

University of Anbar

College of Science – Applied Geology Department

Dr. Omar AL-Jarrah

Assis. Professor

4th Stage

Quaternary

Lecture 5: Glacial Movements

Glaciers Movement

The glacier moves by plastic flow the internal deformation in response to pressure , and by basal slip sliding over its underlying surface .

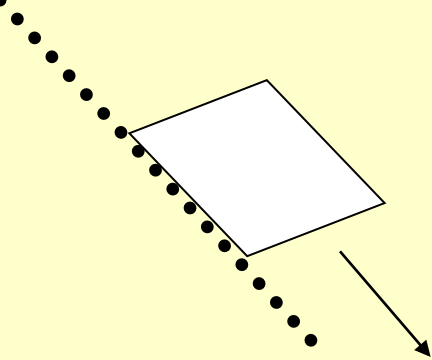
Once a glacier forms it moves from a zone of accumulation toward its zone of wastage (processor area) .

Movement is not uniform

- Velocity increases from head to snow line
- Velocity decreases after snow line

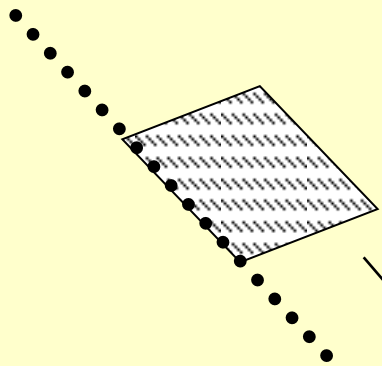
When the snow fall down its soft – brittle – light with density 0.06 – 0.16 called snow field (neve) , then the neve change to (Firn) density 0.72 – 0.84 by effect of Pressure and compact – re crystallization – melting and re frozen , then it change to (Glacial Ice) density 0.9 .

The movement not begin unless the thickness of ice between 30 – 50 m.



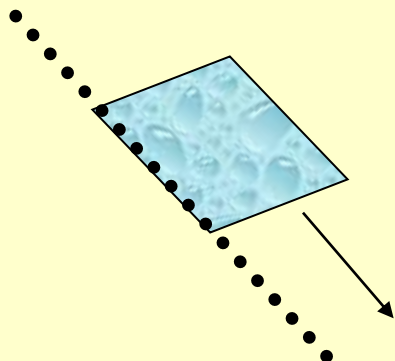
A

Sliding on base : No internal movement



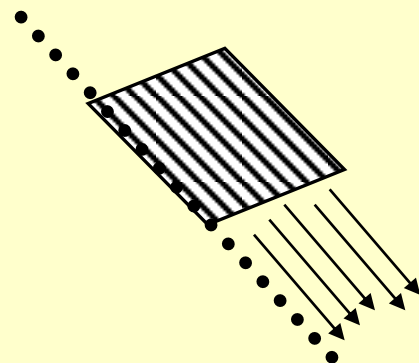
B

Ice crystal will arrange in special way to begin the movement



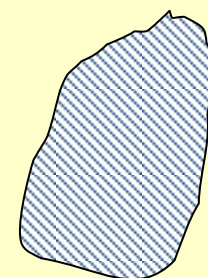
C

Ice face change to liquid or vapor then froze again after movement



D

Internal slip planes with many sliding within the glacial body



E

Inter grain micro sliding plain

Glaciers move by slow deformation of the ice due to increase in pressure from the overlying ice

- Shifting and rotation of ice crystals
- Pressure melting lubricates ice
- Displacement along slip planes

Factors effect the Ice movement

Movement of is dependent on snow accumulation and slope.

