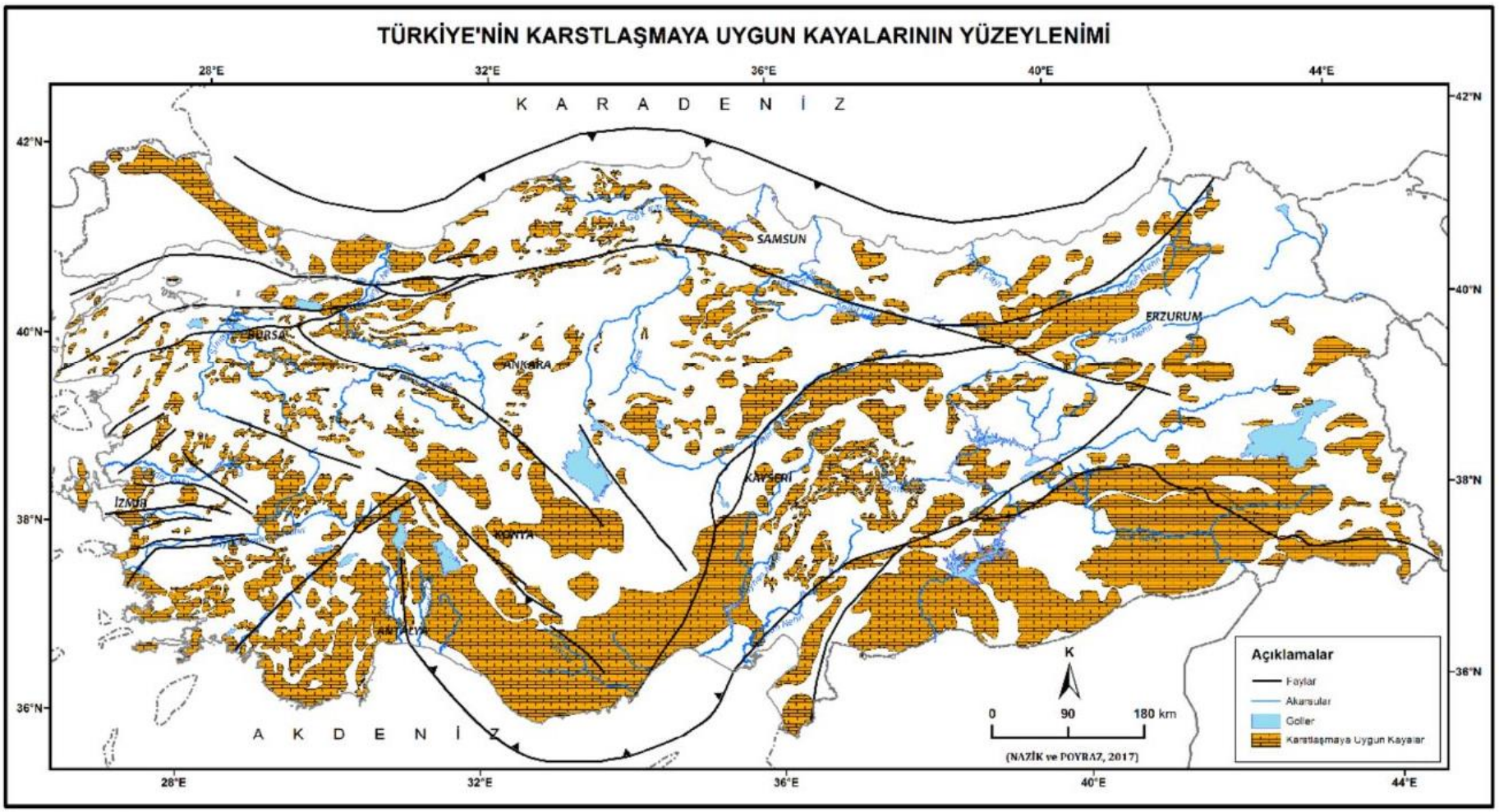
READINGS / REFERENCES

1. Doğan, U., Koçyiğit, A., Yeşilyurt, S. 2019. **The relationship between Kestel Polje system and the Antalya Tufa Plateau: Their morphotectonic evolution in Isparta Angle, Antalya-Turkey**. Geomorphology, 334, 112-125.
2. Doğan, U., Yeşilyurt, S., Mutlu, G., Koçyiğit, A. 2022. **Base-level poljes in the Sivas Gypsum Karst, Türkiye**. Journal of Geomorphological Researches, 9, 19-37.
3. Doğan, U. And Koçyiğit, A. 2018. **Morphotectonic evolution of Maviboğaz canyon and Suğla polje, SW central Anatolia, Turkey**. Geomorphology, 306, 13-27.
4. Güldalı, N. 1976. **Akseki Polyesi, Torosların Karstik Bölgelerindeki Dağarası Ovalarının Oluşumu ve Gelişimi**. Türk. Jeol. Bül., 19, 143-148
5. Doğan, U., Koçyiğit, A., Gökkaya, E. 2017. **Development of the Kembos and Eynif structural poljes:Morphotectonic evolution of the Upper Manavgat River basin, central Taurides, Turkey**. Geomoprhology, 278, 105-120.
6. Şimşek, M., Doğan, U., Öztürk, M.Z. 2020. **Polyelerin Sınıflandırılması ve Toroslardan Örnekler**, Jeomorfolojik Araştırmalar Dergisi, 5, 1-14.
7. Şimşek, M., Öztürk, M.Z., Doğan, U., Utlu, M. 2020. **Toros Polyelerinin Morfometrik Özellikleri**. Coğrafya Dergisi, 42, 1-19.

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

Map of Soluble Rocks



Şekil 1. Türkiye'nin karstlaşmaya uygun kayalarının yüzeylenimi.
Figure 1. *Turkey's rocks suitable for karstification.*

Nazik, L. ve Poyraz, M. 2017. Türkiye karst jeomorfolojisi genelini karakterize eden bir bölge: Orta Anadolu Platoları karst kuşağı. Türk Coğrafya Dergisi, 68, 43-56.

Ponor

Ponor / Swallow hole :

Ponors or swallow holes represent fissures in the karst massif through which the water sinks underground (Ford and Williams, 2007).

Ponor

Ponor / Swallow hole:

Polje

Poljes are large closed depressions with conspicuously flat bottoms, karstic drainage, and steep peripheral slopes, developed on karst rocks.
The angle where the side slope meets the bottom of the polje is distinctly defined, where the flat floor abruptly transitions from the surrounding slopes.
Poljes long axis aligns parallel to significant techtonic patterns and can extend for tens of kilometers.
Sedimentary materials often gather on the polje floor. Drainage can occur via surface watercourses ("open" poljes) or swallow holes ("closed" poljes).

