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Andreas Schachner

## Die Ausgrabungen in Boğazköy-Ḫattuša 2024

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The background image shows an archaeological site with a dirt path leading through large, stacked stone walls. The stones are light-colored and appear to be made of limestone or similar material. The sky is blue with some clouds. The overall scene is arid and rocky.

## ABSTRACT

### The Excavations at Boğazköy-Ḫattuša in 2024

Andreas Schachner

Excavations and 3D surveys on the north-western slope of Büyükkale (BK-NWH), on the northern terrace of Büyükkale and the western slope of the Upper City have yielded significant results relating to the Hittite, the Iron Age and the Hellenistic-Galatian periods. The discovery of a monumental building on the BK-NWH, a connecting building between the upper courtyard and Building E on the Büyükkale and another large building on the western slope of the Upper City, contributes to a more profound understanding of Hittite urban structures. The discovery of a necropolis from the Old Hittite period on the west side of the city in the area of the Upper West Gate was a particular surprise. The Iron Age structures investigated on the BK-NWH and the Büyükkale plateau provide a more general impression of the dynamic development during the first half of the 1<sup>st</sup> millennium B.C. and show how a rural settlement morphed into a complex, probably urban structure. For the first time, the structural development of the settlement can be documented for the Hellenistic-Galatian period, closing a crucial gap in the site's cultural history. This research is complemented by the analysis of the Iron Age small finds from the excavations in the Upper City from 1988–1992, which for the first time provide a complete picture of the material culture of this period.

## KEYWORDS

Ḫattuša, Büyükkale, Northwest Slope, Upper City, Hittite Empire, Western Gate, Cremation Burials, Iron Age, Hellenistic-Galatian Period, Roman Period

# Die Ausgrabungen in Boğazköy-Ḫattuša 2024

Metin Alparslan, Jörg Becker, Meltem Doğan-Alparslan, Martin Gruber, Suzanne Herbordt, Önder İpek, Dominique Krüger, Leopoldo Repola, Daniel Schwemer, Emine Sökmen Adalı, Handan Üstündağ, Giovanni Varriale, Stefano Vitale, Alwo von Wickede

<sup>1</sup> Die lange Forschungskontinuität in Ḫattuša ermöglicht es, die vielfältigen Facetten der kulturellen Entwicklung über die Region hinaus exemplarisch für das nordöstliche Zentralanatolien von den ersten sesshaften, produzierenden Gemeinschaften im Chalkolithikum bis heute zu rekonstruieren. Dabei wird deutlich, dass die Siedlungskammer des südlichen Budaközü-Tals zwar in allen Zeiten genutzt wurde, dass sich aber die Siedlungsschwerpunkte innerhalb des topographisch definierten Raums kontinuierlich verlagerten. Dieses Phänomen, das in dieser zeitlichen Tiefe in Anatolien bisher nur hier definiert werden konnte, und das dem von Südosteuropa bis Zentralasien vorherrschenden Prinzip der dauerhaft einen Ort besetzenden Tell-Siedlungen<sup>1</sup> diametral entgegensteht, ist nicht auf die Bronzezeit beschränkt. Vielmehr ermöglichen es die langen Forschungen in Boğazköy, ähnliche Veränderungen auch im Chalkolithikum, in der Eisenzeit, der römischen Kaiserzeit, der byzantinischen Epoche und der frühen Neuzeit zu beobachten<sup>2</sup>.

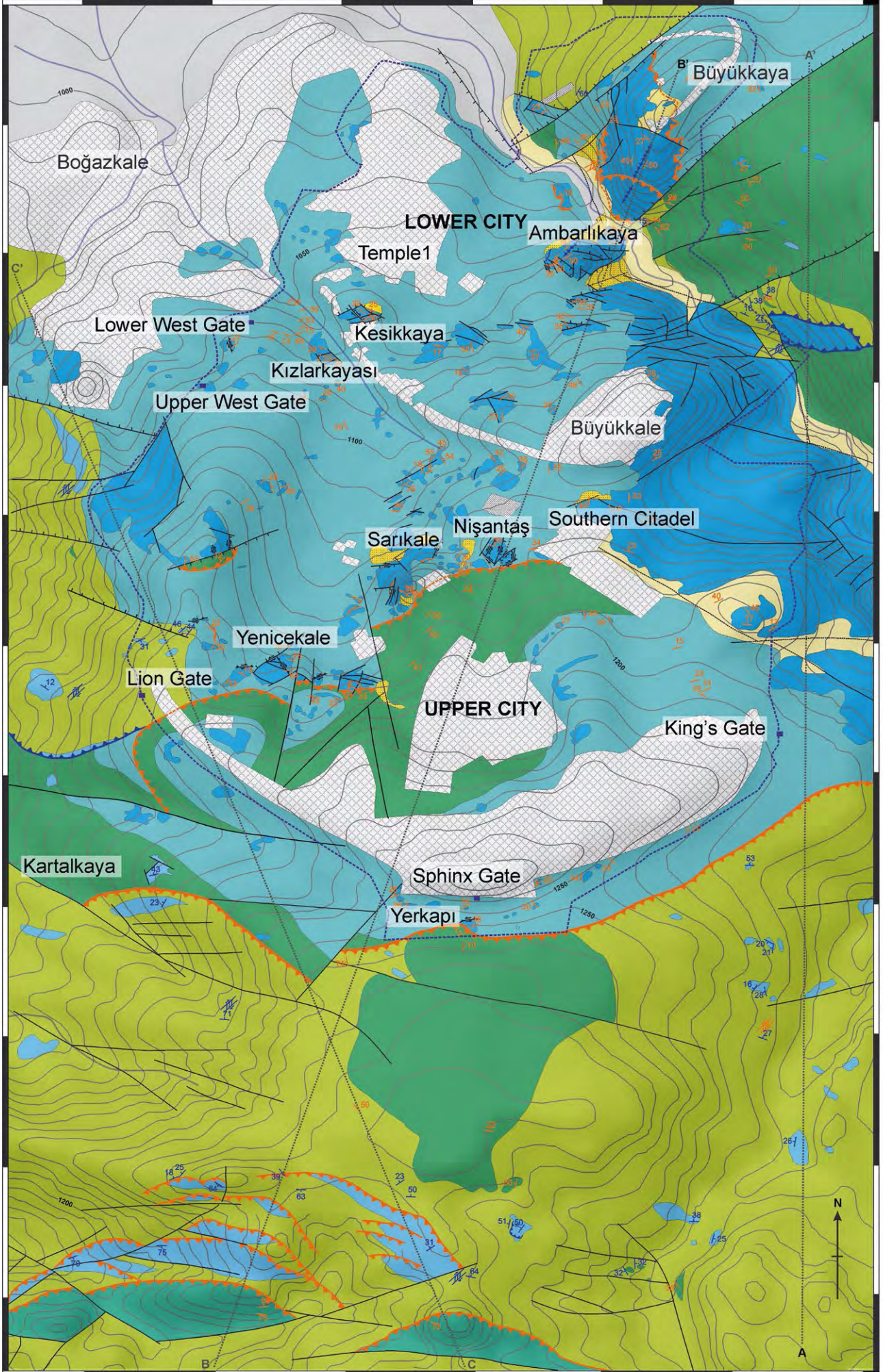
<sup>2</sup> Um die chronologische Dynamik dieser Entwicklung genauer einzugrenzen, gilt es, gezielt bestehende Lücken im Verständnis der Siedlungsentwicklung von Boğazköy zu schließen. Hier setzen die verschiedenen derzeit laufenden Ausgrabungsprojekte auf dem Büyükkale-Nordwesthang (BK-NWH; Beitrag A. Schachner § 3–26), der Büyükkale (Beitrag J. Becker – A. Schachner § 27–60) und dem Westhang der Oberstadt (Beitrag M. Gruber § 61–76) an. Ergänzt werden diese Arbeiten im Rahmen einer Kooperation mit der Hitit Universität in Çorum durch Arbeiten am Oberen Westtor der Stadtmauer der westlichen Oberstadt (Beitrag M. Gruber – Ö. İpek § 77–97 und Beitrag H. Üstündağ § 98–112) und der Fortsetzung der Ausgrabungen eines römischen Bads in der nördlichen Unterstadt (Beitrag E. Sökmen – Ö. İpek § 166–172). Die Aufarbeitung der Funde der Grabungen 1988–1993 in der östlichen Oberstadt (Beitrag A. von Wickede – S. Herbordt § 152–165) und der Arbeiten 2014–2022 in den römischen Siedlungsresten (Beitrag D. Krüger § 173–182) ermöglichen erste Einblick in die materielle Kultur der Eisenzeit und der römischen Epoche.

