

Karst Topography

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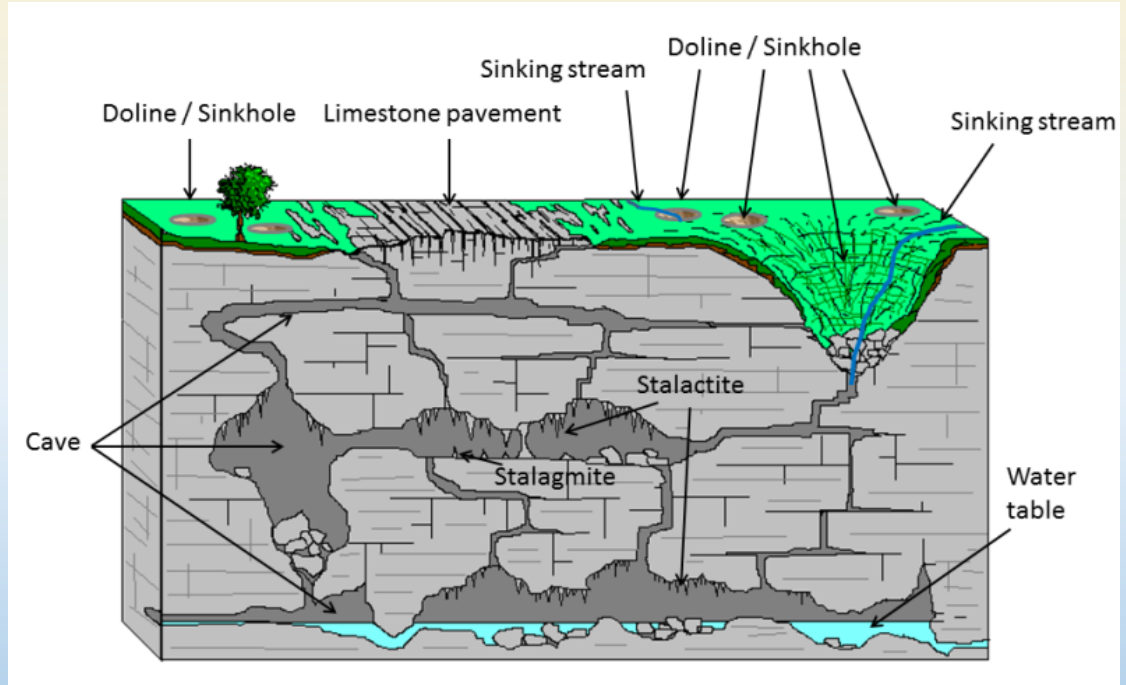
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Contents

Introduction
Importance
Essential conditions
Distribution
Development
Erosional landforms
Depositional landforms
References



Introduction

- The term “Karst” originated in late 19th century from **German word “der Karst”**, the name of a limestone region in Slovenia.
- The term karst describes a distinctive topography formed by **dissolution** (chemical solution) of underlying soluble rocks by surface water or ground water.
- These are commonly associated with **carbonate rocks** (limestone and dolomite) and other highly soluble rocks such as evaporates (gypsum and rock salt), which can form karst terrain.
- Karst terrains are most **abundant in humid regions** where carbonate rock is present, but it also occurs in temperate, tropical, alpine and polar environments.
- Karst features range in scale from **microscopic (chemical precipitates) to entire drainage systems** and ecosystems which cover hundreds of square miles, and broad karst plateaus.

Importance of Karst terrain

- **Ten percent** of the Earth's surface is occupied by karst landscape.
- As much as a quarter of the **world's population** depends upon water supplied from karst areas.
- Approximately 50% of the world's **hydrocarbon reserves** are hosted in porous karst systems.
- Underground water in Karst region are prone to **contamination** from the surface.
- Urban development such as building of roads, buildings and their maintenance is a **tough task** in Karst regions.



Essential conditions

- Relatively thick **massive soluble rock**, i.e., limestone, dolomite, or chalk.
- Carbonate rocks should be very **close to the ground surface**.
- Lime stones should not be porous.
- Limestone should be highly folded, faulted or **fractured**.
- Marked development of **joints**. If the rock is bedded, the beds should be thin.
- **Considerable relief** so that water is capable of circulation to cause typical karst topography.
- Moderate to heavy **rainfall** to cause solution of rocks.



