

MESCİT DAĞLARI'NDA BUZUL İZLERİ

TRACES OF GLACIAL ON MESCİT MOUNTAINS (NE TURKEY)

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Özet

Mescit Dağları, Pleyistosen buzullaşmasının izlerini taşır. Bu dağlık kütlelerin zirve kesiminde sirkler halindeki buzul aşınım şekillerinin varlığı, önceki yıllarda yapılan araştırmalarla belirlenmişti. Bölgede yaptığımız gözlemlerde, zirve kesiminin güneybatısına yakın bir konumda bulunan Petekli Çayı üst çığırındaki Eskiköy de, til çökellerinden oluşan moren setleri tespit edilmiştir. 1800 – 1880 m. yükseltiler arasında bulunan Eskiköy, buzul - akarsu karışımı dolgulardan oluşmuş, üzerindeki moren depolarından dolayı dalgalı görünüme sahip bir düzlük halindedir.

Moren setleri, bu düzlüğü güneyden kuşatan dağlık sıranın kuzeye bakan yamaçları altında ve düzlüğün güneybatı-batı kesimlerinde, yaklaşık 1830 – 1870 m. yükseltiler arasında bulunmaktadır. Sözkonusu setler, belirtilen dağ yamaçları altındaki kesimde, doğal veya beşeri nedenlerle fazla bozulmaya uğramamıştır. Büyük ve Küçük Henegen olarak adlandırılan bu kesimdeki moren setlerinin ilksel biçimlerini koruyor olmaları, onların oldukça yeni olduğu düşüncesini de kuvvetlendirir.

Mescit Dağları, Doğu Karadeniz Dağları'nın güneyinde yer alır. Adı geçen dağ sıraları birbirine yakın konumda bulunur ve yükseltileri 3.000 metreyi aşar. Bu bakımdan Pleistosen buzullaşma süreci, bu dağlar üzerinde benzerlikler göstermiştir.

Eskiköy'deki buzul setleri doğal ve beşeri sebeplerle bozulmalara uğramıştır. Bu tahribat, eski buzul setlerinde daha fazladır.

Mescit Dağları'nın zirve bölgesine yakın kesimlerde, Pleyistosen buzullaşmasının birikim şekillerine ait izler, bu çalışma ile ilk kez ortaya konmaktadır.

Anahtar Kelimeler: Mescit Dağları, Eskiköy, Buzul Maksimumu, Pleistosen Buzullaşması, Petekli Çayı

Abstract

Mescit Mountains reveal traces of Pleistocene glaciation. The presence of glacier erosion formations in the form of the cirque at the crest of such mountainous mass were determined during the explorations performed previously. During the observation we conducted in the region, the moraine deposits were determined, which were consisted of till sedimentations in Eskiköy, located at the upper course of Petekli Brook located close to southwest of the crest section.

Located at heights of 1,800 to 1,880 m., Eskiköy features formation of the mixtures of the glacier and stream, with a wavy appearance due to the moraine accumulations on the surface.

The moraine sets are located under the slopes of mountain range facing to the south, which surrounds that plane from the south and south-east and east sections of it, at heights of about 1,830 m to 1,870 m. At sections below specified mountain, these sets

haven't deteriorated under natural or human factors. It had named as Büyük and Küçük Henegen, the moraine sets located at these sections imply that they are recently formed, considering that they preserve their initial formations.

Mescit Mountains is located in south of the Eastern Black Sea Mountains. Mentioned mountain ranges is located in close to each other and these raises exceeds 3,000 meters. In this regard, the Pleistocene glaciation process showed similarities on these mountains.