<sup>1</sup> Rosenstock 2009.

<sup>2</sup> Chalkolithikum: Schoop 2015; Bronzezeit: Schachner 2024b; Eisenzeit: Schachner 2021; römische Kaiserzeit: Krüger 2021a; Krüger – Kühn 2021; Kühn 2021. Für die Entwicklung der natürlichen Umwelt s. Biltekin u. a. 2025.

34° 36' 30" longitude 34° 36' 40" 34° 36' 50" 34° 37' 00" 34° 37' 10" 34° 37' 20" 34° 37' 30"

latitude  
40° 1' 20"  
40° 1' 10"  
40° 1' 00"  
40° 0' 50"  
40° 0' 40"  
40° 0' 30"  
40° 0' 20"  
40° 0' 10"  
40° 0' 0"  
39° 59' 50"



0 metres 500

**Continental deposits (Holocene)**

- anthropic
- landslide
- colluvial and eluvial
- alluvial

**Ankara Mélange (Upper Jurassic-Cretaceous)**

- calcareous conglomerates in reddish and greysh matrix
- reddish and greysh cherty limestones and argillites
- radiolarites, brown and polychrome argillites, marls, and cherty sandstones.
- basalts and gabbros with different degrees of serpentinization
- marbles, calcareous mylonites, altered limestones
- sheared serpentinites



archeological area

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- buried fault
- indifferentiated fault
- normal fault
- (T1) major thrust or reverse fault
- (T2) major thrust or reverse fault
- (T2) minor thrust or reverse fault
- right-lateral transtensive fault
- left-lateral transtensive fault
- right-lateral transpressive fault
- left-lateral transpressive fault
- T1 shear zone
- T2 shear zone
- bedding
- main tectonic foliation
- anticline plane trace
- cross-section trace

Abb. 69: Boğazköy-Hattuša. Geological Map of Hattuša. Scale 1 : 10 000

Abb. 70: Boğazköy-Hattuša. Schematic stratigraphic log of the Hattuša site

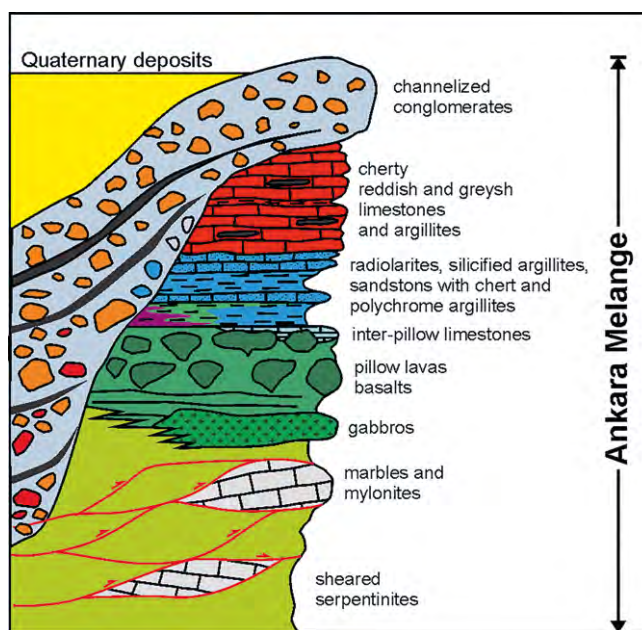
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## Geological Studies and Ongoing 3D Digitisation in Hattuša

### A Geological Map of Hattuša

130 Previous studies have already pointed out the importance of the extraordinary geology in the region of Hattuša and its special meaning for the anthropogenic use of the site<sup>199</sup>. In order to deepen the understanding of the geological features on a micro level a geological survey of the Hattuša area and its immediate surroundings covering an area of approx. 3.14 × 1.57 km<sup>2</sup> was performed. As a product of this effort for the first time a detailed geological map integrates the stratigraphic and structural data collected in previous years and uses new measurements taken in 2024.

131 We utilized the Qfield application (<https://qfield.org> [01.07.2025]) on a Samsung Galaxy Tab S7 which allowed us to collect and record detailed georeferenced field data. To measure the orientations of various sedimentary and structural features, such as bedding planes, fractures, and fault planes, we employed the GeoID v1.8 app on an iPhone. This application provided precise readings essential for our analysis. For the



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198 Für die Diskussion s. Hawkins 2005, 311.

199 Sümer u. a. 2023; Yılmaz u. a. 2022; Yılmaz – Altuner 2014; Kazancı u. a. 2008; Damm 1975; see also Vitale u. a. 2025.

