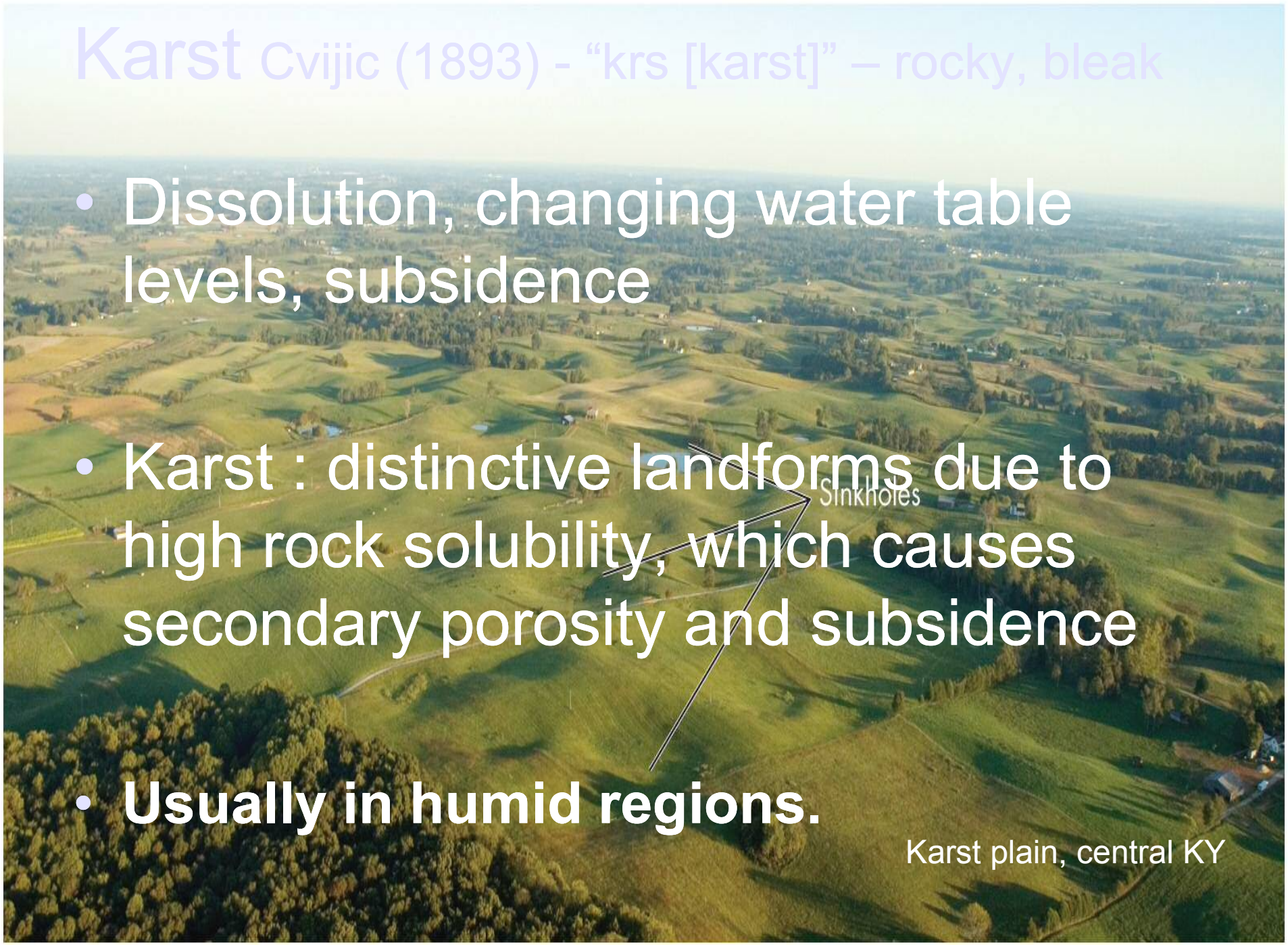
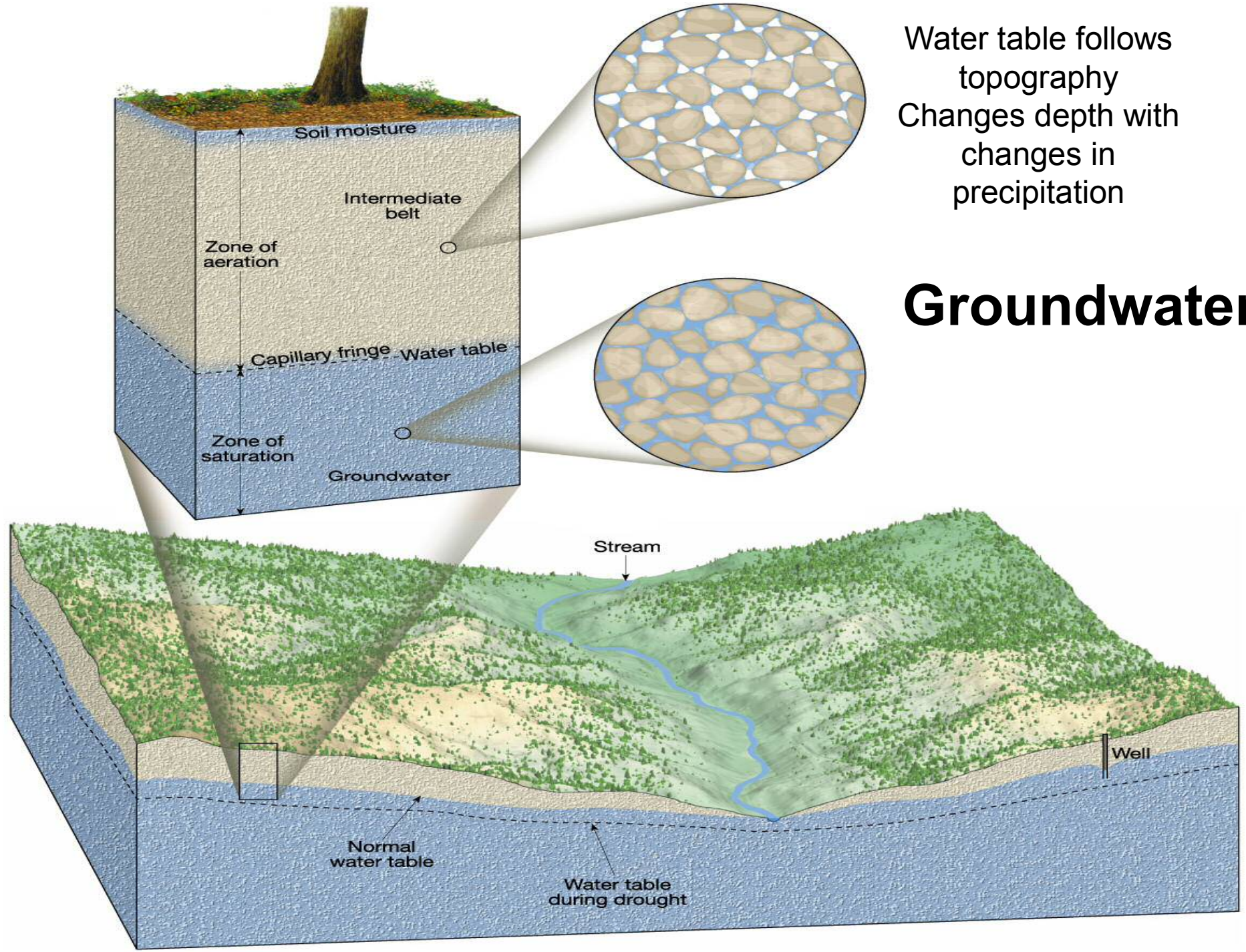
Karst Cvijic (1893) - “krs [karst]” – rocky, bleak