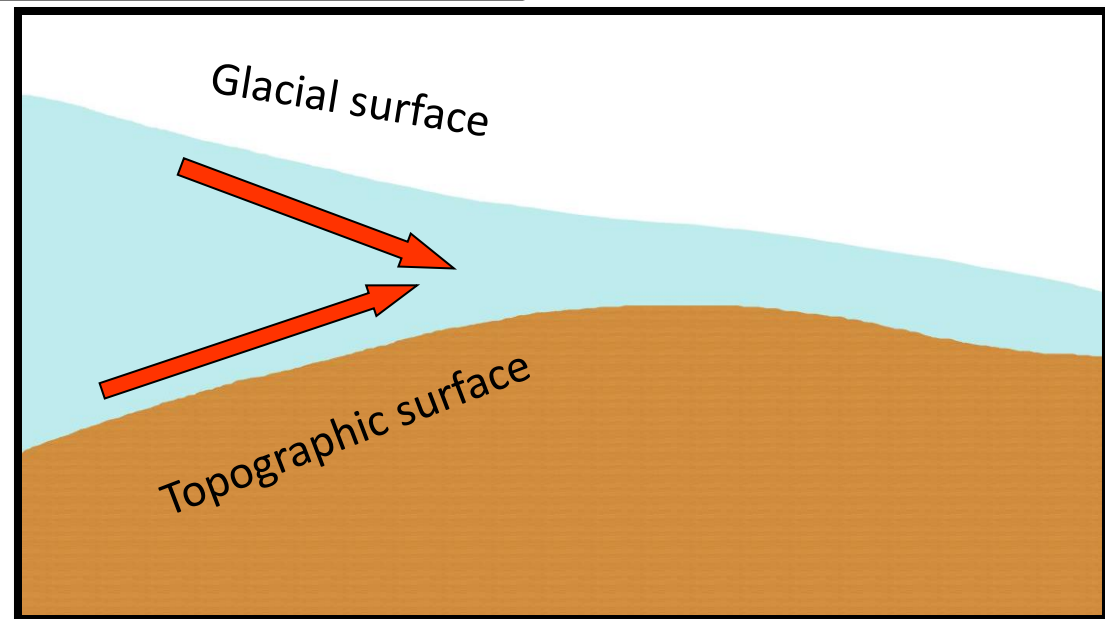
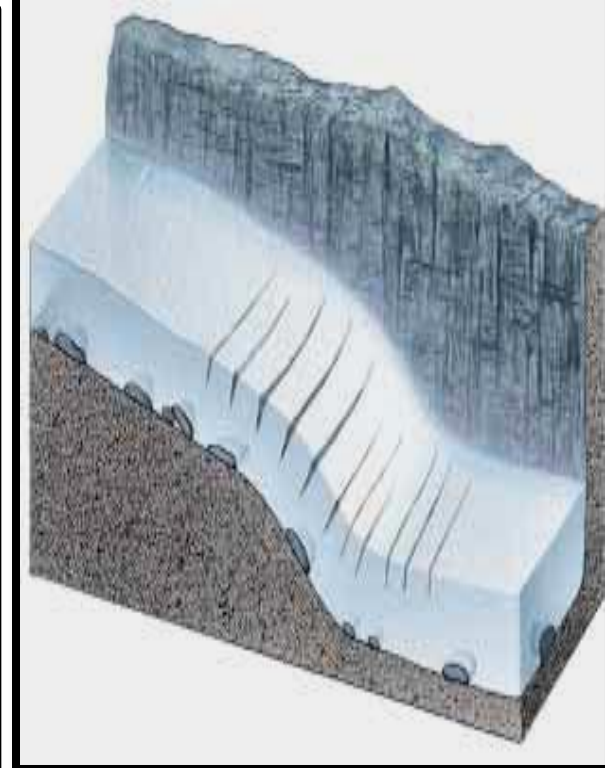