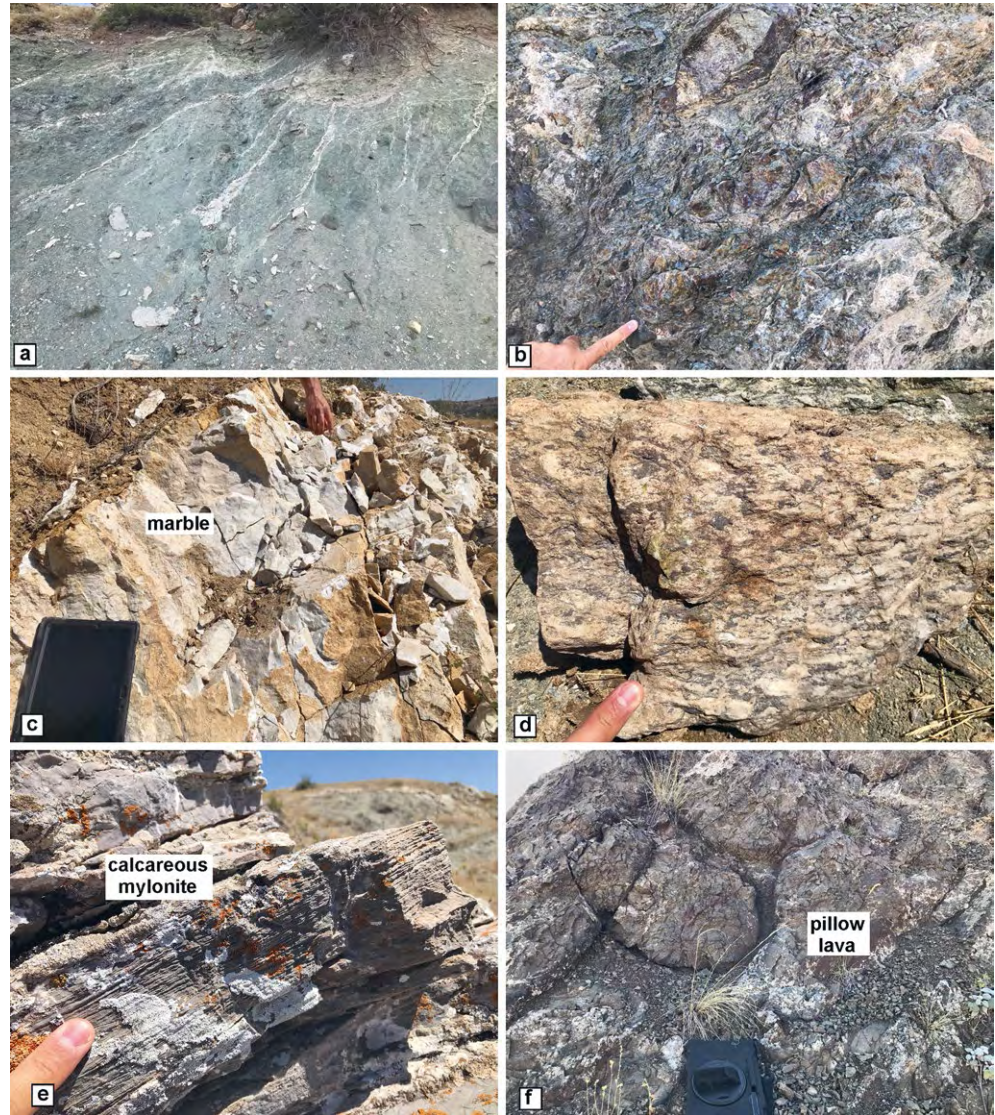


Abb. 71: Boğazköy-Ḥattuša.  
 a: Serpentinites (westward of the Lion's Gate); b: sheared serpentinites (westward of the Lion's Gate); c: Marble lens within serpentinites (southeast of Yerkapı); d: Deformed marble conglomerate in a serpentinite matrix (southeastward of Yerkapı); e: Mylonitic layers within serpentinites. (southwest of Yerkapı); f: Pillow lavas (east of Büyükkale)

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interpretation and analysis of the structural data collected, we used the free software TectonicsFP v.1.19.1171<sup>200</sup>. The final output of our work was a comprehensive geological map created in UTM projected coordinates based on the WGS 84 geodetic datum (Abb. 69). The geological map also includes the traces of three geological cross-sections presented in the following paragraphs.

### Stratigraphic Setting

132 The region of modern Boğazkale is located within a larger geological structure extending east of Ankara. The so-called Ankara Mélange<sup>201</sup> as exposed in Ḥattuša consists of an ophiolitic succession, including a crystalline basement and an oceanic sedimentary cover (Abb. 70). The basement is made of serpentinites, basalts, and gabbros, with the latter two lithotypes showing different degrees of serpentinization. Serpentinites are invariably deformed, characterized by pervasive shear planes and hosting different calcite vein systems (Abb. 71 a). Locally, meters-thick ductile shear zones show very deformed serpentinites with S-C structures (Abb. 71 b). Anastomosing lenses of marbles occur em-

200 <https://github.com/freiter/TectonicsFP> (02.07.2025).

201 Erdogan u. a. 1996, 788–806; Robertson u. a. 2009, 9–66; Sarifakioglu u. a. 2014, 77–108.



Abb. 72: Boğazköy-Çattuşa. a: Pillow lava breccia in calcareous matrix (eastward of Büyükkale); b: Folded, well-bedded, cherty reddish limestones and argillites (southwest of Yerkapı); c, d: Sandstones and radiolarite layers with cherts and argillites (Kızlarkayası). (e) Alternance of radiolarite layers, marls and argillites upward passing to calcareous conglomerate in a purple matrix (Kızlarkayası); f, g: Cherty sandstones and marls (Südburg)

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bedded in the serpentinites (Abb. 71 c). Generally, marbles are massive with a saccharoidal fabric (Abb. 71 c). Somewhere, they are made by stretched clasts embedded in a serpentinite matrix (Abb. 71 d). Calcareous mylonites are also present as lenses within serpentinites (Abb. 71 e) defined by a mylonitic foliation and a stretching lineation. Overlaying and somewhere heteropic basalts occur. They are massive or forming pillow lavas (Abb. 71 f). Rarely a calcareous fine matrix between the pillows is present (Abb. 71 a). In highly deformed areas, the pillows are flattened. More rarely, gabbros are associated with basalts or as lenses within the serpentinites. The crystalline rocks are covered by lenses of polychrome argillites and a succession of radiolarites, silicized argillites (Abb. 72 c) and upward sandstones with dark cherts (Abb. 72 d–g). In some places, the succession contin-