- Dissolution, changing water table levels, subsidence
- Karst : distinctive landforms due to high rock solubility, which causes secondary porosity and subsidence
- **Usually in humid regions.**



Karst plain, central KY



Water table follows topography
Changes depth with changes in precipitation

Groundwater

Carbonate Geochemistry

CO_2 in air dissolved in cloud droplets

Falls as precipitation (say, rainwater)

$H_2O + CO_2 \Leftrightarrow H_2CO_3 \Leftrightarrow H^+ + HCO_3^-$

- Weak acid, very slow dissolution

– Calcite, rainwater, and Humic Acid; pH ~ 4 - 7

- Precip. soaks though O and A horizons, adds plant acids
- $CaCO_3\,(s) + 2H^+\,(aq) \Leftrightarrow Ca^{++}\,(aq) + CO_2\,(g) + H_2O(l)$

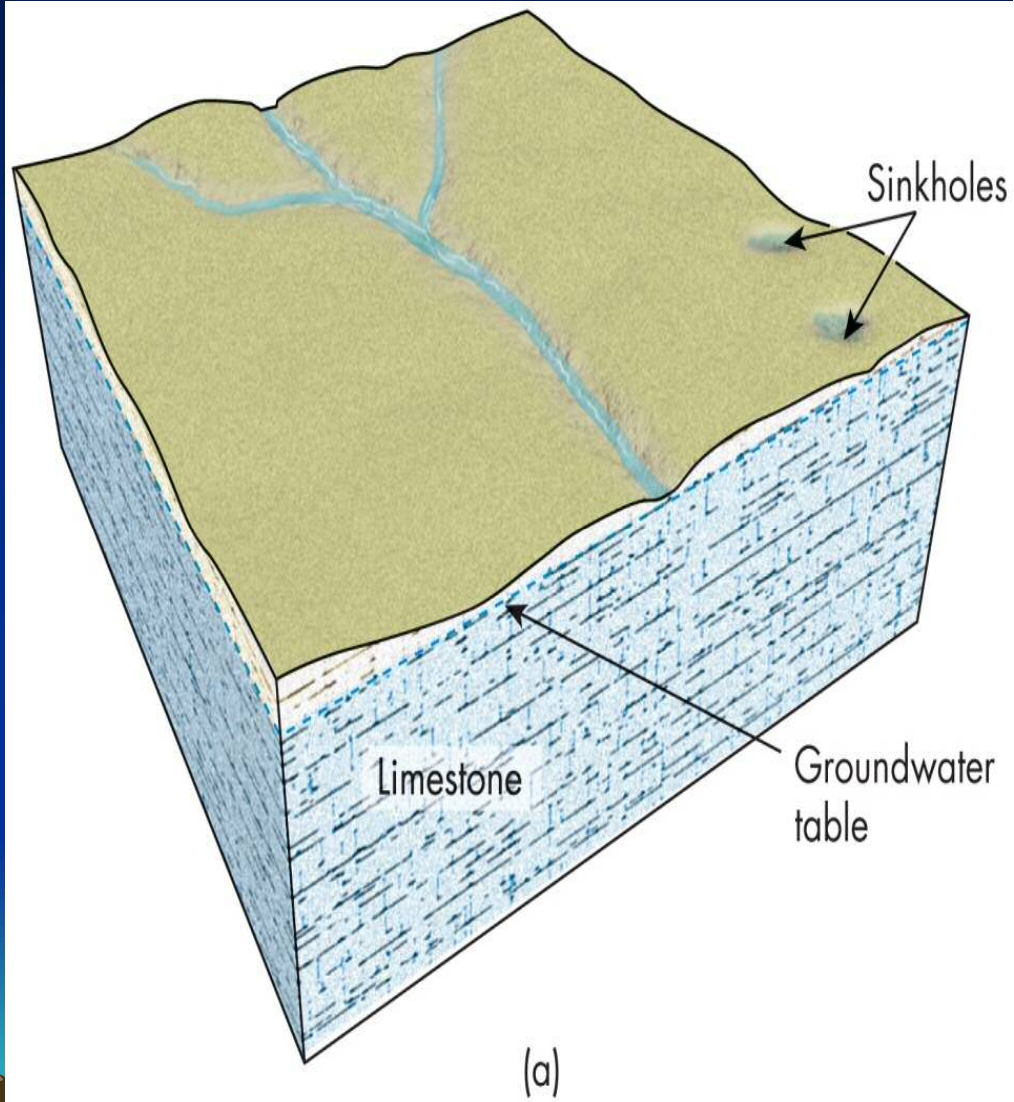
Temp: Cold water contains more CO_2
Pressure: deeper H_2O , more CO_2 absorbed, more acidic

Geologic work of groundwater

- **Karst topography**
  - **Landscapes that have been shaped by the dissolving power of groundwater on limestone**
  - **Some common features include**
    - **Irregular terrain**
    - **Dolines: Sinkholes or sinks (formed by groundwater slowly dissolving the bedrock**
      - **often accompanied by collapse**
    - **Disappearing (aka sinking) streams**