Distribution of Karst terrain around the world

- The prominent karst regions are present in **Yugoslavia**, region of southern France; Spanish Andalusia; northern Puerto Rico; western Cuba; Jamaica; southern Indiana, west-central Kentucky, Virginia, Tennessee and central Florida of the USA.
- There are a few minor karst areas in **Carlsbad area of the USA**, chalk area of England (Peak District), chalk area of France, Parts of Jura mountains, some parts of Alps and Apennines.
- In India, most of limestones of Vindhyan formations are buried under thick covers of sandstones and shales. For example, **Rohtas stage limestones** having famous Guptadham cave in Rohtas plateau (southwestern Bihar) are buried under 90-m thick cover of massive sandstones. A few areas of limestone topography have been identified in the Himalayas (mainly Jammu and Kashmir; Sahasradhara, Robert Cave and Tapkeshwar temple near Dehra Dun in Uttaranchal; Eastern Himalayas; Pachmarhi (Madhya Pradesh), Bastar district (Chhattisgarh); coastal area near Visakhapatnam etc.

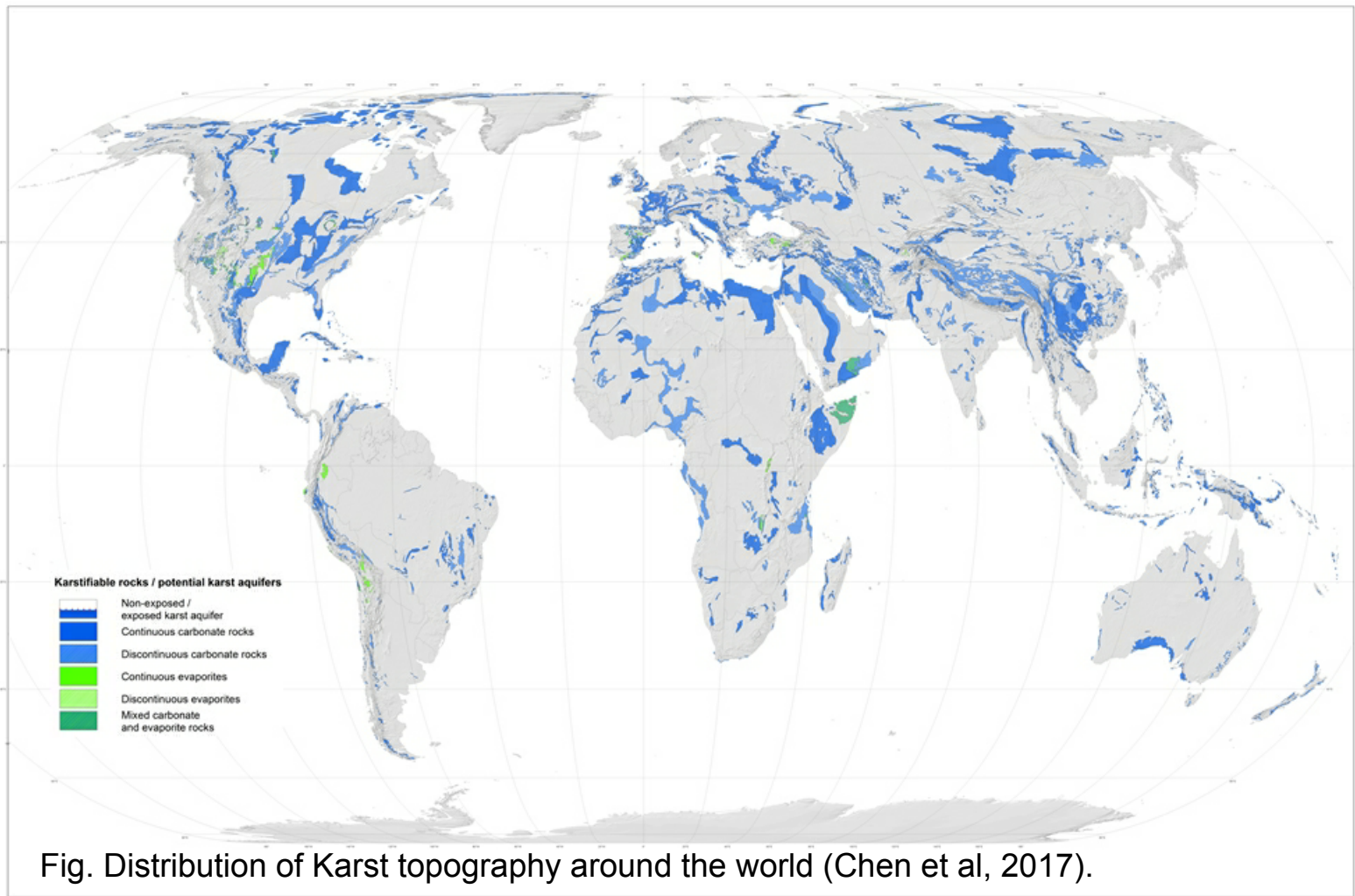
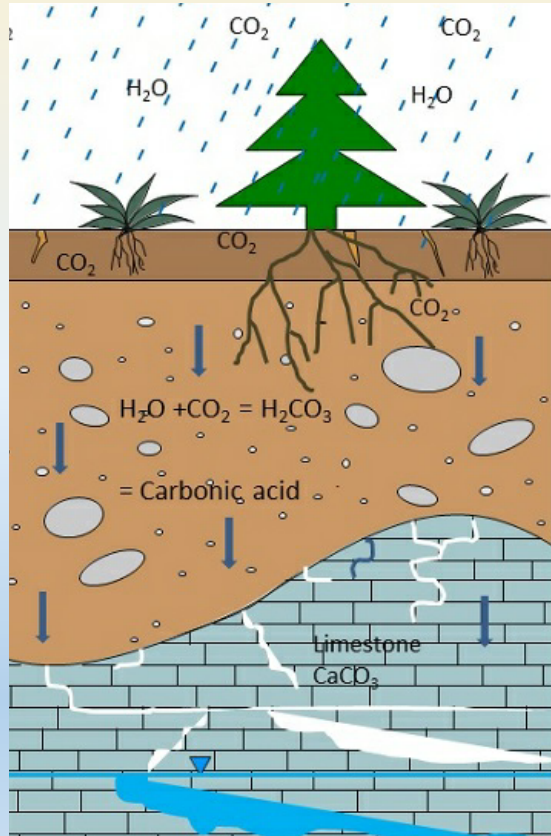