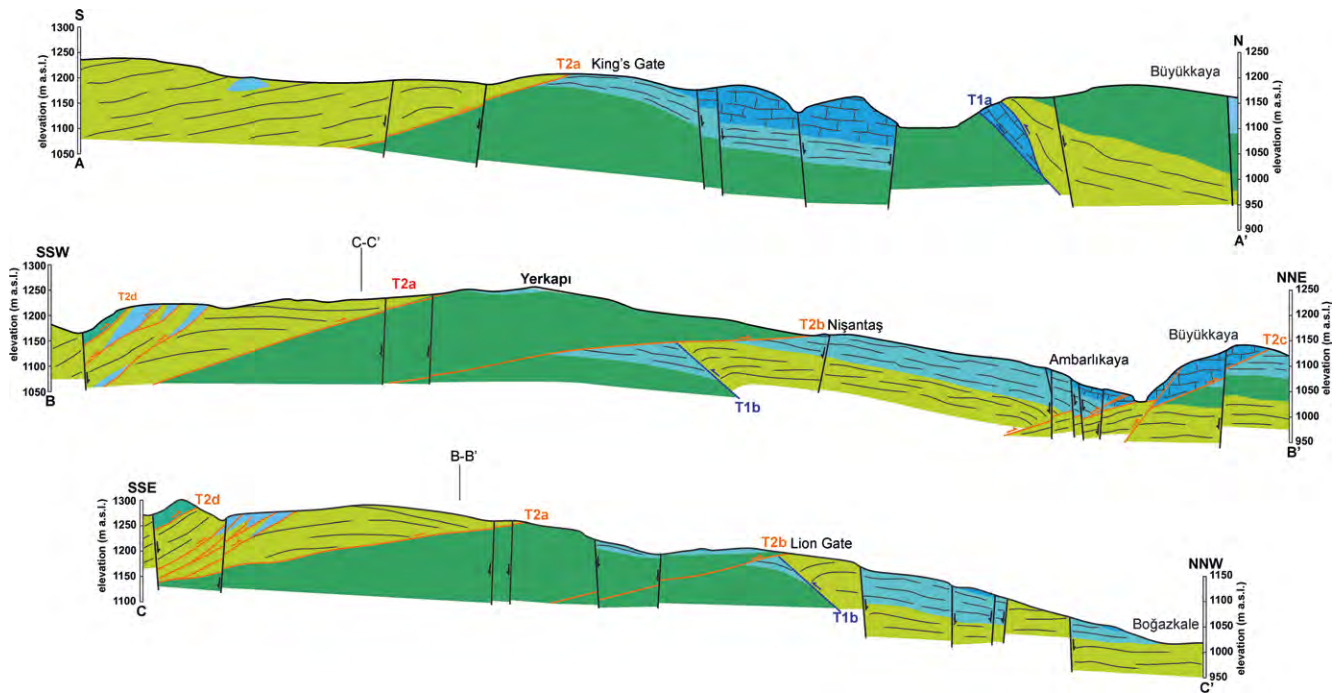
Abb. 73: Boğazköy-Çattuşa.  
 a: Panoramic view of the Sarikale showing the conglomeratic blocks floating on the argillitic and sandstone succession;  
 b: Stratigraphic contact between conglomerates and radiolaritic succession (Lower West Gate);  
 c: Conglomerate with clasts made of marls, chert and radiolarite in a clayey matrix (Lower West Gate);  
 d: Base of the conglomeratic body formed by metric clasts embedded in a reddish and purple clayey matrix (Büyükkaya);  
 e: Layered calcareous conglomerates alternating with reddish argillites (Kesikkaya);  
 f: Matrix supported conglomerate made of angular calcareous clasts embedded in a reddish clayey matrix (Kesikkaya).

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ues with well-bedded reddish and greyish cherty limestones alternated with thin argillitic layers. The succession is regularly deformed by thrusts and folds (Abb. 72 b). The oceanic succession ends with calcareous debris flow deposits, frequently channelized. They form bodies with sizes of a few meters to hundreds of meters (Abb. 72 a), generally floating on the argillites (Abb. 72 b) or directly on the basalts or serpentinites. They are mostly made of breccias (Abb. 72 c–f) and secondarily by calcarenites. Locally, the breccias consist of clasts of the underlying argillites, marls, and sandstones (Abb. 73 c) with sporadic clasts of cherts. Generally, the reddish matrix is calcareous (Abb. 73 d–f). Somewhere, layers of reddish clays and argillites are present (Abb. 73 e). Clasts show a large range of size, from a few centimeters (Abb. 73 f) to several meters (Abb. 73 d), with shapes from angular to rounded. According to Yılmaz et al.<sup>202</sup>, the calcareous clasts are made of shallow-water limestones with a Jurassic to Cretaceous age. They are formed by oolitic/foraminiferal grainstones and wackestones. On the other hand, the whole Ankara Mélange is dated to Triassic-Cretaceous<sup>203</sup>. Finally, the Ankara Mélange is covered by Quaternary deposits consisting of landslides, colluvial and alluvial deposits.

202 Akçar u. a. 2014, 62–68; Yılmaz u. a. 2022.

203 Erdogan u. a. 1996, 788–806; Sarifakioğlu u. a. 2014, 77–108.



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## Tectonic Setting

133 The Ḫattuša area is characterized by the superposition of different thrust sheets made of the Ankara Mélange (Abb. 69)<sup>204</sup>. Basically, within the Ḫattuša site, the sedimentary oceanic succession largely crops out, with the local exposition of basalts. On the contrary, large outcrops of serpentinites characterize the southern and western sectors outside the archaeological site. The tectonic architecture is well described in the geological cross-sections (Abb. 74). The oldest structures are S-verging thrust faults (T1). Eastward of Büyükkale a thrust (T1a) superposes serpentinites onto calcareous breccias, in turn, overthrusting the basalts (A-A' cross-section; Abb. 74). The same geometry characterizes the thrust T1b westward of Lion's gate. Here the serpentinites overthrust the basalts with the interposition of marbles (B-B' and C-C' cross-sections; Abb. 74). In the same area, there are other S-verging structures hosted in serpentinites consisting of ductile shear zones with S-C structures indicating the vergence to the south (Abb. 71 b). The T1 structures are crosscut by T2 thrusts. Generally, they show an N-vergence. Amongst the major structures, the thrust southward of the Ḫattuša site overlays serpentinites onto the oceanic cover (T2a in all cross-sections; Abb. 74), the thrust T2b running from Lion's Gate to Southern Citadel, which superposes the basalts onto the oceanic cover, and the thrust T2c that put in contact the oceanic cover (hanging wall) and the whole succession (footwall) in Ambarlıkaya and Büyükkaya (B-B' cross-section; Abb. 74). Finally, southward of the Yerkapı, several anatomizing thrust faults, verging to the north, put in contact the well-bedded reddish cherty limestones onto serpentinites accompanied by folds and minor thrusts (Abb. 72 b). At the footwall of this thrust (T2d in B-B' and C-C' cross-sections; Abb. 74), different splays embed marble and mylonite lenses.

