

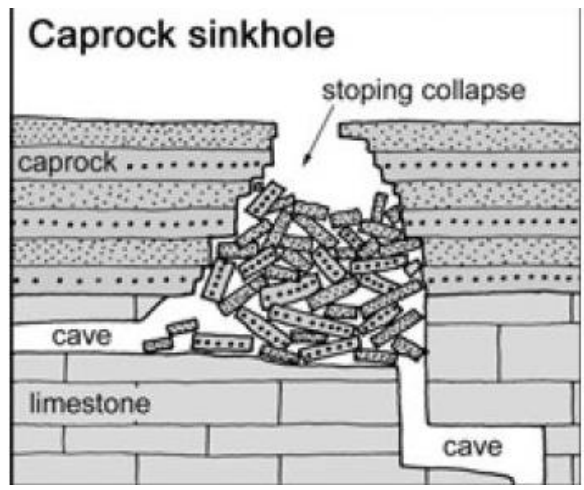
## Course Contents

1. Introduction to Karst Geomorphology
2. Karst Rocks / Soluble Rocks and Karst Processes
3. Karst Hydrology, Karst Drainage System
4. Karst Landforms: Karren
- 5. Karst Landforms: Doline (Sinkhole) and Blind valley**
6. Karst Landforms: Ponor, Sinkhole, Swallow hole, karst spring
7. Karst Landforms: Polje
8. Speleology, Caves, Speleothem
9. Gypsum Karst
10. Psödokarst, Termokarst (kryokarst)
11. Karst Hazards

# Closed Depressions

## 3. Caprock Doline / Örtü Kayası Çökme Dolini

One could argue that a caprock doline is a specific type of collapse doline. The underlying process mirrors that of a collapse doline: a cavity forms in the limestone, its ceiling weakens, and it collapses. However, in the case of a caprock doline, the carbonate rock is overlain by a layer of non-carbonate rock, known as caprock. The upper portion, typically the only visible section of the doline, consists of non-carbonate rock, and the debris at the base shares the same composition.



*Formation process*  
*Host rock types*  
*Formation speed*  
*Typical max size*  
*Engineering hazard*  
*Other names in use*

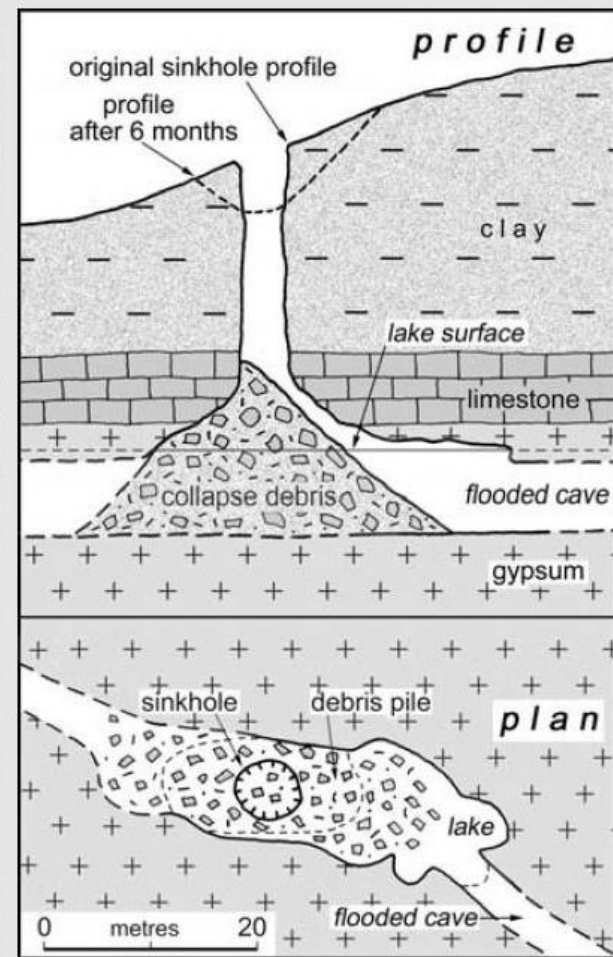
Failure of insoluble rock into cave in soluble rock below  
Any rock overlying limestone, dolomite, gypsum  
Rare failure events, evolve over >10,000 years  
Up to 300 m across and 100 m deep  
Unstable breakdown floor  
Subjacent collapse s/h, interstratal karst

