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Reaserch Article

Geomorphological Features of Terkos Lake and Surroundings

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Abstract
Terkos Lake Formed by the invasion of sea water, the ancient average area calculated as geomorphological is 25 km2. Although the area covered by the lake changes in certain ratios, it has been subject to dramatic changes over time depending on the region. It can be defined as being the most important water basin of Istanbul, and it is an area where scientific work has not been carried out despite all its natural and special beauties. Whereas, being one of the basins of Istanbul, it has been observed that the works carried out at the technical level were carried out by DSİ and İSKİ. The surface area of the lake is 41 km2 and a total drainage area of 775 km2, is approximately 12 km in length and 5 km in width. It is obvious that the morphological features of the lake area, which is located at the border of the most complex and impressive morphological structures. For this purpose, morphometric studies are carried out on the streams feeding the lake and the findings of some shells in the lake and Black Sea are shared in this study.

Keywords: Terkos Lake, Black Sea, Istranca, Coastal Cliff

Introduction

Terkos Basin, one of the dams providing drinking water to Istanbul, was selected as a study area in Figure 1-2. The Terkos Dam water basin area is located on the European side, approximately 50 km away from Istanbul's city centre. The basin is separated into conservation bands according to rules of İSKİ. The old average area of Terkos Lake, which is formed by the invasion of the sea waters, is 25 km2 (İBB, 1995; İSKİ, 1997; Göksel, 1998; Tanık, et al., 2006; Sur et al., 2007). As the geomorphological map of the lake shows that the area of the lake is increased and although it changes from time to time, according to our calculations, the average area of the lake is 41 km2 and is approximately 12 km in length and 5 km in width (Davaşligil, 1998). There has been an advancement over time in the area of the lake. This growth can be followed in satellite images as well. This increase in the area of the lake is mostly in the west of the lake along the Istranca (Yıldız) Stream. The Vezirler Hill (72 m.) location in the west of the lake is accepted as the main area of the lake (Gazioğlu et al., 1997). However, in time, the lake waters rose and began to move along the bed of the Istranca Stream (Burak et al., 2002; Essien et al., 2019). This advancement has reached up to Ormanlı. Sometimes, in exceptional periods, the area of the lake extends to Karacaköy, with the waters rising too much. If we include them in the area of the lake, it will grow even more.

Terkos Lake is a coastal set lagoon separated from the Black Sea by sand dunes whose width ranges from 250 m to 5 km and whose average width is 2 km. It was formed by the creation of a bay as a result of the advancement of the waters of Black Sea, which rose due to Flandrian transgression, towards the land and the conversion of this bay into a lake following its disconnection from the sea in time through a coastal levee (Köken, 1991, Aygün, 1994, Baylan and Karadeniz, 2006; Kurt, 2015;) and Terkos dunes represent the one of the environmental important sandy-coastal systems located northern Istanbul coasts.

When we look at Terkos Lake in general, the lake extends in the northwest-southeast direction and the widest part of this direction is between the Terkos and the north of the Vezirler. Although the lake extends in this direction in general, it extends in the form of a gulf to the southwest, and it is inserted into the land by the coves of Saraç, Hacıömer and Sinanköy. This lake was connected to some of the streams outside of its own lake basin by canals, and an extra water supplement was made to the lake. This leads the lake and basin to experience a rapid geomorphological change. In this study, the last geomorphological situation of the lake is discussed (Fig 1.-2).

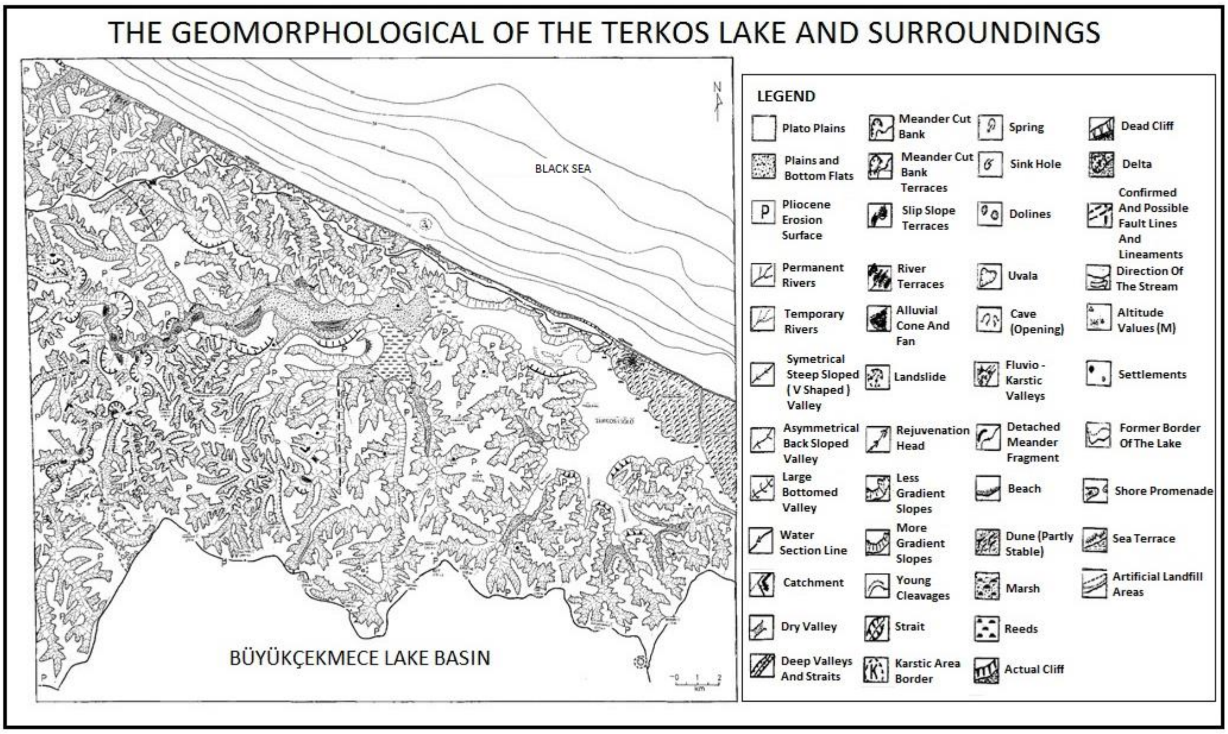


Figure 1. The Geomorphologic Map of Terkos Lake

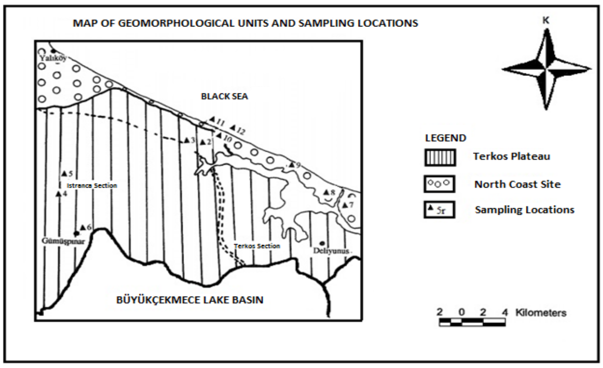


Figure 2. Geomorfphological Units.

Terkos Plateau

Terkos Plateau takes its name from Terkos Lake in the northeastern part of our area. The plateau in our study area, which occupies smaller space than the Büyükçekmece plateau; is composed of two different parts, both in terms of elevation, inclination, splitting of streams and the evidence of rejuvenation, as well as for the development of topographic differences and the morphological aspects controlled by lithological aspects. These are; a part of the Terkos section which was developed on the rocks from Eocene around the Terkos Lake in the east and valleys of different depths of the lstranca Stream and its tributaries in the west from the Paleozoic to the Tertiary (Kaya et al., 2004).

Istranca Section

The Istranca section, which is deeply cut by the Istranca Stream and its tributaries, is the western wing of the Terkos Plateau. Since this plateau is developed on a wide variety of lithologies from Paleozoic volcanic and metamorphics (granite and gneiss) to the clay, sand and gravel formations of Pliocene, a significant instability in the morphology is noticeable. The highest points of the section are Kuşkaya Hill (378 m.), Ferah Hill (382 m.), Garipkuyu Hill (361 m.), Kartalkaya Hill (324 m.).

Northern part

In the Istranca Section, the lowest elevation and least slit section of the plateau areas can be specified as the northern part. The Pliocene age Ergene formation, which is composed of clay, sand and gravel, extends to the north of the Istranca Stream bottom plain, approximately 22 km to the east of Ormanlı at east. Kuzulu Stream Yalıköy Stream and Maden Stream, at the northwest of the stream bottom plains on the plateau flats up to 100 meters, Twin Hills (100m), Cami Hill (162 m) and Tombak Hill (192 m) constitute the important elevations. When moving from the stream bottom plain of Maden Stream to the east, the Karasu Stream joins from the north to the Istranca Stream and the branches to which they open deep valleys. This field appears to be dominated by flattened hills such as Hisar Hill (120 m), Eğrimeşe Hill (105 m) and Sarpdere Hill (102 m) conserves obscure topographical features until the east of the Ormanlı.