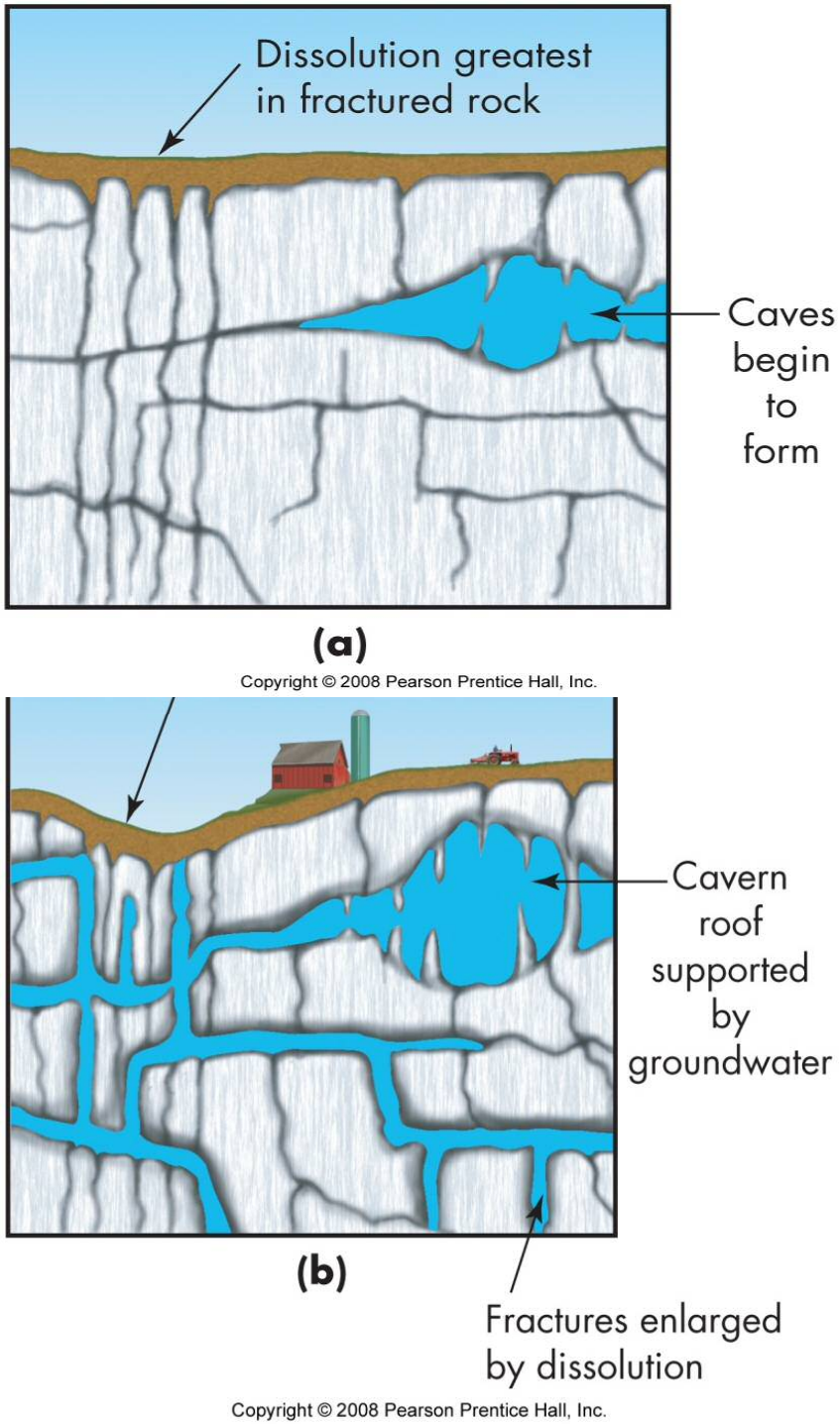
Karst Topography

- Rocks are dissolved by water: surface water or groundwater.
  - Carbonates, limestone, and dolostone are dissolved by acidic water.
  - Evaporites, rock salt, and gypsum are dissolved by water.



Sinkholes

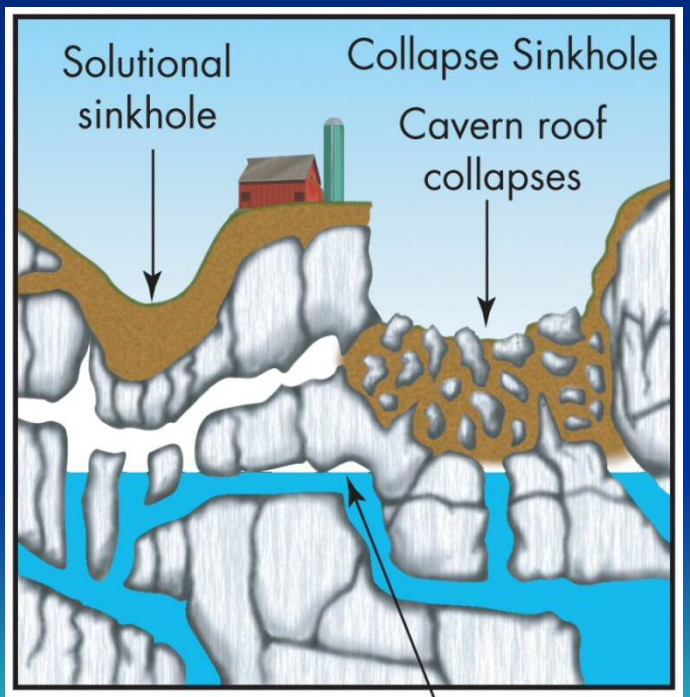
- Groundwater dissolves soluble rock, creating fractures and caves.
- Dissolving continues to form larger caves and fractures.



Dolines (Sinkholes, Cenotes)

- Collapse sinkholes form when water level drops
- Solution sinkholes due dissolution at surface

Large sinkhole and M.F. Peck at Hasan Temple, Albany, Ga. - 8/4/94 by L.E. Jones

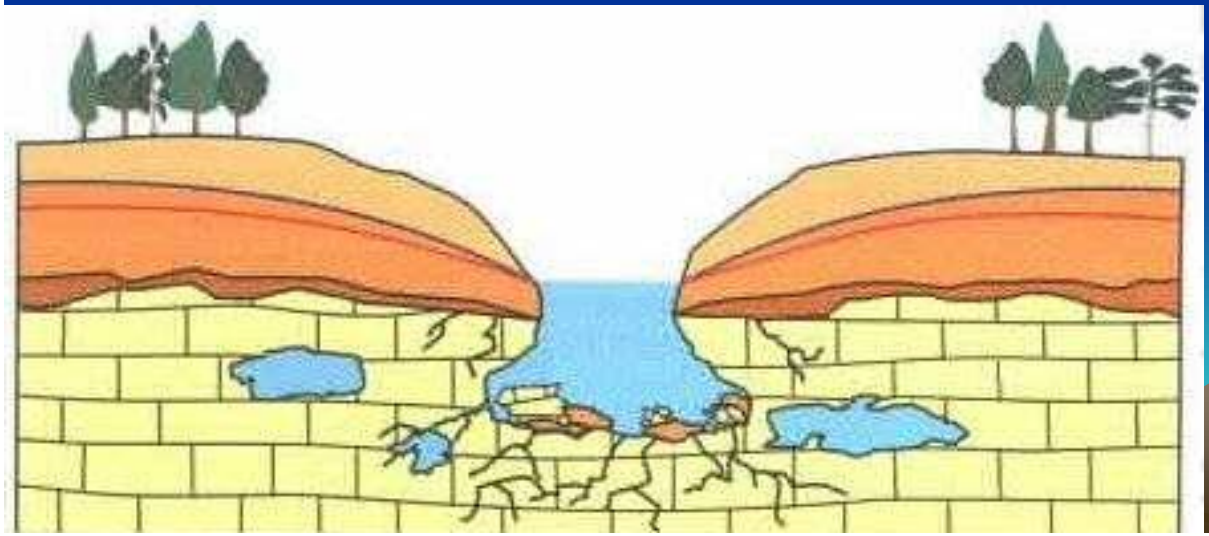


Winter Park sinkhole (1981)

- 100 m across
- One day
- Due to water table lowering
- Now an urban lake.

