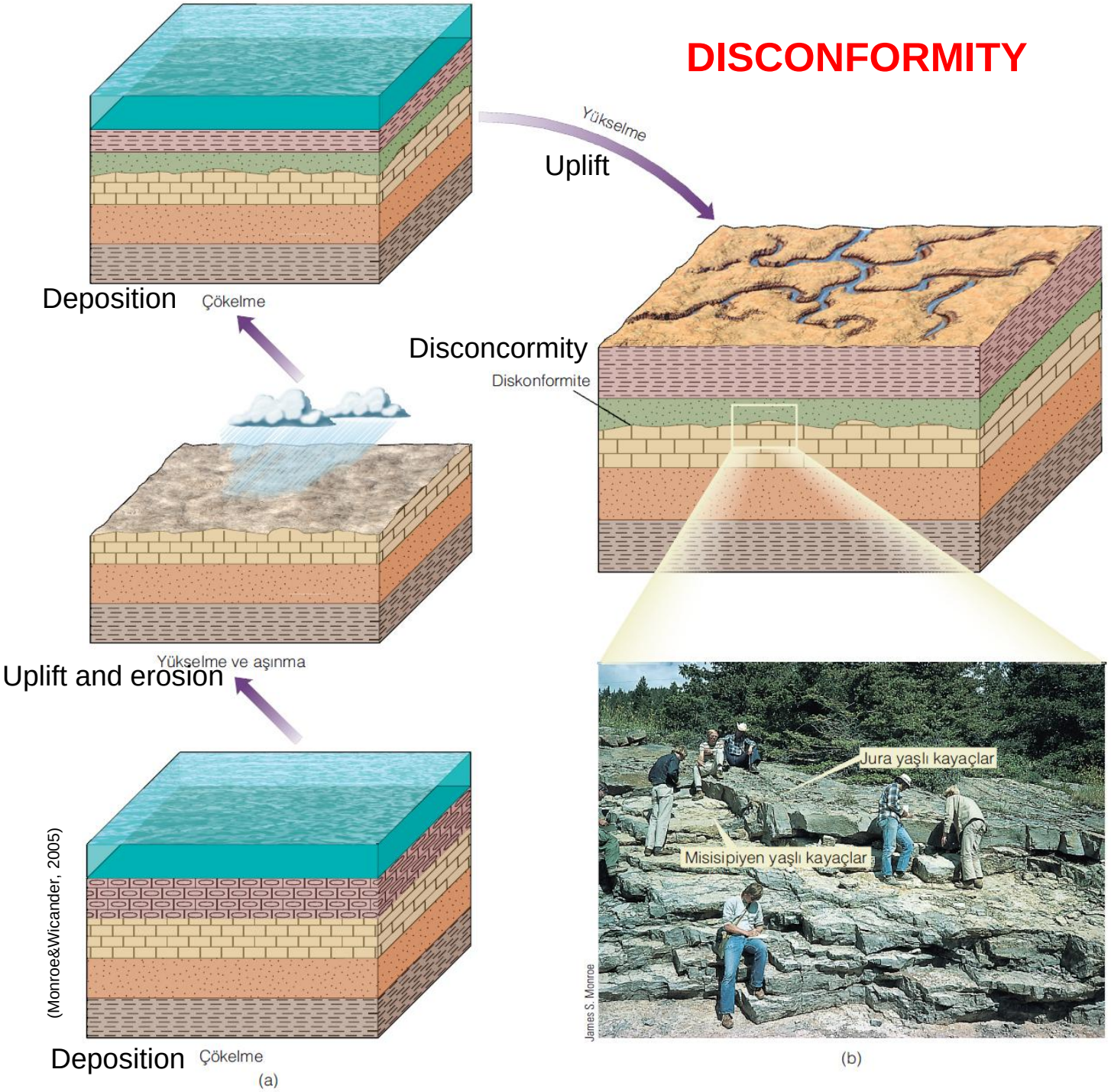
Disconformity

Angular unconformity