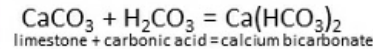
Fig. Distribution of Karst topography around the world (Chen et al, 2017).

Development of Karst terrain



rainfall

This carbonic acid causes the dissolution of calcium carbonate (in limestone) by reacting with the carbonate anion.

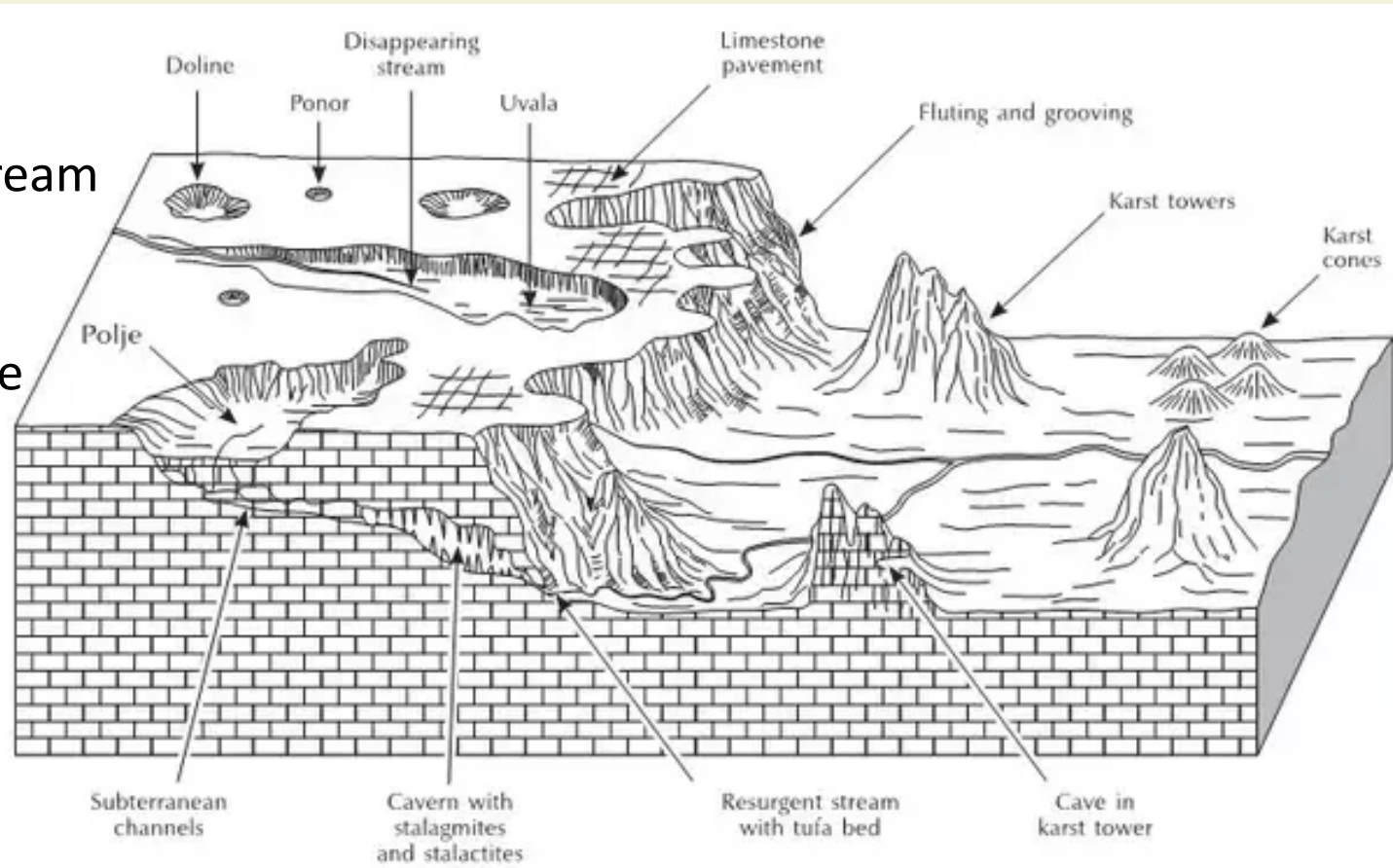


water table

As rain falls through the atmosphere it picks up carbon dioxide (CO_2). When this rain reaches the ground and passes through the soil it picks up more CO_2 and forms a weak solution of carbonic acid. As the acidified rain water trickles down through cracks in the limestone, it begins to dissolve the rock. Over time it progressively enlarges the cracks and openings in the ground an underground drainage system starts to develop.

Erosional Landforms

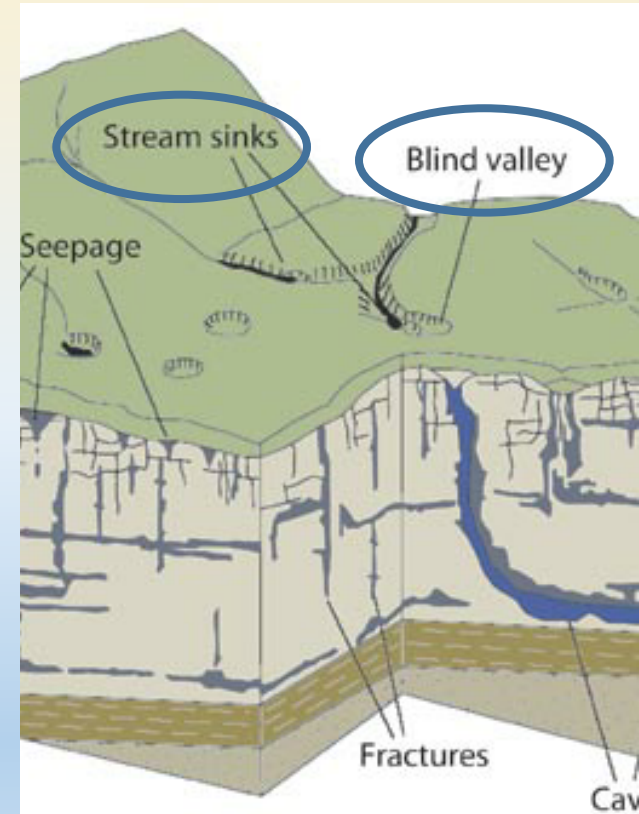
Blind valleys
Disappearing stream
Sinking creek
Lapies
Sink holes/doline
Karst window
Caves
Ponor
Uvala
Polje