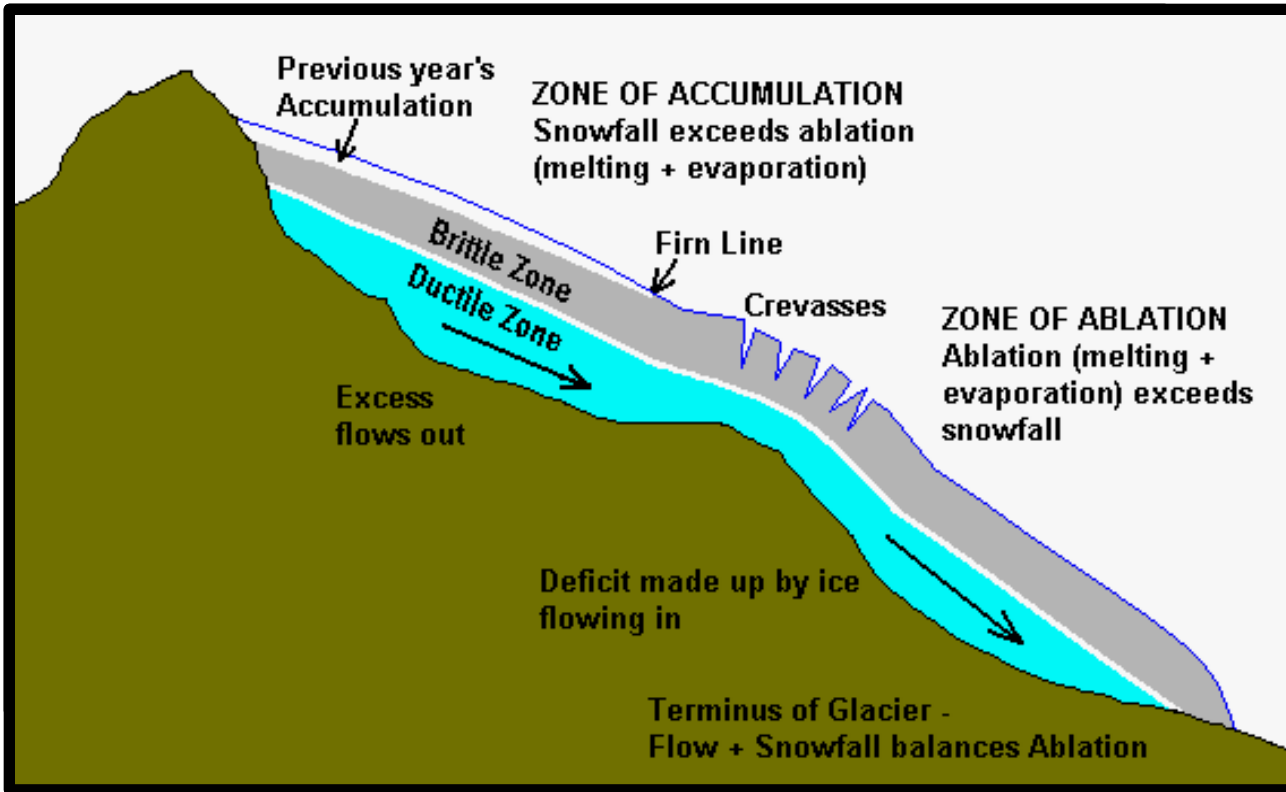
Gravity have the great effect to Ice movement its pulls ice downward & outward.