Polje

Poljes can be categorized based on their hydrological patterns into the following groups:

1. Permanently flooded or lakes
2. Periodically, partly, or completely flooded
3. Dry poljes.

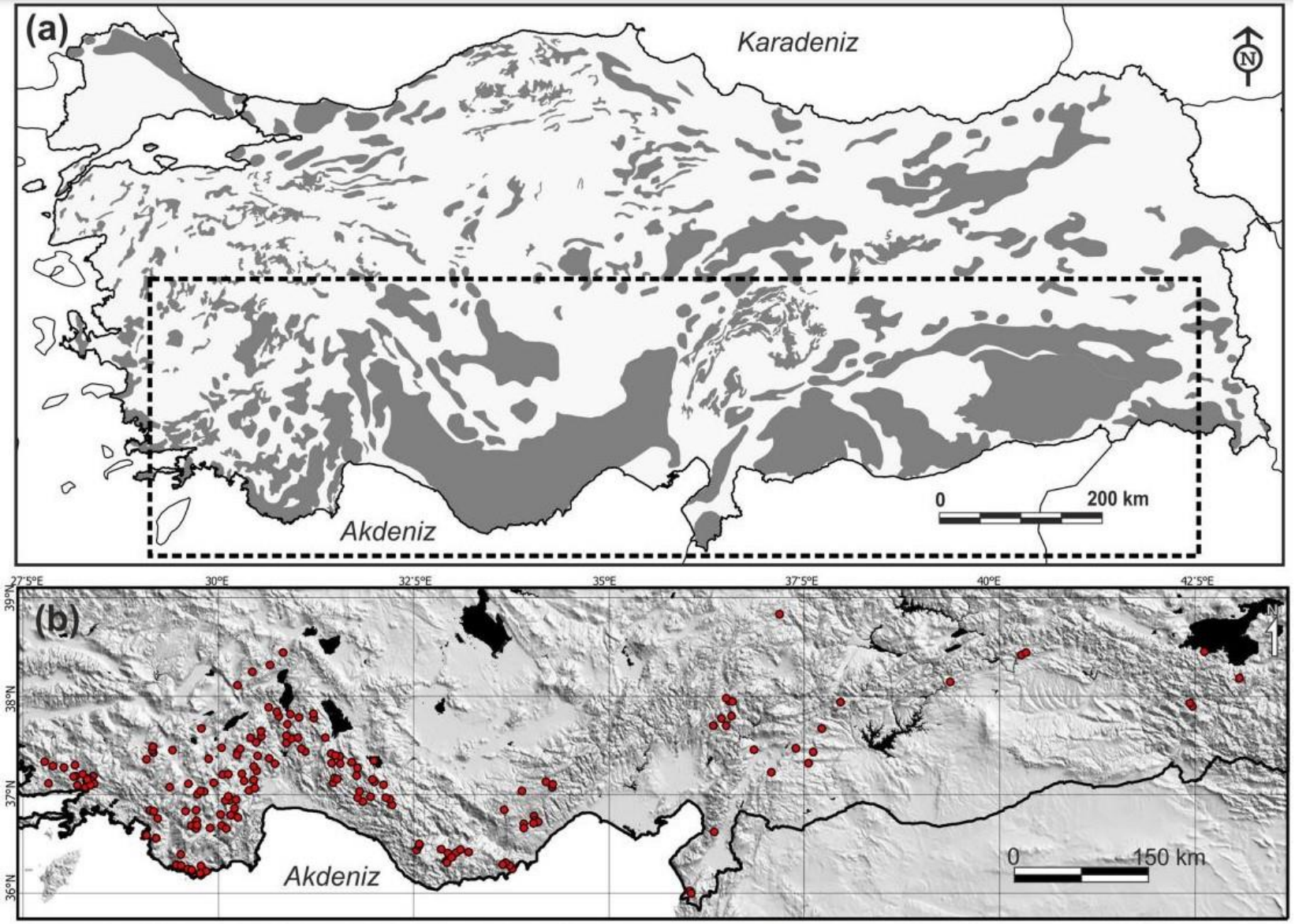
Poljes showcase intricate hydrological and hydrogeological attributes, including both permanent and seasonal springs and rivers, disappearing and sinking rivers, as well as swallow holes and estavelles. Estavelles are karstic apertures that can operate as either a sink or a spring, contingent upon the groundwater level within their surroundings.

Polje

During the cold and wet seasons, poljes experience frequent flooding. In natural conditions, poljes are typically flooding for an average of 3 to 7 months annually, primarily between October and April. Poljes become flooded when: (1) the groundwater level rises; (2) inflow exceeds the maximum capacity of the outflow structures, such as ponors or swallow holes; or (3) both situations happen simultaneously.

https://wwf.panda.org/wwf_news/?146621/Major-Bosnian-karst-polje-receives-international-recognition

Polje



Şekil 1: (a) Türkiye'deki karstik alanların (Nazik & Poyraz, 2017) ve (b) Toroslar'da polyelerin genel dağılışı.

Figure 1: Distribution of (a) karst regions of Turkey (Nazik & Poyraz, 2017) and (b) poljes in the Taurus

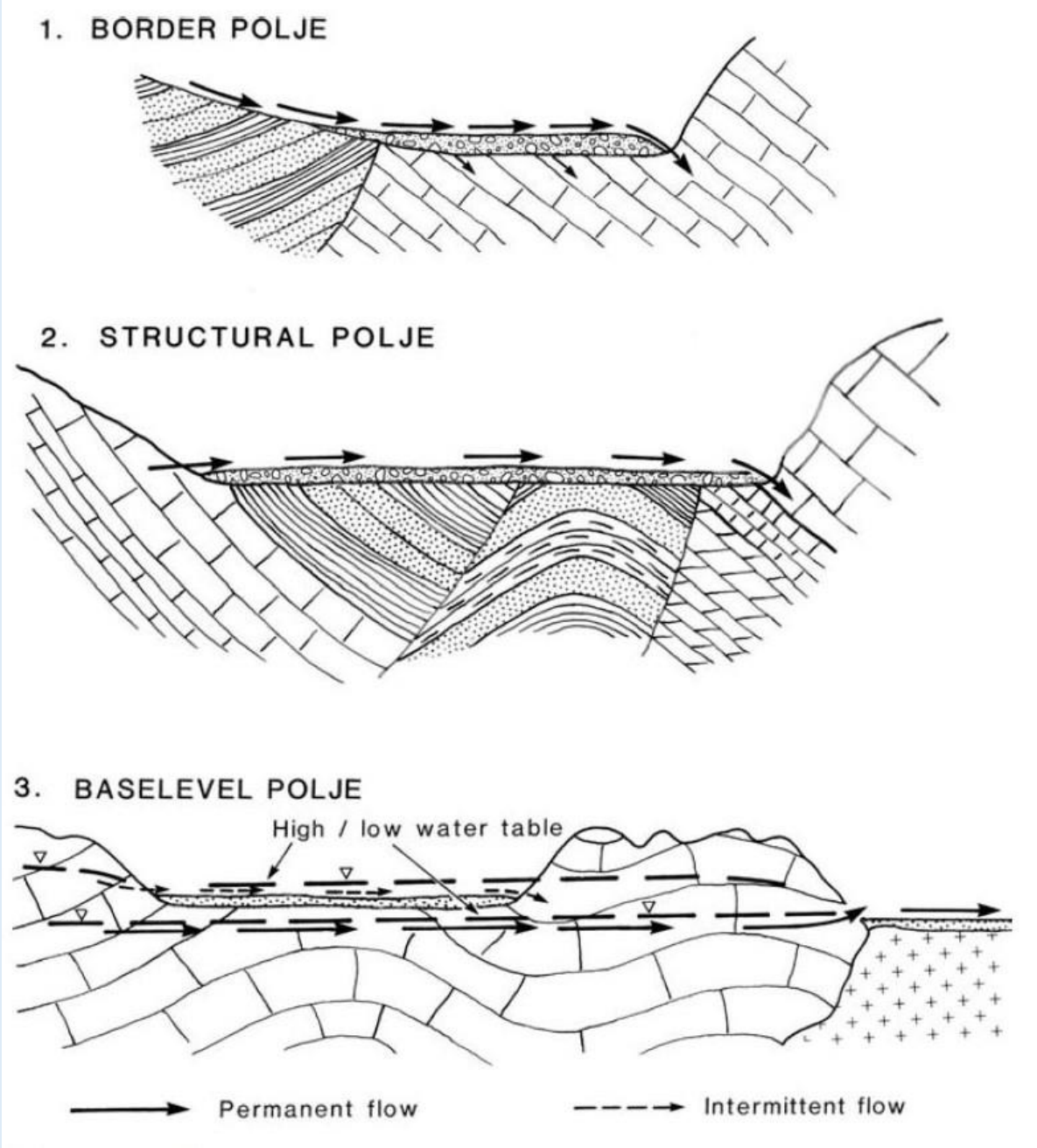
Şimşek, M., Öztürk, M.Z., Doğan, U., Utlu, M. 2020. **Toros Polyelerinin Morfometrik Özellikleri**. Coğrafya Dergisi, 42, 1-19.