Erosional Landforms

Disappearing stream: Disappearing streams are surface streams that flow underground into solution cavities. Numerous small disappearing streamlets in dolines/sink holes are called as **sinking creek**.

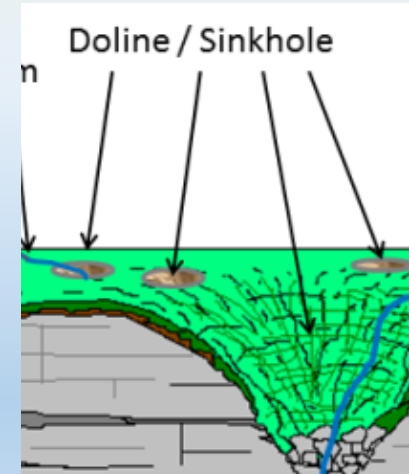
Blind valleys: In some valleys rivers flow over rocks such as shales or sandstones before they flow onto the limestone. The rivers may be able to flow over the limestones for a short distance (perhaps on till), but eventually they disappear underground, leaving a series of features called 'blind valleys'.



Erosional Landforms

Lapies: The highly corrugated and rough surface of limestone lithology characterized by low ridges and pinnacles, narrow clefts and numerous solution holes is called lapies. It forms due to corrosion of limestones along their joints when limestones are well exposed at the ground surface. The weathering residues left at the surface are called **terra rosa** which means red residual soils or red earth.

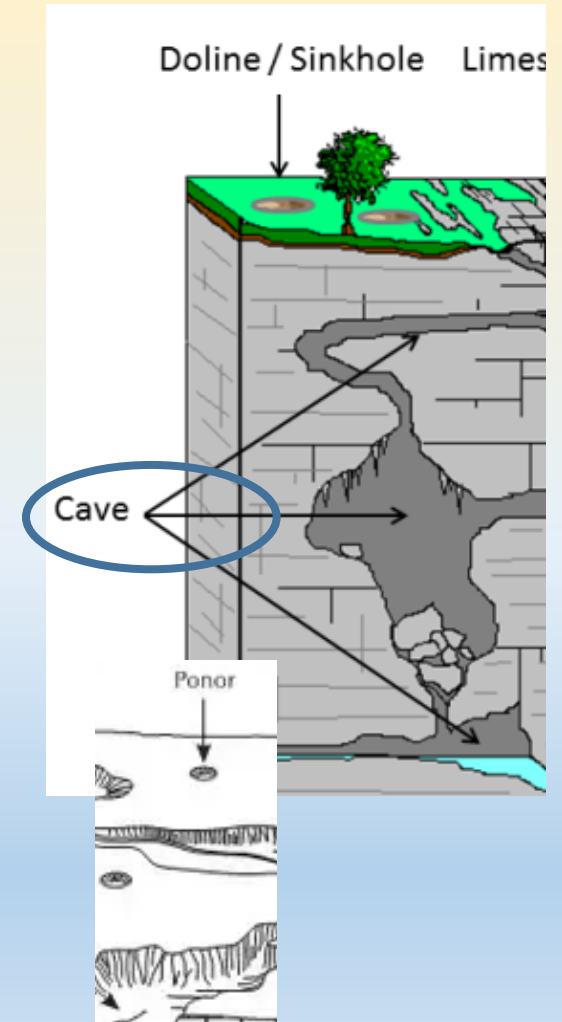
Doline/Sink holes: Chemically active rainwater (charged with atmospheric carbon dioxide) dissolves limestones and other carbonate rocks along their joints and thus numerous types of solution holes (e.g. sink holes, dolines etc) are developed at the ground surface when limestones are directly exposed to the atmospheric processes.