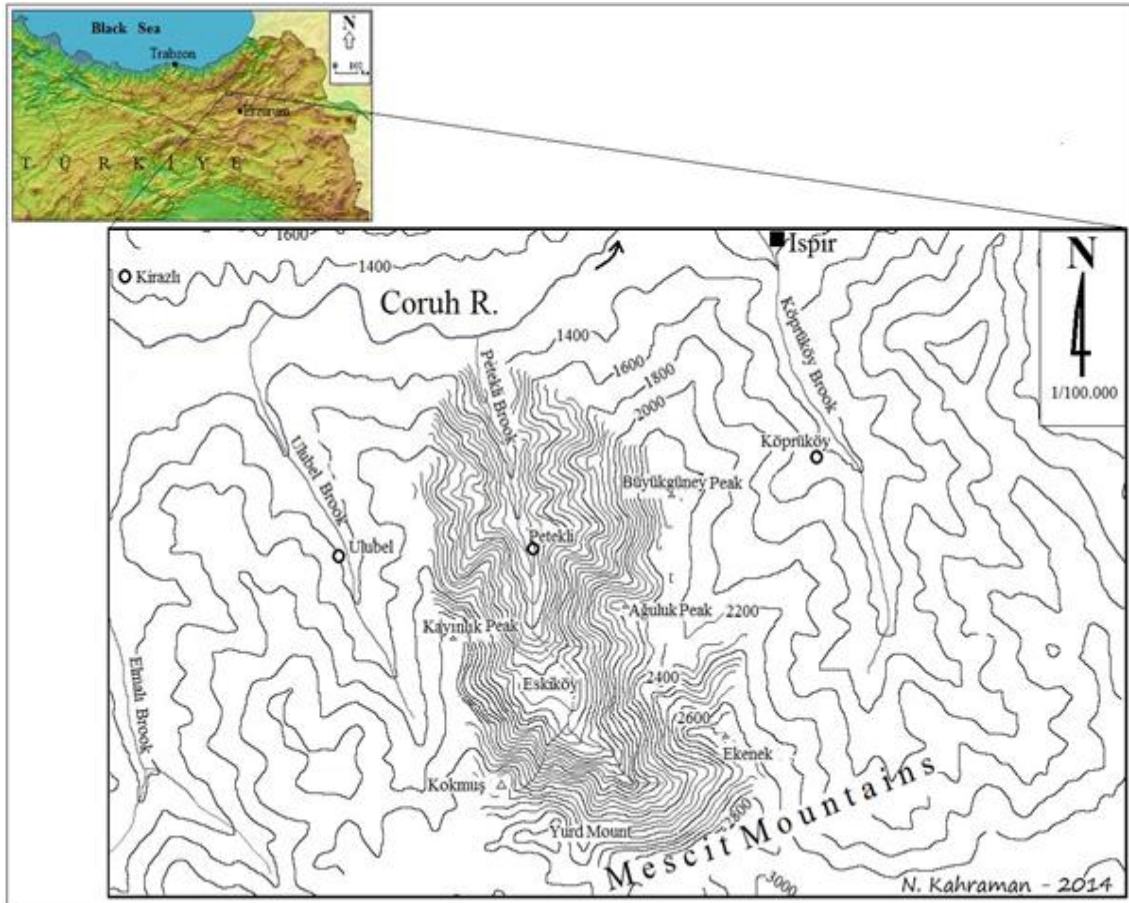
Moraine sets in Eskiköy was considerably to fall into ruin by natural and human reasons. This fall into ruin is further in the former glacier sets.

The traces of accumulation of Pleistocene glaciations observed at the regions near to the summit of Mescit Mountains is depicted with this work for the first time.

Key words: Mescit Mountains, Eskiköy, Last Glacial Maximum, Pleistocene Glaciation, Petekli Village

I. INTRODUCTION

There are various streams located between İspir and Pazaryolu districts, including Köprüküy, Petekli, Ulubel and Elmalı brooks, which spring from Mescit Mountains and join to Çoruh River (Map 1). The slopes of Mescit Mountains that extend to Çoruh Valley at that section were sharply and deeply ripped by the streams (Map 1).



Map 1. Location map of Eskiköy and its surroundings.

The average inclination measured along longitudinal direction of said stream valleys is about 20%. Except Petekli Brook, the inclination of upper courses of other valleys range in between 35 to 40% as an average. The inclination at the upper course of Petekli Brook is about 08%. The reason that decreases the inclination is the formation of the accumulated levels of that portion of the valley, whose surface area is about 1 km².

Petekli Village was first established there, which dates back to before 20th Century and therefore, that accumulation level, so called Eşiköy, located at the heights of 1,800 m to 1,880 m, is actually composed of the filling of fluvial glacial origin of Lower Pleistocene (*Baventian*) Age, which were washed away by the streams fed by melting snow and glaciers at high terrains (Photo 1 and Fig. 1, 2). Our observations performed on the slopes, so called as Atyolları Slope, limiting the plain at the West, revealed that the thickness of filling is about 250 m thick.

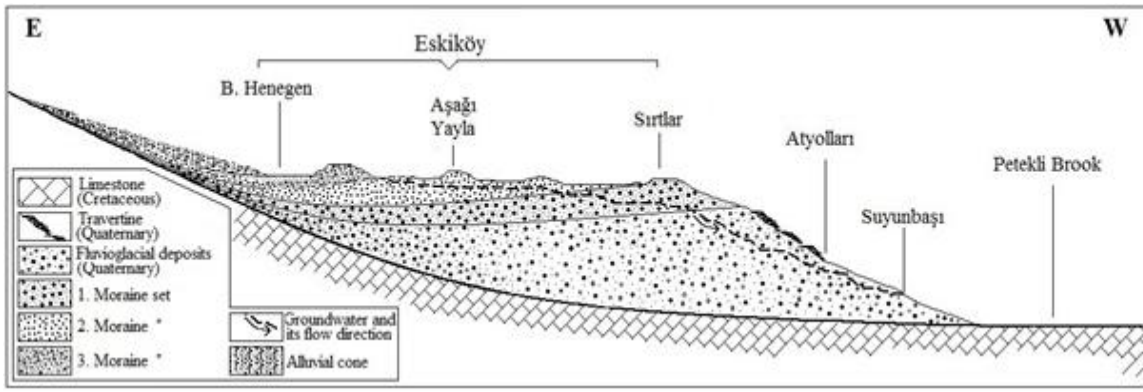


Fig. 1. East and West directions geological cross-section of Eşiköy Plateau (without scale).