Abb. 74: Boğazköy-Ḫattuša. Geological cross-sections (traces are shown in Abb. 69)

## The Digitisation of Ambarlıkaya, Kesikkaya – Kızlarkayası Outcrops

134 The distinctive morphology of Ḫattuša, combined with the unique Hittite construction techniques and their building activities in areas usually not selected for buildings, emphasize somehow continuity between the landscape and architectural

204 Cf. also Drahor u. a. 2023; Sümer u. a. 2019.



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Abb. 75: Boğazköy-Ḫattuša.  
Kesikkaya, from the Southeast.  
The TOF laser scanner survey was  
conducted using a RIEGL VZ400.

features<sup>205</sup>. The combination of natural and anthropogenic structures is in many parts of the site so complex that traditional methods of documentation and measurement do not provide the necessary accuracy. In these areas, digitisation of geological and archaeological features proved to be a practical as well as time and cost sufficient method to create a robust documentation in the rugged landscape<sup>206</sup>. In recent years, 3D survey-work focused on Ambarlıkaya and since 2024 Kesikkaya as well as Kızlarkayası which are the subjects of this study. The data collection allowed for a more modern documentation and representation of the geo-archaeological characteristics of both landscape and monuments.

### Kesikkaya – Kızlarkayası, Methodology

135 The data acquisition process initially proceeded from the southern sector of the monumental complex. Kesikkaya consists of two imposing blocks of limestone breccias, known as Kesikkaya W and Kesikkaya E, located to the east of a main torrential drainage channel, the so-called Büyükkale Deresi, that runs northwards and separates Kesikkaya from the Kızlarkayası monument. The western portion of the west block is partly overbuilt by the old-Hittite city wall of Ḫattuša which is known as the postern wall<sup>207</sup>. A deep opening, possibly an ancient fault which was later widened by the Hittite builders, separates the two blocks in the central part. Excavations southeast of the Kesikkaya revealed how the rocky outcrop was incorporated into the settlement during the Hittite period as well as the Iron Ages and the Hellenistic-Galatian period<sup>208</sup>. On top of both, parts of the outcrop construction activities are attested by traces of foundations cut into the rocks, many of them located directly on the edges of the rocks. The Kesikkaya monument was subjected to a 3D survey, which included time-of-flight (TOF) laser scanning (Abb. 75) as well as terrestrial and aerial photogrammetry.

136 The laser scanner (TOF) surveys were conducted utilising a RIEGL VZ400 (configured with the following acquisition parameters: target distance = 10 m; resolution = 0.006 mm), in conjunction with ground control points. Cylindrical GCPs (markers) with a cross-section of 5 and 10 cm as well as flat markers with a diameter of 5 cm have been employed in the survey. This methodology permitted the acquisition of a total of 78 scan positions which were aligned with one another to an accuracy of 5 mm or less. In order to achieve optimal alignment between the individual scan positions, semi-automatic marker acquisition procedures were conducted utilising Riscan Pro software. The accurate positioning of the GCPs during the surveys was of crucial importance with regard to the quality of the acquired data. The laser scanner survey (TOF) commenced in the southern sector, in proximity to the Hittite architectural remains, in order to obtain a preliminary comprehensive overview of the monument. The survey proceeded in an eastward direc-

205 Schachner 2011.

206 Marazzi – Schachner 2024.

207 Schachner 2009, 48–53.

208 Schachner 2015a, 69–78; Schachner 2015b; Schachner 2016, 1–4.



Abb. 76: Boğazköy-Hattuša. Kızlarkayası, drone photogrammetric survey (status 07/2024)

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tion, encircling and above the two morphologically distinct limestone blocks which are connected to the postern wall on the west side, and concluded along the main street level.

137 Similarly, the aforementioned acquisition parameters and procedure have been employed to collect 3D laser scanner data at Kızlarkayası. Kızlarkayası is located to the southwest of Kesikkaya. The limestone block has an east-west extension of approximately 29 m and a north-southwest direction of approximately 32 m. Kızlarkayası is situated at an elevation of 7,50–8,00 m above present ground level on the east side and 4 m above ground level on the south side, resulting in a slight slope<sup>209</sup>.

138 The necessity to visualise both monuments in the same virtual space meant that the acquisitions continued from the main street level where the Kesikkaya surveys had concluded. Given the articulated nature of the terraced surface that characterises the upper level of Kızlarkayası, it was necessary to increase the number of scan positions. The final scans were carried out along the ground level to acquire the lateral surfaces of the monument. Furthermore, the laser scanner survey covered areas near some limestone outcrops where traces of anthropogenic workmanship are present. The alignment of the acquired data was evaluated progressively using Riscan Pro software.

139 Subsequently, the laser scanner data collection was followed by terrestrial and aerial photogrammetric surveys. To fulfill this purpose, the cylindrical GCPs were integrated with additional 6 aluminum scale bars (50 cm), which were placed over a wide area between Kesikkaya and Kızlarkayası. This enabled the 3D models to be scaled during the post-processing phase. The terrestrial photogrammetric survey at Kesikkaya and Kızlarkayası employed the use of a GoPro Hero camera, whereas the aerophotogrammetric surveys were conducted through the utilisation of a DJI Mini 3 Pro drone (Abb. 76).

140 Furthermore, both cylindrical GCPs and the six scale bars, which were strategically placed at different elevations, were surveyed by total station (thanks to the collaboration with the German archaeological research group). This allowed the 3D models to be aligned with the German topographic reference system.

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209 For previous work at Kızlarkayası cf. Dittmann – Röttger 2010, 183–188.



77

Abb. 77: Boğazköy-Hattuša. Kesikkaya, 3D point cloud model and some of the scan positions referring to the area of interest Riscan Pro software workspace.