Erosional Landforms

Caves: Caves or caverns are voids of large dimension below the ground surface. The cavern is characterized by horizontal passages and amphitheatre-like extensive areas at the junctions of tunnels (cave crossings). The Guptadham cave of the Rohtas plateau (located in the south-western corner of Bihar) is an example of galleried cave and has been formed due to dissolution of Rohtas stage limestones of Vindhyan formations.

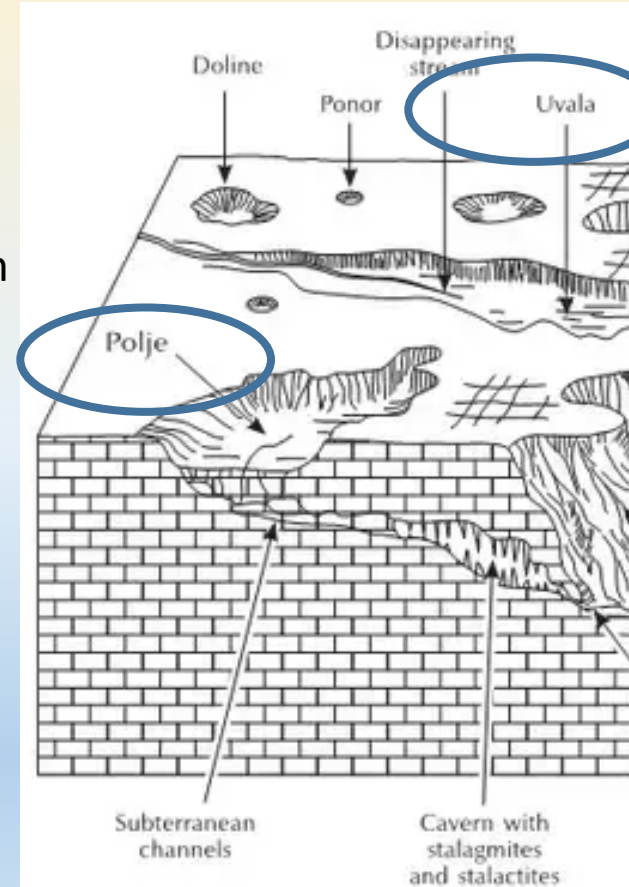
Ponores: The vertical pipe-like chasms or passages that connect the caves and the swallow holes are called 'ponores' in Serbia and 'avens' in France. Ponores are formed due to downward extension of sink holes through continuous solution of carbonate rocks. Ponores may also be inclined.