Polje

Types of Poljes

1. **Border poljes**
2. Structural poljes
3. Baselevel poljes

Border poljes, also known as Randpolje in German, are primarily influenced by external factors. They form where the fluctuation zone of the water table in non-karstic rocks extends onto limestone terrain. This type of polje is frequently found along boundaries with elevated regions that contribute significant sediment loads to rivers.

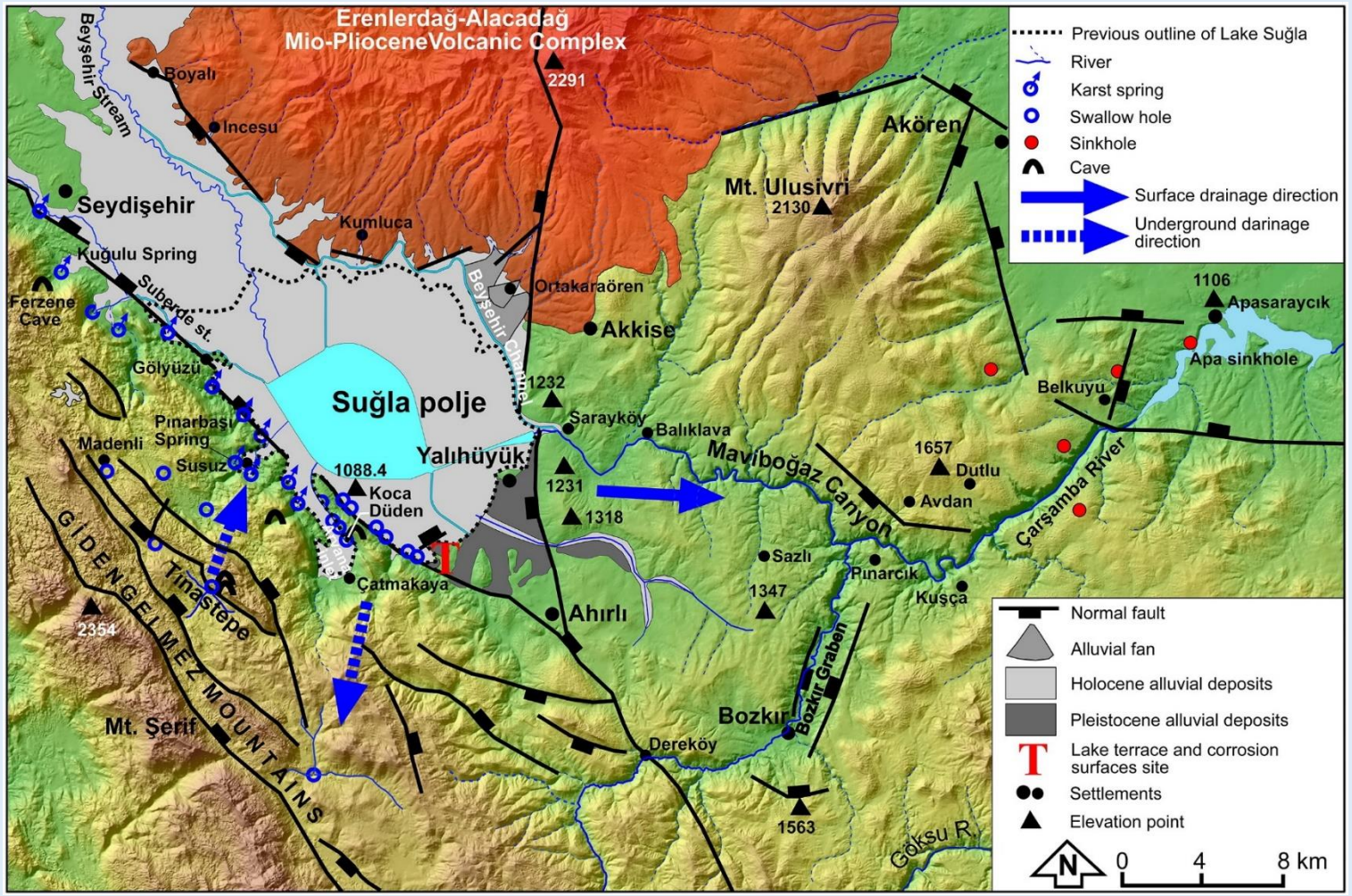


Ford, D.C. & Williams, P. (1989) Karst Geomorphology and Hydrology, Unwin Hyman, London

Polje

Types of Poljes

1. **Border poljes**
2. Structural poljes
3. Baselevel poljes



Doğan, U. And Koçyiğit, A. 2018. Morphotectonic evolution of Maviboğaz canyon and Suğla polje, SW central Anatolia, Turkey. Geomorphology, 306, 13-27.