Cenotes

- Yucatan, Florida
- Flooded and dissolved during interglacial time (high sea-level)
- They broke during glaciations

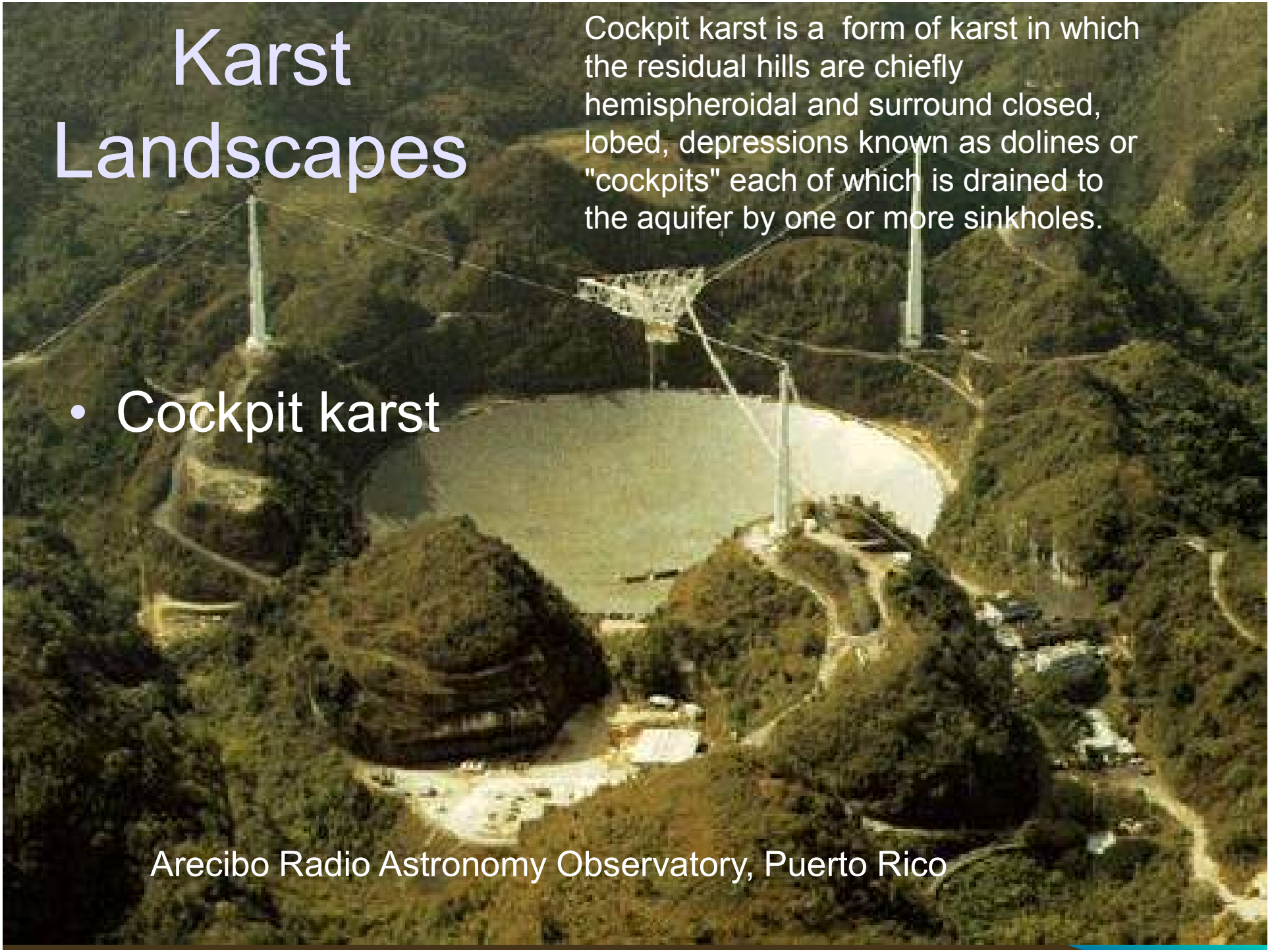


As the sea level dropped during active glaciation, the water table also dropped, leading to the drainage of caverns that were previously filled with water. This caused the ceilings of the caves to collapse

Karst Landscapes

Cockpit karst is a form of karst in which the residual hills are chiefly hemispheroidal and surround closed, lobed, depressions known as dolines or "cockpits" each of which is drained to the aquifer by one or more sinkholes.

