O 85. KARAPINAR (KONYA) THE LAST THREE YEARS OF SİNKHOLES AND CHARACTERISTICS

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ABSTRACT: Karapinar is located in the southeast of Konya and is 110 km away. The number of sinkholes with different diameters and depths, which we can call the world wonder, increased by 300 every day. These natural structures, which are formed as a result of internal karstification near settlements or in the middle of the fields, continue to be a threat for the people of the region. In the last three years, Karapinar has started to occur at more frequent intervals in the KB and there has been a significant increase in the number. In 2017, there were 17, 7 of which were 8, 2019 and 7 of which were in 2019.
Miocene-Pliocene, Pleistocene and Holocene aged rocks are in the study area. The lithological characteristics of the land, the drop in groundwater level, the current direction of the groundwater, the chemical composition of the rock and the volcanic rocks of the Pliocene Uzecek Mountain and the other volcanoes around Karapınar are solved by the groundwater enriched by the carbonic acid. In the last three years, the ponds were formed in Karapinar's KB, in the vicinity of Üzecek Mountain, in Eşeli Karakul, Güllükkuyu, Çakırca, Üçler kamışağıl, Sırnık, Kızılcakuyu and Küçükkuyu. The distance between the settlements is 7-37 m. The circle is shaped 3-60 m. in diameter and 3-50 m in depth between. The depth of the sinkholes can not reach the level of groundwater in the region is waterless only one water is water.. In February, March, April and May, in the period when precipitation was high, the soil forming the agricultural lands became saturated with water. In July August and September, the increase in the weight on the soil cover was caused by the decrease of ground water level. Excessive attraction of groundwater in the region and the existence of a plant pattern that requires water accelerate the formation of sinkhole.

Keywords: Karapınar, Sinkhole, Groundwater, Volcanısm depth

1.INTRODUCTION

Karapinar district is in the middle of Konya Closed basin, 110 km southeast of Konya. The high mountainous areas formed by the Middle Taurus belt and the Pliocene Quaternary volcanism in the west and south of Karapınar are bordered by the Obruk Plateau and Tuzgöl (Figure 1). The number of different diameters and depths that we can call the wonder of the world formed in Karapınar has increased with each passing day and exceeded 300. These natural structures, which are formed as a result of internal karstification near the settlements or in the middle of the fields, continue to be a threat to the people of the region. Obruks have started to occur more frequently in Karapınar yıldas NW in the last three years and there has been a significant increase in their numbers. In 2017, 17 potholes were formed, 2 in 2018, 8 in 2018 and 7 in 2019.

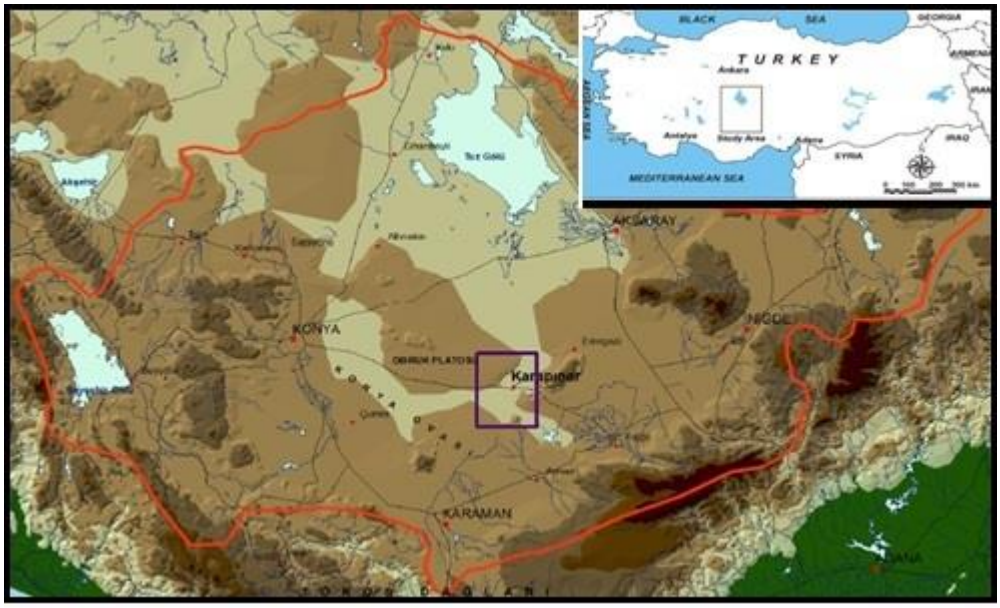

Figure 4. Location map of the studied area.