Polje

Types of Poljes

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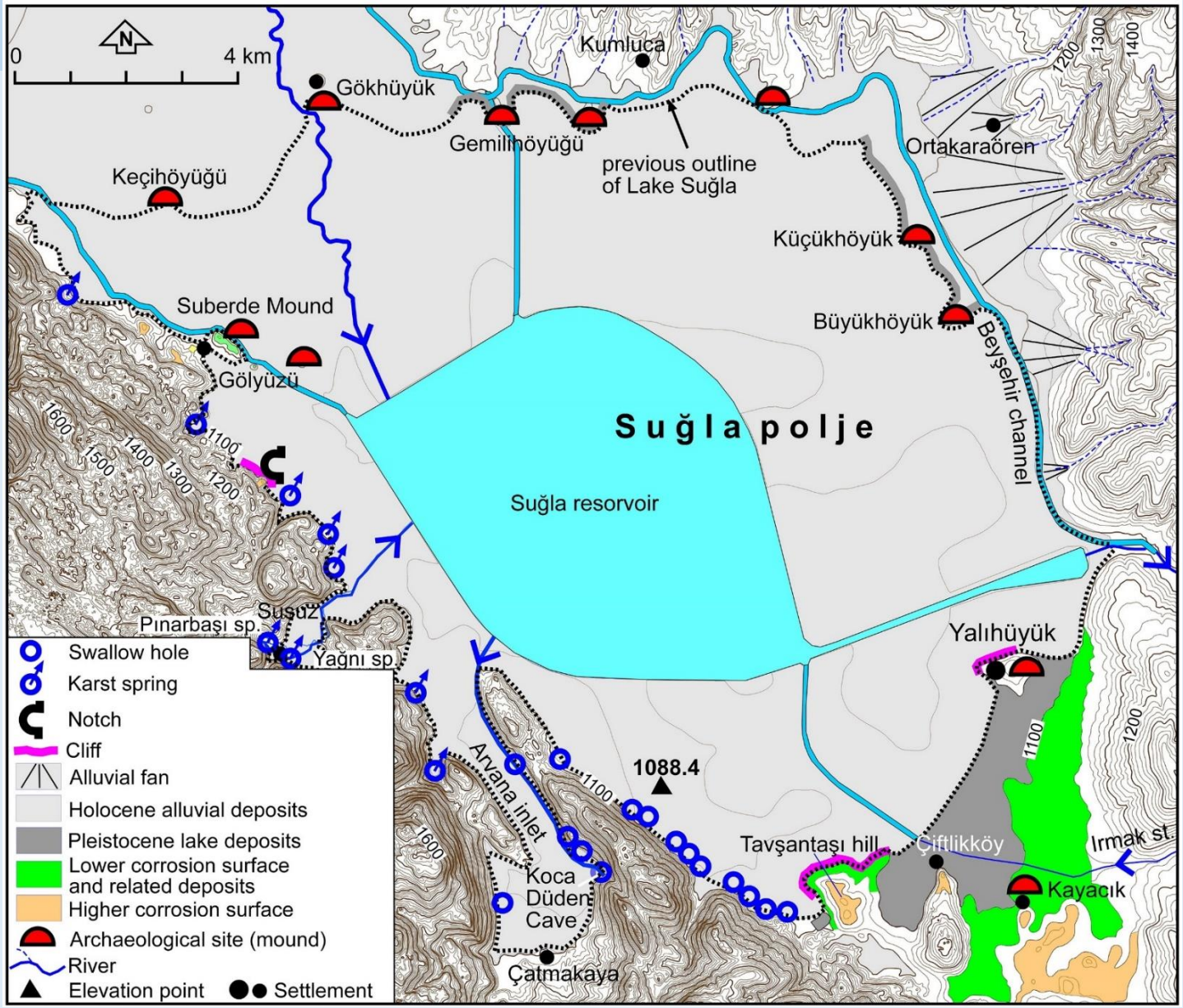
2. Structural poljes
3. Baselevel poljes

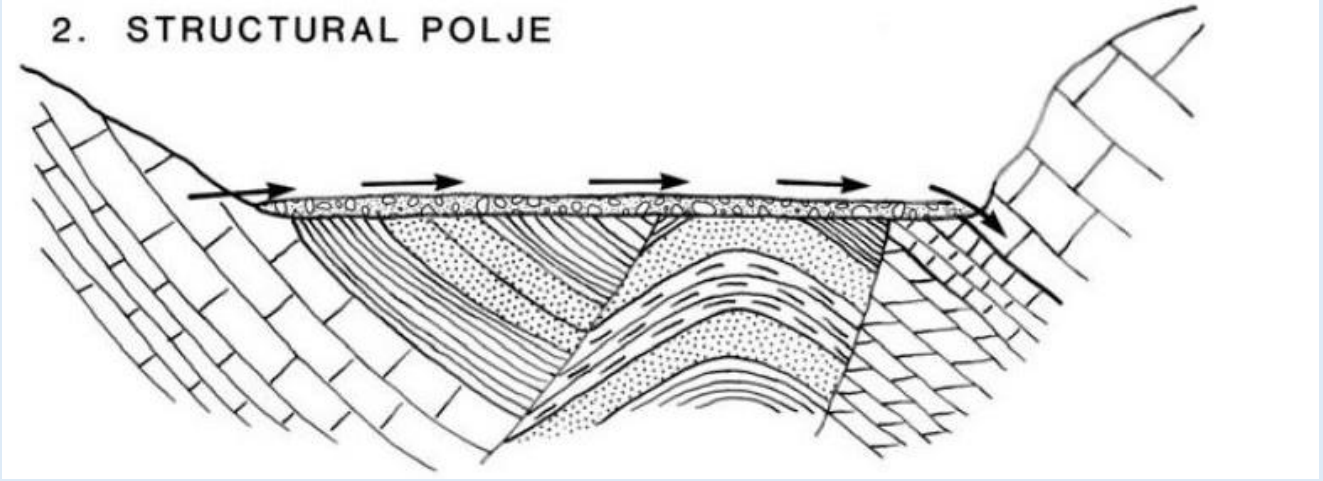


Doğan, U. And Koçyiğit, A. 2018. Morphotectonic evolution of Maviboğaz canyon and Suğla polje, SW central Anatolia, Turkey. Geomorphology, 306, 13-27.

Polje

Types of Poljes

2. Structural poljes



Ford, D.C. & Williams, P. (1989) Karst Geomorphology and Hydrology, Unwin Hyman, London

Structural poljes are primarily influenced by geological characteristics of the bedrock. They often coincide with grabens or fault-angle depressions and are located within areas of impervious or less permeable rocks like dolomite.

These depressions typically align with the structural orientation, although their boundaries may be altered by extensive erosion across karstic formations.

Structural poljes are significant features, giving rise to some of the world's largest karst depressions. They are the predominant type of polje in regions like the Dinaric karst and other active tectonic zones such as the Taurus Mountains in Turkey.

They exhibit characteristics of a normal fluvial terrain, often featuring floodplains and terraces, with the local water table situated close to the surface due to the limited permeability.

Water drainage from these basins occurs where the hydraulic gradient steepens, typically along the karstic rock side of a bounding fault, where numerous ponors (stream-sinks) may be present.