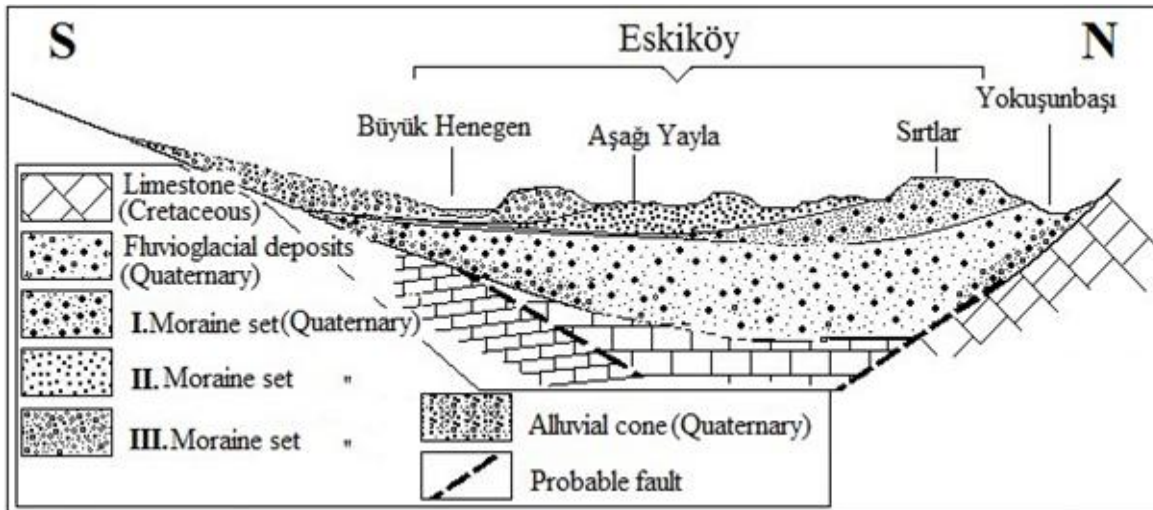


Fig. 2. South and North directions geological cross-section of Eşiköy Plateau (without scale).

The boundaries of stable snow in Pleistocene glaciations phases in Anatolia changed dispersedly, however, it depended onto the topography and exposure conditions at the heights of 400 m to 1,500 m (Erol 1979). According to Kuzucuoğlu and Roberts (1998), that height changed between 1,000 m to 1,500 m. under the same conditions. The glaciations accumulation

forms we determined in Eskiköy are encountered at the heights of 1,800 m to 1,880 m, conforming to the specific elevations in question.