# Closed Depressions

## 3. Caprock Doline / Örtü Kayası Çökme Dolini



**Figure 3.2.2.** The grass-covered clay slope at Dankivsky broken by the new caprock sinkhole.  
Photo: Alexander Klimchouk.

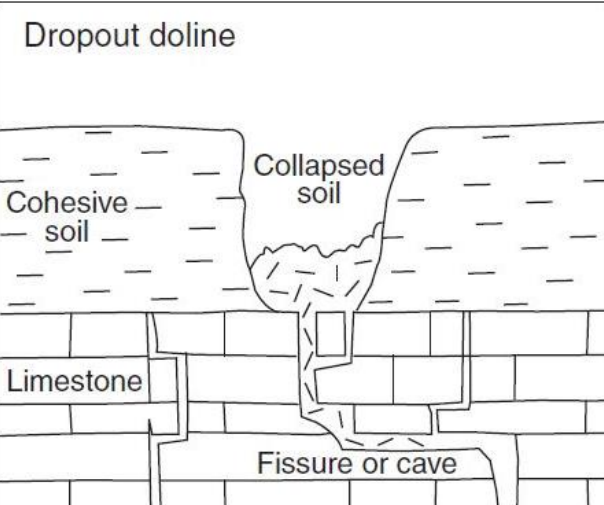


**Figure 3.2.3.** Plan and profile of the Dankivsky caprock sinkhole; the extensions of the cave underwater and behind the debris cone are unknown.  
After Klimchouk and Andrejchuk (2003).

# Closed Depressions

## 4. Dropout Doline (Cover-Collapse Doline / Subsidence) / Örtü Çökme Dolini

A subsidence doline is a closed surface depression in the form of a solution doline, but in a sediment cover of carbonate rock. It is developed by evacuation of sediment cover downward into a karst void underneath. The result is rapid or gradual subsidence of the surface. According to the type of subsidence, the subsidence dolines are divided into two types: the dropout and the suffosion dolines. In cohesive sediment, the subsidence is often sudden and the result can be catastrophic. This type of a doline is called a dropout doline.

	<p><i>Formation process</i></p> <p><i>Host rock types</i></p> <p><i>Formation speed</i></p> <p><i>Typical max size</i></p> <p><i>Engineering hazard</i></p> <p><i>Other names in use</i></p>	<p>Soil collapse into soil void formed over bedrock fissure</p> <p>Cohesive soil overlying limestone, dolomite, gypsum</p> <p>In minutes, into soil void evolved over months or years</p> <p>Up to 50 m across and 10 m deep</p> <p>The main threat of instant failure in soil-covered karst</p> <p>Subsidence s/h, cover collapse s/h, alluvial s/h</p>
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# Closed Depressions