141 The preliminary processing of the laser scanner data was conducted using the native software of the RIEGL VZ400 scanner, Riscan Pro (Abb. 77). The »Tie Point Import« procedure enabled the association of local coordinate values acquired through the total station with the cylindrical GCPs. Subsequently, a semi-automatic denoising procedure was conducted on the point clouds related to each scan position, applying the parameter ›deviation = 0 – 18‹. This proved to be an effective approach for the entire laser scanner dataset. Once the scans have been merged within the workspace, it will be possible to proceed with the segmentation of the point clouds through a subdivision into two macro blocks: Kesikkaya and Kızlarkayası. The Kesikkaya macro-block incorporates three sub-layers: »Kesikkaya« which refers to the rock outcrop; »Kesikkaya\_Architecture« which encompasses the walls; and »Kesikkaya\_Ground« which includes the ground level. The Kızlarkayası macro-block includes the rock monument named »Kızlarkayası«, while »Kızlarkayası\_Ground« refers to the ground level in the area of the aforementioned monument. The data will be subjected to manual vegetation removal to enhance the visualisation of the rock surfaces and architectural features. In order to reduce redundant reflections, the point clouds will be filtered using the parameter ›Oc-tree = 5mm‹ for the layers »Kesikkaya« and »Kesikkaya\_Architecture«, ›Oc-tree = 0.5m‹ for »Kesikkaya\_Ground«; ›Oc-tree = 2mm‹ for the layer »Kızlarkayası« and finally ›Oc-tree = 0.5m‹ for »Kızlarkayası\_Ground«. This allows each point to be located at a distance in accordance with the value set by the aforementioned parameter. Each portion of the point cloud will be exported in text (or PTS) format and processed using Cloud Compare software, enabling the generation of a 3D model of the entire study area.

142 In the context of photogrammetric drone survey, sequences of images were utilised to generate a sparse point cloud using Agisoft Metashape software. Ground control points were meticulously marked on each photograph where markers were identified, following a more refined selection process. The sparse point cloud was then processed to produce a dense cloud with minimal noise. This involved a series of semi-automatic denoising operations, in accordance with procedures outlined for dense cloud preparation<sup>210</sup>. A series of gradual selection tools were employed in



78

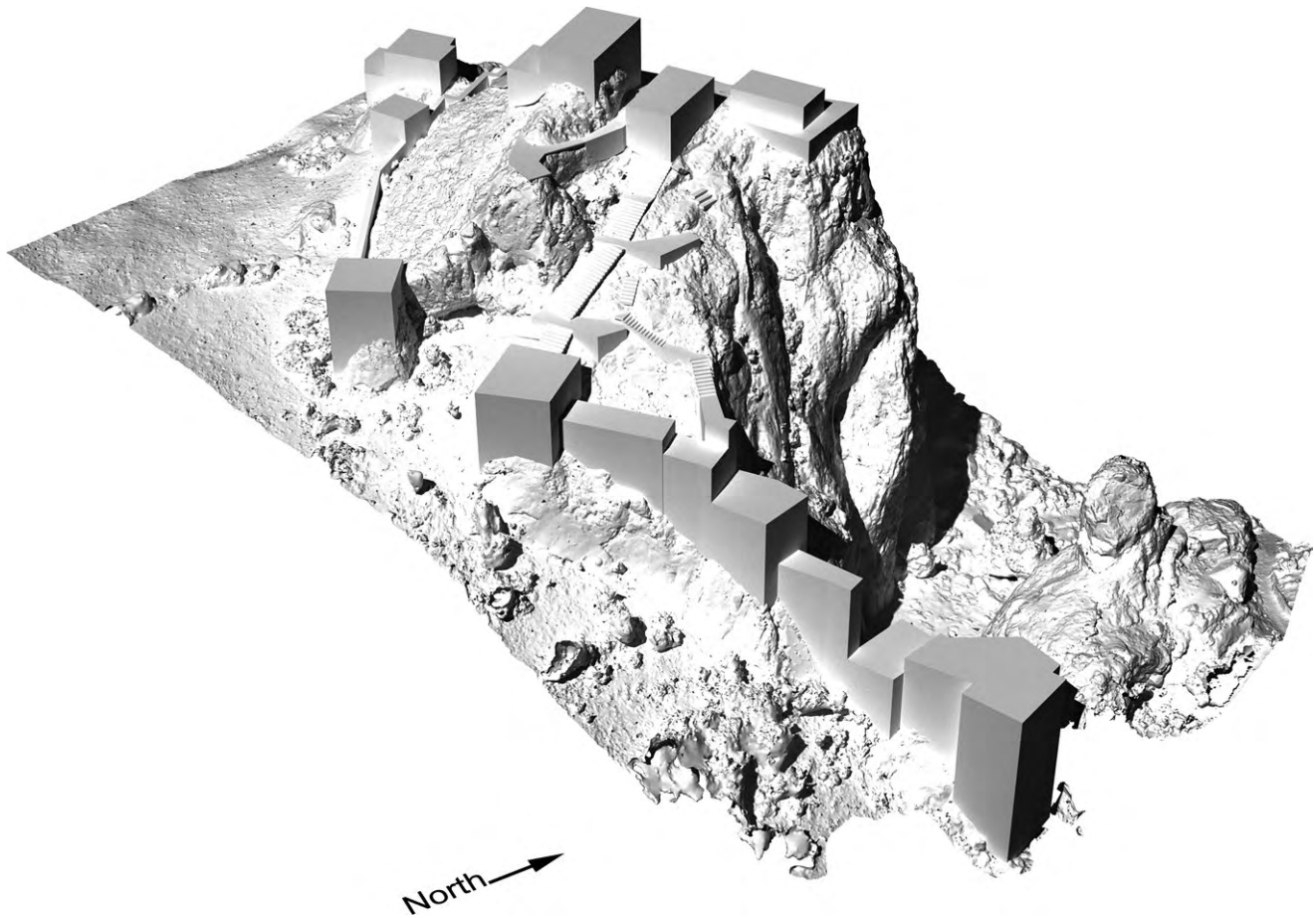


79

Abb. 78: Boğazköy-Hattuša. Kesikkaya – Kızlarkayası, 3D drone model aligned with the German local coordinate system (contour lines). Rhinoceros 8 software workspace

Abb. 79: Boğazköy-Hattuša. Kızlarkayası, 3D drone model

succession. The application of »reconstruction uncertainty, projection accuracy, and reprojection error« was achieved by adjusting the percentage of points selected for each tool based on the specific data being analyzed. Additionally, camera location optimization was performed. After activating the markers, the high-quality, dense cloud was produced. Any remaining noise that could not be removed semi-automatically, along with vegetation, was manually eliminated, followed by applying a confidence filter of approximately 1%. A high-resolution 3D model of the monumental complex of Kesikkaya and Kızlarkayası has finally been produced (Abb. 78. 79). Due to the significant presence of vegetation along the channel separating the Kesikkaya and Kızlarkayası monuments, a specific portion of the drone model named »Kızlarkayası\_



80

Abb. 80: Boğazköy-Hattuša. Ambarlıkaya. Perspective view of the 3D drone model, interpolating data from previous drone and TOF laser scanner analyses. The fault plane to the southeast of Ambarlıkaya is visible at the bottom of the image, beneath the architectural structures. This feature is also evident in the geological map shown in Abb. 69.