Polje

Types of Poljes

2. Structural poljes

Kembos polje

Polje

Types of Poljes

2. Structural poljes

Kembos polje

Polje

Types of Poljes

2. Structural poljes

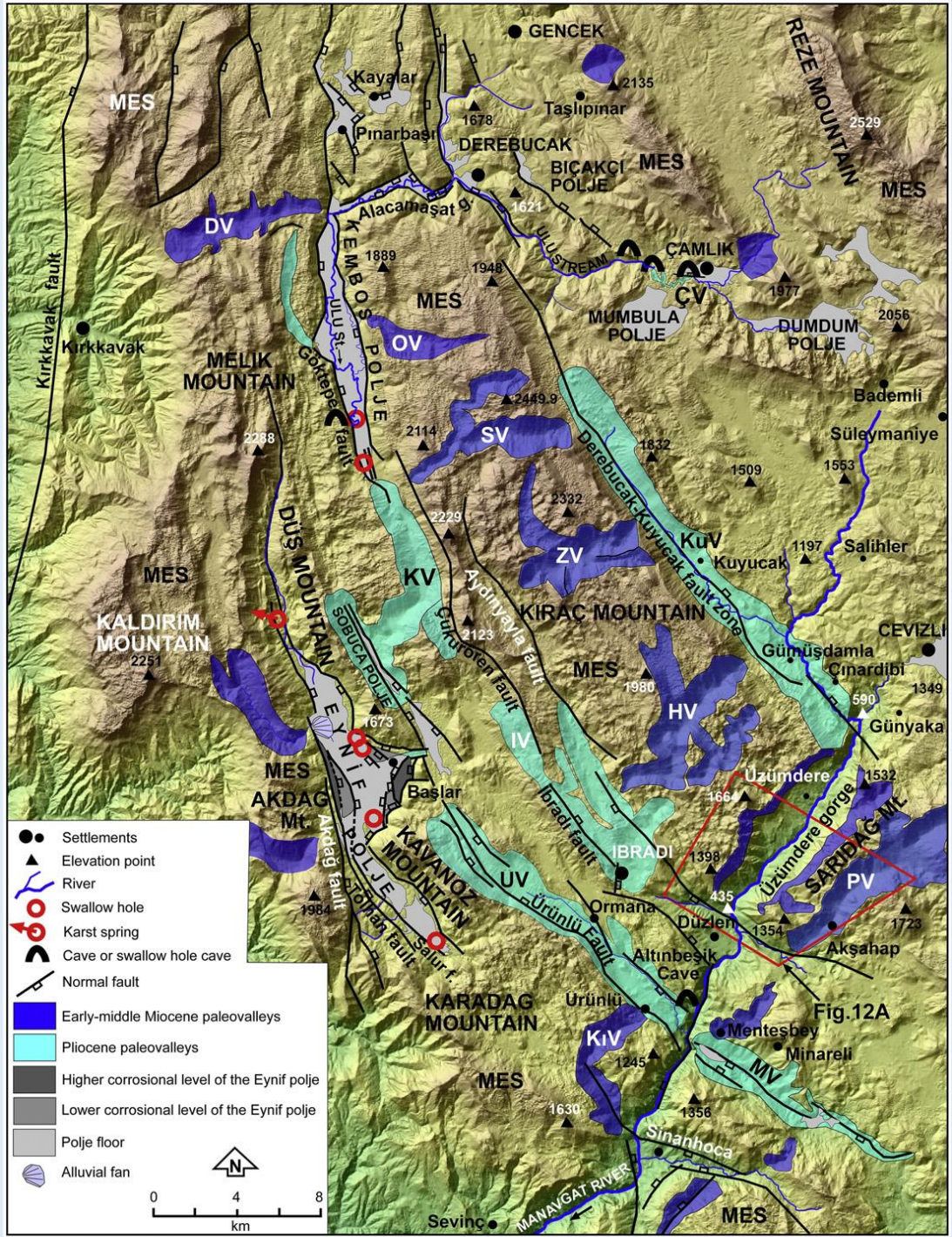
Kembos polje

Polje

Types of Poljes

2. Structural poljes

Kembos polje



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Polje

Types of Poljes

2. Structural poljes

Kestel polje

Polje

Types of Poljes

2. Structural poljes

Kestel polje

Polje

Types of Poljes

2. Structural poljes

Kestel polje

Hum

Polje

Types of Poljes

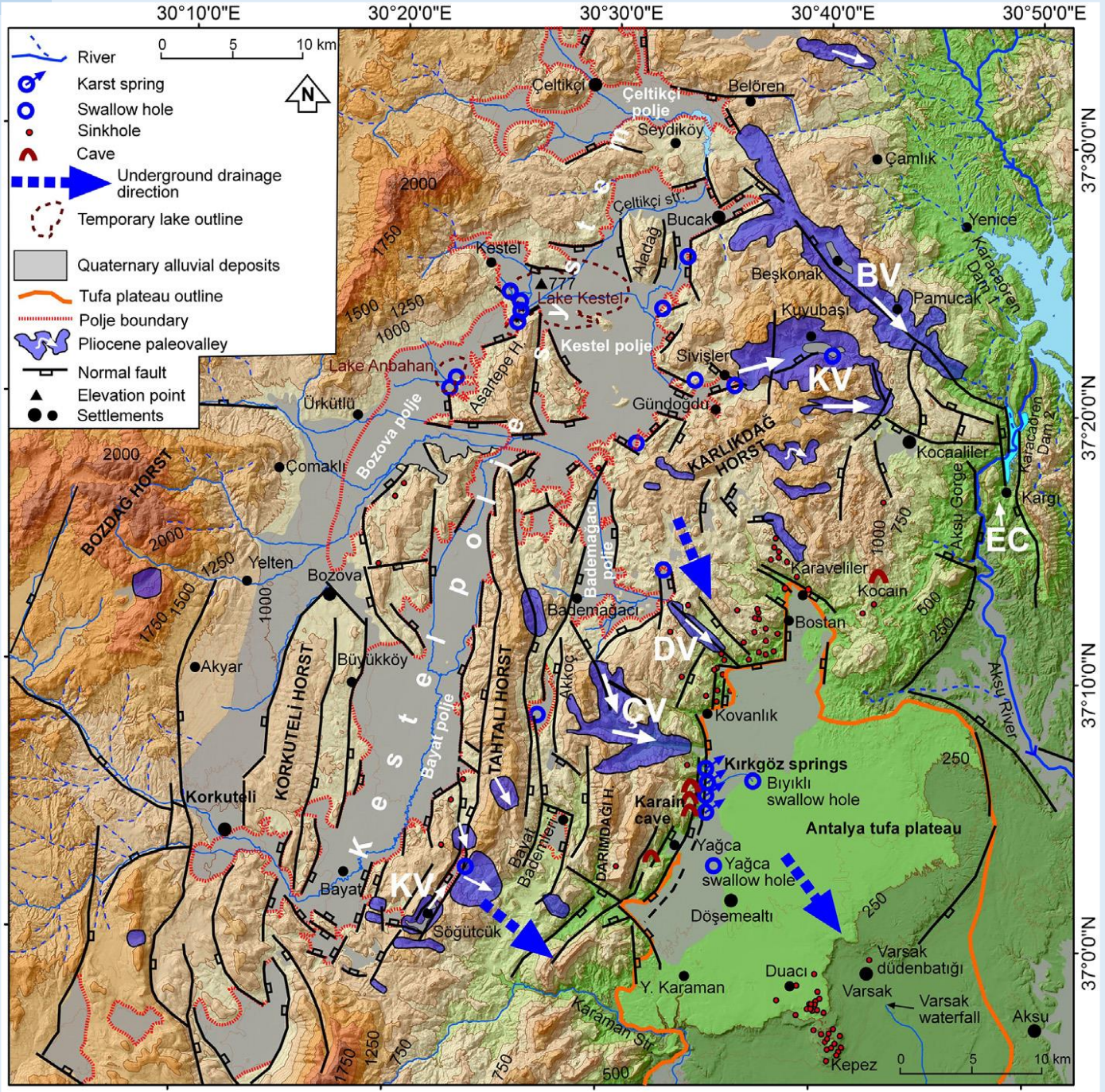
2. Structural poljes

Kestel polje

Polje

Types of Poljes

2. Structural poljes



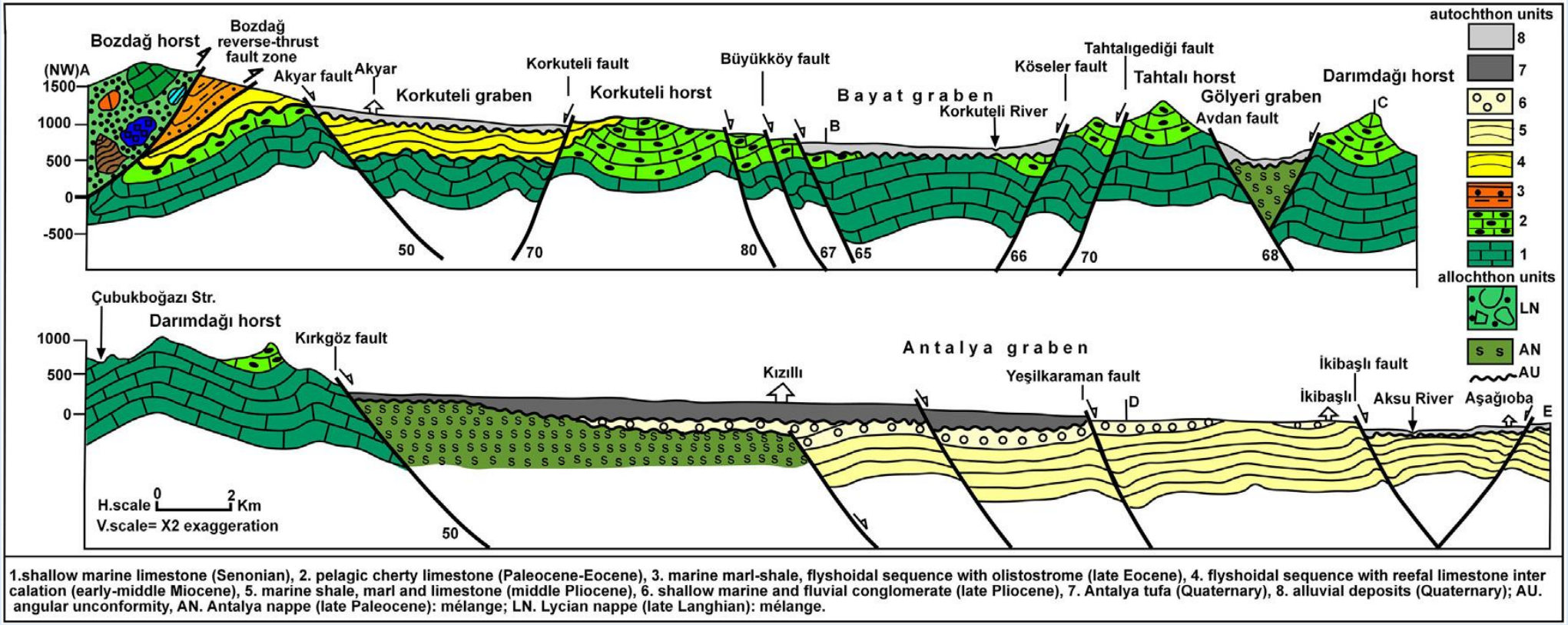
Doğan, U., Koçyiğit, A., Yeşilyurt, S. 2019. The relationship between Kestel Polje system and the Antalya Tufa Plateau: Their morphotectonic evolution in Isparta Angle, Antalya-Turkey. Geomorphology, 334, 112-125.

Polje

Kestel polje

Types of Poljes

2. Structural poljes



1.shallow marine limestone (Senonian), 2. pelagic cherty limestone (Paleocene-Eocene), 3. marine marl-shale, flyshoidal sequence with olistostrome (late Eocene), 4. flyshoidal sequence with reefal limestone inter calation (early-middle Miocene), 5. marine shale, marl and limestone (middle Pliocene), 6. shallow marine and fluvial conglomerate (late Pliocene), 7. Antalya tufa (Quaternary), 8. alluvial deposits (Quaternary); AU. angular unconformity, AN. Antalya nappe (late Paleocene): mélange; LN. Lycian nappe (late Langhian): mélange.

Doğan, U., Koçyiğit, A., Yeşilyurt, S. 2019. The relationship between Kestel Polje system and the Antalya Tufa Plateau: Their morphotectonic evolution in Isparta Angle, Antalya-Turkey. Geomorphology, 334, 112-125.