## 4. Dropout Doline (Cover-Collapse Doline / Subsidence) / Örtü Çökme Dolini



# Closed Depressions

## 4. Dropout Doline (Cover-Collapse Doline / Subsidence) / Örtü Çökme Dolini



# Closed Depressions

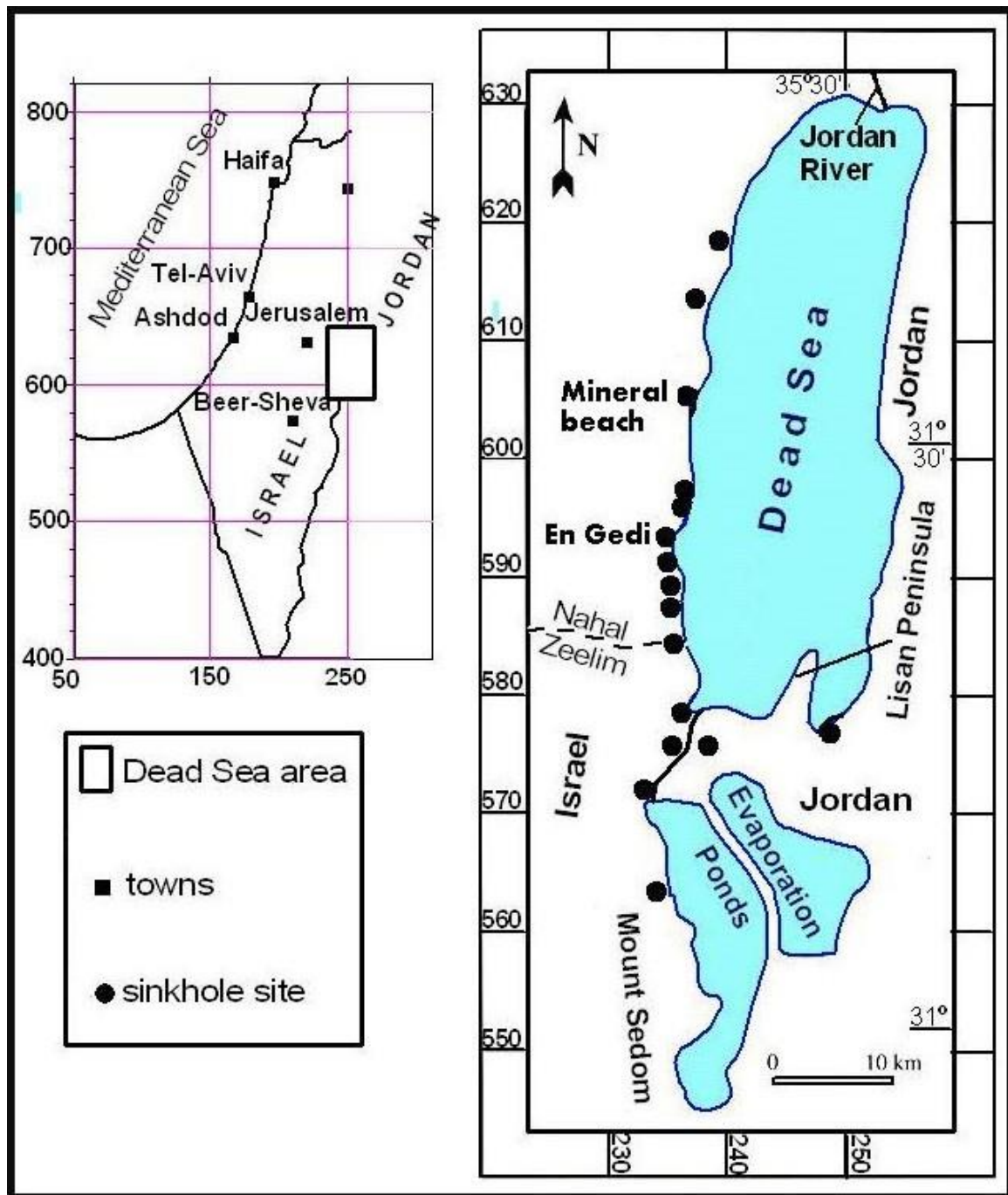
## 4. Dropout Doline (Cover-Collapse Doline / Subsidence) / Örtü Çökme Dolini