2. MATERIAL AND METHOD

In the geological studies carried out in the study area, 1 / 100.000 scale geology map prepared by the General Directorate of Mineral Research and Exploration (MTA) was used. During the study period, the pores were periodically monitored and the depths of the mouth diameters were measured. The processes of completing the formation of the sinholes were followed.

3. RESEARCH FINDINGS

Miocene-Pliocene, Pleistocene and Holocene rocks are observed in the area. The Miocene Üzecekdağı andesites (Tmua) are composed of light burgundy colored andesites with frequent cracks and fractures. Üzecek Mountain (1293m.) Is an ellipse-shaped volcano cone. The long axis of this volcano cone in the southeast-northwest direction is 12 m. The other peaks are Topbaşı Hill (1200m.), Monster Hill (1252m.). For the first time by Lahn (1945), Karacadağ volcanics are named as. The unit is part of the Karacadağ volcano group outside the area. Basalt flows and tuff sediments around the ellipse-shaped grape mountain, dark black color, hard and compact appearance (Bas 1984). The Miocene-Pliocene İnsuyu formation (Tmi) overlies the unconformably. Insuyu formation consists of conglomerate, sandstone, claystone marl and limestone. divided into three members. The claystone member (Tmikl) is composed of pied colored loosely bonded weakly strengthened carbonated claystones. Limestone member (Tmik) is composed of gray-white medium thick bedded cracked limestones. The conglomerate member (Tmiç) is composed of yellow carbonate cemented andesite and basalt pebbles.

Sinkholes is formed within Insuyu formation. This unit is unconformably overlain by the Komatyayla formation (QGk), which consists of Pleistocene aged sandy gravels and a stony member (QGkt) consisting of horizontally bedded silts and marls. Komatyayla formation is overlain by the same aged Hotamış formation. Hotamish formation (QGh) is composed of pebbles, gravelly sand, fine sand, clay and silt. The Börücek plateau member (QGhb), which is a member of the Hotamış formation, consists of cross-bedded horizontally bedded pebbles and sand. All these units are unconformably covered by Holocene sediments. Holocene sediments consist of Alluvium (QAl), Stream fan sediments (QAy) and slope debris (Qym). Holocene sediments consist of unblocked blocks, gravel, sand, clay and silts.

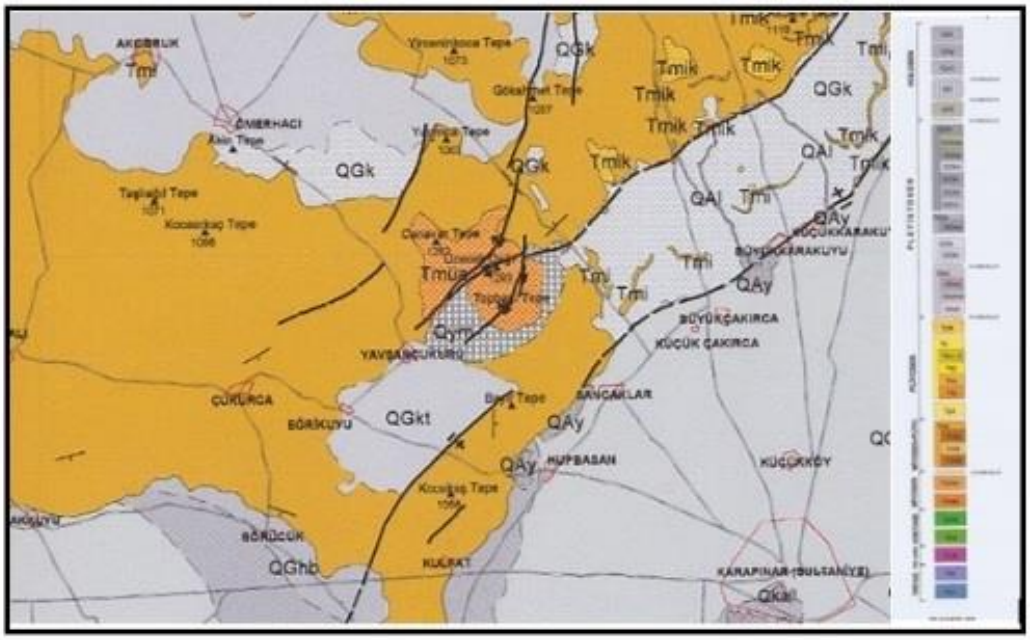

Figure 2. Geological Map of the study area (MTA Map archive archive no: 44673)

