

KARST HYDROGEOLOGY



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What is a Karst ?

- **Definition:**
 - ✓ Karst is a term used to denote the topography over limestones, dolomites or gypsum rich rocks where there are sinkholes, caverns and lack of surface streams.
- **Mainly refers to carbonate rocks:**
 - ✓ Limestones (CaCO_3) or Dolomites ($\text{MgCa}[\text{CO}_3]_2$)



Formation of Carbonate rocks

- Physical deposition:
 - Clastic nature (formed by deposition of particles carried in suspension)
 - Higher primary porosity
 - Low secondary porosity
- Chemical deposition
 - Precipitate (formed by deposition of particles from solution)
 - Low primary porosity
 - High secondary porosity



Formation of Karst

- Solubility of rock:
 - Limestone (more)
 - Dolomite (less)
- Water
 - Mildly acidic
 - Carbonic acid



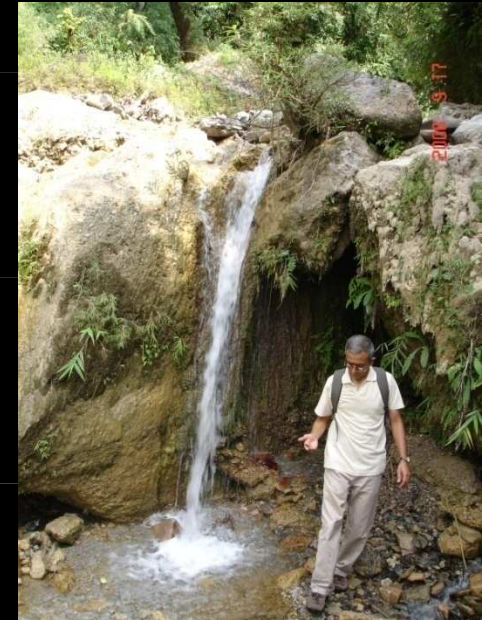
Porosity and Permeability

- Porosity and permeability
 - Solution channels
 - Cavities
 - Caverns
- Increase in porosity and permeability with enlargement of fractures and bedding planes
- Dissolving of rock matter follows pre-existing structure: bedding planes, fractures, their intersection
- Dissolving of rock matter depends on:
 - Rate of groundwater flow through rocks
 - Degree of saturation of moving water



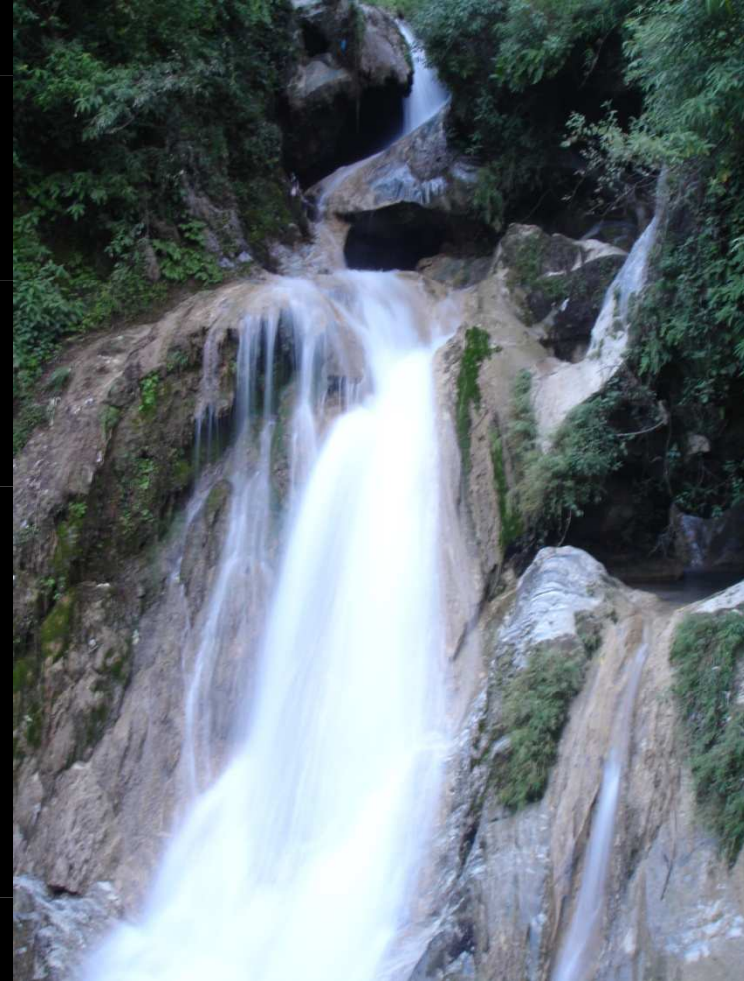
Characteristics of Carbonate aquifers

- Wide variety of hydrologic characters
 - Underground rivers at places
 - Homogenous unidirectional flow
 - Intermediate types
- Discharge variance-high