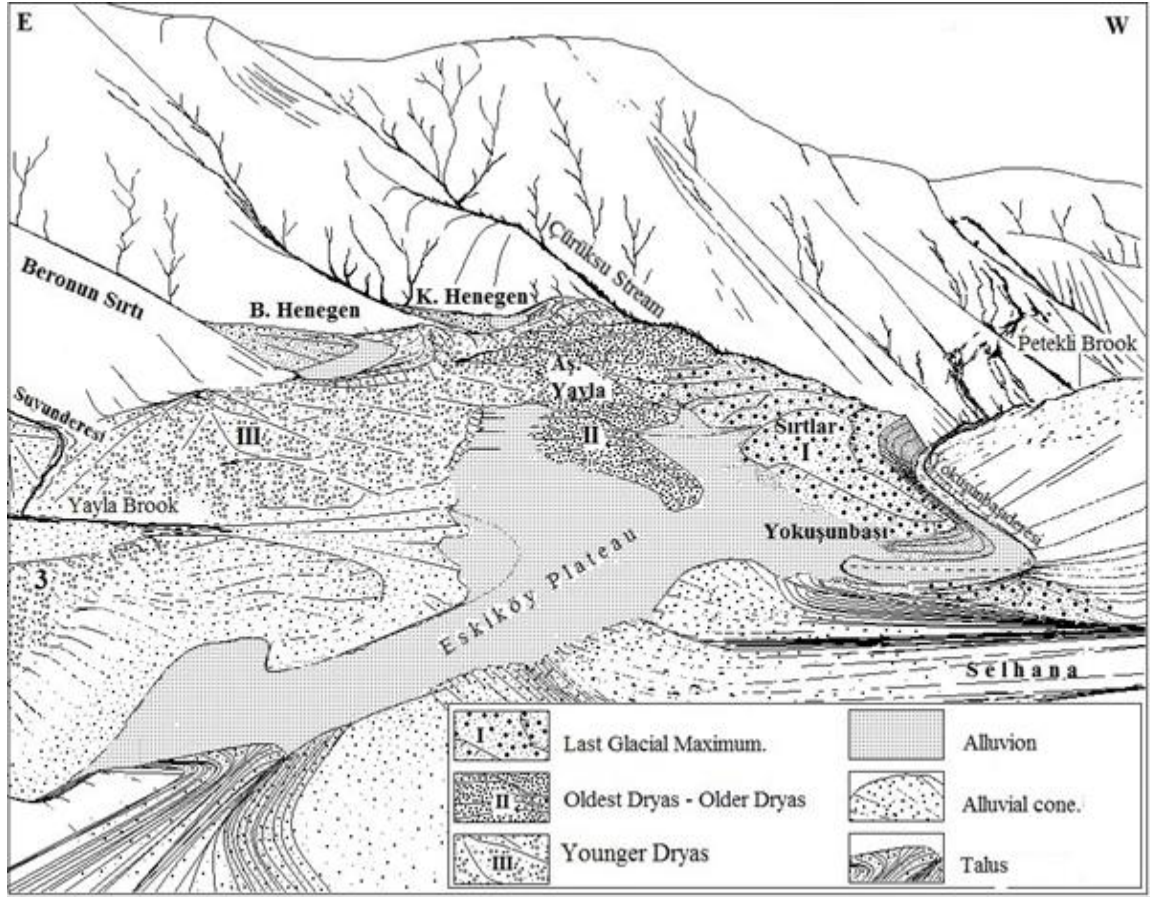


Fig. 3. Blockdiagramme of Eskiköy Plateau and its surroundings (without scale).

The moraine sets consisted of till sedimentations as we determined on Eskiköy plateau roughly stretches along north-northeast direction as to form convex arc segments (Fig. 3). They are mostly the stores belonging to the moraines. Fillings forming the moraine sets differ from each others in terms of dissolution, soil formation, abrasion and degree of ripping. Considering the features specified, it is possible to differentiate the moraine sets on the said plateau into three ranges. Such moraine sets are numbered from the older to the younger, depending on the period of the formation (Photo 1, Fig. 2).

First and second moraine sets at outermost portion of these moraine sets are located at a distance about 700 m – 800 m and 450 m – 500 m from the mountain slope skirts surrounding Eskiköy from east-south east, respectively. The moraines forming third set are accumulated overcast ridges stretching along the skirts of the mountains surrounding Eskiköy from the south in parallel-wise (Fig. 3).