In the study area, major tectonic structure forms from two fault lines that are two-fold axis parallel fault lines .Faults are dip-slip faults. Common directions are the NE-SW, NW-SE

The sinkholes in the study area are large depressions formed deep into the ground as a result of internal karstification. The mouth diameters of the pores are circular or ellipsoidal in shape and the horizontal cross-sectional area increases to the depths. The slopes of the slopes are very steep. In some of them, it is close to 90 ^{o}, if it collapses up to the groundwater level while the sinkhole is formed, it contains water and it is called as sinkhole lake by the local people. They are also locally called opanes. Those who do not reach the groundwater level are called dry sinkholes.

The formation of the sinkholes is influenced by Pliocene groundwater, which is enriched in carbonic acid by dissolving CO_2 from other volcanoes around Üzecek Mountain and Karapınar.

Acidic groundwater flows from the south to the north as the groundwater flows along the flow path, affecting the limestone and melting the limestones and forming caves underground. Thus, as a result of the rising karstification and internal karstification event, the caves formed in the limestones underground are gradually growing. These gaps are 20-25 m. As it approaches, the cave cannot stand its weight on the marl and clay ceiling and collapses. Large explosion sounds are heard during their formation. If this subsidence reaches the groundwater level in the region, the pothole carries water.

Climatic factors such as temperature, precipitation and evaporation, geological and lithological characteristics of the region, tectonic properties, volcanism in the region, flow direction of groundwater, chemical composition of groundwater, plant pattern are effective on the formation of sinkholes.

The sinkholes formed in the last three years were formed in the NW of Karapınar, around Eşeli, Eşeli, Karakuyu, Güllükkuyu, Çakırca, Üçler reed, Sırnık, Kızılcakuyu and Küçükkuyu highlands. The distance of the sinkholes to the settlements is between 7-37 m. It has a circular shape with a diameter of 3-60 m and depth of 3-50 m. between. The depths of the sinkholes are dehydrated since they cannot reach the groundwater level in the region only one of them is juicy (Table 1,Figure 3).

The sinkholes formed in the last three years have been formed as a result of the increase in the weight of the ground cover during the harvest period in July, August and September, and the increase in the weight of the ground cover during the harvest period during the periods of rainfall in February, March, April and May. Excessive attraction of groundwater in the region and the presence of water-demanding plant patterns accelerate the formation of sinkholes.

Table 1. Values of the boreholes formed in the study area

Sinkhole name	Place	Mounth date	Geometry	Longitdinal axis	Depth	Topoğ. hight	distance	water
karakuyu	reşadiye	9-2017	circle	25	3	1011	10	dry
hotamış	hotamış	5-2017	circle	10	20	1005	10	dry
Güllükuyu	reşadiye	2-2018	circle	5	10	1038	15	dry
Eşeli obruk	Eşeli y.	5-2018	Circle	7	8,4	1042	7	dry
Üçler obruk	Üçler yayla	7-2018	Circle	68	64	1028	9	dry
kökenoğlu	Karakuyu yayla	8-2018	Circle	15	2	1007	9	dry
Karakuyu-1	Karakuyu yayla	5-2018	Circle	34	9	1009	10	dry
Karakuyu-2	Karakuyu yayla	9-2018	Circle	3	8	1009	10	dry
Karakuyu-3	Çiğil-karakuyu	9-2018	Circle	60	20	1009	38	dry
Tilki obruğu	Kamışağıl	9-2018	Circle	60	20	1009	16	wet
Kızılcakuyu	Kızılcakuyu	2-2019	Circle	20	10	1100	37	dry
Eşeli-3	Eşeli yayla	2-2019	Circle	7	1	1041	956	dry
Eşeli-4	Eşeli yayla	2-2019	Circle	7	6	1038	7	dry
Eşeli-5	Eşeli yayla	2-2019	Circle	25	3	1038	20	dry
Çingir	Eşeli yayla	2-2019	Circle	7	10	1053	20	dry
Küçükkuyu	Reşadiye	4-2019	Circle	10	10	1053	10	dry
Çakırca	Reşadiye	-2019	Circle	15	30	1050	15	dry