Erosional Landforms

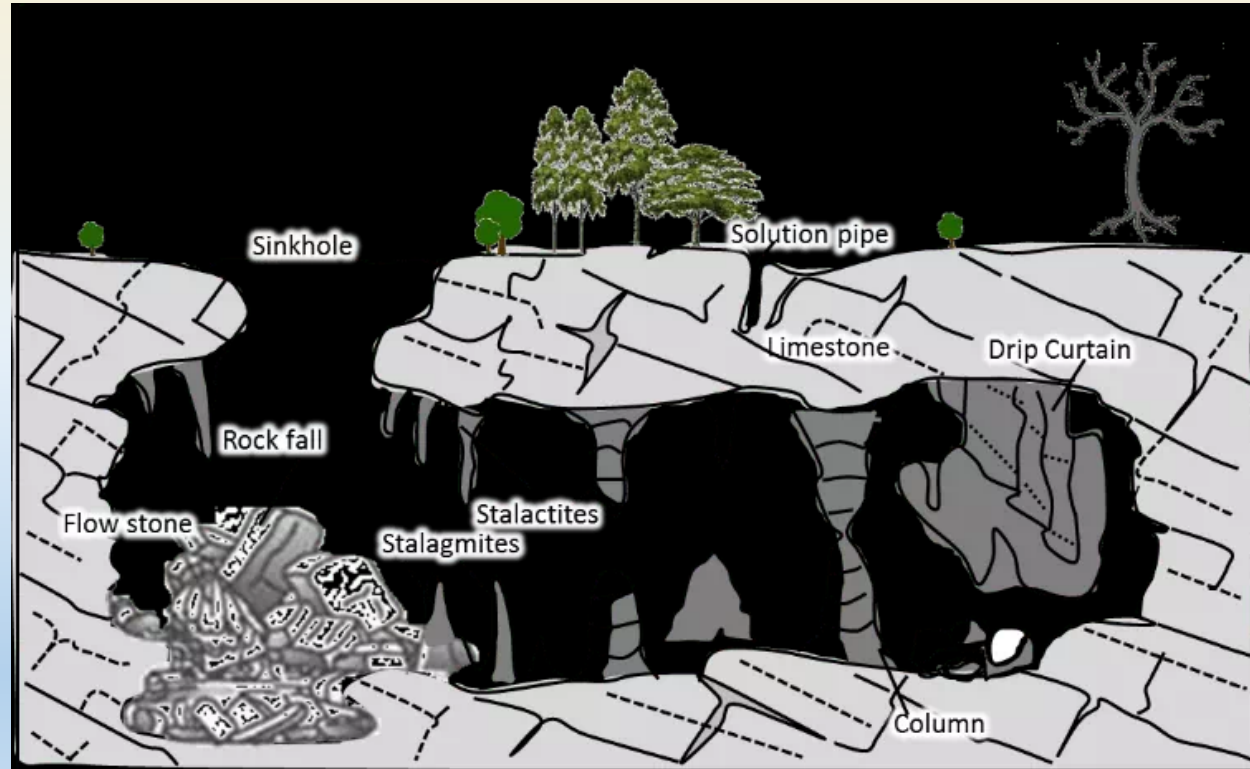
Uvala: Extensive depressions are called uvalas which are upto one kilometre across. They are formed due to coalescence of several dolines due to continuous solution and enlargement of dolines or due to collapse of upper roof of large cavities formed underground or due to coalescence of various sink holes etc.

Polje: Most extensive, larger than dolines and uvalas, depressions are called 'poljes'. They are characterized by vertical side walls, flat alluvial floors, independent surface drainage systems on their floors, irregular borders and central lake.



Depositional landforms

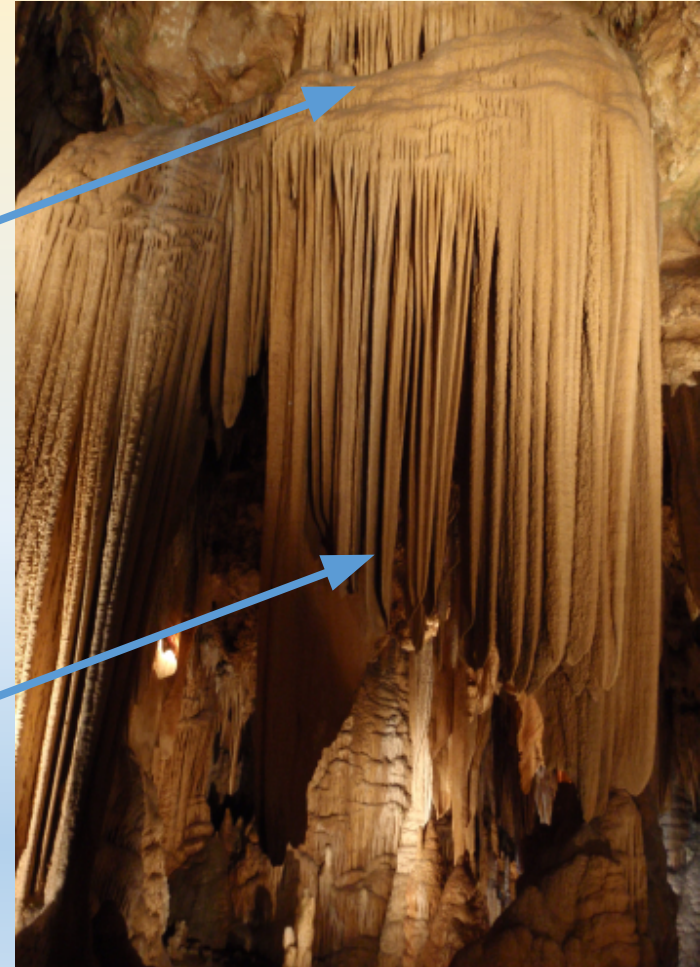
Dripstones
Drapes
Stalactite
Stalagmite
Pillars/Columns
Flowstones
Travertines



Depositional landforms

Dripstones: The calcareous deposits from dripping of water in dry caves are called dripstones. Beside this, all types of deposits in the caverns are collectively called **speleothems** of which calcite is the common constituent.