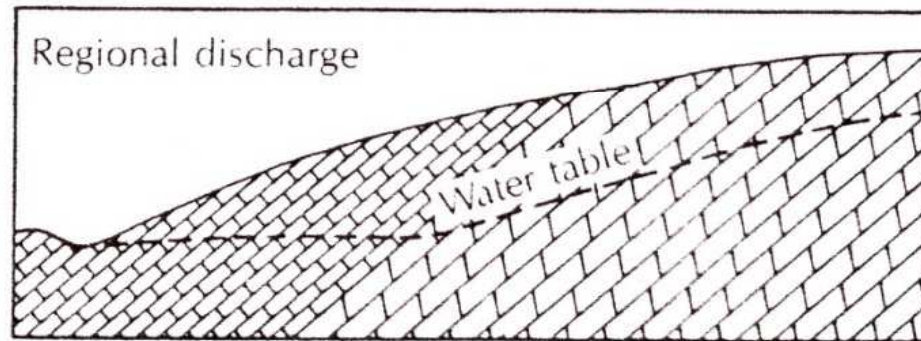
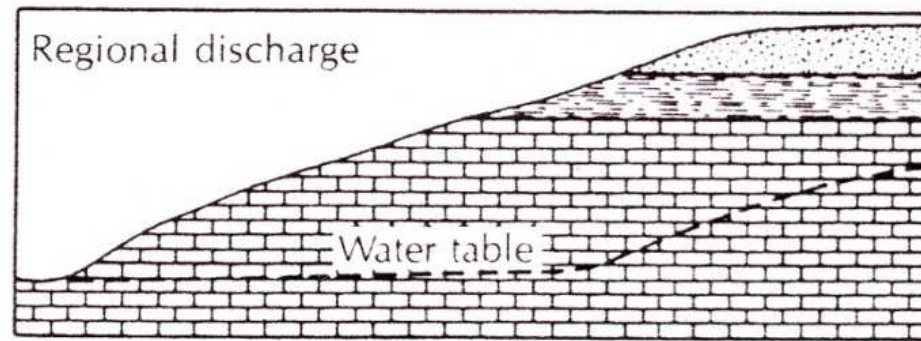


Models of carbonate aquifers

- Diffuse flow carbonate aquifers (clastic)
 - Less solution activity
 - Directed towards larger openings
 - Homogenous flow
- Free flow carbonate aquifers (solution)
 - Diffused recharge
 - Well developed solution channels
 - No structural or stratigraphic control on movement of water
- Confined flow carbonate aquifers (clastic + solution)
 - Solution channels in a few units
 - Non-permeable units present
 - Stratigraphic or structural control on flow

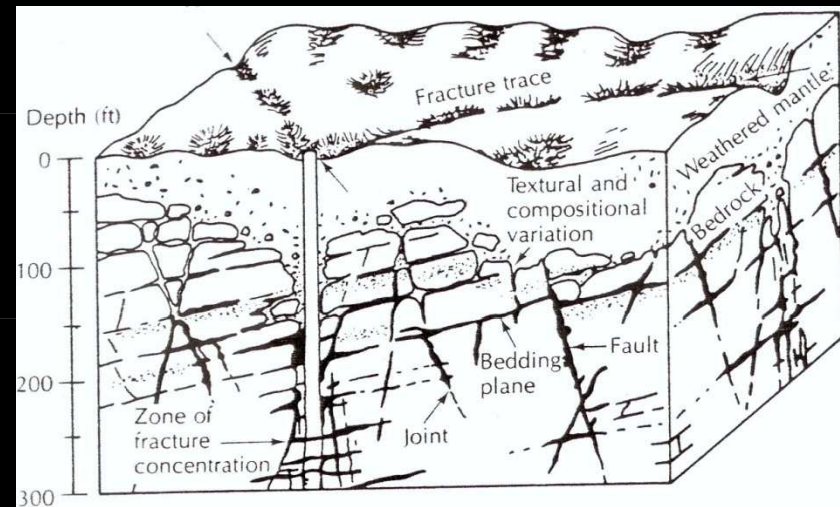


Discharge variation in springs



Mountainous carbonate aquifers

- Water table can be deep in mountains
- Perched conditions are common in solution depressions at shallow levels
- Intersections of fracture zones and bedding planes commonly give rise to such conditions
- Bore-wells drilled in such intersections will receive water while nearby wells outside this zone may be dry.



Source: C.W.Fetter



Regolith

- Layer of soil and weathered rock above bedrock.
- Release of water from the regolith in areas where it is thick keeps the discharge from springs more constant as compared to areas where it is thin or absent.





THANK YOU