The Morphological appearance characterised by the deeper valleys on the Ergene formation, the slightly undulating plateau surfaces, the short rivers, and the ridges dipping into the bottom plain, also exist in the section west of the Karacaköy where Ergene formation shows large mostras. This section where Dağlıoğlu Hill (84 m), Radıç Hill (71 m) and Kale Hill (55 m) is separated from the slightly wavy plateau plains by valleys with large bottoms formed by the Karasu stream, the northern tributary of the Istranca Stream. The relief amplitude values in the northern part of this section do not exceed 40 meters. Only the alluvial bottom of the Kuzulu Stream in the northwest and the plateau plains that surround it have a relief amplitude of more than 100 meters. To the east, it is observed that almost no streams form the "V" shaped young and deep valleys, and the gradient values on the Ergene formation with clay, sand and gravel lenses do not exceed 5%, the ridges are lowered to the mature valley bases and the depth values of the valleys do not exceed 40 meters.

In this section, which we mentioned as the northern part of the Istranca section, the drainage features also show uniformity. The dominant drainage is dantritic drainage. However, it is seen that Karasu Stream, which is an important tributary of the Istranca Stream, was previously a north-flowing stream and later turned to the eastward. The grabbing bracket formed by this grab is noticeable. In addition, a small stream in the northeast of Karacaköy has changed direction towards the west. No significant changes in drainage are observed except for these two grabbing.

On the lower plateau surfaces in the northern part of the Istranca section, and on the ridges descending the steep gradients towards the mature valley bottoms, the lower tread erosion surfaces developed.

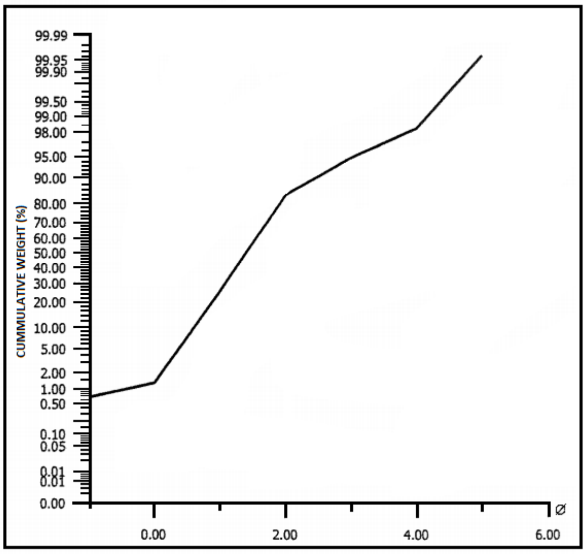
These surfaces, whose average elevation is not more than 50-80 meters, have a wide spread area, have been evaluated as Pliocene erosion surfaces. These surfaces are probably due to the final basal levels caused by young tectonic movements, which have maintained continuity following Pliocene peneplanation.

At the northwest of the site, the levels of the erosion surfaces that cut the plateau surface between the Kuzulu Stream bottom plain and the northwest of Terkos Lake vary between 50-80 m. To the west of Yalıköy Stream, the surface on the Kocameşe ridge is descended from 80 meters to 40 meters. The equal of this surface is observed at a level of 70-80 meters between the east of the same alluvial bottom, between Hartayolu Ridge and Nakkaş Hill. These erosion surfaces, which cut the sand, clay and gravel-lined Ergene formation, are actually developed on the Mesozoic schists, quartzites and marbles in the south and these ridges stretching up to 250 meters are the protruding ridges of the rising Pliocene erosion surfaces. The continuation of the surface is observed with a gradient as low as 1% for 2 km to the south. The gradient of the 2 km-long ridges between the Topaç hill and Sivri Hill is 2%. This surface is the east equivalent of the surface on the back of the Kocameşe ridge, which is mentioned earlier and extends between 50-90 meters.

The northern slopes of Karasu Stream, which stretches from the source area of the Istranca Stream, extend into the talveg line by offering very mild gradients. In this section, 90 m level of erosion surfaces has been transformed into ridges that descend up to 40 meters towards the valley floor. On the ridges of Palamut, south of the Kurtçu Hill and Hamaylı Hill, this is evident. Upper Pliocene erosion surfaces, which descended to 50 meters on Kum ridge, just to the east of Karasu catchment bracket, fall down to 40 meters around Palamut Stream valley, which is the northern tributary of Karasu, and continue to the dune area starting from its east.

In the northern part of the Istranca section, these Pliocene surfaces, which descends slightly to the alluvial baselines of Karasu and Istranca in the south, are most commonly seen around the Sinir Stream valley on the plateau surface. The plateau surfaces, which offer 70-meter levels between the young tributaries of the Sinir stream that breaks the site with their dantritic drainage, are in the state of slightly wavy, 10-meter undulating surfaces extending between 70-90 meters. Again, the same level of erosion surfaces is seen around Sarp Stream valley which is one of the northern tributaries of the Istranca Stream. The erosion surfaces starting from the north of Sarpdere Hill (106 m) in this area are lowered to 40 meters following the railway and forested ridge. The gradient of the surfaces is about 1.5%.

In order to base the development process in Ormanlı Village on more concrete data, various samples were taken around this village. The first of these is the sand sample taken from the sand storages of the road cuts belongs to Neogene which is 200 m north of the village (Graph 1). According to the analysis of this example, we see that the elements in the middle sand size are dominant. However, it is noteworthy for coarse sand and fine sand size. The scarcity of the large size elements such as coarse sand, pebbles, etc., means that the pre-existing stream cannot carry these large-scale elements here; on the other hand, the small size of fine sand, silt and clay, shows that those materials are transported by the stream. Therefore, in addition to the reduced flow rate of the stream in this region, we also understand that the eroding force and carrying power is not very strong here.

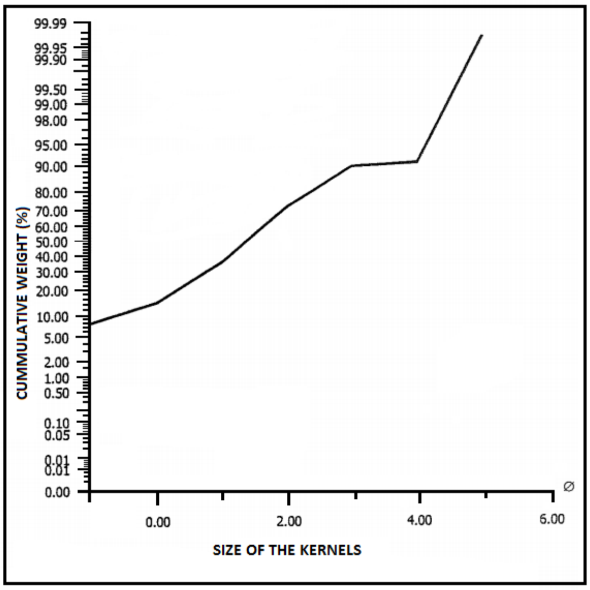


Graph 1. The curve of the Neogene sands 200 meters north of Ormanlı Köyü (▲ 2)

When the curve of the Neogene sands taken from the 10 m high roadcut north of Ormanlı village, is analyzed (Graph 2); it is understood that the elements of medium sand size are dominant, but in general, other elements are stored in mixed formation. Due to the fact that these elements are close to each other; that the existing stream had little effect on transportation and shaping and that the stream suddenly increased its strength; in the meantime, it stacked his material here; therefore, we can say that this stream is exposed to floods occurring in various periods.

Parts of the Istranca section with lower cleavage that has been developed on the less resistant Ergene formation, Karasu being caught in the source area, and forming two meander cut banks, 30-40 meters high in the northwest of Karacaköy are among the evidence of young tectonics.

However, in the section where Sinir Stream merges with Karasu, there are amplitude young 5-10 m ravines are observed. These ravines, which show that Karasu and Istranca Stream frequently change beds, form wide crescents, like the two meander cut banks. Again, the alluvial cone formed by Sinir Stream also diverted Karasu at this point to the south.



Graph 2. The curve of Neogene sands 10 m high north of Ormanlı Köy (▲ 3)

West and Southern Sections

Especially in terms of morphological criteria such as elevation, gradient and rejuvenation, this section, which differs greatly from the low plateau in the north, has a massive characteristic developed on rock groups ranging from Paleozoic metamorphics to Pliocene detritics. The section boundary with the water section separating the Terkos Plateau in the south from the Büyükçekmece Plateau ends at 50 meters level on the ridges east of Sivasköy and Tarfa Stream in the east.