The different between Glacial movement and water movement that : the ice more density than water therefore the upper surface will control all the movement not the lower topographic surface . So the The Glacial can move some material up to up hill against the topographic surface that material called Erratics

Ice is brittle & ductile

Differential flow velocity creates tensional stress

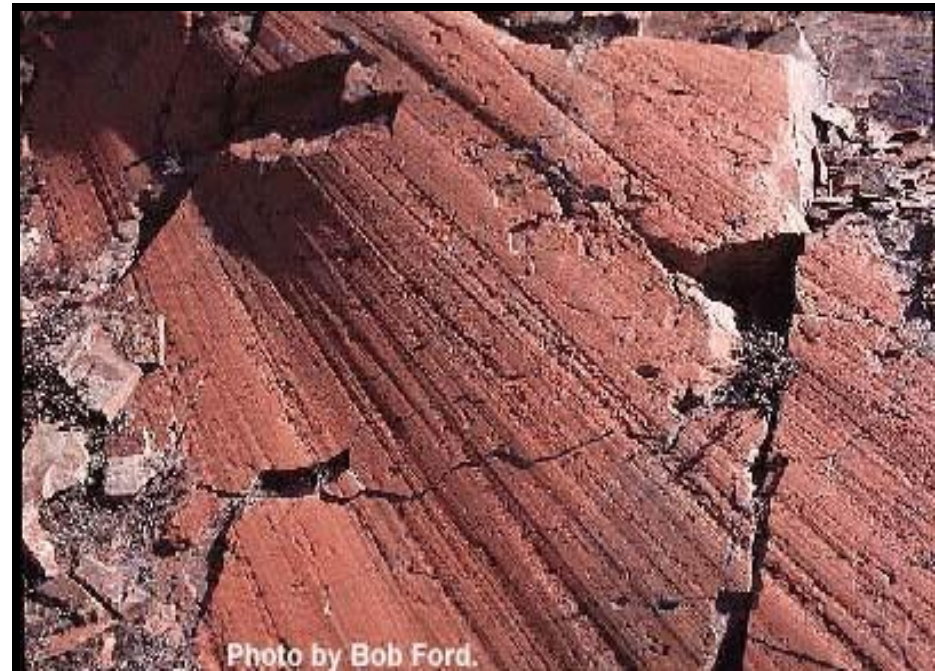
Crevasses form as a result of differential flow



Glacial Erosion

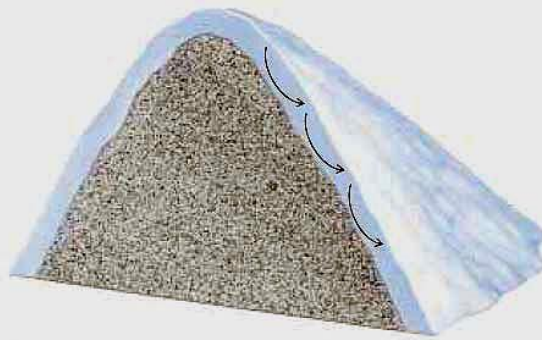
Powerful of erosion

- Up to 0.35 mm/yr
- Ice moving tends to smooth surface
- Plucking pulls up loose fragments or the ice interface at rock joints and pluck up the material inside it
- Ground-up rock abrades surface
- glacial polish the surface pass over

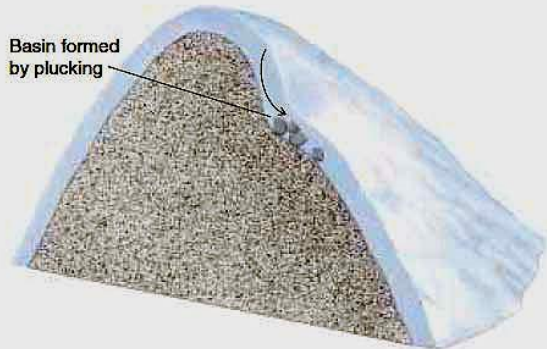




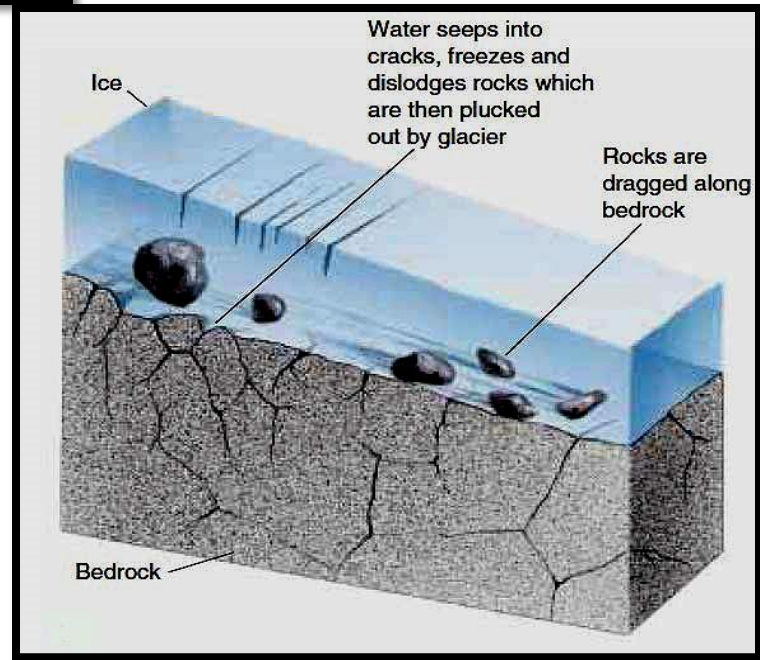
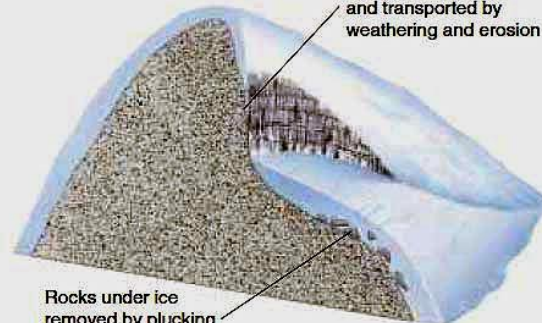
(a)