- Cockpit karst



Arecibo Radio Astronomy Observatory, Puerto Rico

More terminology

- Disappearing streams
  - Sinks => springs

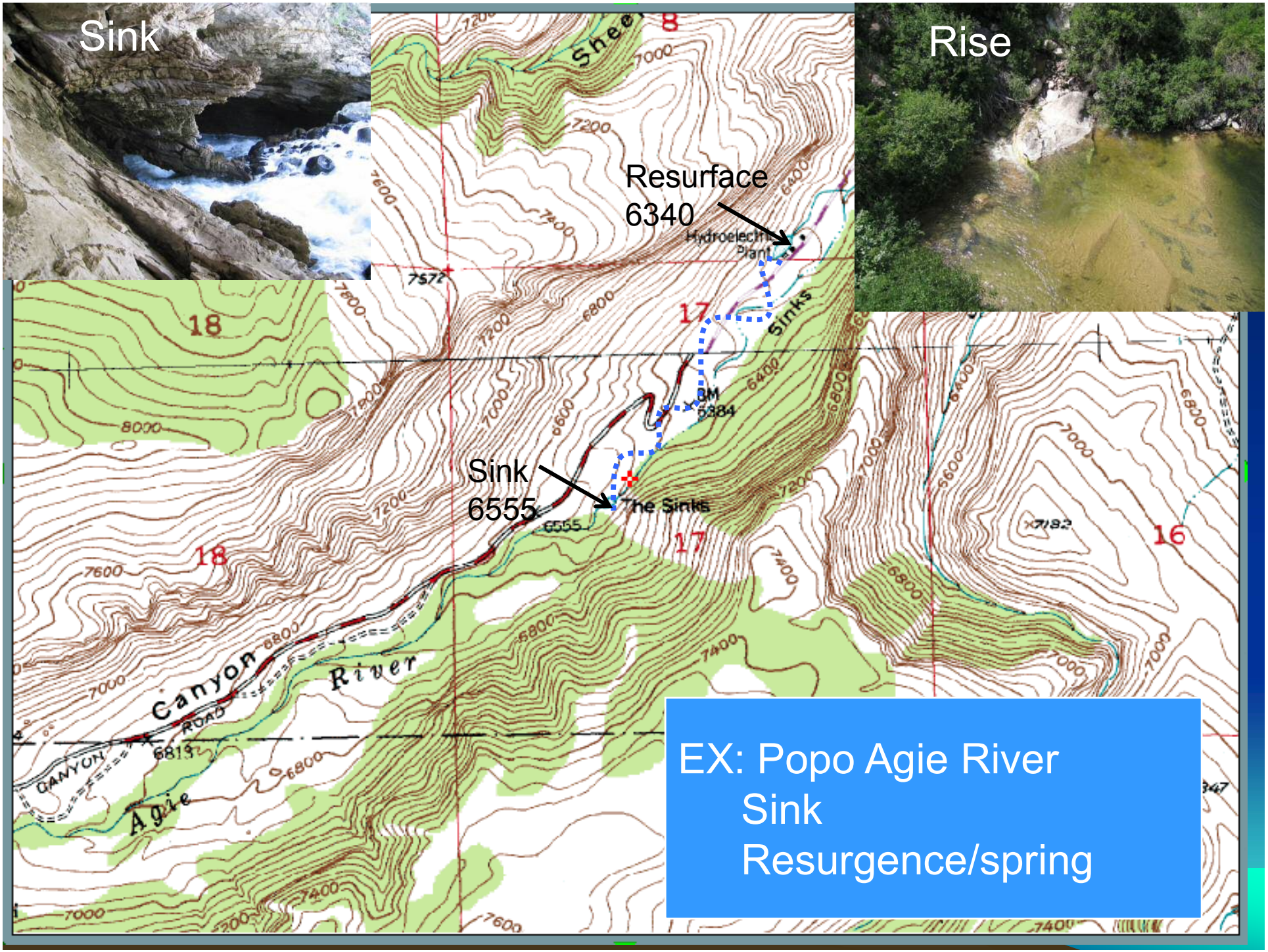
Dissolution surface features:

- linear Doline: Polje
- Karren: grooves and rounded runnels
- Clints and Grikes
- Solution Valley

Karren the micro-solutional feature that forms on exposed limestone surfaces, favoured by pure, homogeneous limestone with low primary permeability and well developed, widely spaced joints.

Disappearing Streams

- Coleridge "Xanadu"
- Sinks
- Exit as spring or rise


Sink
Rise
Resurface
6340
Sink
6555
The Sinks
EX: Popo Agie River
Sink
Resurgence/spring