In this basin, the Istranca section stands out as a massive area which can rise up to 380 m. In places where the Ergene and Terkos formations are exposed, there is a sudden decrease in the elevations. In this section, the areas where the plateau reaches the highest values are the marble, quartzite and schist areas of the Mesozoic, which encircles the Akalan formation to the east of Gümüşpınar, and the areas consisting of granite and gneissic rocks of Paleozoic age.

Istranca section is separated from the low and slightly slumped plateau area in the north of the western part, roughly along a line that can be drawn between Tombak Hill and Karasu's catchment bracket. At the same time, this area, which corresponds to the formation boundary between the Mesozoic hard masses and the Ergene group, narrows to the south by the introduction of the Ergene group formation to the west of Karacaköy and joins to the southern part of the valley of Istranca Stream. Kartalkaya Hill (324 m), Garipkuyu Hill (361 m) and Nokta Hill (297 m) form the most important elevations to the west of the area where the Istranca Stream enters our site and forms meanders to the north of the section. In this part of the plateau, the elevation towards the Ergene group formation in the north falls from 300 meters to 50 meters. The most important rivers that break the site are, the north-flow Kuzulu Stream, Podima Stream and Maden Stream; east-flow Karasu stream and its tributaries, Kazan Stream and south flow Orta Stream and its tributaries which formed deep valleys in the parts where Istranca Stream merges into our site. Most of these streams, which break the plateau in the western part of the Istranca Stream, flow in the 'V' shaped young and deep valleys. Only in the north and east, in the transition zone to Ergene group formation, recumbence in valley profiles are observed. Gradient fractures are also present in longitudinal profiles of well-developed dantritic networks. The relief amplitude between the valley floor and the plateau surface can reach up to 100 meters in most places. Topographical discordance is prominent on the Mesozoic rocks with high resistance.

The erosion surfaces in this section show mainly two stages. Erosion surfaces extending from 150 to 200 meters along a line that can be drawn northwest-southeast between Tombak Hill (192 m) and Yolayrımı Hill (152 m); On the northern part of the Istranca section, the surface extends from 40 to 50 m, with very slight gradients from the south (for example, with a gradient of 2.6% on the axis of ridges of Sarıbayır and Harta). Pliocene erosion on the Tombak Hill north of Pazarbasi Hill (282 m) at 180 - 200 meters has turned into ridges extending 51% to the south of the Cami Hill (162 m) at the north. The erosion surfaces passing through the Istranca way and Sarıbayır ridge, up to the catchment bracket of the Karasu Stream further to the east, descend to the north, starting from 200-250 meters, with a gradient of 41%. This erosion where plains up to 200 meters can be observed and 200m contour lines are limited by very steep gradients, extends to 150-200m levels with a 4% gradient and slightly undulating with its surfaces forming the water section between the source tributaries of the Karasu Stream.

Behind the Ergene formation in the western part of the Istranca section, the erosion surfaces, which descended to 100 meters, turned into descending ridges towards the west of Karacaköy in the east.

This situation is best seen on the Balkan Crossroads ridge. These erosion surfaces extending along the Erikler Ridge to the east from Nokta Hill, extend over Yassı Hill at 115 meters, with a gradient at a rate of 3%, to the north and west of Karacaköy. As all these surfaces cut the Mesozoic marble, quartzite and schists, they can also be referred to as erosion surfaces since they cut the young Pliocene units of the Ergene group formation in the north and west and show the level of conformity. They are developed to the detriment of each other and there is a level difference of 50-100 m. These levels, defined as Pliocene surfaces, are surrounded by a third level around the Garipkuyu Hill, Kartalkaya Hill, and Katıryolu Hill (331 m). In fact, these 300 m level surfaces, which are the continuation of the Pliocene surfaces at the higher levels, should be related to the tectonic movements formed after the Pliocene period and after the young tectonic movements. In fact, the erosion surfaces of the east and southeast of Garipkuyu Hill, which extend at 300-310 meters, are descended to 250 meters down to the previously mentioned surfaces. This situation can best be observed along the possible fault line in the northwest-southeast direction between Nokta Hill and Tombak Hill. In this case, it can be said that these surfaces, whose elevation exceeds 300 meters, are pieces that are elevated due to the grading of 150-200 meters of erosion surfaces.

A part of those high-level erosion surfaces located at the north of Garipkuyu Hill is at the level of 320-330 meters and is slightly undulated. The surface part, located on the east of Yayla Hill (330 m) and ending at the possible fault steep of the Karasu Stream catchment bracket is at 260-300 m level; it is slightly fluctuating and has a gradient of 4%.

The erosion surface in the north and south of Çifttepe (310 m) also extends by creating undulations caused by the resistance difference. The equivalent of this Pliocene first stage surface, which cuts the Mesozoic marble and quartzite, lies about 2 km south of the Garip Koyu Hill at levels 320- 350 m. Lightly fluctuating surfaces around 310-330 meters in the vicinity of Katıryolu Hill, on the plateau surface at south and north, encircling the Orta Stream joining Istranca Stream from the north, descends until 250 m at the point of Çatal Ridge.

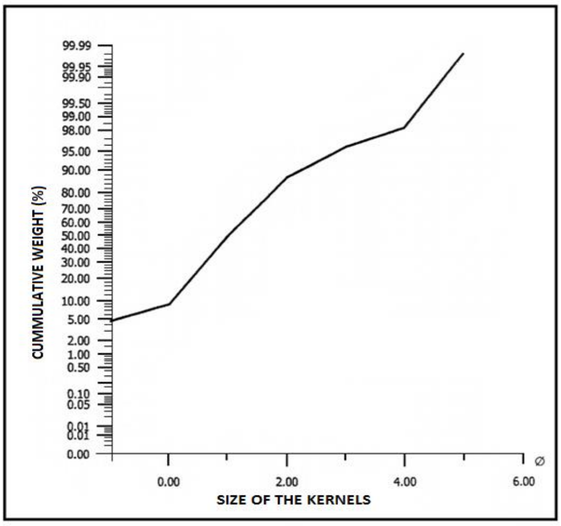
The evidence of young tectonics is found in many places in the western part of the section. The most obvious example of this is the possible fault separating the first stage erosion surface extending at an average of 330 m and the second stage erosion surface extending in the north at 150-200 m. Apart from this possible fault extending in the northwest-southeast direction, there can be meanders embedded in the Orta Stream valley. Two meander cut banks, about 1-1,5 km north of the section where Orta Stream joins the Istranca Stream, are up to 100 m high. Again, the meander cut banks and slip gradient terraces, which form the 80-meter steepness to the north of Katıryolu Hill, reveal the rejuvenation on the site. In this section, the "V" shaped, amplitude valleys up to 100 meters, reveal the contradictions formed by the old mature topography after the Pliocene period with the effect of neotectonics in the strong topographic discordances between the plateau surfaces and the valley slopes.

The southern part of the Istranca section, like the western part, shows even more faulty and high topography characteristics. Ferah Hill, Nalbantağaçlar Hill (360 m), Küçükkuşkaya Hill (375 m) and Kuşkaya Hill (378 m) are the most important peaks in this area. This area, which is very deeply divided by the southern Tributaries of the Istranca Stream, consists mainly of Mesozoic schists, quartzites and marbles. To the east of Gürpinar, while the Eocene aged Akalan formation consisting of sand, clay, silt, gravel and sandstones, and the relief amplitude on this massive plateau further east formed on the Paleozoic basement rocks consisting of granite, gneiss and mylonitic gneisses, is 80m in Kürk Stream valley, at Karamandere meandering valley east towards east, It exceeds 150m. Generally, on this hard foundation, the valley depths reach 100 meters and there are straits as well. The maximum gradient values in the plateau are observed around Ferah Hill, Kuşkaya Hill, K.Kuşkaya Hill and Nalbantağaçları Hill. The average 300 contour line encircling those hills, is a continuation of mentioned plateau plains of 300-350m, in the western part of Istranca. In the southern part of the Istranca section, frequent changes in the lithology between Gümüşpınar and the section of the Istranca Stream, which is located on our site, cause decreases in the elevations in the plateau. Indeed, while slightly undulating plateau plains around Harman Hill (259m), Balık Hill (240m) and Ballımezar ridge at a level average of 250 meters, developed on Mesozoic rocks; Kürk Dere, located further south, excavated its symmetrical valley within the Paleozoic units. To the south of this valley, the elevation falls thoroughly and descends to 170 meters on the Atkoşu and Sirnit ridges. The reason for the difference between these flat ridges and the Yüksek Hill (213m), where the Paleozoic basement out-cropped again, is the presence of the Pliocene aged Terkos formation. n this case, sudden changes in the plateau surface interrupted by Kürk Dere and Karaman Dere valleys in the area between Gümüşpınar Village and Harman Hill can be explained by the Terkos formation outcropping in several points.