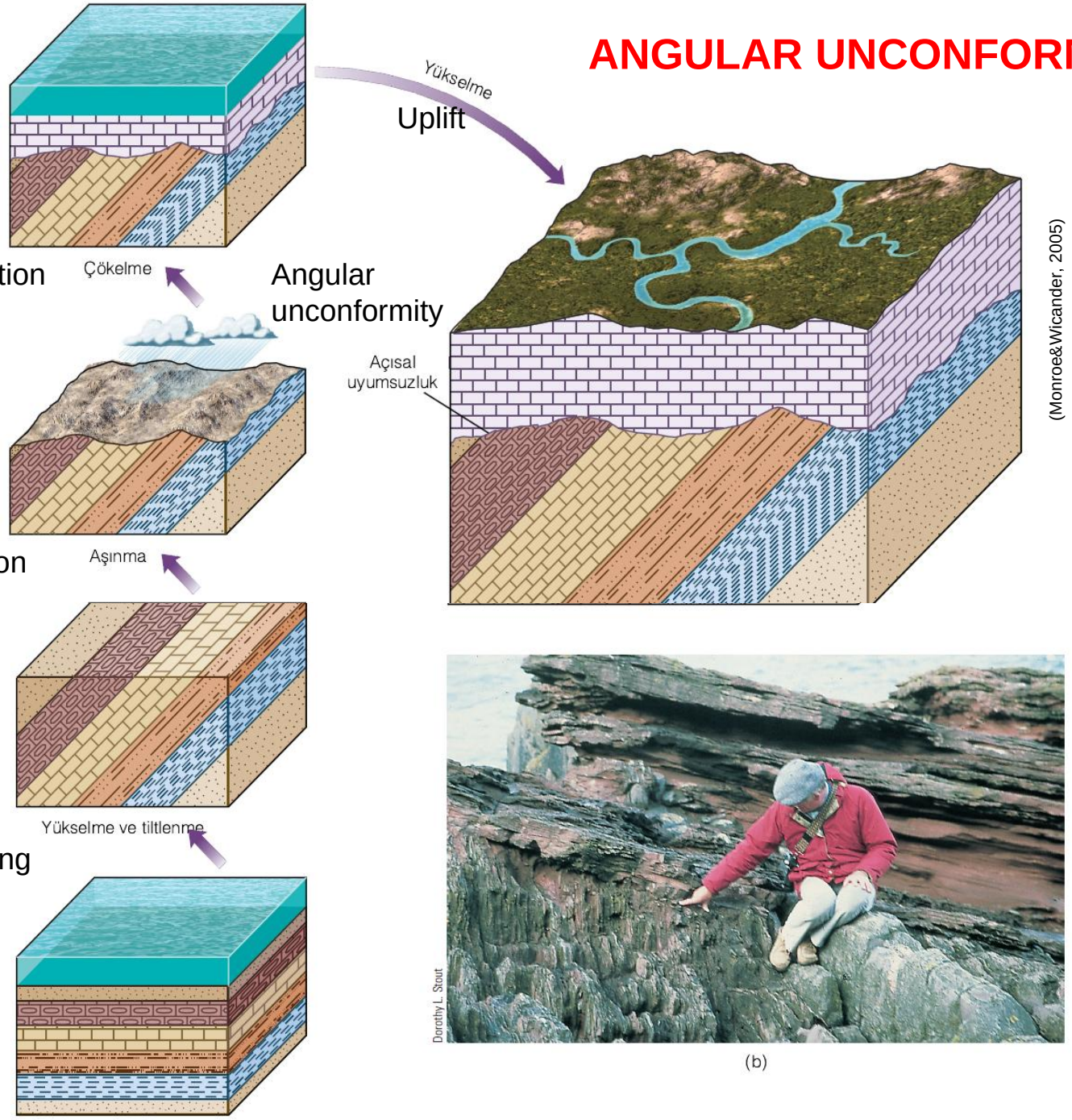
Nonconformity



DISCONFORMITY



ANGULAR UNCONFORMITY



NONCONFORMITY