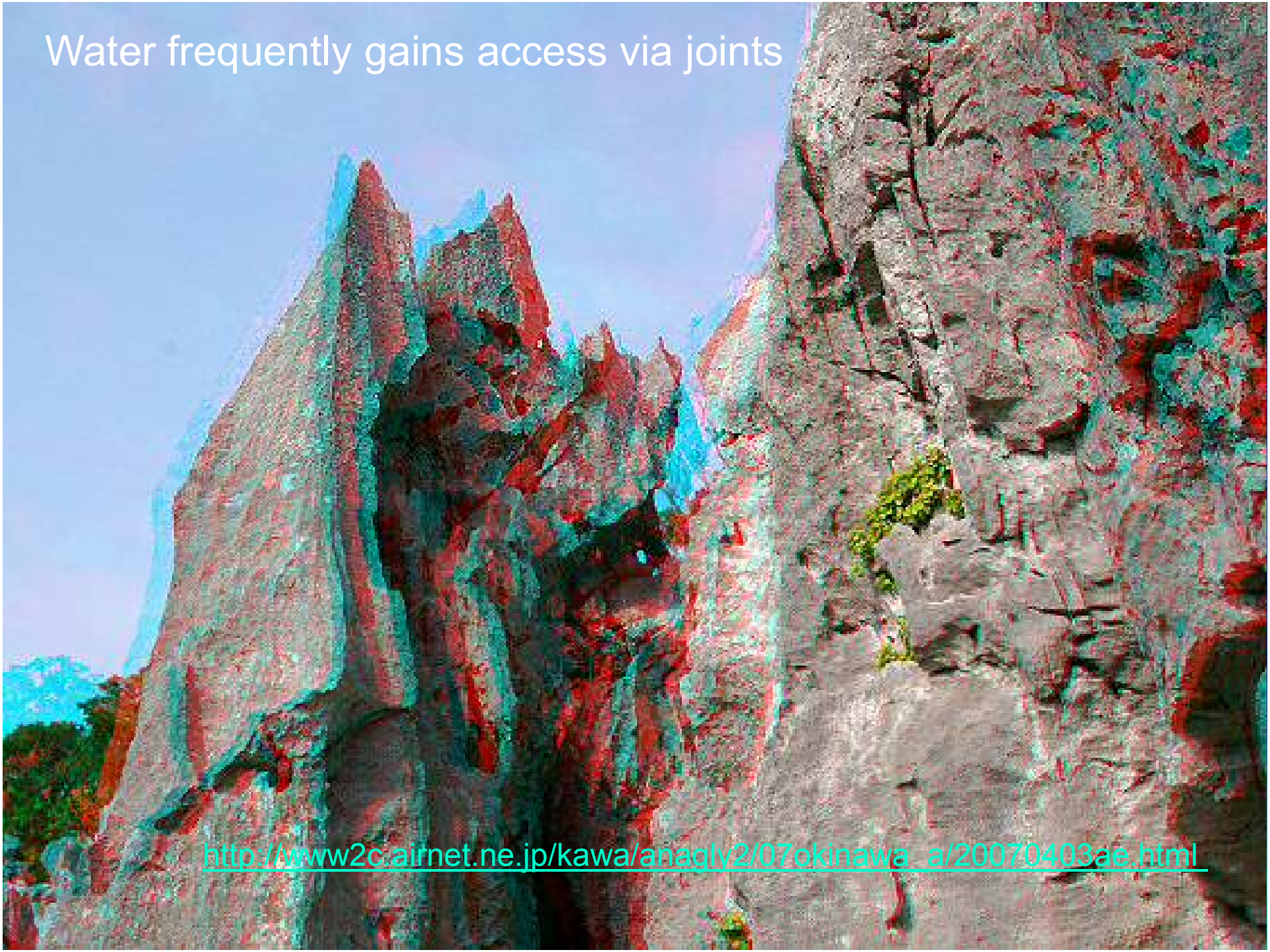

Springs

Polje

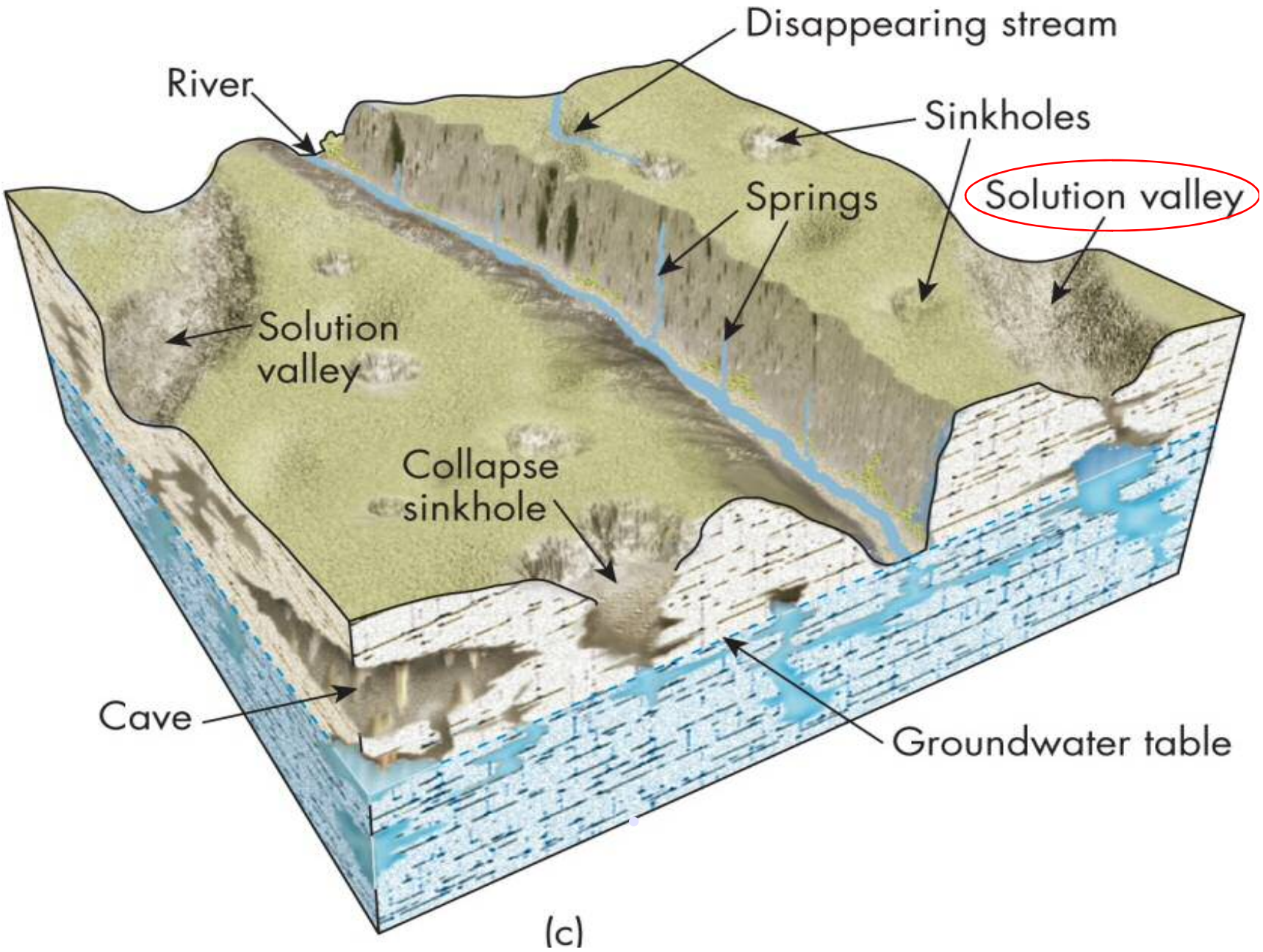
- A polje is a large flat plain in karst territory, often structurally controlled