The Karaman Stream valley is a small meandering zone with a narrow alluvial base with 40-50 meters of steepness as a result of meandering in the south. The Karaman Stream valley over the reef limestones of Kırklareli was buried deep into the Paleozoic granites and gneisses at the east of the Yüksek Hill; formed meander cut banks that reach 100m in patches. The relief amplitude between the plateau surface and the Karaman Stream talveg flowing in a strait valley of approximately 6 km reaches 150 meters in the central part of the strait. The meandering movements made by the Karaman Stream, flowing in a valley with deep and steep slopes, which is indeed not a meander, can be described as mounded and buried meanders.

The preservation of Pliocene sand, clay and gravel depots in the environment can be said to have been formed as a result of the of a stream on Pliocene cover storages that was buried completely as a result of the change of the base level due to the neotectonic movements. Because this stream, born at 200 meters in the south, on the limestones of Kırklareli, and ran in a very wide valley ended on the Terkos formation which could be up to 50-100 meters in the north and formed this steep valley. The formation of such a strait in this massive area between the Istranca valley and the plateau surface at 200 meters in the south; can be explained by the burial of a stream which is located on the cover storages in Pliocene as with its young tectonic movements.

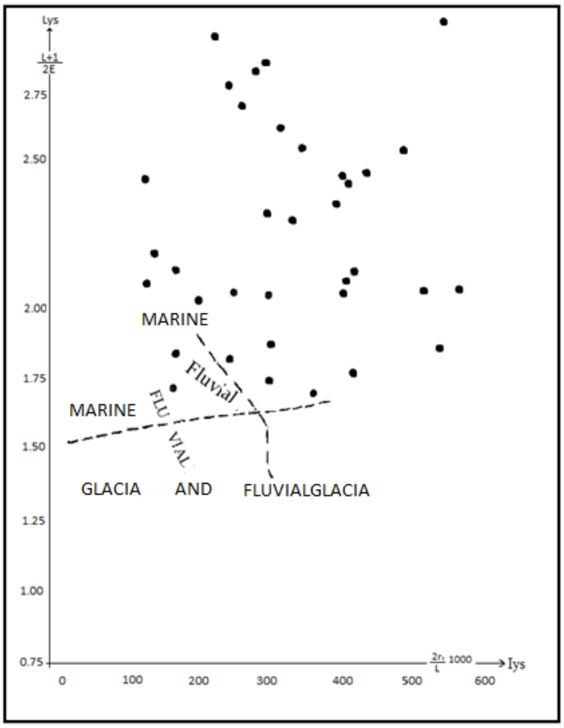
As a result of this burial; the 150-meter value seen in the relief amplitude; very steep slopes in the transverse profiles of the valley; slope fractures in the longitudinal profile; meander cut banks and meandering terraces developed south of Bostan Hill (268 m); The meander piece detached from the opposite slope of the meander cut bank south of the Arabacı Hill (245 m); catchment towards the east of the Pirenli Stream joining the Karaman Dere from the west and the meander of 80 m and the meander and the meander cut bank to the south of Pirenli Hill (220 m); the rapid development of this deep valley in the Paleozoic basement of Karaman Deresi; is the evidence that the Karaman Stream deepens its bed. Thus, it is understood that the Karaman Stream strait valley is an epigenic strait, which is opened between the less divided plateau of an average of 200 meters in the south and the alluvial floor of the Istranca in the north.



Graph 3. The curve of Neogene sands taken 2 km southwest of Karamandere Village (▲ 4).

The source area of Karaman Dere is composed of mature valleys in the Pliocene Ergene formation on the southern border of the Istranca section. The rivers joining this river named as Tahtaköprü Stream in the source section, exhibit poorly developed dandritic drainage. The low density of drainage in this area is related to the fact that Eocene aged reef limestones are adjacent to the site in the east. According to the curve drawn from the Neogene sands taken 2 km southwest of the Karaman Dere Village; It is noteworthy that rough and medium-sized sands dominate in the storage. This shows that from this area, fine sand, very fine sand, silt and clay size elements are very easy to move; large and medium-sized elements such as coarse sand could not be moved further through the stream and settled here. This shows that the previously existing stream is not very effective in shaping and transporting the site.

According to the histogram of the morphology analysis performed on the gravel of 50 units, we took in Karaman Dere area; The median roundness index value is Iyv = 404 and the median flatness index value is Iys = 2.35. Accordingly, if we evaluate our storage in terms of morph dynamic processes: Shaping factors are 70% marine or lake waves. Radiolarite in our storages has a high roundness index as 5,33. This rock, which is hardly rounded under normal conditions, is a distinctive feature for sea and lake waves. Fluvial effects are observed in the storage at a rate of 30%. This is a sign that both stream and surface flooding are effective together and have an intense period of erosion.

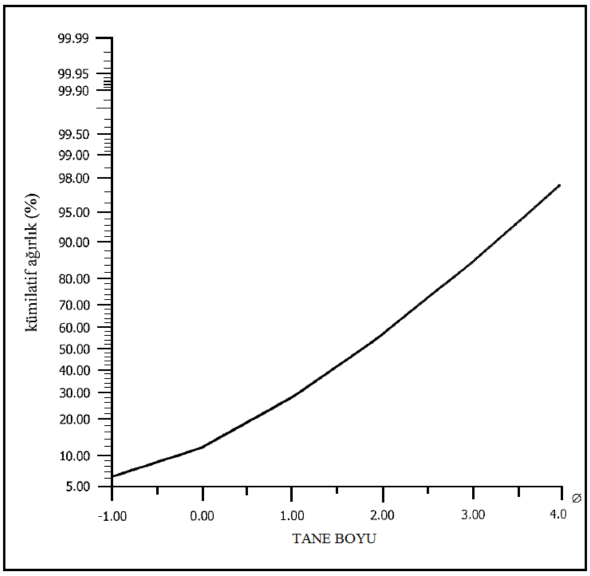


Graph 4. Comparison of flatness and roundness index of gravel taken from Karamandere area.

When moved eastward, there is an area that is mostly located in the Istranca section. The karstic formations, which are represented by small dolines in the karstic area west of Gümüşpınar, are formed on the plateau surface which extends over 280 meters. About 10 dolines around the Beşmeşeler Hill (290 m); can be shown as karst plateau surface. In the south of this area where the drainage is very weak, the Gümüşpınar Dere source site has been completely karstified and many dolines and several uvalas have been developed. The entire area is a fluvio-karstic region. These karstic pits, which have local names such as Araoğlu pit, Saklı pit, formed by karstification of Gümüşpınar Stream floor extending at 220-250 meters level. The bed gradient of this old valley is 2.5%; slope gradient is 3%.

When we look at the curve drawn as a result of the analysis of the sand sample taken from the edge of the sinkhole at the base of one of the sediments at the Ihlamur location in this karstic plateau; It is observed that the sands accumulated at the doline bottom generally consist of elements of medium sand size, but also exist in other dimensions. For the sands accumulated at the doline base transported from the environment; It can be said that the sand is accumulated at the base of the doline located where the force of the transient stream transporting the material from east and northeast, had been suddenly cut; it can also be said that finer and coarser grained sands are accumulated, too and they exist in the storage. It is observed that very large sands couldn't have been transported to the storages whereas very fine sands could have easily carried on. This stream bed is probably located at a distance away from the mouth and the source section.

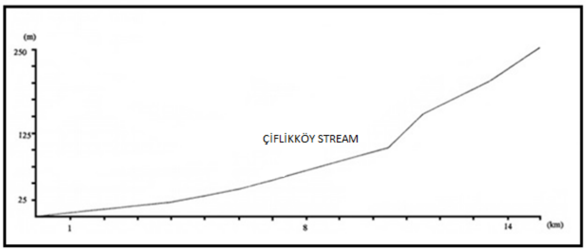
When moving towards the east of this karstic area around Gümüşpınar from the southern part of the Istranca section, Akalan formation, where the eastern tributaries of the Karaman River excavated in the deep valleys, starts. This formation, consisting of Eocene aged sand, clay and pebbly sands, has V-shaped young valleys, such as Kürek Stream and Dingil Stream, which have dug their beds to form an amplitude of 80 meters. These valleys, which are surrounded by plateau plains with 200-250 meters elevation and thus with erosion surfaces, constitute the subsequent tributaries of Karaman Stream.



Graph 5. Granulometric Curve of the sand sample taken in the karstic area of Gümüşpınar village (▲ 6)

As it moves towards the eastern part of the high plateau, the topography falls into the form of low plateaus falling to 100 meters in the vicinity of the Çiftlikköy valley. It is seen that Çiftlik Stream, which we think that it has adapted to a fault line due to the flow direction, is a stream flowing in a steeper, asymmetrical valley. In this section, a sudden decrease of 200 m, unlike the Istranca mass, is related to the transition from Eocene aged clayey limestone, marls and shales to Terkos formation. The area between Çiftlikköy and the section on the east of the Tarfa Stream, where the Istranca section ends, consists of low plateaus developed on the Terkos formation.