Polje

Types of Poljes

2. Structural poljes

Kestel polje

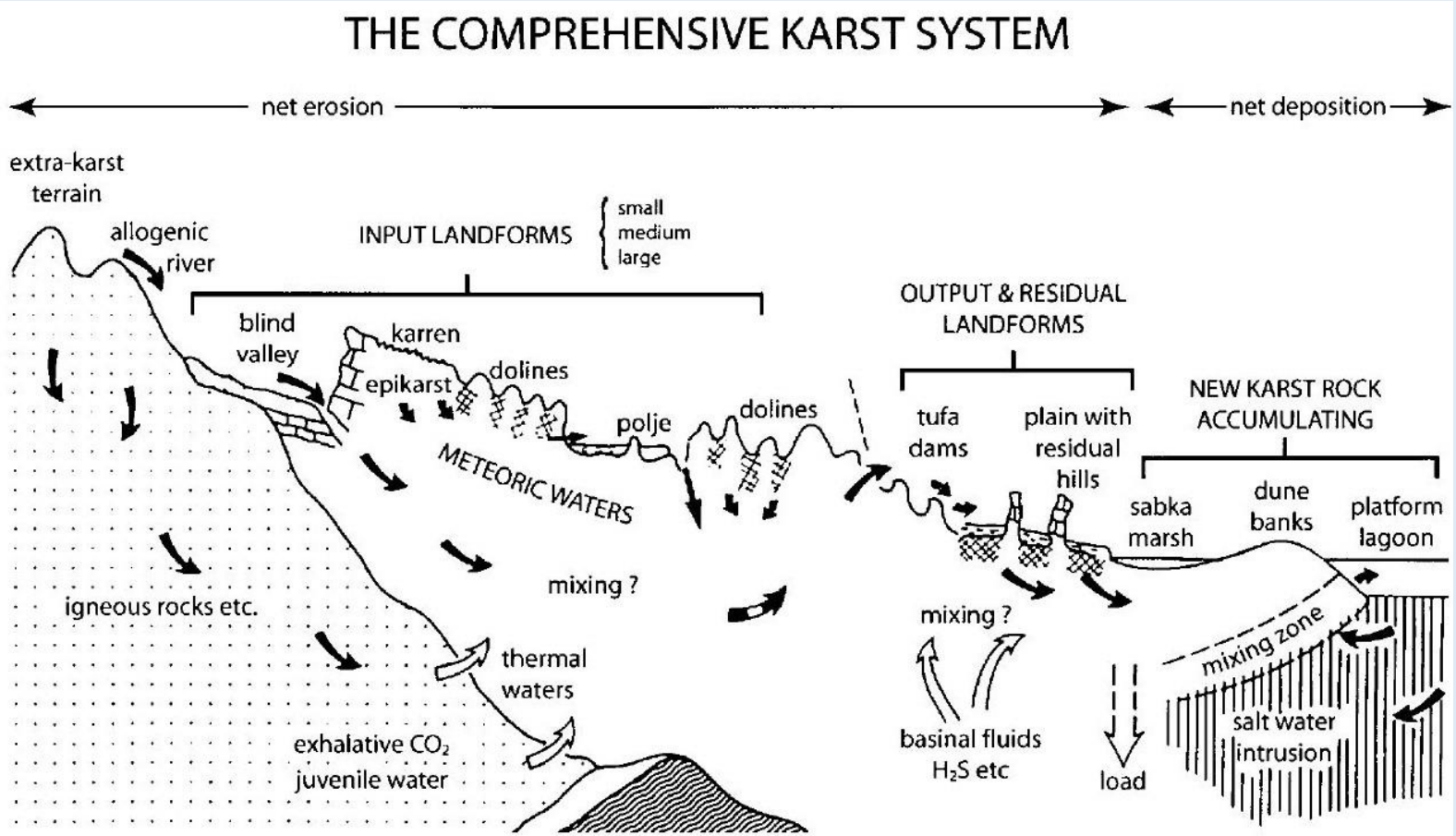


Figure 1.2 The comprehensive karst system: a composite diagram illustrating the major phenomena encountered in active karst terrains. Reproduced from Ford, D.C. and Williams, P.W. (1989) *Karst Geomorphology and Hydrology*.

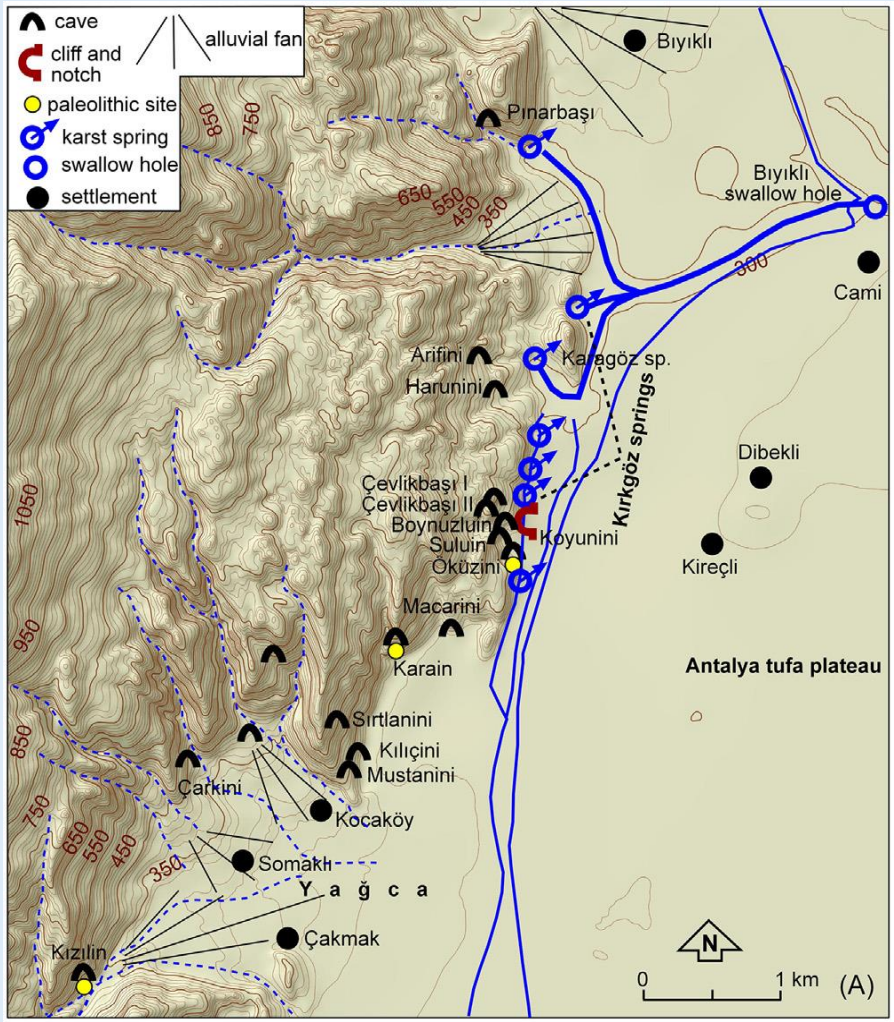
Ford, D.C., Williams, P.W. 2007. Karst Hydrogeology and Geomorphology. John Wiley & Sons Ltd