Drapes: Numerous needle-shaped dripstones hanging from the cave ceiling are called drapes or curtains.

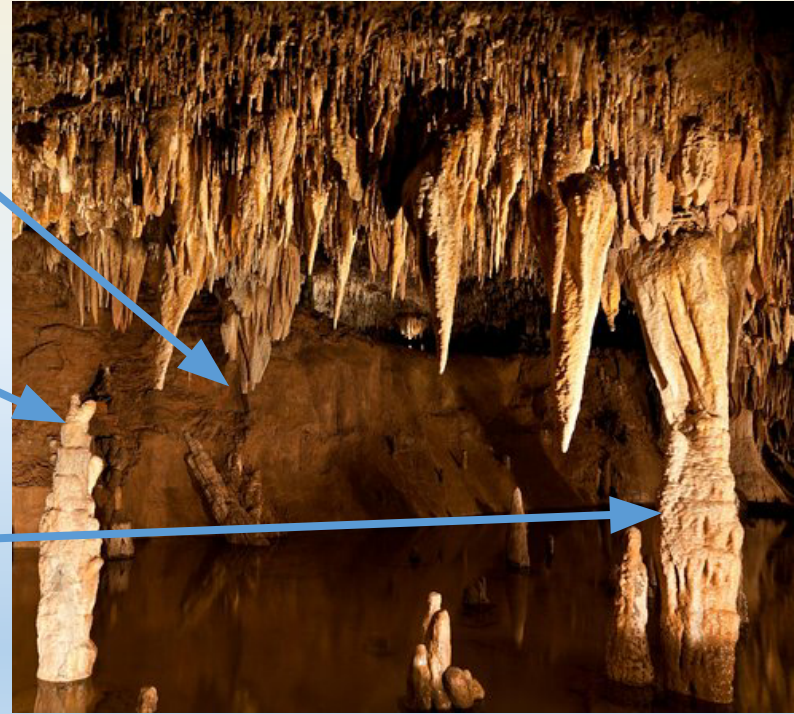


Depositional landforms

Stalactite: The columns of dripstones hanging from the cave ceiling are called stalactites.

Stalagmite: The calcareous columns of dripstones growing upward from the cave floor are known as stalagmites.

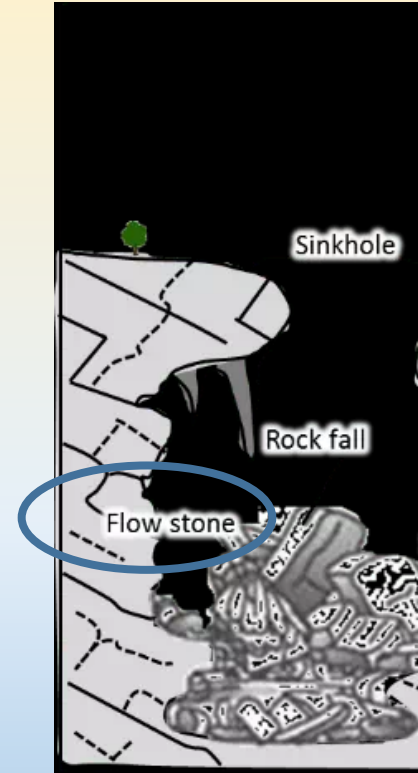
Pillars/Columns: When stalactites and stalagmites meet together, they form pillars/columns.



Depositional landforms

Flowstones: Floor deposits caused by seepage water and water flowing out of stalagmites are called flowstones.

Travertines: Banded calcareous deposits are called **travertines** whereas the calcareous deposits, softer than travertine, at the mouth of the caves are called **tufa or calc-tufa**.



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Thank you

Your queries are welcome at,

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