

Significant Cave Identification – Cave Types

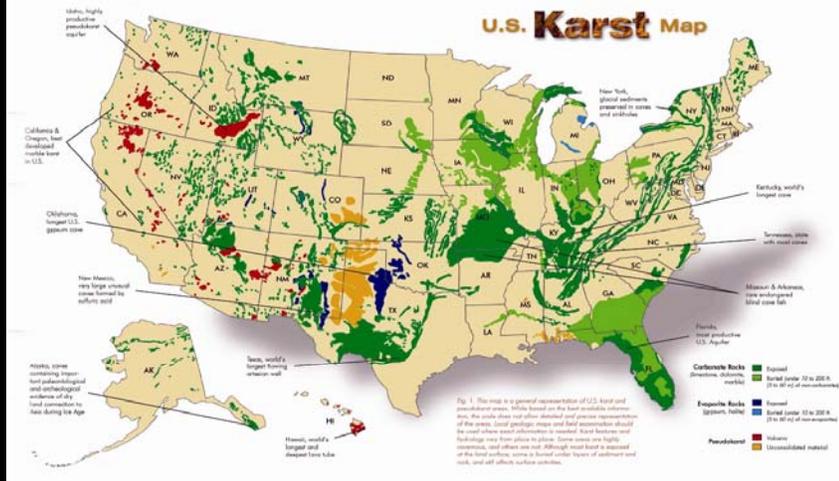


NPS Photo

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Karst in the United States

(Map from "Living With Karst", drawn by Dr. George Veni)



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Types of Caves

The longest cave in the world is Mammoth Cave in Kentucky (over 360 miles of passageways), in Mammoth Cave National Park.

The deepest limestone cave in the U.S. is Lechuguilla Cave in Carlsbad Caverns National Park in New Mexico (over 1,500 feet deep).

The vast majority of caves form in soluble rocks such as limestone, dolomite, gypsum, and marble, but caves can form in other types of rock.

The major cave types are:

- A. Solution
- B. Ice
- C. Lava
- D. Sandstone
- E. Sea
- F. Talus
- G. Tectonic



**Terrestrial
carbonate dissolution
comes in 2 main flavors**

**Epigenic
Hypogenic**

Epigenic Caves

Epigenic caves form from the action of weak acids derived from the atmosphere, soil and oxidation of sulfides in the vadose zone.

The diagram illustrates the process of epigenic cave formation. It shows a cross-section of the ground with a blue brick-like layer representing limestone. Above the ground, a cloudy sky is shown with yellow arrows pointing down to the ground labeled CO_2 , H_2O , and O_2 . A small 'c' is visible in the sky. Below the ground, a dark, irregularly shaped cave system is shown, with a 'Cave' label. To the right, a 'River' is shown flowing in a valley. The entire diagram is enclosed in a yellow border.

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Hypogenic caves

Comprise ~5% - 10% of all caves. They are formed by acids generated within the earth.

The diagram illustrates the process of hypogenic cave formation. It shows a cross-section of the ground with a blue brick-like layer representing limestone. Above the ground, a cloudy sky is shown with yellow arrows pointing down to the ground labeled $\text{H}_2\text{O} + \text{O}_2$. Below the ground, a dark, irregularly shaped cave system is shown, with a 'Cave' label. To the right, a 'River' is shown flowing in a valley. The entire diagram is enclosed in a yellow border.

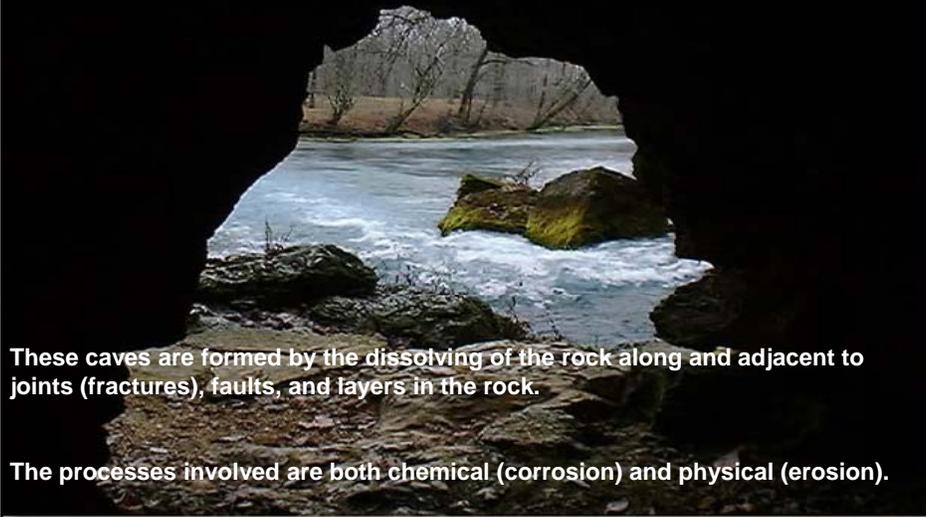
Profile view of Lechuguilla Cave, 115 mi of passage

Carbon dioxide CO_2 Methane CH_4 Organic acids CH_3COOH Hydrogen sulfide H_2S

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Solution Caves

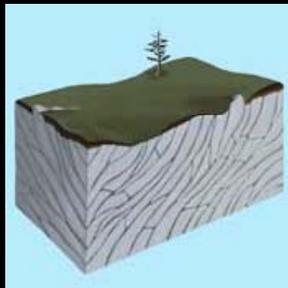
Solution caves are, by far, the most common type of cave. They can be found in Limestone, Dolomite & Marble.