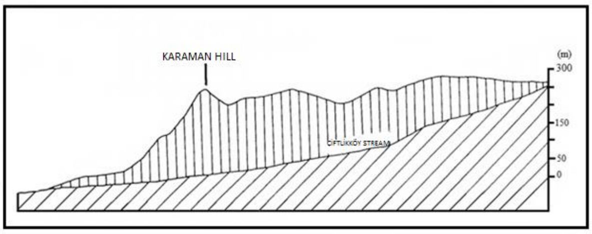
Apart from the Çiftlikköy Stream, the Sivasköy Stream and Tarfa Stream in the east are also the major tributaries of the Istranca Stream.



Graph 6. Çiftlikköy Stream Valley Profile

In order to better understand the condition of the streams in the region, "Valley length, Cleavage degree profiles and Talveg Reconstructions" of the Çiftlikköy and Sivasköy streams were extracted (Charts 6-7-8-9-10-11).

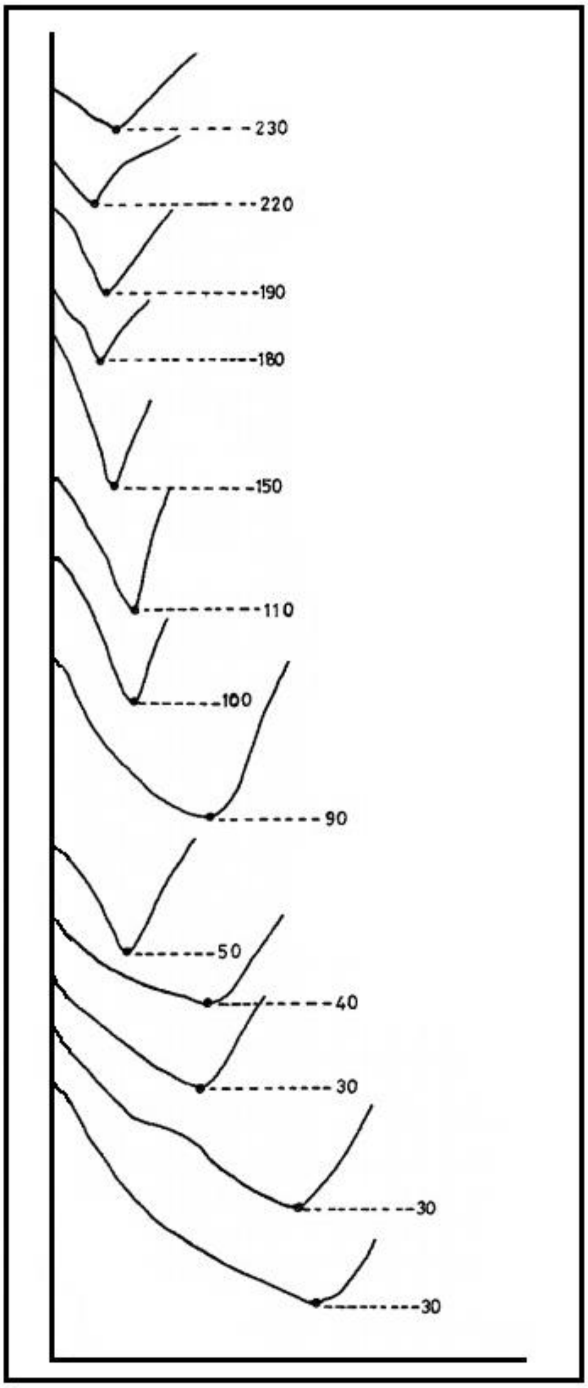
The highest peaks in the Istranca section, Ferah, Kuşkaya, Küçükkuşkaya and Nalbantağaçları Hills, attract attention as peaks consisting of resistant Mesozoic marble and quartzite. The high field, where 300 meters contour line surrounds the plateau plains, is the source point for the tributaries of the Istranca Stream. Apart from Karaman Stream, Kaşıkçı Stream, Maçka Stream, Ceviz Stream and Balıklı Stream are the deep and young valleys, whose up-stream beds are opened in this Mesozoic mass. Almost all of the valleys are V-shaped and the relief amplitude is 70-80 m. Although the valleys are deep, the drainage has not yet fully acquired the dantritic character. Mesozoic aged marbles should have an effect on this.



Graph 7. Ciftlikkoy Stream Cleavage Degree Profile.

In this direction, although it is observed that the profile series of the two streams show a lot of similarities, they are about to reach the balance profiles. The reason for being rejuvenated once in the mouth is due to the immersion in the lithology of the Istranca massif. This plunge has also affected the degree of cleavage. On the source side of the Sivasköy Stream, one these streams, each of which is more than 10 km long, a karstic area with two dolines lies in South of Kalfaköy settlement. Karstification was not well developed on these clayey limestones which are not suitable for karstification as much as Kırklareli formation. However, a certain density is not observed in the drainage.

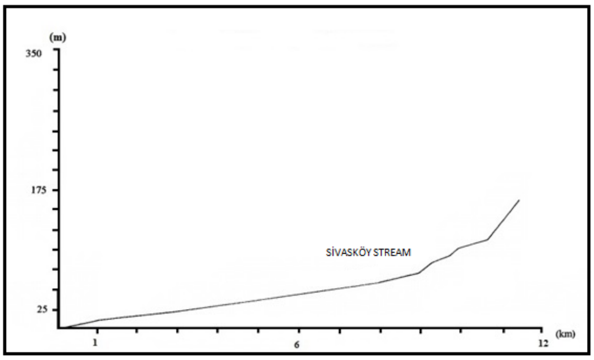
This section of the Istranca section, which is slightly deeply cut by these three streams and their tributaries, is somewhat higher in relief, but similar to the northern part of the Istranca section. The plateau surface varies at an average of 90 meters.



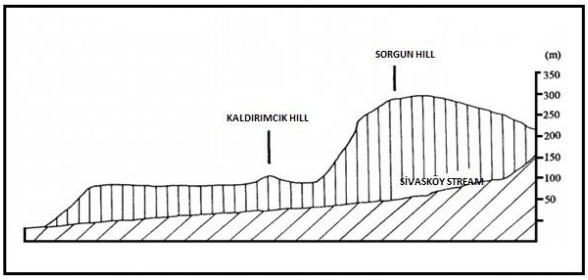
Graph 8. Talveg Reconstruction of Ciftlikkoy Stream

In the Mesozoic area to the west of Çiftlikköy, the Merdivenli Stream valley presents evidence particularly important regarding the young tectonics. Merdivenli stream, taking its tributaries from Kınalı (266 m) and Acemalan Hills (270 m) has a well-developed dandritic drainage. This stream, which has opened a wide basin by absorbing streams such as Fındıklı Stream, Kereste Stream, Sülüklü Stream and Kayalıboran Dere; attracts attention with its bed making wide meanders in the middle and mouth sections.

The drainage density of the Merdivenli Stream basin, which is the source part of the Çiftlik Stream, is quite high and the V-shaped young valleys are observed at a depth of 100 meters. Meander cut banks, offering steeps of 60-80 meters, and slip slope terraces, gradient fractures in the longitudinal profile and the erosion surfaces and fragments mentioned below are evidence of young tectonics in the site. The erosion surfaces in the southern part of the Istranca section have quite different qualities both in terms of grading and in the area of narrow and wide area undulations.



Graph 9. Sivasköy Stream Valley Profile

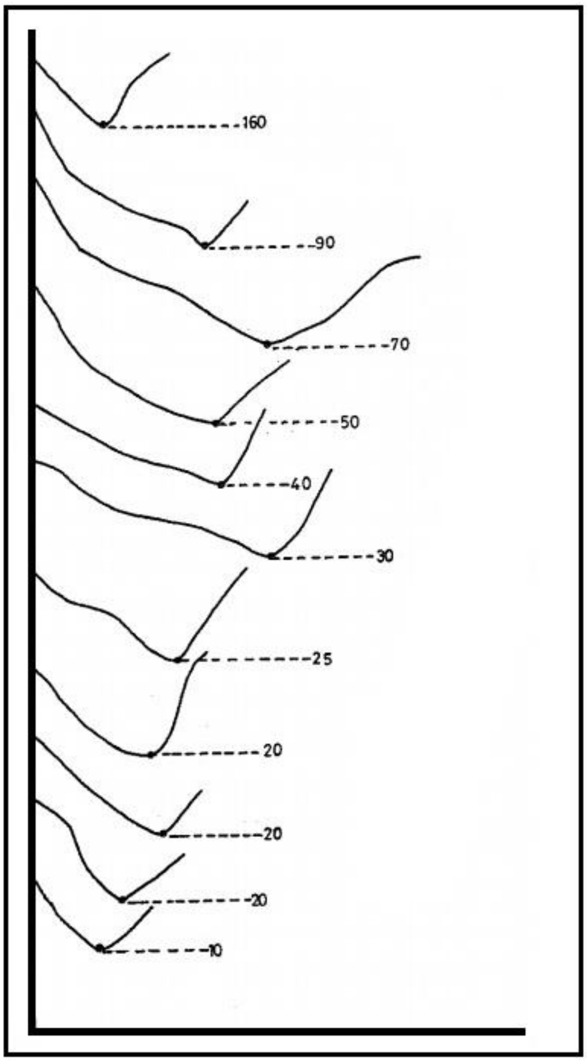


Graph 10. Sivasköy Stream Cleavage Degree Profile

To the south of the section where the Istranca Stream is located, the erosion surfaces on the Harman and the Fish Hills extend between 210-250 meters. Particularly, the piece of the erosion surface at 210-220 meters to the south of the hill is prominent.

