

University of Anbar
Department of Applied Geology
Ramadi-Iraq
Mahmood H. D. Al-Kubaisi

Lecture (7)

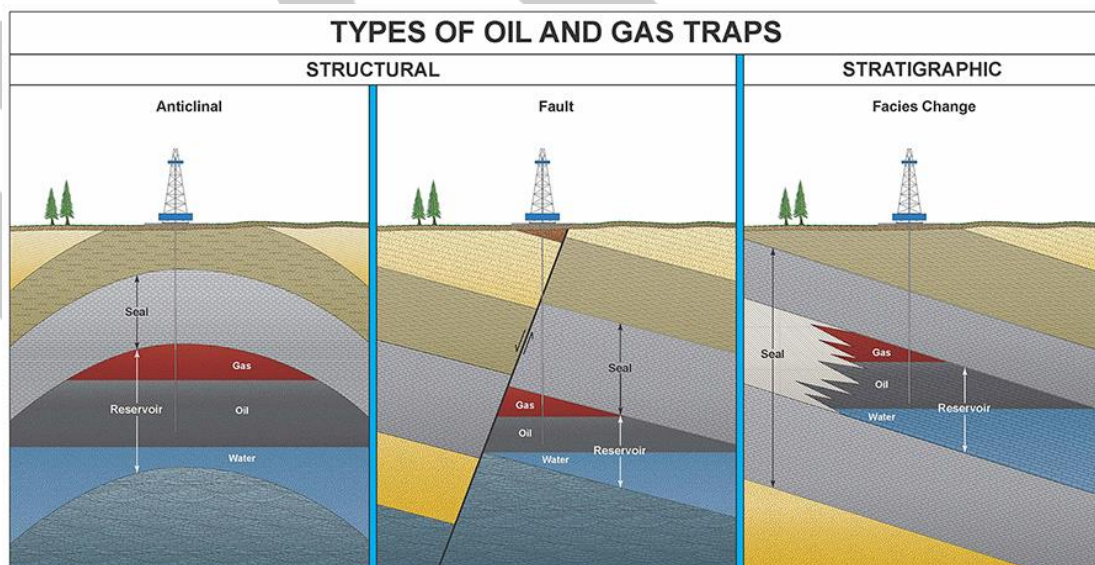
Groundwater activity

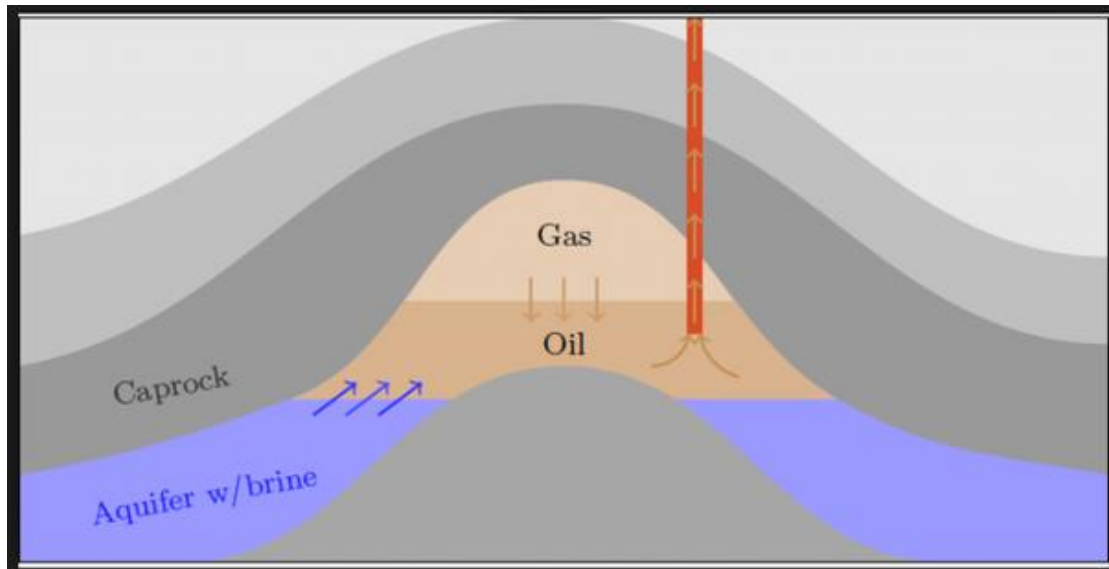
The geological work of groundwater is determined by the extent of its activity and its mechanical and chemical effect on rocks and the environment.