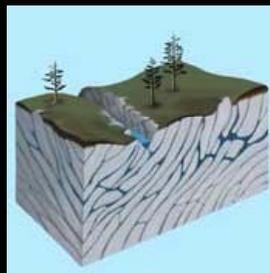
These caves are formed by the dissolving of the rock along and adjacent to joints (fractures), faults, and layers in the rock.

The processes involved are both chemical (corrosion) and physical (erosion).

Solution Cave Development-1



Step 1-- Rain falling on a limestone terrain reacts with carbon dioxide, produced by the decay of plant material in the soil, forming a weak acid.

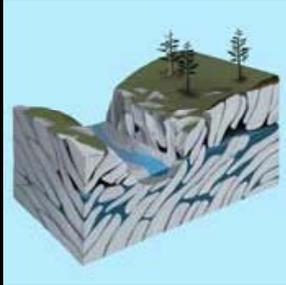


Step 2--The acidic groundwater accumulates at the surface of the water table and begins to dissolve the limestone forming flooded passages into the limestone bedrock.

("California Underground" website)

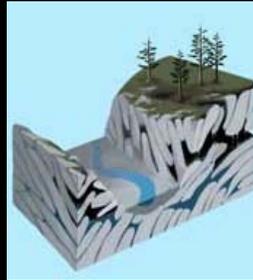
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Solution Cave Development-2



Step 3--The deepening river valley drains away ground water, lowering the water table and draining the caves. The valley intersects the cave passage, revealing an entrance

("California Underground" website)



Step 4--Once the cave is opened to the atmosphere, carbon dioxide can escape from the cave. This allows the groundwater seeping into the cave to release carbon dioxide and redeposit the dissolved limestone it carries. This forms calcite stalactites and stalagmites.

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Ice Caves

The term "ice cave" requires some clarification because it has been applied to caves that form both in ice and in rock.

Ice caves that form in ice are also called glacier caves. Melt water moving through glaciers can form this type of ice cave.

Caves, formed in rock, that contain ice all year round are also referred to as ice caves. They are also called frozen caves.

These caves may contain very large crystals of ice that form on the floors, walls, and ceilings of the cave.

("California Underground" website)



Photo © Peter and Ann-Bosted

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Lava Tube Caves



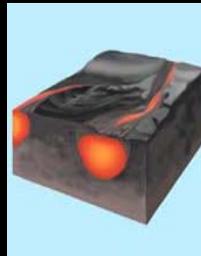
When fluid, molten lava flows out of the ground, it works its way downhill. Soon the surface of this lava stream cools and hardens into a crust. Although the outer crust is hard, the lava inside is still molten, and continues to flow downhill. Once the molten lava has passed through, a lava tube, or cave, is all that remains.

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Lava Tube Development



Step 1 -- Lava erupting from volcanoes flows like a river down the flanks of the volcano.



Step 2 -- Lava spilling or splattering over the banks of the lava river forms natural levees, further channeling the flow.



Step 3 -- If the lava meets a downstream blockage, the lava slows, the surface cools and forms a solid crust.

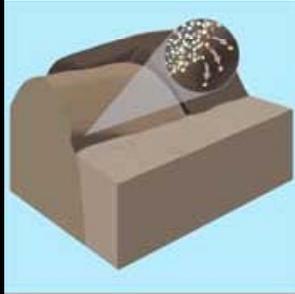


Step 4 -- If the lava breaks through the downstream blockage, the lava will flow again. When the eruption slows, or if the flow is diverted elsewhere, the tube drains and a lava-tube cave is born.

("California Underground" website)

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Sandstone Caves



Step 1-- Moisture persists on the shady side of a sandstone rock. Here it dissolves away the substances that glue together the rock's component sand grains