The south of Kürk Dere valley, the erosion surface at the vicinity of Simit Ridge and Atkoşur Ridge extends from the Yüksek Hill at the south; lies in a slightly fluctuating manner, forming a distinct topographical discordance with the slopes of the Kürk Dere valley at an average depth of 50 meters. It is seen that the erosion surfaces of this section are descended to 150 meters in areas where the Ergene formation is re-exposed.

On the source side of the Karama Stream, the erosion surface on the Tahta Köprü Ridge, which extends from the Tahta Köprü Hill (234 m) to the north, descends with a very slight gradient towards the valley floor. This surface at 190-220 meters extends over the Ergene formation to the south of the karstic area around Gümüşpınar. This surface, again on the same formation that is on the sand, clay, pebble and lenticular Pliocene land extends up to 190-225 meters in the east of Tahtaköprü Stream, and descends to 180 meters on the ridges of Lake Kavak.



Graph 11. Reconstruction of the Sivasköy Stream Talveg

The continuation of this surface cuts the Kırklareli limestone composed of Eocene aged reef limestones in the east. However, this surface which is in the northeast-southwest direction and has undergone karstification on the plateau surface has lost its significance by karstification. However, the level of this surface can be observed around Hırsız Hill (217 m).

To the north of Gümüşpınar, 230 m to the south of Yazda Hill, the surface extending between 190 and 200 m was formed on the Paleozoic basement rocks. In the vicinity of Yazda Hill, the surface of the Mesozoic, where the erosion resistant quartzites and marbles are out-cropped again, undulations can be seen on the surface.

It is seen that erosion surfaces on Ergene Group, which extends to 500 meters southwards, extend to lower level surfaces. This surface part extending to 100-120 meters to the south of Karaman River continues on the plateau surfaces, which separates the short, deep stream valleys in the east, by gaining a slight rise. Indeed, erosion surfaces on the Kosabayırı ridge to the east of Tuğlapınar Dere, at 130-160 meters to the south of the meandering west of Belgrad Village, on the 100-110 meter level and on the Kale Ridge, at 100-140 meters can be mentioned as erosion surfaces. In fact, these surfaces are surface parts developed in the foothills of the Pliocene surfaces developed on the basement rocks of Mesozoic marble and quartzites and schists of the Istranca massif; Starting from roughly 100 meters up to 150 meters, these slightly sloping surfaces form the lower skirts of the massive plateau, as in the western part of the Istranca Section, where the probable fault exists between the Tokmak Hill-Erikler ridge. These surface parts are seen around Çiftlikköy south of the high plateau. Here, on the slope of Çiftlikköy, the surface part, which is stretched at 90-110 meters and interrupted by two dolines, is also prominent. These two surface parts are formed on the Eocene aged Terkos formation, which is composed of clayey limestone, marls and shales. The erosion surface on the Hisarbeyli, which borders from the east, where the water section lies at 50-80 meters and the Hisarbeyli village is located on it, forms the southern part of the Istranca section. This surface, which turns to the ridges which descend with slight inclinations towards the plain of Istranca, reaches down to 40 meters west of Kuzuluk Hill (58 m). The gradient of this surface on Hisarbeyli is about 1.5%.

Similarly, the surroundings of the Tarfa Village are another part of this lower level. The surface, which extends to the north of the village at 60-70 meters, is transformed into upper Pliocene surfaces which are slightly inclined towards the mature valley of Tarfa Stream. The surface part, which lies to the north of Furgan Hill (126 m) to the south, is in the shape of an elongated ridge at 70-80 meters.

Roughly, in the eastern part of the Tarfa Dere valley, these plains, which are slightly inclined towards the valley floor, can be represented as Pliocene erosion surfaces and show continuity in the western part of the same valley. The surface extending over the Yayla Hill (60 m) and descends to the north at 40 meters, the continuation of the 6 km long erosion surface which actually extends northward from the surroundings of the Eğrek Hill (151 m) in the south, exceeding the Uzuntarla position, and descends to the north with a gradient of 1.6%.

Two surface fragments to the north of Sivasköy, on 100-110 meters levels, descend to 80 meters in the north of Dikilitaş Hill (118 m.) And to 50 m on Ihlamur ridge. These surfaces, which are formed on the Terkos formation and not as strong as the others, should also be of Pliocene age.

To summarize the Pliocene erosion surfaces in the southern part of the Istranca section that we briefly described; we can say that they elevate up to 150 meters on the Pliocene Ergene formation rocks between Karaman and Belgrad village, but they mostly extend to 100-130 meters. Further west, the surface fragments at the same level behind the meander cut banks of the Istranca Stream cut the Mesozoic rocks.

The erosion surfaces seen in the vicinity of Hisareyli Village, Tarfa Köy, Sivasköy, Kalfaköy and Çiftlikköy to the east of the section cut the Terkos formation, which is composed of clayey limestone and marls of the Eocene. These surfaces are descended to the valleys of Tarfa

Stream, Sivasköy Deresi and Çiftlikköy Streams and their elevations usually fall to 40 meters.

Pliocene, mainly develops on Eocene and Pliocene rocks in the southern part of the Istranca section, while the uppermost Pliocene surfaces gain elevation in high hills such as Ferah Hill and Kuşkaya Hill. These surfaces, which extend at 320-350 meters which we cannot see in any other part of the site, can also be shown as Pliocene and show slight undulations due to the difference in resistance. These erosion surfaces of Mesozoic aged hard marbles, quartzites and schists are separated by 40-50 meters of knickpoints from the surrounding erosion surfaces. The surface located around the Kuşkaya Hill (378 m), extending at 300-320 meters, extends to 3 km to the west and the gradient is 1.5%. Again, the erosion surfaces north of the Ferah Hill (382 m) and Nalbantağaçları Hill (360 m), extends up to 300-330 meters. The erosion surface fragments at 260 meters above Hasandağ Hill in the north and 230 meters around Yalnızagaç Hill (242 m) can be shown as the second stage of these high-level erosion surfaces that cut the Mesozoic terrain. Again, these surfaces, which cut the Mesozoic units, turned into ridges that stretched to the northeast with a gradient of 6% starting from 250 meters on the ridge of the ridge. Immediately to the north of these surfaces, comes the erosion surfaces extending until the west of the Belgrad village, beyond the large meander cut bank, cutting the Pliocene formations.

The erosion surface at the east of Küçükkuşkaya Hill starts at 260 meters and ends at the Fırın hill (210 m). The equal levels of this surface are seen on both sides of the young valleys that limit it to the east and west. For example, the surface extending on 100-260 meters on the Mahkeme ridge is an approximately 2.5 km long erosion surface and is connected to the fluctuant surfaces extending to the northeast by Terkos formation over 100 meters. This transition around the Mahkeme hill (118 m) is clearly visible.

The erosion surfaces, located to the west of Çiftlikköy and on the surface of the Mesozoic massive plateau, south of the Karaman Hill (272 m), which is descending to the village with steep slopes, lies at levels of 210-250 m. Near the west of the Çıplak hill to its west, turned into ridges stretching down to the Sülüklü Dere valley, and its 200-250 m long surfaces lie behind the meander cut bank to the south of the Naked Hill.

The erosion surface on the Sülüklü Lake ridge at the source section of the Sülüklü Stream is at the level of 215 meters. This surface which cuts hard rocks like granite and gneiss of Paleozoic age also constitutes the southern part of Istranca section and forms the lower part of the 6 km long erosion surfaces where the high 300 meter plains in the north are lowered by a gradient of 1.5%. Arabacı Mansion, as the equivalent of this surface, is observed to be at the same elevation with Yörük Cemetery and Yarmakaya ridges. The erosion surfaces in this section are formed as the equivalents to the surfaces of 200-250 meters of the south of Kuşkaya Hill, observed in the vicinity of the Sülüklü Dere basin. To the further east, it is seen that the surfaces could rise up to 250 meters with the appearance of the Mesozoic terrain resisting in the direction of Kalfaköy. As a matter of fact, the surfaces of the erosion surface in the east and north of Nişan Hill (306 m.) Are seen to extend 250-280, and the surface parts at the north of Dörtyolağzı Hill (286 m.) Extend to 285 m and fall down to 220 m north. To the east of the Kiraz Ridge, there is a 4 km long erosion surface with a gradient of 1.7%.