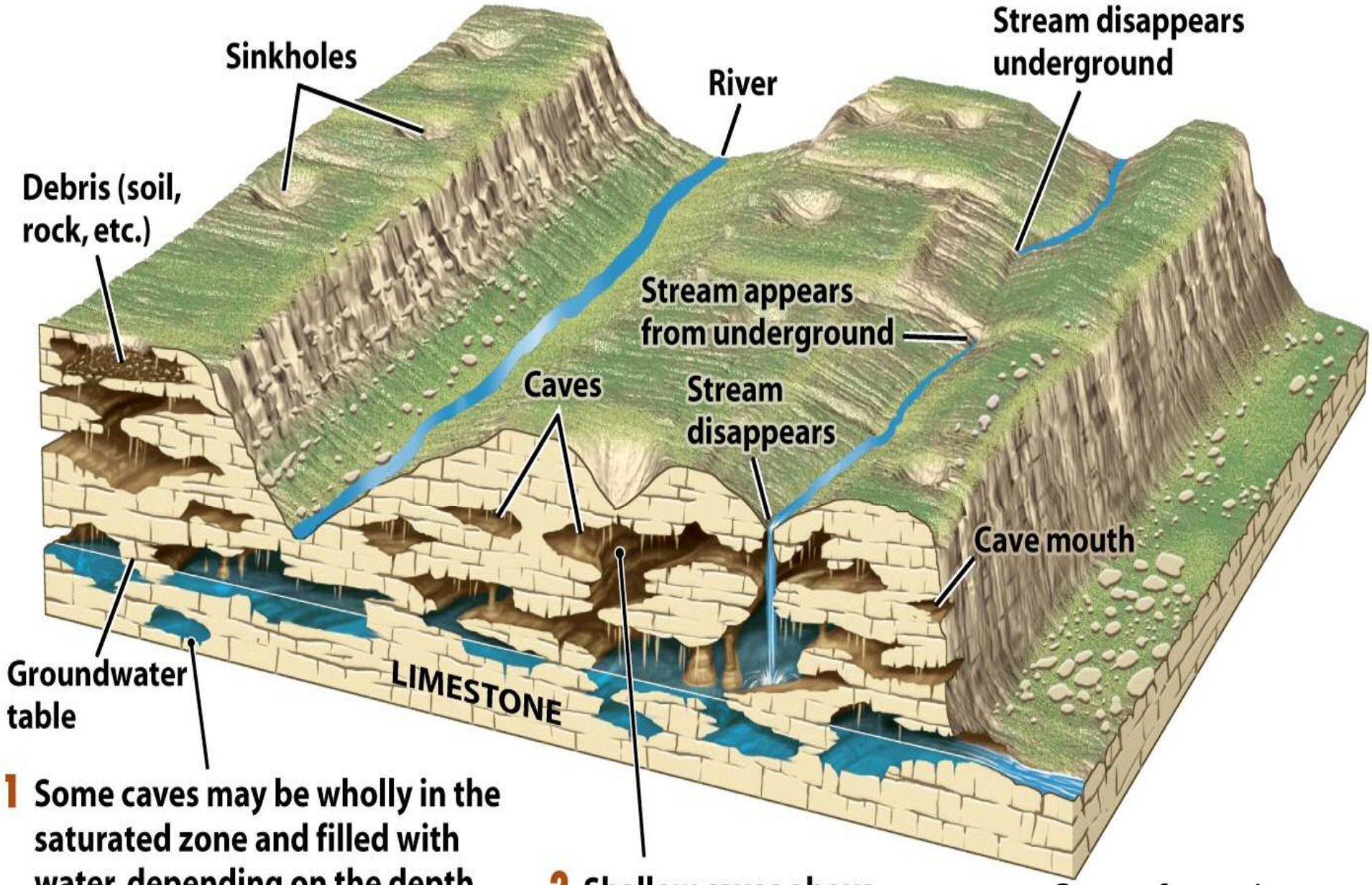
Exposed Clint and Grike

Corrosive drainage along joints and cracks in the limestone can produce slabs called "clints" isolated by deep fissures called "grikes".


Water frequently gains access via joints
http://www2c.airnet.ne.jp/kawa/anaglv2/07okinawa_a/20070403ae.html