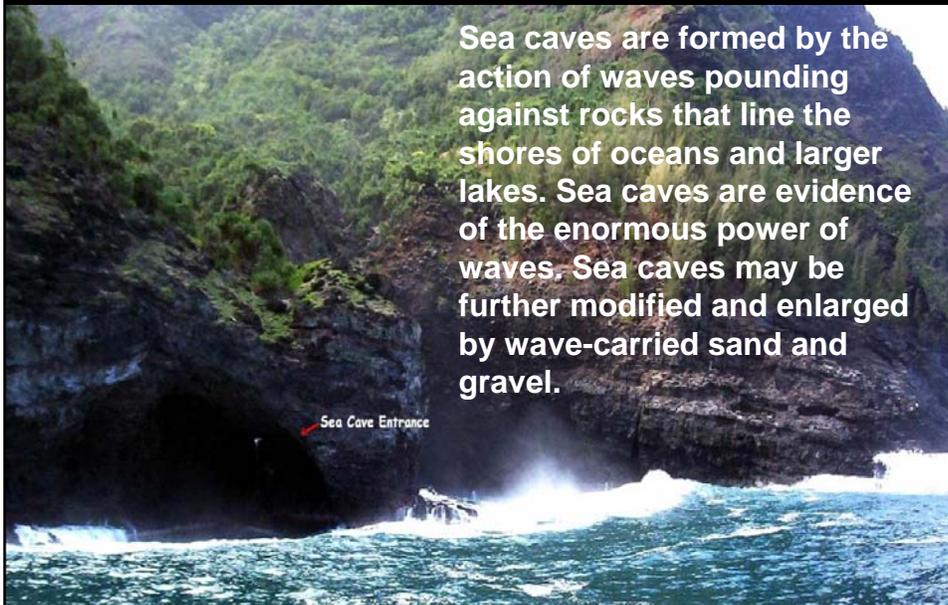


Step 2-- Loosened sand grains have blown away, leaving a shallow cave.

("California Underground" website)

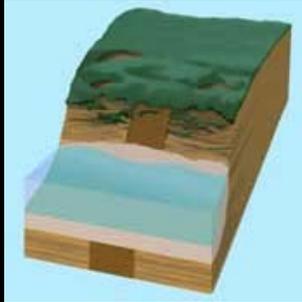
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Sea Caves

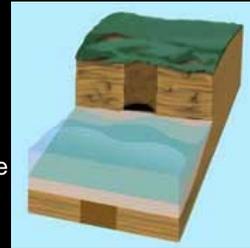


Sea caves are formed by the action of waves pounding against rocks that line the shores of oceans and larger lakes. Sea caves are evidence of the enormous power of waves. Sea caves may be further modified and enlarged by wave-carried sand and gravel.

Sea Cave Development-1



Step 1--On rocky shorelines, the relentless surf erodes weak points in the cliffs forming sea caves. As the glaciers melted at the end of the ice age, the sea level rose. The eroding surf cut coastal bluffs as the ocean flooded inland.



Step 2-- Some parts of the shoreline rock were softer than surrounding rock. There erosion proceeded faster.

("California Underground" website)

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Sea Cave Development-2



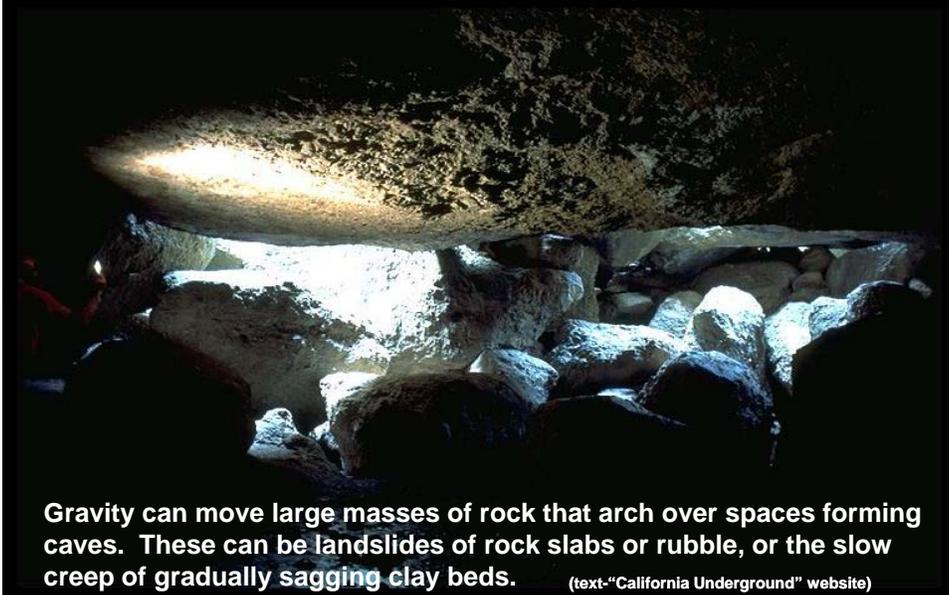
Step 3-- A large cave has formed in the weak portion of the rock.

Step 4--The bluff will continue to erode inland. Where the cave is today, will, in time, be carved away.



("California Underground" website)
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Talus Caves-1



Talus Caves-2



Step 1--A stream winds its way along cracks in a boulder-strewn landscape.

Step 2--In time the stream cuts a deep slot canyon through the rocks.



("California Underground" website)

Talus Caves-3



Step 3--Boulders on the canyon rim tumble into the slot canyon, roofing it over.



Step 4--Additional boulders accumulate further roofing over the cave.

("California Underground" website)

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Tectonic Caves

Earthquake activity can create fissures in the limestone called earth cracks, along joints and as a result of faulting.

Some of the deepest earth cracks are in Arizona caused by volcanic activity near the Flagstaff.

As the San Francisco Mountains rose up as volcanoes, the lime stone was fractured to depths of over 500 feet.



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