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Lecture (1)
Introduction

What is hydrogeology?

Quite literally hydrogeology is (hydro- meaning water, and -geology meaning the study of the Earth). However, the terms groundwater hydrology, geohydrology, and hydrogeology are often used interchangeably, which is specialized in the study of water under the surface of the earth, from where of their occurrence, distribution, movement, physical and chemical properties, classification and geological interaction of water in the Earth's crust (commonly in aquifers).

Hydrogeology depends on geology, meteorology, soil science, chemistry, physics, mathematics, and engineering. Groundwater engineering, another name for hydrogeology, is a branch of engineering which is concerned with groundwater movement and the design of wells, pumps, and drains.

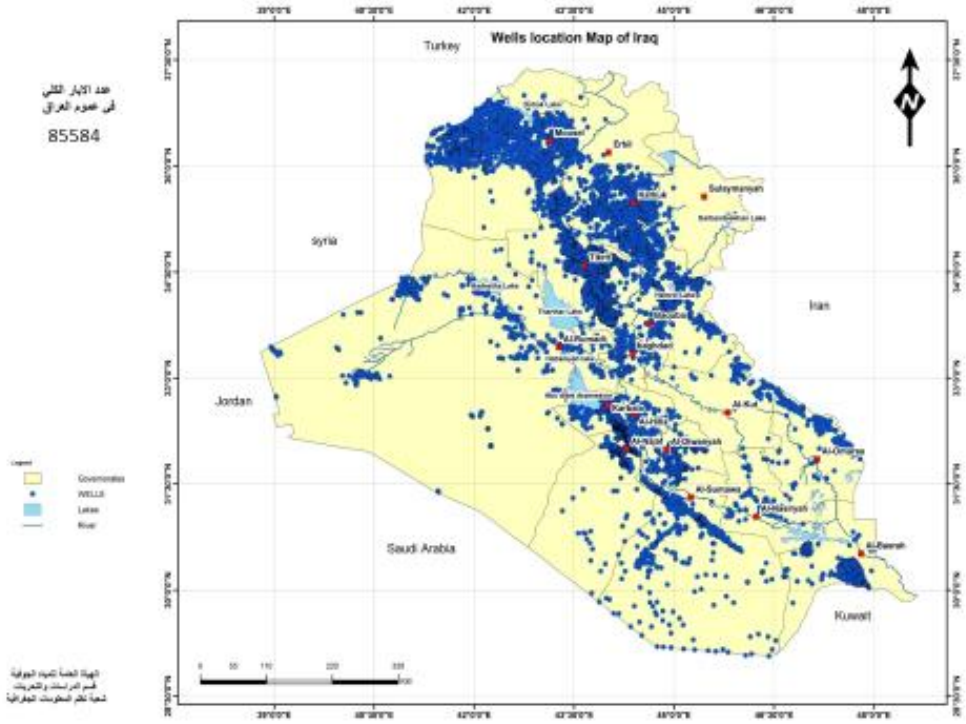
Hydrogeology dealing with the flow of water through aquifers and other shallow porous media (typically less than 450 m below the land surface). The very shallow flow of water in the subsurface (the upper 3 m) is pertinent to the fields of soil science, agriculture, and civil engineering, as well as to hydrogeology.

Groundwater is a natural resource

Groundwater is the water present beneath Earth's surface in soil pore spaces and the fractures of rock formations. Formed as a result of the penetration of water located above the ground to the bottom and moving

towards drainage areas, it may naturally flow to the surface of the earth in springs.

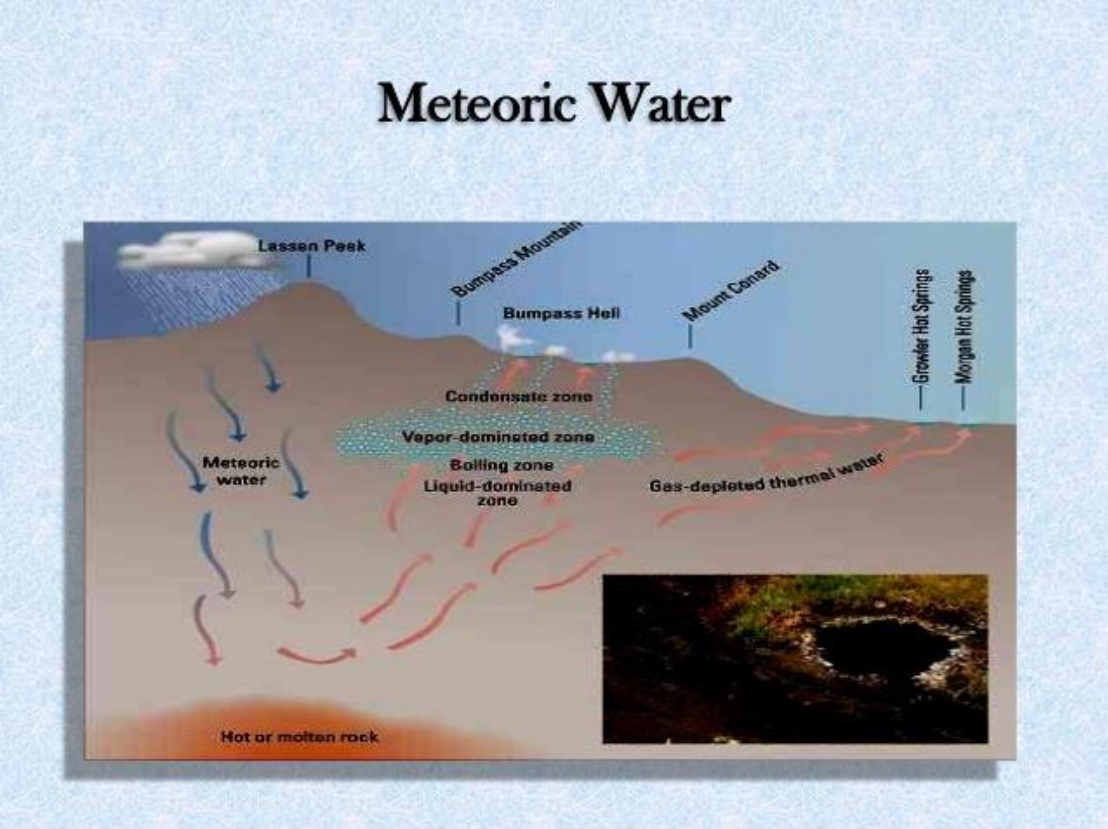
Groundwater is an important natural resource. Worldwide, more than 2 billion people depend on groundwater for their daily supply (Kemper 2004). With rapid population growth, groundwater abstractions have tripled over the last 40 years, due to the rapid increase in irrigation development in the 1970s (World Bank 2007).