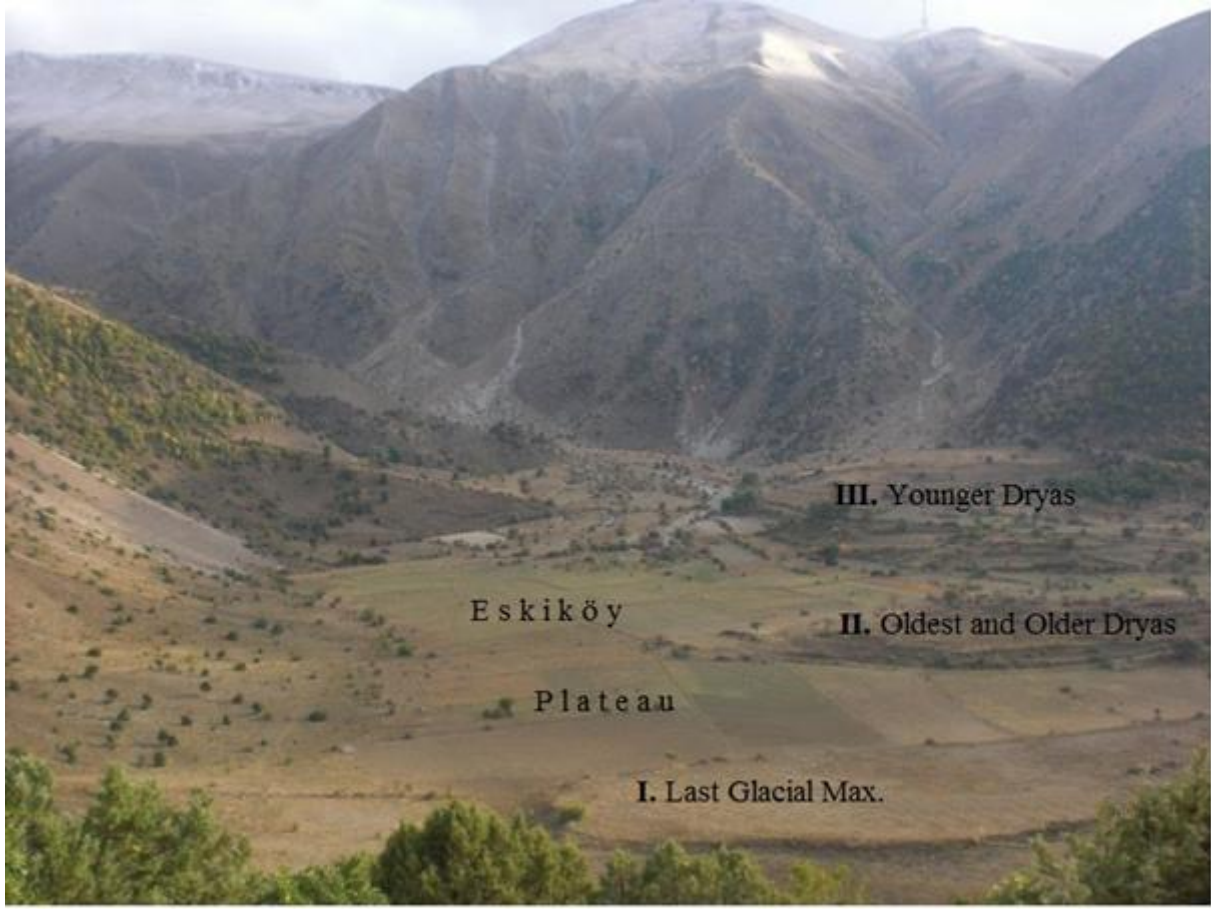


Photo 1. View from Northwest to the Eskiköy Plateau.

II. CHARACTERISTICS OF MORaine DEPOSITS

First moraine set that can be observed from Sırtlar District located at the northeast corner of Eskiköy Plateau is located at about 1,830 m high and stretches for about apparent 1 km distance in N-NE to S-SW direction. When compared with others, that moraine set is characterized by high soil content and featuring long-term abrasion process. The surface of low south ridges consisted of till sedimentation was flattened under the natural process, in addition to the artificial operations for cultivation purposes (Photo 1, Fig. 3).

The northern part of moraine set at Sırtlar District is emptied by Yokuşunbaşı Brook infiltrated from the West. Upon abrasion process, the level difference of about 15 meter occurred between the brook bottom and top surface of the moraine set. Filling remains belonging to western stretch of the moraine set remained after abrasion process are observed within narrow stripe leaned on the slopes at the North of the valley formed by Yokuşunbaşı Brook (Fig. 3). There is an inclination fracture formed along the line that separates the upper course of the brook from Eskiköy Plateau upon backward abrasion as a result of fluvial processes. Passing the inclination fracture in the East direction, there is bottom of Eskiköy Plateau.

The surfaces formed from the other glacial abrasion featuring the same characteristics with the till sedimentation within first moraine set are broken on so-called Atyolları Slopes that

limit Eskiköy Plateau at the west. In southeast direction, however, the terrain is covered with the till sedimentation that forms second moraine set.

Well protected drumlin-like ridge formed by second moraine set intrudes into the bottom of Eskiköy Plateau (Photo 1, Fig. 3). Such plateau gets narrow between the ends of the talus formed by the rock avalanche and slides coming from the set ridge and Selhana slopes that limits Eskiköy Plateau from the north (Fig. 3). At the southwest of Aşağı Yayla, the ridge formed by the moraine set becomes indistinct. Covered with the moraines these surfaces complete with the levels used for the plantation, the original formation of the moraine storages at that portion have been modified with rock accumulations. The fact that Petekli Village is a long-dated settlement and cultivation activities performed upon established of new village settlements are all among the basic reason of deterioration. Fillings characterized with irregular distributions belonging second moraine set are interrupted on the valley slopes ripped by Çürüksu Stream at the southwest of Eskiköy Plateau, as it is the case for first moraine set (Fig. 3). Beronun Sırtı is covered with the till sedimentations belonging to third moraine set. That transition to third ridge from second moraine set as observed between the said ridge and Aşağı Yayla is revealed by irregular terraced slopes. Fillings forming the steps are observed as forming the base level of the youngest third moraine set. They are bottom moraines that were retreated in stadial periods prior glaciations phase that formed third and newest moraine set.

Third moraine set is protected better then other moraine sets. Said moraine set stretches at diverse elevations in front of the mountain skirts surrounding the bottom Eskiköy Plateau from east and southeast directions, leaning onto these slopes. Diverse elevations observed for the set are due to the quantity of the till washed by the glaciers from the slopes. The sedimentation process of the till is observed mostly on the portion that is near to the mouth of Suyunderesi and therefore, they caused the formation of the hill (Fig. 3).

Third moraine set is ripped by Yayla Brook emerging from mountainous site at the East upon last glaciations at eastern part of Eskiköy Plateau and glacial filling of various dimensions are dispersed to form vast accumulation cone at eastern edge of that site. Filling residues belonging to the moraine set limiting that portion from the North and extending up to so-called Selhana Mountain transformed into a ridge that descend toward to the bottom of Yayla Brook with a surface inclination of about 12% and slope length of 140 m (Photo 1, Fig. 3). Such a ripping of third moraine set indicates that that portion was under the influence of the streams distinguished with considerably high flow rates originating from the mountain slopes after last glaciations more intensively than as it is observed at the present. Washed by Yayla Brook, filling materials in various particulate sizes belonging to third moraine dispersed in Eskiköy Plateau, giving rise to the present-day appearance upon leveling of low portion between moraine sets. The stream bed located at the portion of Yayla Brook where it ripped third moraine set is covered mostly by the block materials. The stream waters infiltrate within from these blocs and spring out from so-called Suyunbaşı Spring located at the northwest of Atyolları Slopes that limits Eskiköy Plateau located at about 1 km-distance (Map 1, Fig. 1). It is likely that Yayla Brook's springing out from the spring located at about 1 km to the west of Eskiköy Plateau took place in Holocene period. The stream bed that can be traced along the course between the lower sections of Selhana Slopes and Eskiköy Plateau, which is rather considered as belonging to recent past, as well as formation of the valley in Yokuşunbaşı District, which provided stream bed for the water of the plateau are the evidences of these conditions.