1. Mechanical activity:

Mechanically, groundwater activity is through movement and velocity of groundwater flow and spread within the aquifers between the recharge and discharge areas and through fluctuating levels and their relation to water bodies. Therefore, groundwater has a physical activity that can be summarized as follows:

- Groundwater through its movement helps the migration of oil and gas.





- Groundwater transfers the results of the chemical work of groundwater on rocks (weathering results), in a soluble load (salts and ions) between recharge and discharge areas.



- Groundwater near the surface, transport the salts, and then deposition in the soil. It is a negative factor in influencing the agricultural environment.



- Fluctuating of groundwater levels creates engineering problems for the foundations of buildings. Where the low groundwater levels in sediment under the buildings lead to the compression of soil and occurrence subsidence. And the high groundwater levels may lead to high rates of salts in the foundations of buildings.



- The presence of groundwater in geological strata, directly effect on the landslides.



- The transition of the ground temperature through the springs helps greatly in creating thermal balances of the earth.



2. Chemical activity:

The chemical activity of groundwater is divided into three sections: Dissolution, Replacement, and Deposition.

- Dissolution: groundwater dissolves a lot of rock minerals depending on the amount of acid or alkaline water in addition to water temperature.

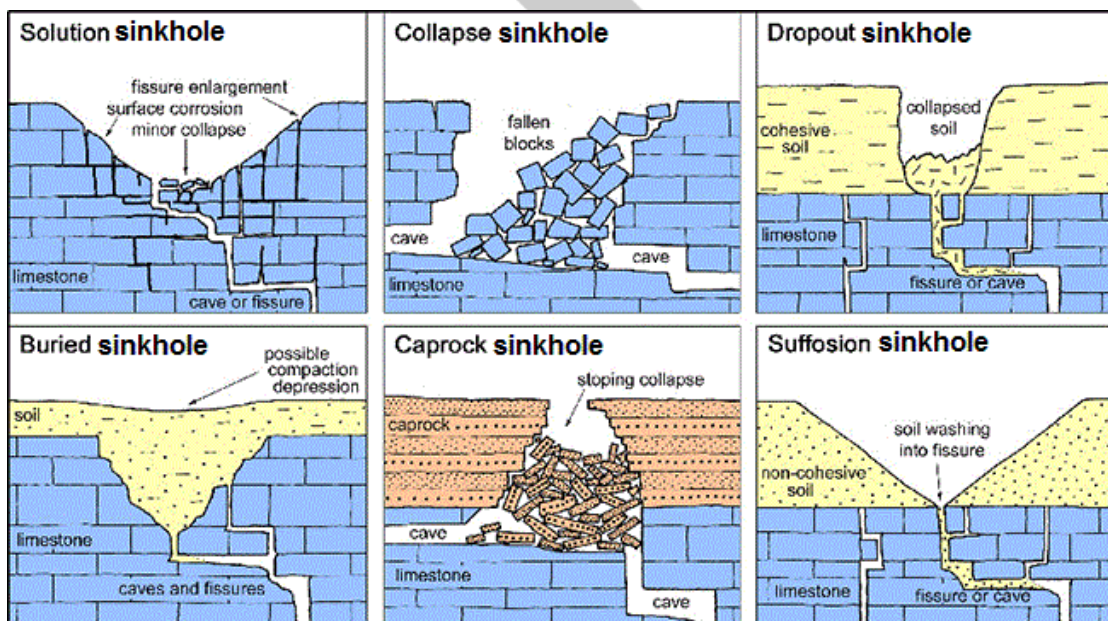
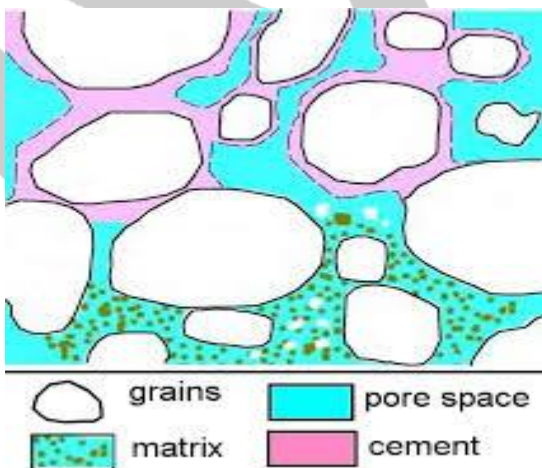


Fig. --: Dissolve limestone rocks and forming different types of Sinkholes.

- **Replacement:** Is the process of deposition of minerals carried by groundwater to replace organic matter (plant and animal residues) buried in sediments. Such as the replacement of silica to replace plant wood for conversion into fossils. And Iron oxide replaces the leaves and snails of animals, this is known as the process of fossilization.