The erosion surface fragment at the north of the Kayalı Burun Hill (283 m) is at a level of 290-300 m. Located in the western water section of Kayalı Burun Stream, the equivalent of this surface is a slightly fluctuant surface which borders the valley from the east and extends to the 231-meter high Kara Hill. At the east of the hill, 4 km long erosion surface extending at 285 meters, ends at 220 meters at Kara Hill and has a gradient of 1.7%.

Pliocene erosion surfaces around the Karaman River basin also cut the lithologies of various ages and resistances. In the area where Mandıra Stream, the long tributary of the Karaman Stream, joins Karaman Stream by meandering, there is a 160-170 meter erosion surface on the Pirenli Hill and behind the meander cut bank. The continuation of this surface is around 150 meters around Yazda Hill and reaches up to 190 meters with a gradient of 1.6% by gaining elevation towards the south. It cuts the Paleozoic basement rocks in this area.

The plateau surface in the west of Sivasköy consists of erosion surfaces extending by 1-20 meters of undulations. These 100-meter levels which do not show continuity due to the fact that Sivasköy takes more and longer arms than the west, is observed as the equivalent of the surface passing through the previously mentioned Uzuntarla ridge.

These surfaces to show lower levels than the erosion surfaces of 200-320 meters in the southern part of the Istranca section, may be related to their development on the less resistant Terkos formation, or due to the young tectonic movements, these upper stage plains getting elevated and those surfaces to remain at a lower level compared to them. As a matter of fact, there is a transition to the Terkos section in the east and the altitude exceeds 150 meters in only a few places (Kel Hill 173 m, Fatmacık hill 160 m etc.).

As a result; Pliocene erosion surfaces extending at 300-320 meters in the southern part of the Istranca section, and the erosion surfaces descending down to 180 meters or even 150 meters below; extend down to 40 meters, especially on the slopes of mature valleys at 150 meters. Apart from the graded erosion surfaces and their fragments, the following can be given as evidence of rejuvenation: Karaman Stream Epigenic strait; irregular longitudinal profiles and nickpoints of young streams digging deep valleys in Paleozoic and Mesozoic hard masses; sharp topographic discordance between the steep slopes of these valleys and plateau plains; meander cut banks and slip slope terraces; The catchment of Karaman Stream in the west of Pirenli Hill. The existence of large areas of young Tertiary formations from the west, north and east in the section, and the existence of the hills over 350 meters on the Paleozoic and Mesozoic - resistant rocks; indicates that Eocene and Pliocene were swept in the center of the site and these basement rocks were partially stripped. The Karaman Stream strait is also an epigenic strait that is embedded in the Paleozoic basement following this sweeping (Ardel, 1958; İ.BB, 1995; Kurter, 1963; Okay and Görür, 1995; Şen et al., 1996; Kaya, 1999; Şeker et al., 2013).

Terkos Section

The Terkos section, which forms the eastern flank of the Terkos Plateau, is a roughly circular plateau region around the Terkos Lake. It lies behind the Terkos Lake, which is limited to a 12 km long sand dune area that starts from the east of Orhanlı in the north and is made up of partly fixed sand dunes. The average elevation on the plateau is 150-170 meters and the highest point is the 173-meter high Kel Hill.

The general introduction of the department can be done as follows; the section, bounded by the Western Istranca section, is oriented towards the southeast on Kel Hill (173 m), 1 km south of Fatmacik Hill (160 m), and reaches to the Martyrs Hill (145 m) 4km in the southeast via Dikilitaş Hill (128m) and Yiğitler Hill (110m), respectively. This water section rises further to the east of the Martyrs Hill and reaches Usak Hill (162 m) at 1.5 km east. Before this, the water section that passes the flat plateau surface 1 km to the east comes to the Dokuz Dolamaç Hill (156 m) on the east through the Pliocene erosion surfaces extending to the south at 140-150 meters. From this hill, it passes over the plateau plains and reaches to Sakaloğlu Hill, through the plateau surface, which is at 5 km east and reaches an altitude of 190 meters, and then, again, it extends beyond the Sakaloğlu ridge by losing altitude, and descends down to 130 meters on Boyalık ridge, 3 km northeast. 1 km to the east of this ridge, the section boundary ends at the surface of the fluctuant plateau, which maintains its level of 130 meters.

The rivers forming the plateau in the Terkos Department are flowing towards the lake from the periphery to the center with a drain that is not frequently developed, except for the short streams pouring into the narrow branch of the lake in the west. The most important ones are; Küçük Orman Stream, Derin Stream, Mafakci Stream, Sinan Köprü Stream, Kapaklı Stream and Yeni Çayır Stream. Apart from these, short streams such as Celep Dere, Kömür Dere in the western extension of Lake Terkos and Ayazma Dere and Tefne Dere in the east opened young valleys in the tip sections where the elevation of the plateau fell to 80 meters. The gradient of the plateau falls towards the north and the plateau plains on the southern shores of Terkos Lake descend to 40 meters.

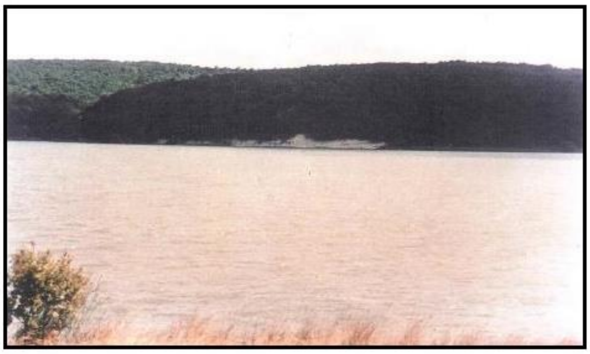
The deep plains of Derin Stream, Kaptan Çayır Stream, Mafakçı Stream and Kapaklı Streams have been formed by weak streams which have not been able to excavate valleys deeper than 50 meters in almost no section. The relief in the Terkos section shows a rather faint relief character according to the morphological features in the southern part of the Istranca section. Less deeply excavated valleys, low plateau plains, and the one-stage erosion surfaces to be mentioned later appear dominant in morphology. In the section where the streams are poured into the lake and the streams with alluvial filling plains with narrow areas have joined the lake, coves such as Saraç Bay, Vezirli Bay, Hacı Ömer Bay and Sinan Village Bay are actually the old mouth sections of these streams. As a result of the Flandrien Transgression, in the period that the sea level rises, the erosion of the land is paused and alluvial drowning occurs, these river valleys are flooded by the sea and alluvial bottoms were formed while coves were formed.

Again during this sea flood, the cliffs on the south of Terkos Lake were formed. These cliffs are located between Saraç-Hacı Ömer-Sinan village coves and also with the southern coastal extension of Kapaklı stream, and they are still active cliffs. Therefore, the plateau is cut by active cliffs in the southern parts of Terkos Lake.

The rivers forming the plateau flow in valleys with a maximum depth of 50 meters over the Terkos formation, which is composed of Eocene aged clayey limestone and marls that form the basis of the plateau. The dominant drainage type is dandritic drainage. However, these streams with a length not exceeding 6-7 kilometers do not have a fully developed drainage network.

The steep slopes of 40-50 meters to the lake in the plateau area are equivalents of the old cliffs formed by sea before the formation of the lake. The cliffs in the south of the Saraç Bay, in the east of Hacı Ömer Bay and in the south of Sinan village Bay, especially the cliffs leading down to the lake with dictations of 50-60 meters behind the dunes in the north, can be shown as examples of these. Apart from these cliffs that are splitting with very new streams several hundred meters in length, another interesting figure is the large meander cut bank west of Vezirler Hill (72 m) in the Orman Strait point, where the lake is very narrow. This 50-meter-high cut bank, which is located in the old bed of the Istranca Stream, was slightly split by Pınar Dere.

River valleys in the Terkos section are slightly V-shaped, have slanted slopes in terms of transverse profile, and the slopes are concave. No knickpoints are found in longitudinal profiles. This can be attributed to the lack of lithological changes that can create a difference in resistance, that is, the development of drainage on a single lithology.