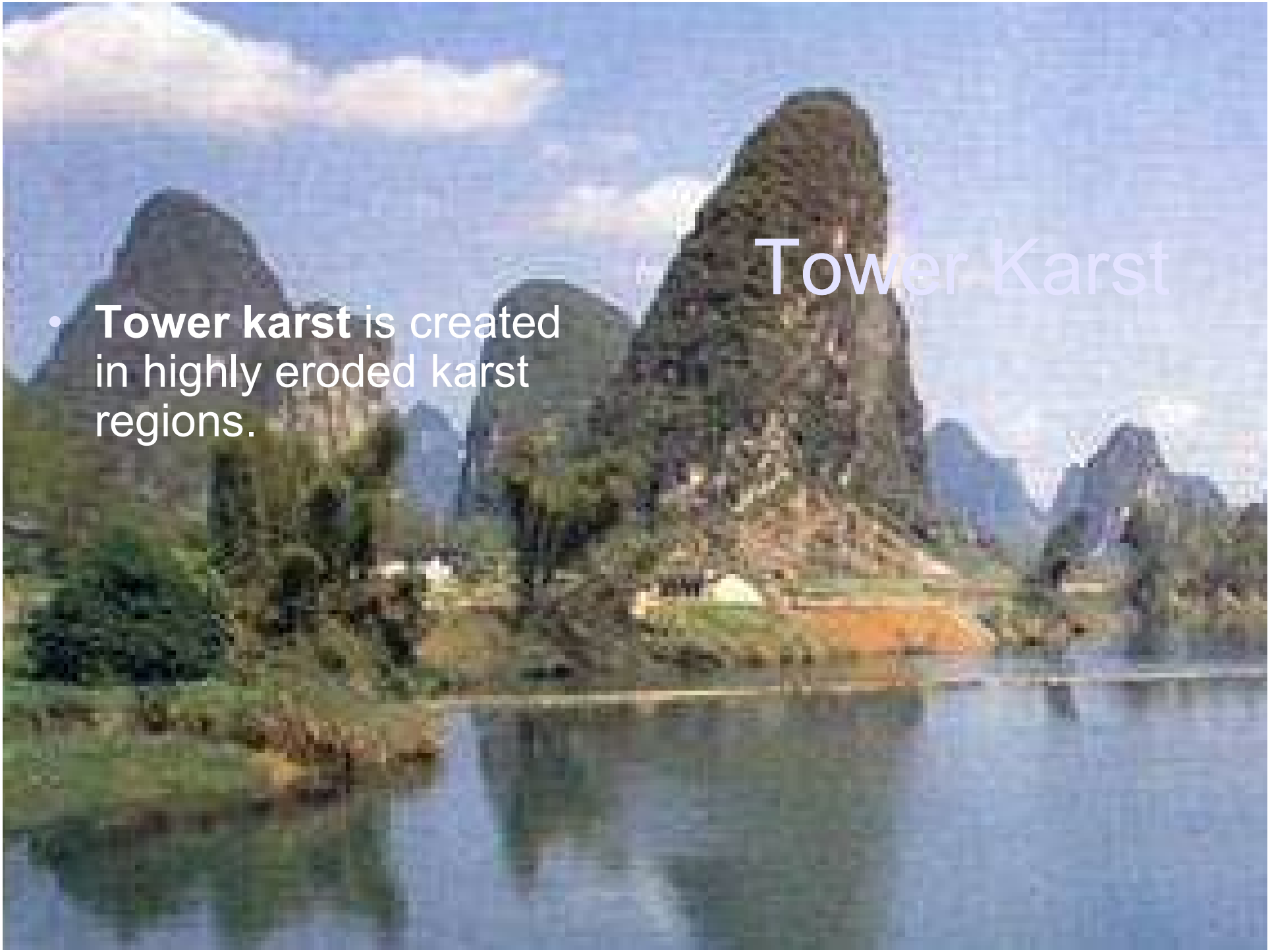
Karst Topography Summary





Caves form above, at, and below the GWT

Tower Karst

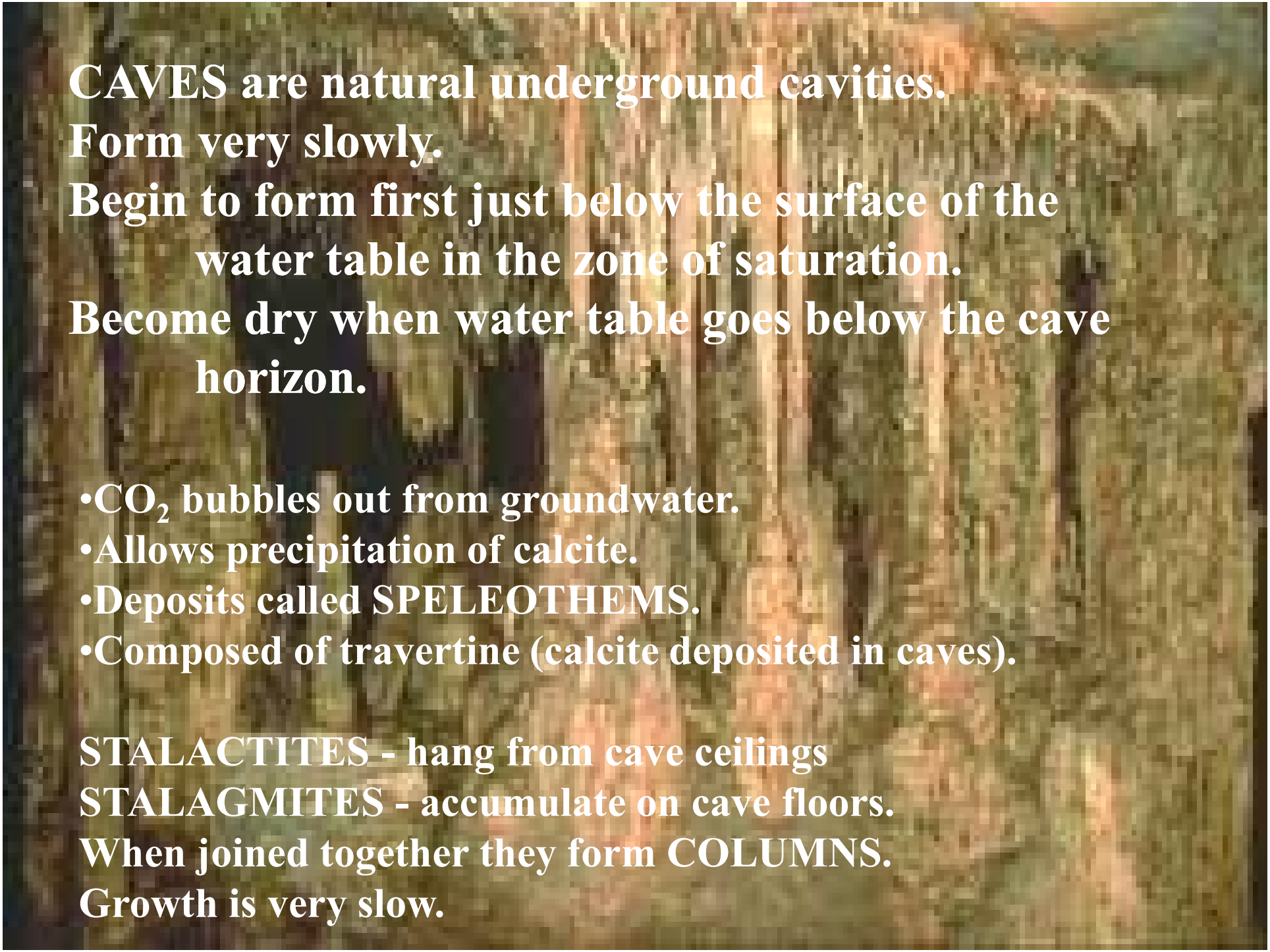


- **Tower karst** is created in highly eroded karst regions.

Thermokarst

- Soils containing water expand when frozen moving the soil upward.
  - **Frost heaving**

- **Cold regions, permafrost.**
- **Surface has winter heaving and summer thawing => uneven soil**



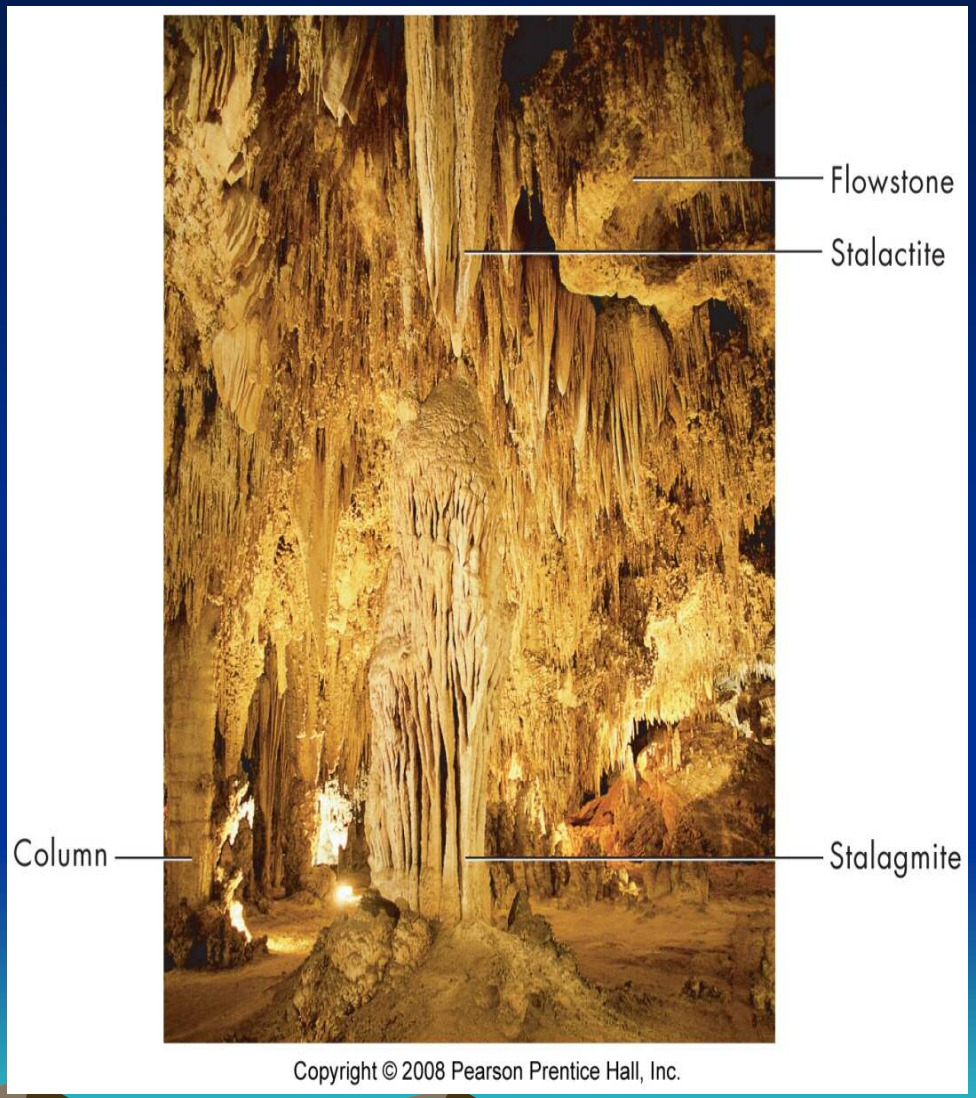
CAVES are natural underground cavities.
Form very slowly.
Begin to form first just below the surface of the water table in the zone of saturation.
Become dry when water table goes below the cave horizon.

- **CO_2 bubbles out from groundwater.**
- **Allows precipitation of calcite.**
- **Deposits called SPELEOTHEMS.**
- **Composed of travertine (calcite deposited in caves).**

STALACTITES - hang from cave ceilings
STALAGMITES - accumulate on cave floors.
When joined together they form COLUMNS.
Growth is very slow.

Cave Deposits - Speleothems

- **Cave systems** are formed when dissolution produces a series of caves.
- Related to fluctuating groundwater table.
- Groundwater seepage causes stalagmites, stalactites.



$CaCO_3\,(s) + 2H^+\,(aq) \Leftrightarrow Ca^{++}\,(aq) + CO_2\,(g) + H_2O(l)$