- Deposition: Deposition occurs from groundwater when the concentration of ions in the groundwater reaches the degree of saturation. Then start process deposition of minerals in the pores of the rock to be the cement. Or in cracks and fractures to form veins. Or in caves as in the deposition of stalactites and stalagmites. Or calcite and silica minerals may be deposited around springs and geysers.





Springs

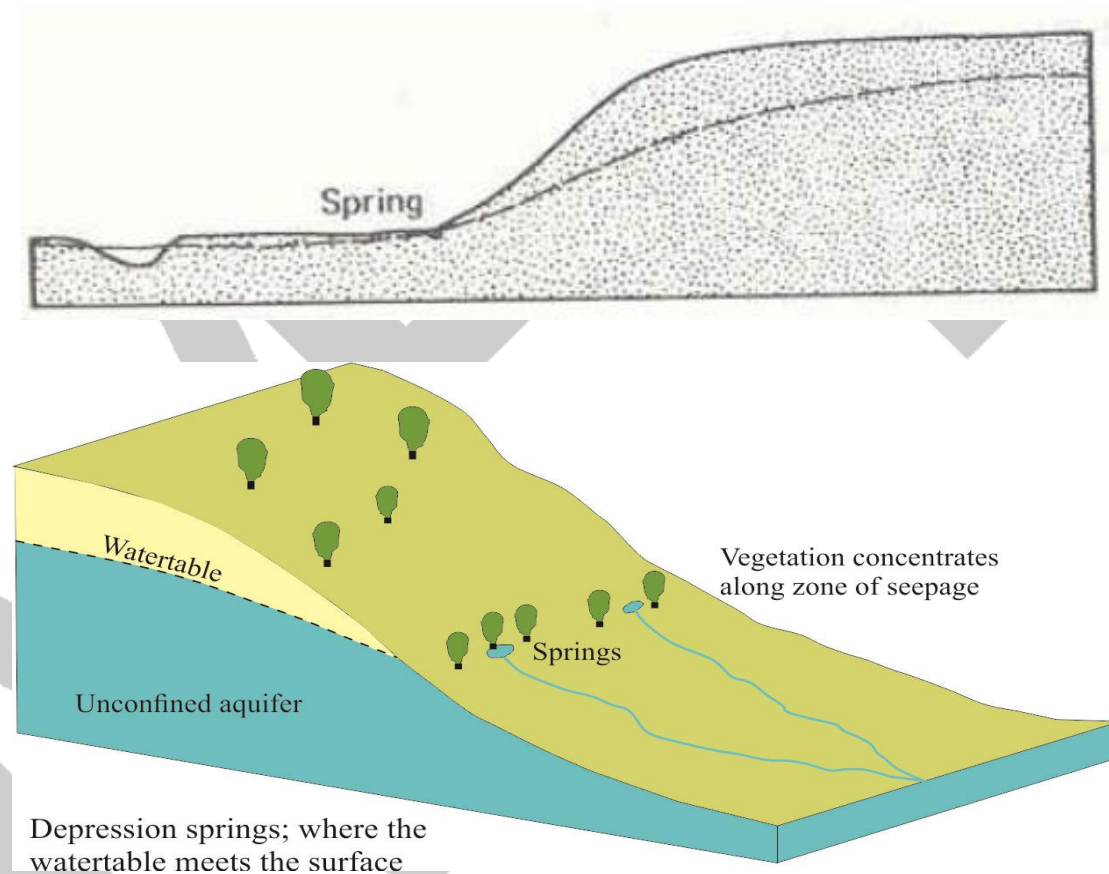
Spring is a concentrated discharge of groundwater appearing at the ground surface as a current of flowing water. To be distinguished from springs are seepage areas, which indicate a slower movement pond and evaporate or flow, depending on the magnitude of the seepage, the climate, and the topography.

Springs occur in many forms and have been classified as to cause, rock structure, discharge, temperature, and variability.

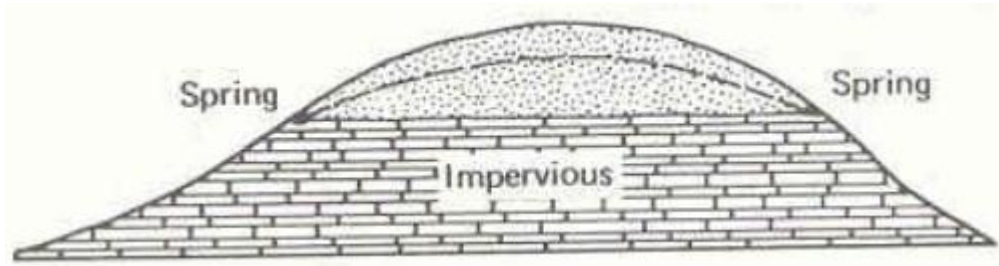
Springs can be divided into (1) those resulting from no gravitational forces, and (2) those resulting from gravitational forces. The first category of springs is included volcanic springs, associated with volcanic rocks, and fissure springs, resulting from fractures extending to great depths in the earth's crust.

