Ankara University
Faculty of Languages and History-Geography
Department of Geography

(GGR324) Karst Geomorphology

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READINGS / REFERENCES

1. Ford, D. and Williams, P. 2007. Karst Hydrogeology and Geomorphology. John Wiley & Sons Ltd.
2. Pekcan, N. 2019. Karst Jeomorfolojisi (3. Baskı). Filiz Kitapevi, İstanbul
3. Erinç, S., 2001, **Jeomorfoloji I**, Der Yayınları, İstanbul.
4. Huggett, R.J., 2013. **Fundamentals of Geomorphology**. Third edition.
5. Huggett, R.J., 2015, **Jeomorfolojinin Temelleri** (Çeviri Editörü: Prof. Dr. Uğur Doğan), Nobel Akademik Yayınları, Ankara.

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: Swallow hole, karst spring
7. Karst Landforms: Polje
8. Speleology, Caves, Speleothem
9. Gypsum Karst
10. Psödokarst, Termokarst (kryokarst)
11. Karst Hazards

Dissolution

$$H_2O + CO_2 \rightarrow H_2CO_3$$

Carbon dioxide (CO_2) from the atmosphere dissolves in rainwater to form carbonic acid (H_2CO_3)

$$H_2CO_3 + CaCO_3 \rightarrow Ca(HCO_3)_2$$

Carbonic acid in rainwater percolates through the soil and reaches the limestone bedrock. The carbonic acid reacts with the calcium carbonate ($CaCO_3$) in the limestone.
In this reaction, calcium bicarbonate ($Ca(HCO_3)_2$) is formed, which is soluble in water. This is the primary mechanism by which limestone dissolves in karst environments.

Dissolution

Table 3.1 Dissociation reactions and solubilities of some representative minerals that dissolve congruently in water, at 25 °C and 1 bar (105 Pa) pressure (Modified with permission from Freeze, R.A. and Cherry, J.A. Groundwater © 1979 Prentice Hall)

Mineral	Dissolution reaction	Solubility ($mg\,L^{-1}$)	Common range of abundance in waters ($mg\,L^{-1}$)
Gibbsite	$Al(OH)_3 + H_2O \rightarrow 2Al^{3+} + 6OH^-$	0.001	Trace
Quartz	$SiO_2 + H_2O \rightarrow H_4SiO_4$	12	1–12
Amorphous silica	$SiO_2 + H_2O \rightarrow H_4SiO_4$	120	1–65
Calcite	$CaCO_3 + H_2O + CO_2 \leftrightarrow Ca^{2+} + 2HCO_3^-$	60*, 400†	10–350
Dolomite	$CaMg(CO_3)_2 + 2H_2O + 2CO_2 \leftrightarrow Ca^{2+} + Mg^{2+} + 4HCO_3^-$	50*, 300†	10–300
Gypsum	$CaSO_4 \cdot 2H_2O \rightarrow Ca^{2+} + SO_4^{2-} + 2H_2O$	2400	0–1500
Sylvite	$KCl + H_2O \rightarrow K^+ + Cl^- + H^+ + OH^-$	264 000	0–10 000
Mirabilite	$NaSO_4 \cdot 10H_2O + H_2O \rightarrow Na^+ + SO_4^{2-} + H^+ + OH^-$	280 000	0–10 000
Halite	$NaCl + H_2O \rightarrow Na^+ + Cl^- + H^+ + OH^-$	360 000	0–10 000

*$P_{CO_2} = 10^{-3}$ bar.
†$P_{CO_2} = 10^{-1}$ bar.

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Fractured Rock and Joints (Tectonics)

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