Photo 2. View from West of the Küçük (front) and Büyük Henegen pits.

Originating from the slopes of the mountain located at the South, Suyunderesi joins to Yayla Brook as a side branch at the portion where it descends to the base plateau and rips third moraine set which forms Eskiköy. Fillings belonging to moraine set at the West of the Suyunderesi mouth remained as a hill whose relative elevation is more than 20 meters, as already mentioned above. The ridges belonging to third moraine set extends in the direction of southwest under the mountain slopes after the said hill, which is called as Beron Ridge (Photo 1-2, Fig. 3). Filling belonging to that set has given rise to the formation of a concavity, where entry portion of the valley is closed, upon accumulating the front portion of the valley in the form of an crescent, which was formed by Büyük Henegen Brook at the west of Beronun Sırtı skirts (Photo 2, Fig. 3, 4/VI). Mostly formed by the block materials in different sizes, the height of the set in the interior part and exterior parts range between 5 to 10 meters and 8 to 12 meters, respectively. At the upper part of moraine set, its width ranges between 5 to 30 meters.

The bottom of Büyük Henegen Pit behind the moraine set is covered with a soil layer formed by the fine materials washed by the waters infiltrated from the filling cone. This area is used for the cultivation. The width of the bottom plateau ranges between 70 to 90 meters. Upper parts of the valley plain covered with moraine set after this distance are covered with fillings of alluvial developed in postglacial stage (Photo 3, Fig. 4/6).

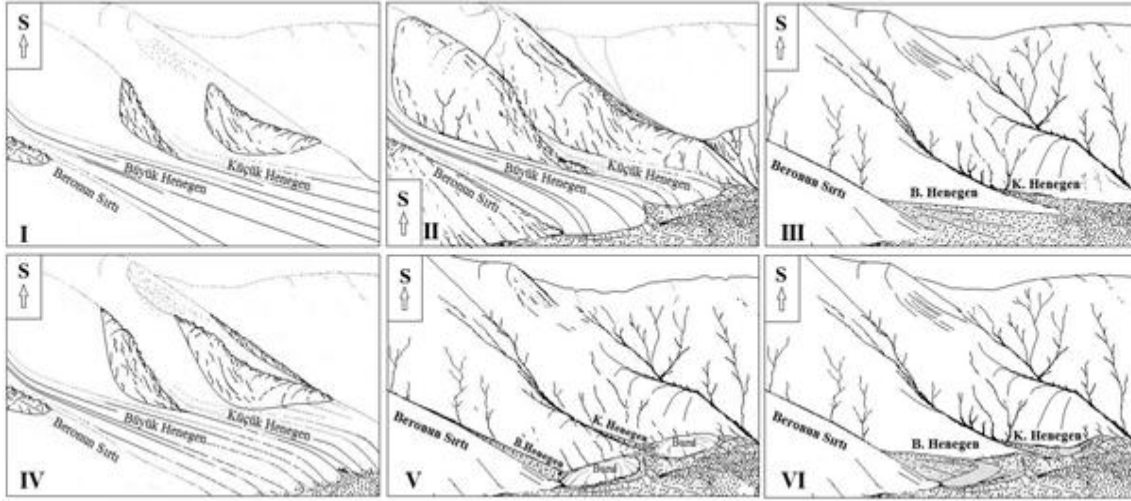


Fig. 4. Upper Pleistocene glaciations in Küçük and Büyük Henegen (without scale).

Explanations: I. Last Glacial Maximum. II. Late in Glacial Maximum (LGM). III. Interglacial periods between in LGM, Older – Oldest Dryas and Young Dryas. IV. Glacial period of Young Dryas. V. Early Holocene. VI. Recent.

There is Küçük Henegen moraine set pit located at the West of Büyük Henegen pit. Küçük Henegen moraine set pit is smaller than its bigger one in regard to morphometric dimensions. The shapes and formation processes of both pits are similar. The accumulation cones generated in post-glacial phase on the valley bottom of Büyük and Küçük Henegen Brooks feature formation of the boundary layer between the edges of the lowest portion of the pits, leaning onto inner wall of the moraine set. As a result, the bottom level covered with the soil is formed within the lowest bottom portion of the moraine set at the back, which surrounds these pits from the North. Such an appearance is significant in revealing the fact that the emergence of the floods that washed the materials to accumulation cone when the glaciers were present at the mouth of the valley (Fig. 4/ VI).