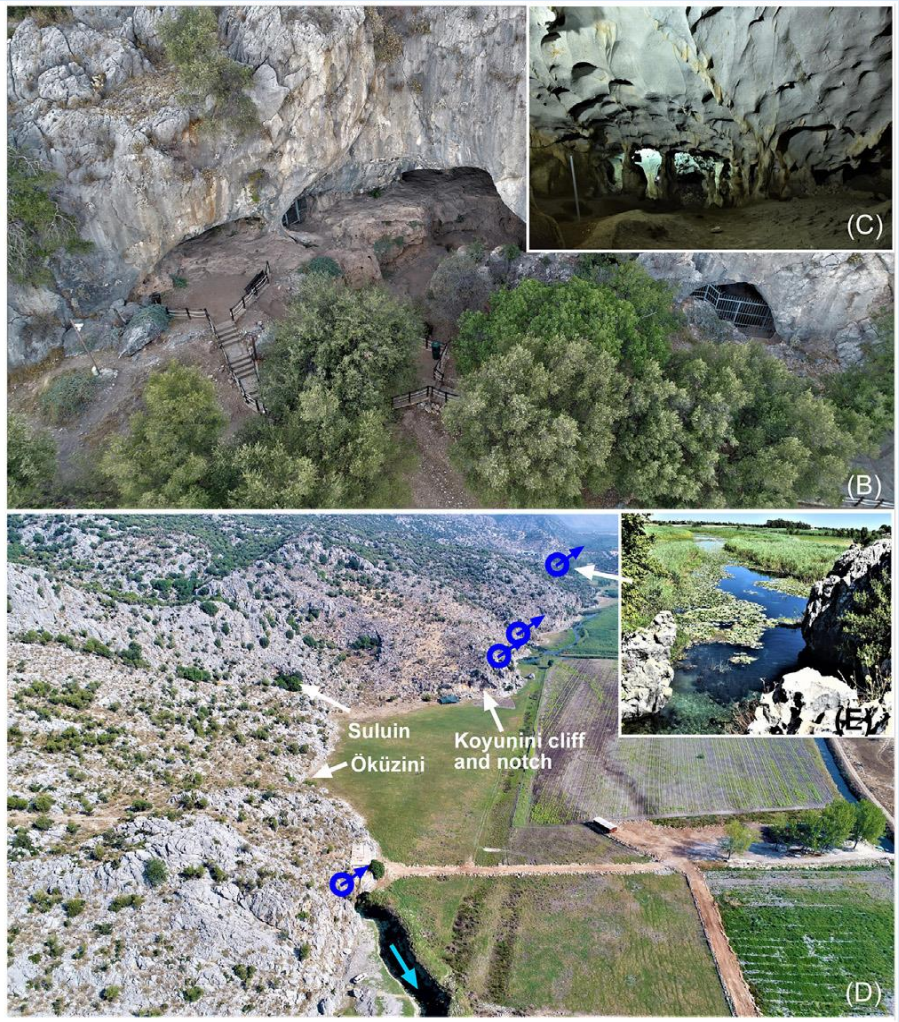
Polje

Types of Poljes

2. Structural poljes

Kestel polje





Polje

Types of Poljes

2. Structural poljes

Kestel polje

Polje

Kestel polje

Types of Poljes

2. Structural poljes

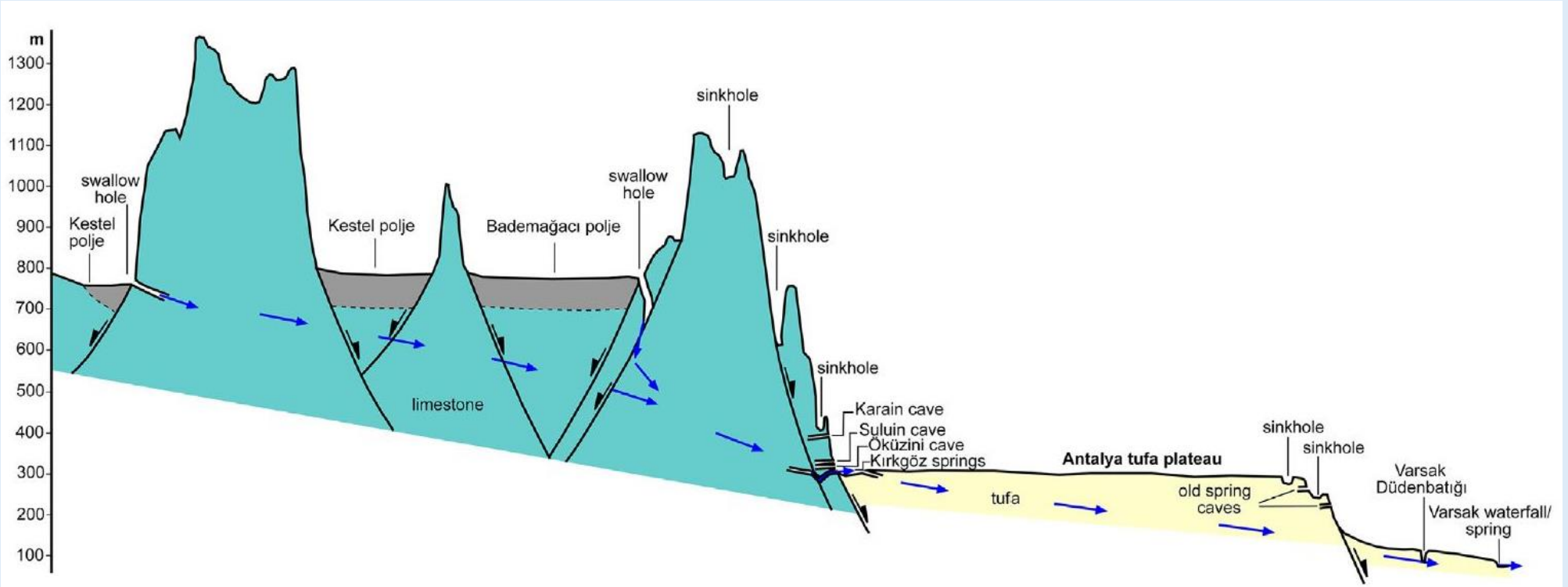


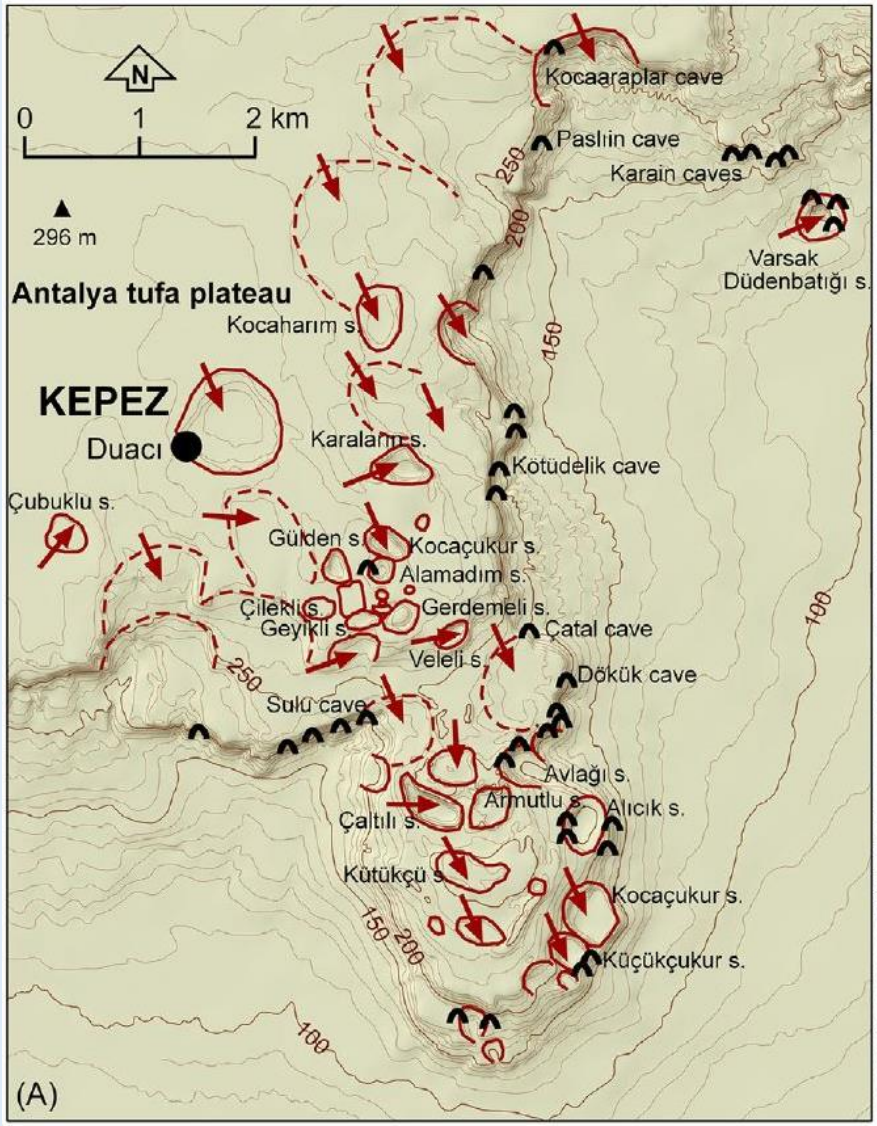
Fig. 13. Sketch profile depicting morphological record of karst hydrology between Kestel polje system and Antalya Tufa Plateau.

Polje

Kestel polje

Types of Poljes

2. Structural poljes



Polje

Types of Poljes

2. Structural poljes

Düden Şelalesi

Polje

Types of Poljes

2. Structural poljes

Aşağı Düden Şelalesi

Polje

Types of Poljes

2. Structural poljes

Elmalı polje