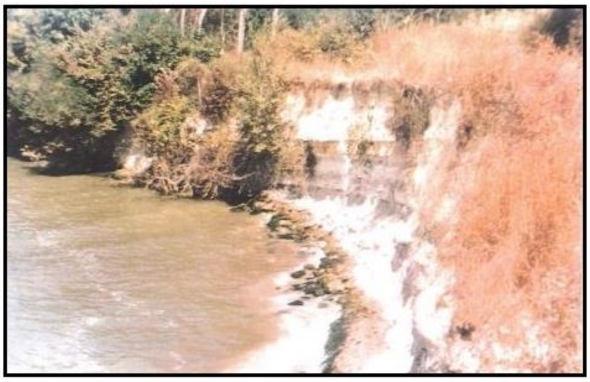


Photo 1, 2. Cliffs in Terkos Lake

The erosion surfaces in the Terkos Section are similar to the erosion surfaces in the transition area at the east of the southern section of the Istranca Section. Behind the aforementioned meander cut bank, the erosion surfaces around Çanak Hill (92 m) extend at 60-90 meters. Equal levels of these erosion surfaces, which are descended with a slope of 1.5% towards the Vezirler Hill (72 m) in the northeast and towards the Dikilitaş Hill (84 m) to the south, are also observed on the Pliocene aged Ergene group in the northern part of the Istranca Section. The erosion surfaces around Kurtlar Çiftliği Tepe (106 m) have transformed into slightly inclined ridges at 60-90 m.

There are erosion surface fragments encountered around the slanted sloped valley of Derin Stream, at 60-70 meters level that shows continuation on both slopes.

In the vicinity of the valley of Kaptan Çayır Stream, the erosion surfaces extend at 60-80 meters. The erosion surface at the south of the Yazlık village and the erosion surfaces at Kavaklar Hill (83 m) are at an altitude of 70-90 meters. Another surface at the same level is the erosion surface extending to the north of Sazli Hill (118 m) and it is cut in 50 meters by the old cliff to the east of Hacı Ömer Bay, showing sporadic undulations. This surface that can be observed about 3 km has a gradient of 1.6%.

The erosion surface fragment at the north of Yeşil Hill (84 m) ends on a 50 m high ancient cliff at the south of Sinan Village Bay. This plain, which forms the eastern water section of Kapakli Stream and extends to 50-80 meters on the plateau surface, where the Deli Yunus village is established on, is the continuation of the same surface fragment. On the Mahkeme Ridge to the east of the Deli Yunus Village, a slightly fluctuant erosion surface lies with a level of 60-100 meters. These Pliocene erosion surface fragments, which descended up to 35 meters on the same ridge, were transformed into sloping ridges with a gradient of 5% which descends up to 50 meters in the upper part of the Kapaklı Stream.

Mutual levels are observed on the plateau surface of Balaban Village. These Pliocene erosion plains, in the area between Balaban Village and Kule Hill (50 m), extend with an inclination of 2.5%, showing undulations.

The erosion surfaces behind the old meander cut bank, to the north of Balaban Village, lies between Tekekuru Ridge and this village on 80 meters, by partly loosing levels. The erosion surfaces in this section turn into fragments falling down to 50 meters in the plains, separating the young river valleys to the north and south. This situation can be noticed at Maltepe and Atyarlar ridges. Their equivalent levels can also be seen on the plateau plains at 50-90 meters west of Vezirli Bay.

In the Terkos section these erosion surfaces, which extend the valleys of the streams pouring into the lake and fall down to 50 meters, generally extend to 50-80 meters, in fact, forms the Pliocene erosion surfaces form the continuation of the same surface as separate levels from the 100-150 level erosion surfaces which form the plateau plains separating the section from the Istranca Section in the west and Büyükçekmece Plateau in the south. The surfaces were developed on the Terkos Formation which is composed of Eocene aged marl and clayey limestone.

In this part of the Terkos Plateau, this monotony in the topography can be attributed to the lack of a significant stream that splits the site, together with the simplicity of lithology in the topography and the absence of possible faults and lineaments in this section. Therefore, it is possible to see the drowning forms and alluvial floor flats, which are the result of the Flandrien transgression, as well as the erosion in the morphodynamic formation in the site. Saraş Bay, Hacı Ömer Bay and Sinanköprü Bay, which penetrate into the land for 2.5 km, 1.5 km, and 2 km, respectively, were flooded the mouth cuts of the streams Kaptan Çayırı, Hacı Ömer, Sinanköprü and Kapaklı Stream joining the lake, respectively; and the lake is still filled with alluviums brought by these streams and reeds are formed in the Stream mouths.

The site I investigated as Terkos Plateau covers an important part of the Terkos Lake basin. The plateau is gradually rising from east to west. For this reason, generally, the western and southern parts of the lake are quite high. However, while the western part of the lake presents an irregular appearance as it is more fragmented by rivers, the southern parts of the lake show a smoother and continuous topography feature. But the high levels of these areas also affected the shores of the lake. The steepness of this elevation extending to the shore and, as mentioned above, not only ensured the formation of the present cliffs; the streams in this area remained short and they have not developed, much since the water line in the south of the lake is very close to the lake shore. For this reason, especially the southern part of the lake has a more smooth and continuous appearance.

However, streams in the west of the basin are very developed. They are located in deep and young valleys. Although not as much as they are in the west, in the east, which is not pretty much part of the site, the rivers are also highly developed. Moreover, if we look at the basin in general; although deeply split by erosion towards bottom, sides and back by the rivers, back sloped mature valleys with no rivers flowing in it can be encountered, it is noteworthy that the basin, old or new, has been cleaved by many streams of various sizes. Among these streams, Istranca Stream is the largest one in terms of both its length and the material it moves. The alluviums, which were deposited just behind the steepness on the edge of the lake, from the surplus of the material it carried, ensured that this place gained the appearance of a plain. This is the lowest part of the plateau (Kaya, 1999; DSİ, 1967 - 1990; Gazioğlu et al., 1998; Köken, 1991; Ministry of Environment, 1995).

Conclusion

In this study, the geomorphological structure of our site, which covers the northern part of Çatalca peninsula, is located on the Kocaeli-Çatalca peneplain, and the effect of morphodynamic processes on this structure was investigated. Our site shows a low plateau feature which is not high and is generally limited to high cliffs on the coast. In spite of the elevations that form an extension of the Istranca massif in the northwestern part of the site and the sudden elevations in the Çatalca massif to the south, the plain is intact. Terkos lake, Çatalca plain, Istranca basement plain and dune area north of Terkos Lake played an important role in this appearance of the site.

When the morphodynamic processes that are effective in the site are examined, it is seen that the most effective process is rivers. The Plio-Quaternary (MTA, l985- ATLAS, l999) rivers in the area were very effective in erosion and accumulation activities by forming a dantritic drainage network in a large part of the site. Topography in the site is generally mature.
The rivers in the north of the site are less developed than the ones in the south and usually, they are "V" shaped, narrow, deep short streams. The lithology of the rivers, where the rivers are developed, plays a primary role at the beginning of the different development of the rivers in the north and south.

In addition to the rivers in the site, wind, wave, mass movements, currents and static processes (Physical and Chemical) also have important effects.

One of the most effective processes in the site is the winds. Especially in the dune area to the north of Terkos Lake, the sands carried by the waves and the streams to the Black Sea coasts are carried to the inner parts with the effect of the winds here. These sands are constantly filling the inside of Terkos Lake. Currently, the lake area grows superficially due to other basins connected to the Terkos Lake. However, the sands that are transported accumulate in the lake and reduce the depth of the lake. Since Istanbul does not have many alternative water sources today; it is necessary to take more permanent measures by taking sets with the afforestation on the dune area immediately.

In addition, the formation of dense reeds in the mouth of the Streams pouring into the lake of Terkos is also remarkable. In some places, these reeds have turned into marshes. The lake, which is already in danger of being stuffed by the Streams, is in danger of being extinguished more quickly if these reeds are not taken. Because the formed reeds are turning this section into a marsh by holding some of the materials, then transform it into landfill area. Therefore, if the life span of these water reservoirs is to be extended, the reeds in the lake should be cleaned and the materials coming into the lake should be reduced by the barriers to be built on the main streams.

Undulating plains and steep hills that rise to heights around Lake Terkos is close to the west. The lake is 100-150 m high on the Black Sea Coast and formed by the edge of this hilly area has a less robust morphological structure. Between the sea and the lake it is covered by steep cliffs and some are covered by beaches. The land around the lake has structural features prone to erosion. The lake, which is rich in river supply, has fresh water properties even though it is near the Black Sea. The geological foundation of the lake is composed of metamorphic rocks of Paleozoic and Mesozoic age. Cover rocks in the upper part, young sediments and Ergene group can be found in metamorphic rocks. The limited areas under the rivers pouring into the lake are covered by the existing quaternary alluvium. Geological units around the lake are the Eocene aged Kırklareli, Miocene aged Ergene formation, Pliocene age formation, alluviums and sand dunes. They are also the units that mainly carry groundwater. The rocks in the water section that limits the Terkos Basin are generally impermeable or less penetrable. This prevents water exchange with neighboring basins. In some regions between the Black Sea and the lake, it can be concluded that water leakage from the lake to the Black Sea is not possible due to the width and geological structure of the dunes.

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