Büyük and Küçük Henegen moraine set pits preserved their appearance specific to their formation phase until now. The lack of sufficient soil necessary for the cultivation process on top of the moraine sets surrounding the pits prevented the human involvement to the region for cultivation. As a result, said moraine sets preserved their primitive formation until the present time. Third moraine set has undergone the abrasion process less than that experienced by first and second moraine sets. It is unlikely to see dissolution and discoloration of filling materials forming the set, whereas the percent of the soil is much smaller, as compared to stone materials. When compared with other moraine sets, these features imply that the abrasion process wasn't sufficient enough to induce dissociation of the materials in filling. Therefore, third moraine set is formed as a result of younger glacial accumulation. Büyük and Küçük Henegen moraine sets preserving their original forms are more likely the traces of Younger Dryas that appeared at the last glacial phases of Pleistocene.

It seems that more pronounced accumulation of glacial filling materials is observed on the ridges formed at the skirts of mountain slopes that surround Eşiköy Plateau from the East and South. The peaks on these ridges are higher than those peaks on top of first and second moraine set. The reasons of such an appearance include the formation of the base by third moraine set for the moraines accumulated during retrieval process of the glaciers emerged

before glaciations phase giving rise to these formation, where the abrasion process at the base was at its early stages and therefore the progress wasn't distinct.

III. THE PROCESS GLACIATION IN ESKIKÖY

Ageing works conducted by Akçar et al. (2007) on Kaçkar Mountain glaciers located at the northwest of Mescit Mountains revealed that the formation of the glaciers on Doğu Karadeniz Mountains began around 26.000 years ago. According to information provided by said researchers, the valley glacier formed during Last Glacier Maximum in Kavron Valley located in Northern shoulder of Kaçkar Mountain concluded its formation process around 18.500 years ago. After that its recession process began, which was concluded about 15.000 years ago completely. According to the results obtained by the researches conducted by cosmogenic ¹⁰Be ageing process, the last evolution phase of Kavron Valley Glacier started about 13.000 years ago and lasted about 11.570 years during Younger Dryas. These researchers concluded that, the glaciations phases in Kavron Valley occurred concurrently with both global climate variations and glaciations in Anatolia and Alps.

Dating works conducted and Kaçkar Glaciers are important for determining the progress of the glaciations of Mescit Mountains, on account of their proximity. Taking into consideration the outcomes of foregoing ageing works, it is likely that the glaciers evolved on the slopes of the mountains surrounding Eskiköy Plateau from the South and featuring the heights up to 2,500 m, which were formed during the period between 26.000 and 18.500 years ago covered the surface of the said plateau completely as a result of progression up to 1830 m high during the stadial phase that is named as Last Glacier Maximum. It seems that during said glacier phase, the glaciers progressed until the perimeters of Sırtlar and Yokuşunbaşı districts located at northwest of Eskiköy Plateau and reached to Selhana slopes, as it is derived from the presence of the till storages dispersed around that area. The surfaces of the ridge formed from these fillings at Sırtlar District have completely been leveled. The ridge in low oval form extending in NE – SW direction transformed into an elevated plateau upon such leveling according to its neighboring areas (See: Photo 2, Fig. 3). Today, the plateau is used for cultivation purposes. The deformation upon abrasion process depending on the elapsed time as well as soil content and physical dissociation observed in filling materials of the moraine set located at Sırtlar District are more pronounced when compared with those for second and third moraine sets. All these favor the idea that implies first moraine set being the trace of the oldest glacier in the region.

No trace is found pertaining to the formation of the glacier on so called Selhana slopes that surround Eskiköy Plateau from the North. No observation is made for the formation of a valley upon the action of the glacier, where the slope spillages as an outcome of the physical dissociation of the slopes upon screed formations are abundant. As a result, it is clear that no glaciations had ever occurred during Last Glacier Maximum on Selhana slopes facing to the South. On the contrary, a wavy line is perceived on the skirts of said slopes, which separates these slopes from Eskiköy Plateau. The said line marks the boundary between the alluvion covering Eskiköy Plateau and slope spillages, as it is observed from the satellite images. That boundary is perceived as beginning at a height of 1830 m, progressively increasing in the direction of the East.

Akçar et al. derived, during their works on Kaçkar Mountain, that the glaciers were present in Kavron Valley in Last Glacier Maximum for about 8 thousand years. Considering the same case prevailing for Mescit Mountains, it is likely that the glaciers washed significant amount of the till sedimentations to Eskiköy Plateau during the specified time period.

There are plateaus stretching toward to the southwest between Sirtlar District and Aşağı Yayla of Eskiköy Plateau, where first moraine set is located. There are extremely rough surfaces perceived on the continuation of these plateau in the same direction. The rough appearance was also influenced by the land process of the cultivation of the land during more recent past centuries, in addition to accumulation during the discontinuous retreat of the glaciers at that part and stream abrasion during the period in between the glaciations period after Last Glacier Maximum.