There are many licensed, unlicensed drilling wells drilled in the study area for irrigation purposes. In recent years, the change of plant pattern in the region, growing and encouraging plants that require a lot of water, such as corn, have increased water use. Apart from the licensed wells drilled by DSI, many unlicensed wells were drilled and unconsciously groundwater was drawn. Excessive withdrawal of groundwater caused the groundwater level to decrease. The groundwater level decreased the carrier effect of the water and accelerated the formation of Sinkholes (Figure 4).

Figure 3. Tilki and eşeli sinkholes

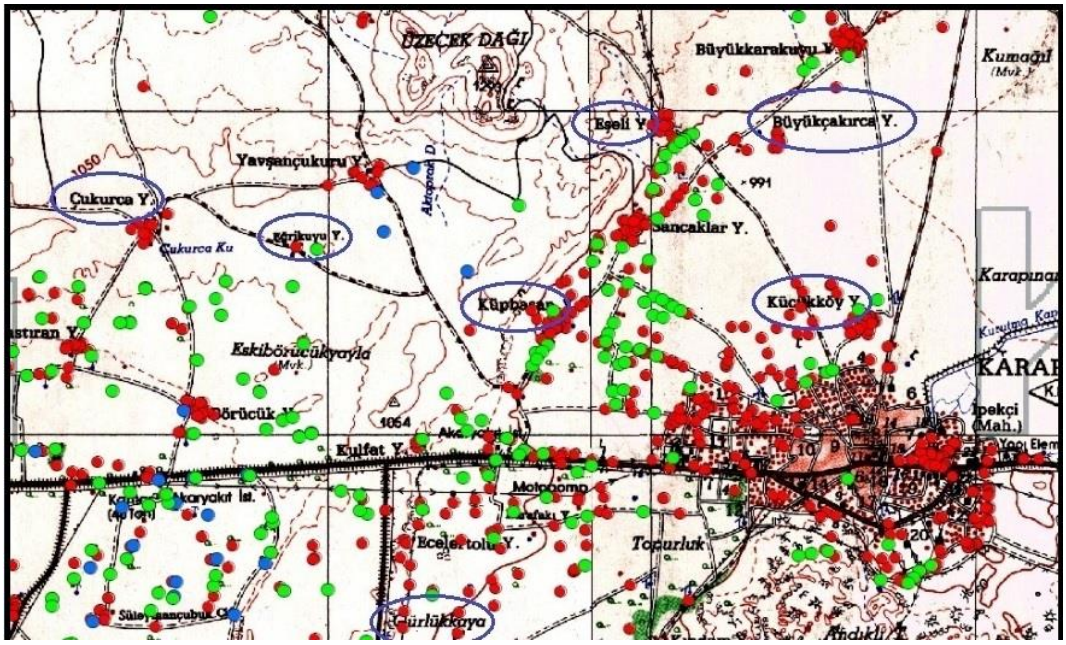

Figure 4. Drilling wells and final sinkholes formation areas in the study area

4. CONCLUSION

The sinkholes formed in the last 3 years have been formed in Karapınaraps NW, around Eşecek mountain, Eşeli, Karakuyu, Güllükkuyu, Çakırca, Üçler reed, Sırnık, Kızılcakuyu and Küçükkuyu highlands. The distance of the sinkholes to the settlements is between 7-37 m. It has a circular shape with a diameter of 3-60 m and depth of 3-50 m. between. The depths of the sinkholes are dehydrated since they cannot reach the groundwater level in the region. only one of them is juicy. Sinkholes were formed as a result of the drop in the groundwater level in February, March, April and May when the rainfall was high during the period of rainfall. Excessive attraction of groundwater in the region and the presence of water-demanding plant patterns accelerate the formation of sinkholes.

Sinkholes threaten the lives of the local people who live here.These structures are not known exactly when and where to be.Unconscious excessive irrigation, groundwater extraction, triggers the formation of sinkholes.Places in and around sinkholes occurs seismic, migration and ect. geological and engineering problems must be addressed one by one. Geological and geophysical surveys in the region with the melting of all buildings and underground caves, large gaps should be identified in advance. Plateaus residential areas should be moved to safer places as soon as possible. The effect of these problems to the environment and the area must be evaluated properly.These structures can be opened to tourism. These natural wonders can become beautiful national parks to leave a legacy for future generations. Geological and geophysical surveys in the region with the melting of all buildings and underground caves, large gaps should be identified in advance.