Valley« was processed separately to approximate the two river slopes. The processing of the »Kızlarkayası\_Valley« layer was performed using Cloud Compare software.

### Hypothesis on the Original Configuration of the Ambarlıkaya Volumes

143 Whereas in the case of Kesikkaya and Kızlarkayasi the necessary topographical and archaeological data were collected in the first step during the campaign 2024, the example of Ambarlıkaya shows the possibilities for interpreting this methodology. Time-of-flight laser scanner data and drone data from previous digitization campaigns were interpolated with new aerial drone photogrammetry models of Ambarlıkaya. Analysis of the 3D models allow for the first time possible interpretations of the attested anthropogenic traces on various terraces of the rocky summit and along its southeastern ridge. Along this slope, the city walls connect with wall structures that cross the gorge and ascend toward the area near a cave within Ambarlıkaya. The Hittites constructed the walls by utilizing a fault line and employed an alternating sequence of walls and towers to account for the elevation difference between the gorge, the riverbed, and the cave (Abb. 80).

144 Above the city walls, along the south-eastern slope of Ambarlıkaya, a series of steps and embankments connected the walls themselves to the monumental buildings atop the rock. Two-dimensional representations of the cave within Ambarlıkaya were produced to highlight its geomorphological features and setting within the rock (Abb. 81).

145 This preliminary study is part of a broader set of activities aimed at understanding the relation of buildings and the topography into which they are embedded. By utilizing three-dimensional data, combined with information derived from the geological map (Abb. 69), this approach is a substantial step towards a better understanding

of the Hittite approach to transforming the orographic context. It also lays the groundwork for developing a rigorous symbolic-functional framework that offers a novel reinterpretation of the sequential use of urban topographic areas across different phases of the city's history<sup>211</sup>.

## Discussion and Conclusions

146 The inclusion of the topography and geological features of the area within the city's fabric is one of the many aspects that make Ḫattuša a place of exceptional importance in the study of the evolution of urban planning in the 2<sup>nd</sup> millennium B.C. The study of the geological features of the area, integrated with the architectural structures represented through numerical models derived from 3D scanning, enabled a comparative analysis of the data and the validation of an innovative approach to understanding the archaeological site. This method employs digital technology as a tool for verifying and simulating research hypotheses concerning the cultural development of the Hittites within the broader context of Anatolian civilizations during the Bronze Age. The Hittite planners, in fact, not only functionally used natural borders such as rivers and ravines to define and protect the city but also incorporated the landscape into the urban environment, thus making it part of the function and symbolic language of individual buildings<sup>212</sup>.

147 Analysing the site of Ḫattuša shows the clear plan of the Hittite planners to shape the morphological and geological characteristics of the territory by building architectural structures that connected the symbolic space of the city and the natural environment. Given these considerations, the geological map presented here (Abb. 69) is an important tool for critically reading the landscape, understanding the use of the geological features and unveiling the environmental modifications due to anthropic activity.

148 The map and the reconstruction of the geological stratigraphy of Ḫattuša further develops our knowledge about the geological setting. In particular, the field survey allows us to reconstruct a stratigraphic log (Abb. 70) for this area, marking the stratigraphic continuity of the sedimentary cover (argillites, radiolarites, sandstones, pelagic limestones and calcareous conglomerates) over the crystalline rocks (serpentinites, basalts and gabbros), previously interpreted as two thrust sheets, hence separated by a tectonic contact.

149 In our reconstruction, they form a single oceanic succession, as observed in other areas of central Anatolia. Compared to previous geological maps, the present map shows a higher spatial resolution, a higher subdivision in lithotypes, an even more detailed fault mapping, widespread measurements of beddings and the reconstruction of the tectonic setting by three geological cross-sections. We mapped in detail the calcareous conglomerate bodies frequently used by Hittites as room walls, basements for foundations, or support for inscriptions and bas-reliefs.

150 The geological map is fundamental to understanding the landscape, and furnishes clues for reconstructing the original topography before anthropogenic impact.

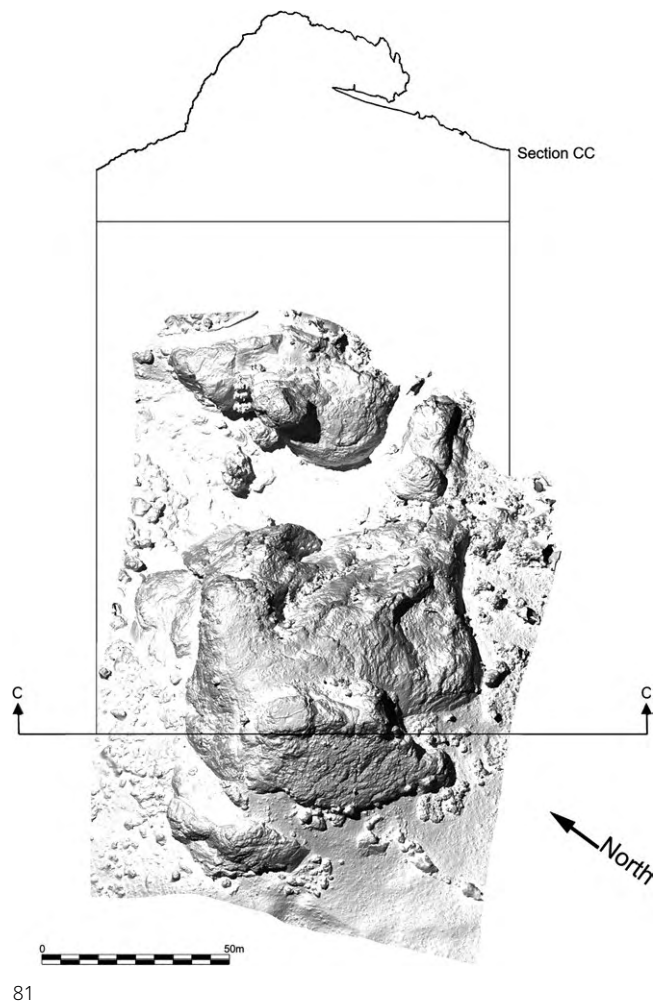


Abb. 81: Boğazköy-Ḫattuša. Ambarlıkaya. The C-C' section, traced on the TOF laser scanner model of the cave within Ambarlıkaya (SE), highlights the cave's geomorphological features.

211 Schachner 2024b.

212 Schachner 2017, 32; Schachner 2022.

The site, located along a mountain slope bounded by two deeply indented river valleys, is one of the few places where the oceanic cover has been preserved; indeed, all around the site the crystalline basement is exposed. Furthermore, in the Hattuša area widespread outcrops of calcareous conglomerate bodies occur on the top of the sedimentary sequence, making it a unique place in Central Anatolia.