Gravity springs result from water flowing under hydrostatic pressure; the following general types are recognized.

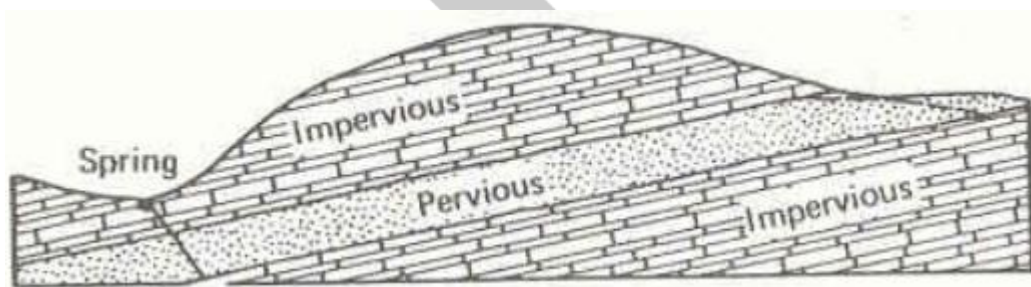
1. Depression Springs – formed where the ground surface intersects the water table.



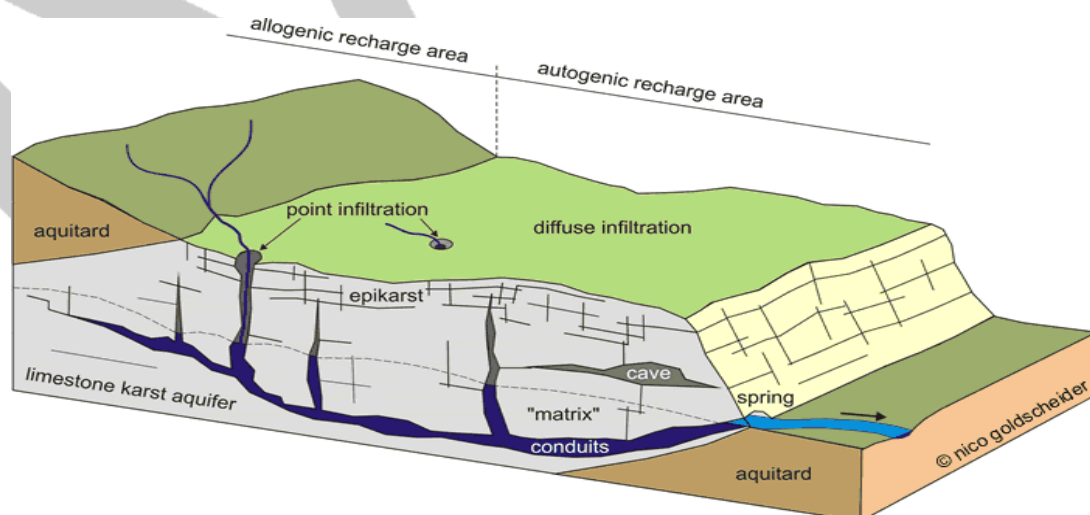
2. Contact Springs – created by permeable water-bearing formation overlying a less permeable formation that intersects the ground surface.



3. Artesian Springs – resulting from releases of water under pressure from confined aquifers either at an outcrop of the aquifer or through an opening in the confining bed.



4. Tubular or fracture Springs – issuing from rounded channels, such as lava tubes or solution channels, or fractures in impermeable rock connecting with groundwater.



References:

- **Groundwater hydrology third edition**, Todd, D. K. 2005.
- **Analysis and Evaluation of Pumping Test Data**, Kruseman, G. P., and de Ridder, N. A. 1994.
- **Hydrogeology Principles and Practice**, Second Edition, Kevin M. Hiscock and Victor F. Bense.
- **Watershed management**, Prof. T I Eldho, Department of Civil Engineering, IIT Bombay.
- **Manual on artificial recharge of groundwater**, Central Ground Water Board 2007.
- Getting Up to Speed, for “**Ground Water Contamination**” is adapted from US EPA Seminar Publication.
- **Lectures** by Professor Bayan Muhie Hussien. 2011.