# Closed Depressions

## 4. Dropout Doline (Cover-Collapse Doline / Subsidence) / Örtü Çökme Dolini





# Closed Depressions


## 4. Dropout Doline (Cover-Collapse Doline / Subsidence) / Örtü Çökme Dolini



# Closed Depressions

## 5. Suffosion Doline / Alluvial Doline / Subsidence Doline / Alüvyal Dolin /

A subsidence doline is a closed surface depression in the form of a solution doline, but in a sediment cover of carbonate rock. It is developed by evacuation of sediment cover downward into a karst void underneath. The result is rapid or gradual subsidence of the surface. According to the type of subsidence, the subsidence dolines are divided into two types: the dropout and the suffosion dolines. In noncohesive sediment, most commonly soil, the clayey fraction tends to move as slurry into the cavity underneath, whereas the coarser fraction remains nearer to the surface. Such a type of doline is called a suffosion doline and it is usually of relatively small dimensions, in the meter scale.

 <p><b>Suffosion sinkhole</b></p> <p>non-cohesive soil</p> <p>soil washing into fissure</p> <p>limestone</p> <p>fissure or cave</p>	<p><i>Formation process</i></p> <p><i>Host rock types</i></p> <p><i>Formation speed</i></p> <p><i>Typical max size</i></p> <p><i>Engineering hazard</i></p> <p><i>Other names in use</i></p>	<p>Down-washing of soil into fissures in bedrock</p> <p>Non-cohesive soil over limestone, dolomite, gypsum</p> <p>Subsiding over months or years</p> <p>Up to 50 m across and 10 m deep</p> <p>Slow destructive subsidence over years</p> <p>Subsidence s/h, cover subsidence s/h, alluvial s/h</p>
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# Closed Depressions

4. Dropout Doline (Cover-Collapse Doline / Subsidence) / Örtü Çökme Dolini

5. Suffosion Doline / Alluvial Doline / Subsidence Doline / Alüvyal Dolin /

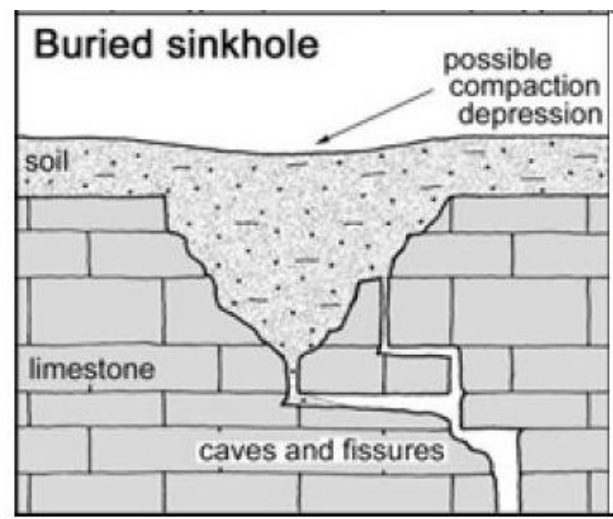




# Closed Depressions

## 6. Buried Doline / Örtülmüş Dolin

When a solution doline or collapse doline filled with sediment buried doline forms. On the surface, there is no evidence that in the bedrock there is a closed depression / buried solution doline. They can be located by earth excavation or by geophysical or geotechnical survey.

 <p><b>Buried sinkhole</b></p> <p>soil</p> <p>possible compaction depression</p> <p>limestone</p> <p>caves and fissures</p>	<p><i>Formation process</i></p> <p><i>Host rock types</i></p> <p><i>Formation speed</i></p> <p><i>Typical max size</i></p> <p><i>Engineering hazard</i></p> <p><i>Other names in use</i></p>	<p>Sinkhole in rock, soil-filled after environmental change</p> <p>Rockhead depression in limestone, dolomite, gypsum</p> <p>Stable features of geology, evolved over &gt;10,000 years</p> <p>Up to 300 m across and 100 m deep</p> <p>Local subsidence on soft fill surrounded by stable rock</p> <p>Filled s/h, compaction s/h, paleosinkhole</p>
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# Closed Depressions

## 6. Buried Doline / Örtülmüş Dolin





# Closed Depressions

## 6. Buried Doline / Örtülmüş Dolin