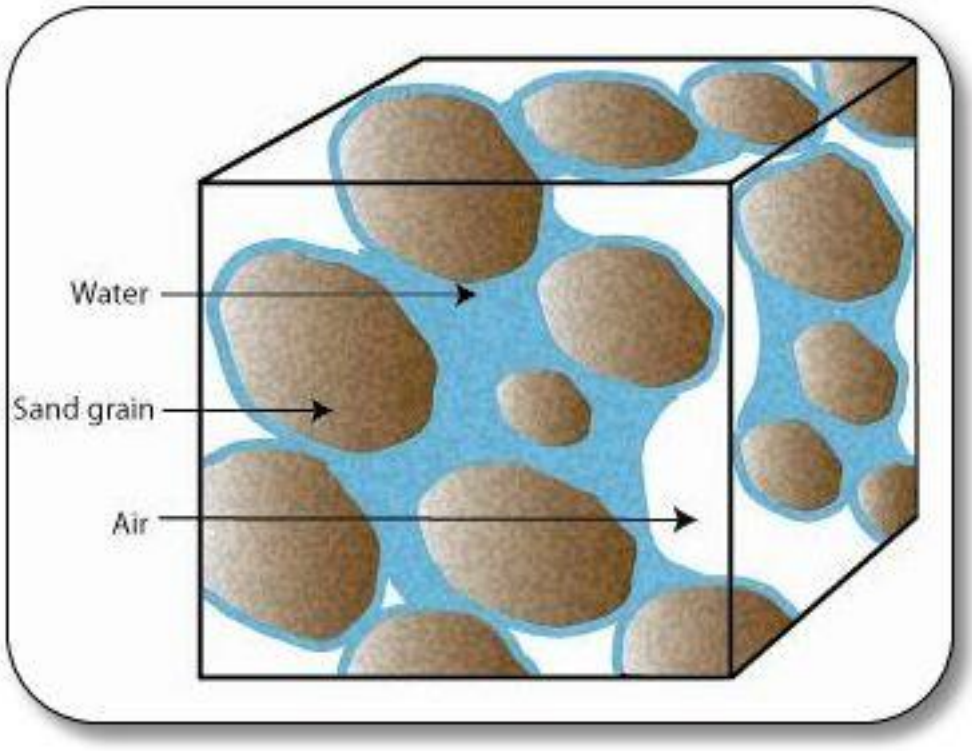
Origin of Groundwater

The origin of groundwater is one of the following:

1. Groundwater derived from rainfall and infiltration within the normal hydrological cycle. This kind of water is called ***meteoric water***. The name implies recent contact with the atmosphere.



2. Groundwater at great depths in sedimentary rocks as a result of water having been trapped in marine sediments at the time of their deposition. This type of groundwater is referred to as ***connate waters***. These waters are normal saline. It is accepted that connate water is derived mainly or entirely from entrapped seawater as the original seawater has moved from its original place. Some trapped water may be brackish.



Fossil water if fresh may be originated from the fact of climate change phenomenon, i.e,. some areas used to have wet weather, and the aquifers of that area were recharged and then the weather of that area becomes dry.

3. ***Magmatic water*** or ***juvenile water*** is water that exists within, and in equilibrium with, a magma. This water is rich in volatile fluids, minerals, and dissolved salts at high temperatures that are derived from magma. This magmatic water is released into the atmosphere during a volcanic eruption. Magmatic water may also be released as hydrothermal fluids during the late stages of magmatic crystallization or solidification within the Earth's crust.

Occurrence of groundwater

Groundwater is water that exists in the pore spaces and fractures in rocks and sediments beneath the Earth's surface. It originates as rainfall or snow and then moves through the soil and rock into the groundwater system, where it eventually makes its way back to the surface streams, lakes, or oceans.

To know the occurrence of groundwater requires knowledge of the vertical and lateral distribution of groundwater in the crust. This distribution is based on a combination of hydrological factors, structural geology, and the properties of sediments in the range of the possibility of water storage or transport, these properties must be studied to determine how much water can be obtained from the ground.

* Porosity, which is the property of a rock possessing pores or voids.

* Saturated and unsaturated zones.

* Permeability, which water can flow through the rock.

* Aquifer, which is a geologic formation sufficiently porous to store water and permeable enough to allow water to flow through them in economic quantities.

* Storage coefficient, which is the volume of water that an aquifer releases from or takes into storage per unit surface area of aquifer.

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