The glaciers covered Eskiköy Plateau toward the end of Last Glacier Maximum as a result of progressive increase in the global heating began retreating after about 18.5 thousand years ago. The glacier retreats in Eskiköy Plateau are considered as proceeded as it was observed for Kavron Valley. During these retreat phases, the end moraines stored onto the bottom moraines along the lines where retreat slowed down, formed the role of the base for the moraine masses to be formed during the subsequent glaciations. In fact, the glaciers formed on the northern slopes of the mountainous ranges at the South emerged during Older Dryas glaciations about 14.000 years ago, together with Oldest Dryas emerged about 15.000 years ago proceeded toward to downwards and proceeded toward to Aşağı Yayla and north-south of that district. New moraines accumulated onto the moraine storages located near northeast of Aşağı Yayla during glaciations phases toward to the end of Last Glacier Maximum generated thicker layers compared to those located at other places. The moraine set formed as such underwent to the abrasion process in the course of time, adopting drumline-like appearance (Photo 1). The relative elevation of the ridge with respect to Eskiköy Plateau it is located is more than 10 m. The soil ration and degree of abrasion of the moraine storages forming the ridge is less than first moraine set and more then third moraine set. We've already mentioned about the said moraine set becoming indistinct between Aşağı Yayla and Henegen districts towards southwest, where extremely rough terrains are dispersed, depending on the progress and retreat of the glaciers.

Except portion of Yayla Brook ripping Eskiköy Plateau and the moraine storages, third moraine set uninterruptedly surround these plateau from the east and south in parallel direction to the mountain skirts. The moraine storages forming third moraine set preserve its original form to a great extent, since they underwent lesser deformation compared to other moraine sets with respect to soil formation and degree of abrasion. The traces pertaining to the last glacier remaining formed onto the moraine storages in the region and in particular within Büyük and Küçük Henegen districts are visible more clearly (Photo 2, Fig. 3).

It is evident that the moraine set indicated by No. 3 is the youngest glacier accumulation formation stored in Eskiköy Plateau. The fact that the moraine sets preserve their formation supports that they belong to the last stages of Pleistocene glaciations phases. Considering the massive conditions formed by the young glacier storage, their formation during Little Ice Age that occurred during Holocene from 1450 to 1850 seems unlikely to occur, since insufficient time interval of the cold period in question. Akçar et al. proved, with their works performed, that the recent progress in Kavron Valley glaciers occurred during the period between 13.000 and 11.500 years ago. The time intervals of latest progress phase of Kavron Valley glacier and formation of Younger Dryas glacial phase are consistent with each others. It is therefore appropriate to attribute the glacier phase that formed the newest moraine set in Eskiköy located at Mescit Mountains to Younger Dryas.

Following last glacial phase within Eskiköy Plateau, the region underwent a period where periglacial conditions were dominant. The streams formed upon precipitation and melting of the glaciers at elevated sections formed the accumulation cones upon washing the materials onto Eskiköy Plateau. The valley glaciers during that period in particular subsisted

within the concavities surrounded by the moraine sets formed the skirts of the slopes facing to the north for a while under progress of diminishing in their size depending on the structure of Büyük and Küçük Henegen (Fig. 4/VI).

Supplied with mountain slopes and melting glaciers at the beginning of postglacial phase (Holocene), Yayla Brook ripped third moraine set that surrounding Eskiköy Plateau from the east and washed the materials forming that set and consisted from the moraines onto Eskiköy Plateau. By this way, rough appearance of Eskiköy was partially leveled at its northern part. As a result of such leveling, the materials originating from the sets destructed by the streams accumulated at the low terrains, giving rise to the present appearance of the bottom portion of Eskiköy Plateau (Photo 2, Fig. 3).

Glacier accumulation formations of Eskiköy Plateau belong to new traces of Quaternary glaciations determined on the mountainous mass, after glacier abrasion formations spotted by Atalay (1984) at the crest of Mescit Mountains. The moraine storage of Eskiköy is allocated at the lowest level in the region as per the elevations available.

IV. CONCLUSION

Eskiköy Plateau is located at the southwest of the Mescit Mountains crest at a height of 1,800 m to 1,870 m. The moraine storages spotted in the plateau belong to the new traces of Upper Pleistocene glaciations. These traces are consisted of the moraine sets stretching in three ranges located a height of 1,830 m to 1,870 m.

The investigations performed yielded that Eskiköy moraine storages evolved in Last Glacier Maximum and Younger Dryas stadial.

The moraine set indicated by number three that emerged under the slopes of the mountains facing to the North, surrounding Eskiköy Plateau from the South depending on the exposure and topographic conditions. Along the sections away from that moraine set in east-northwest direction, the age of moraine set filling dates back progressively and number two and number one moraine tests appeared during Younger Dryas and Last Glacier Maximum periods, respectively, as perceived from the comparative and stratigraphic assessments with Kavron Valley moraines.

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