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REFERENCES

Baş, H., Ayhan, A., 1984, Mekegölü (Karapınar) Dolayının Jeolojisi (yayınlanmamış rapor).

Başal, A., Ekmekçi, M., 1997, Değirmenlik Karst Çöküntüsünde Morfolojik-Yapısal özelliklerin Karst Evrimi

Açısından Yorumlanması. 20. Yıl Jeoloji Sempozyumu., Bildiriler, s. 103-114, Konya.

Bayarı, C.S., Pekkan, E. and Özyurt, N, N. 2009. Obruks, as Giant Collapse Dolines Caused by Hypogenic Karstification in Central Anatolia, Turkey: Analysis of Likely Formation Processes. *Hydrogeology Journal*,17, 327-345.

Biricik, S. A., 1992, Obruk Platosu ve Çevresinin Jeomorfolojisi. Marmara Üni yayın no153.

Bozyiğit,R. ve Tapur,T. 2009. Konya Ovası ve Çevresinde Yeraltı Sularının Obruk Olusumlarına Etkisi. Selçuk Üniv.Sos. Bil. Enst. Dergisi, 21, 137-155

Bulduk, A., Horasan Ö.R., Tekdere, M. ve Solak N. 2008. Konya Kapalı Havzasın 16/2-a Alt Havzasında Yeraltı Suyu ve Seviye Değismeleri. Konya Kapalı Havzası Yeraltı Suyu ve Kuraklık Konferansı, Bildiri Kitabı:125-134,11-12 Eylül 2008, Konya.

Canik, B., 1997, Konya Dolayında Suların Oluşturduğu Doğal Anıtlar ve Bunların Korunması. 20. Yıl Jeoloji Sempozyumu. Bildiriler, 159-166, Konya.

Canik, B. Arıgün, Z. 2001. Karapınar-Kızören (Konya) Dolayındaki Obrukların Olusumu ve Karapınar Volkanizmasının Bu Olaya Etkisi, Karapınar Sempozyumu Bildiri Kitabı: 295-303,
26-27 Ekim 2000, Karapınar.

Canik, B. and Çörekçioğlu, Đ. 1985. The Formation of Sinkholes (Obruk) Between Karapınar and
Kızören-Konya, Karst Water Resources (Proceedings of Ankara-Antalya Symposium, July 1985) IAHS Publ.no.161,193-205.

Çörekçioğlu, İ., 1985, Konya Karapınar-Kızören Arasındaki Obrukların Oluşumu ile İlgili Hidrojeoloji Etüd
Raporu, DSİ IV. Bölge Müdürlüğü, Konya.

Eroskay, O., 1976, Konya Obruklarının Oluşumunu Etkileyen Faktörler ve Yeraltısuyu Yönünden Değerlendiril
mesi. İst. Üniv. Fen Fak. Mecm. Seri B., 31, İstanbul

Göçmez, G., Dıvrak, B.B. ve Galena, Đ. 2008a. Konya Kapalı Havzası'nda Yeraltı Suyu Seviyesinin Değisiminin Tespiti Özet Raporu. WWF, İstanbul.

Göçmez, G., Genç, A. ve Karakoca, A. 2008b. Konya Kapalı Havzası Yeraltısuyu Seviye Değisiminin İstatistiksel Değerlendirilmesi. Konya Kapalı Havzası Yeraltı Suyu ve Kuraklık Konferansı, Bidiri Kitabı:98-107, 11-12 Eylül 2008, Konya.

Göçmez,.G, Eren Y,Aydın Y,Söğüt A.(2000),Karapınar çevresinde oluşan yeni obruk, Karapınar Sempozyumu
s.305-316.Konya.

Lahn, E., 1945, Anadolu'da Neojen ve Dördüncü Zaman Volkanizması. Türk.Coğr. Derg. no. 7-8, s. 37-50, Ankara.

Yılmaz, M, 2010, Environmental Problems Caused by Ground Water Level Changes around Karapinar Ankara Üniversitesi Çevrebilimleri Dergisi 2(2), 145-163 .