(b)



Exposed rocks dislodged and transported by weathering and erosion



Glacial Sediment

Glaciers typically deposit poorly sorted non stratified sediment

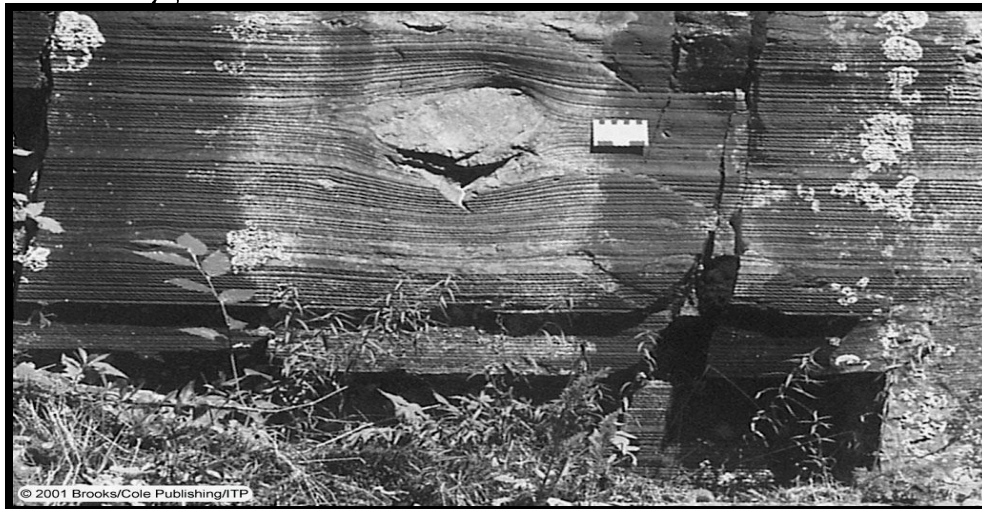
Moraine One of Most important Glacial Sediment



Preglacial Lakes

- The melt water accumulates along a glacier's margin form the PreGlacial Lakes , the Deposits vary considerably from gravel to mud
- of special interest are the finely laminated mud deposits consisting of alternating dark and light layers
 - Each dark–light couplet is a varve
 - representing an annual deposit
- Light-colored layer of silt and clay
 - formed during the summer
- The dark layer made up of smaller particles and organic matter

- formed during the winter when the lake froze over The melt water accumulates along a glacier's margin form the PreGlacial Lakes , the Deposits vary considerably from gravel to mud
- of special interest are the finely laminated mud deposits consisting of alternating dark and light layers
 - Each dark–light couplet is a varve
 - representing an annual deposit
- Light-colored layer of silt and clay
 - formed during the summer
- The dark layer made up of smaller particles and organic matter
 - formed during the winter when the lake froze over



References

Glacial and Quaternary Geology

http://www.colby.edu/geology/GE354/Index_GE354.html

Internet Remote Sensing Lectures sites