151 On the one hand, the widespread presence of naturally fractured calcareous bodies allowed the Hittite builders to easily gather building blocks in situ<sup>213</sup>, on the other hand they were able to directly use the high-angle fault planes and fractures to separate internal architectural spaces (e.g. Yazılıkaya) or as grounds for monumental installations such as the hieroglyphic inscription at Nişantaş. (L. R. – G. V. – S. V.)

## Die Aufarbeitung der Kleinfunde vom Nişantepe und der Südburg

152 Bei den Ausgrabungen von 1988–1992<sup>214</sup> in der östlichen Oberstadt von Hattuša im Bereich von Nişantepe (NT), Südburg (SB), Büyükkale Südosthang (BK-SOH), Ostplateau (OP), Viadukt (V) und Poterne 2 (P2) wurden ca. 2800 Kleinfunde geborgen (Abb. 82), die überwiegend aus der Eisenzeit stammen. Im Rahmen der in Angriff genommenen Endpublikation wurden während der Grabungskampagne 2024 über 300 inventarisierte Funde im Museum von Boğazkale und über 1600 Objekte im Depot des Grabungshauses klassifiziert, vermessen, fotografiert, gezeichnet und – soweit notwendig – restauriert, konserviert und mikroskopisch untersucht<sup>215</sup>. Die ausgegrabenen eisenzeitlichen Siedlungsschwerpunkte umfassen die Südburg mit den Komplexen 1–5 (N/12 bzw. 330/310-320) sowie das zentrale Häuserviertel vom Nişantepe (L-M/12-13 bzw. 310-320/310-320, NT-ZH) mit zum Teil in situ oder im Gebäudeschutt geborgenen Hausinventaren (Abb. 82)<sup>216</sup>.

153 Das Fundmaterial in diesem Bereich der Oberstadt unterscheidet sich vollkommen von demjenigen im zentralen Tempelviertel der Oberstadt, wo neben den hethitischen Fundinventaren der Tempel und den Funden der byzantinischen Besiedlung keine nennenswerten Funde der Eisenzeit gemacht wurden<sup>217</sup>. Neben der Masse eisenzeitlicher Funde wurden auch römische und byzantinische sowie vereinzelt Funde anderer Perioden geborgen<sup>218</sup>.

154 Die hethitischen Funde in diesem Teil der Siedlung stammen aus dem Bereich von Tempel 31 an der Nordspitze der Südburg und des Nord- und Westbaus vom Nişantepe (Abb. 82)<sup>219</sup>. Die eisenzeitlichen Funde können allgemein mit den Schichten BK Ic–a parallelisiert werden. Die typologisch einzuordnenden Funde – vor allem Fibeln (Abb. 83) – datieren überwiegend in die späte Eisenzeit (7.–6. Jh. v. Chr.). Die Geräte und Werkzeuge sind meist aus Eisen im Gegensatz zu den spätbronzezeitlichen Artefakten.

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213 Sümer u. a. 2023, 17; Yılmaz – Altner 2016.

214 Für die Ergebnisse der Ausgrabungen s. die vorläufigen Berichte im Archäologischen Anzeiger (Neve 1989; Neve 1989; Neve 1990; Neve 1991; Neve 1992; Neve 1993) und die Endpublikation der baulichen Befunde (Neve 2018). Zu den Grabungsflächen: Neve 2018, Abb. 1–4.

215 Unser Dank gilt dem Grabungsleiter Andreas Schachner für seine umfassende Unterstützung in allen Belangen, Resul İbiş (Direktor Museum Boğazkale), Mehmet Türk (Kurator) für die Unterstützung bei der Bearbeitung der Funde im Museum sowie Sena Baskın, Klara Czarnitzki, Lukas Karbach, Rafiya Soy und Bahar Köşe für die Anfertigung von Fotos und Zeichnungen. Senem Işık und Efehan Erdem haben dankenswerterweise die Restaurierung und Konservierung der Fundstücke übernommen und Stefano Vitale und Giovanni Varriale (Universität Neapel) haben Fragen zur geologischen Bestimmung der Steinartefakte beantwortet.

216 Neve 2018, 92–104. 110–126.

217 Zu den hethitischen und byzantinischen Funden im zentralen Tempelviertel: Herbordt – von Wickede 2021; Böhlendorf-Arslan 2019.

218 Zur allgemeinen Entwicklung der Besiedlung von Boğazköy während des 1. Jts. v. Chr.: Schachner 2021.

219 Die Tonbullen des Nişantepe-Archivs vom Westbau wurden bereits vorgelegt von Herbordt 2005 und Herbordt u. a. 2011.

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## ZUSAMMENFASSUNG

### Die Ausgrabungen in Boğazköy-Ḫattuša 2024

Andreas Schachner

Durch Ausgrabungen und 3D-gestützte Surveys konnten auf dem Büyükkale-Nordwesthang, der nördlichen Büyükkale und dem Westhang der Oberstadt wesentliche Ergebnisse für die hethitische Zeit, die Eisenzeit und die hellenistisch-galatische Periode gewonnen werden. Der Nachweis eines monumentalen Gebäudes auf dem BK-NWH, eines Verbindungsbaus zwischen dem oberen Hof und dem Gebäude E auf der Büyükkale und eines weiteren großen Gebäudes auf dem Westhang der Oberstadt tragen zu einem vertieften Verständnis der hethitischen Stadtstrukturen bei. Eine besondere Überraschung stellt die Entdeckung einer Nekropole der althethitischen Zeit auf der Westseite der Stadt im Bereich des Oberen Westtors dar. Die auf dem BK-NWH und der Büyükkale untersuchten Strukturen der Eisenzeit vermitteln in ihrer Gesamtschau einen Eindruck von der dynamischen Entwicklung während der ersten Hälfte des 1. Jts. v. Chr. und zeigen, wie sich eine rurale Ansiedlung in eine komplexe, wahrscheinlich urbane Struktur veränderte. Erstmals kann für die hellenistisch-galatische Epoche eine strukturelle Entwicklung der Siedlung dokumentiert werden, die eine entscheidende Lücke in der Kulturgeschichte des Ortes schließt. Ergänzt werden die Arbeiten durch die Aufarbeitung der eisenzeitlichen Kleinfunde der Grabungen in der Oberstadt aus den Jahren 1988–1992, die erstmals ein geschlossenes Bild der materiellen Sachkultur dieser Periode liefern.

## SCHLAGWÖRTER

Ḫattuša, Büyükkale, Nordwesthang, Oberstadt, hethitische Zeit, Westtor, Kremationsbestattungen, Eisenzeit, hellenistisch-galatische Zeit, römische Kaiserzeit

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## ABBILDUNGSNACHWEIS

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