CLIMATE CHARACTERİSTİCS OF LORAS MOUNTAIN AND HATUNSARAY (KONYA) AND ITS INTERACTION WİTH THE CULTURAL ENVIRONMENT

Halil Mesut BAYLAK

Dr., Ministry of Education, halilmesut68@mail.com, Türkiye. Orcid:0000-0002-6369-5765

Abstract

Climate characteristics are important in examining the mutual relationship between geomorphology and human activities. The characteristics of the climate are an important factor explaining the environmental relationships between the characteristics of the natural environment and the cultural environment. For this reason, the main purpose of the research should be to make a general analysis of the climatic structure that emerges in determining the climate characteristics in the research areas. From this point, the climate elements of the study area were obtained and subjected to a general climatic analysis. The current problem and suggestion were developed by interpreting the data presented. Observation data of Güneydere, İnlice, Loras Dağı, Hatunsaray and Akören stations were taken into consideration in order to make a consistent climate conclusion due to reasons such as elevation differences and unevenness in the study area. As an effect of the climate and with the addition of geological-geomorphological development, the population in the research area is generally engaged in agriculture and animal husbandry as an economic activity. In order to reduce the impact of the negative consequences of the climate, the people in the study area increase their intervention in the topography as much as possible by building wells, ponds and canals, especially in order to meet the need for irrigation and drinking water in agriculture. For this reason, planned water storage and sustainable water use studies need to be planned in order to meet the water need in periods when rainfall decreases in the field.

Key Words: Virtual Station, Climate, Hatunsaray, Mount Loras.

Entrance

The characteristics of the climate are an important factor explaining the environmental relationships between the characteristics of the natural environment and the cultural environment. Human activities have positive and negative effects on climatic conditions. Topographic features cause the effect of erosion in the field to increase. Examining the climate structure is important in explaining the interaction between human activities and geomorphology.

The general character of the climate reveals an important argument in shaping living spaces directly or indirectly. Morphological appearance and features find their general character with the climate. This structural feature is effective in the birth and development of a cultural environment in the geographical environment. However, the cultural structure that develops in the field can change the climate elements with its activities. This is an issue that needs to be evaluated in terms of mutual interaction.

From this point of view, there is a need for studies to determine the cultural environment and make evaluations and comments about climate characteristics. For this purpose, the interaction between Mount Loras and Hatunsaray with the climate constitutes the main subject of the study.

Material and Method

The main material of the study consists of climate data. Due to insufficient data records regarding the climate elements seen in the field, data values could not be revealed for many years. However, the study aims to serve as a primary source for climate studies of the field, and for this purpose, an example application for the observation completion and analysis study developed to complete the missing observation data has been presented.

Within the scope of these evaluations, the main purpose of the study is to interpret the climate characteristics of the research area in outline. However, since there are meteorological stations with short observation periods in the study area and its immediate surroundings, or the measurements of some observation stations

have been completed, it became necessary to reveal the values by making a comparison with the station data located near the field. For this reason, "Kilistra Virtual Station" data was created. An evaluation was made regarding the climate characteristics of the field based on the virtual station data created in this way. Climate data was obtained by combining the data of Güneydere, Mount Loras, Akören, İnlice, Hatunsaray meteorological stations, which are close to each other, with the meteorological data of the virtual station, and by completing and correcting the missing observations.

The field has a rugged structure and there are elevation differences even in short distance areas; This makes it difficult to present consistent climate results of the area. For this reason, the observation data of Akören, İnlice, Güneydere, Hatunsaray and Loras Mountain meteorological stations were taken into consideration in this study.

The method of evaluating and interpreting the data, examining the resulting situation in terms of the environment, and developing a solution proposal constitute the scope of the study.

Literature Summary

No study has been found directly related to the climate structure and characteristics of the area. Studies related to the area mostly consist of studies based on the geological structure (Keller et al. 1973-1977, Çelik et al. 1994, Göğer and Kral 1973, etc.) or cover a part of the study area due to its subject (Bozyiğit and Güngör 2011, Güngör and Bozyiğit 2013 etc.). is on topic. For this reason, the study is a research focusing on the area between Mount Loras and Hatunsaray. For this reason, it fills an important gap in the literature.

Location of the Research Site

The study area consists of Hatunsaray District and Lorasdağı in Meram district, within the borders of Konya province, which has been preferred/used as a settlement by people since ancient times (Figure 1). The area determined as the study area consists of approximately 549.8 km2. The main settlements of the area are Erenkaya, Gökyurt, Kayalı, Kumralı, Sefaköy, Yatağan, Evliyatekke and

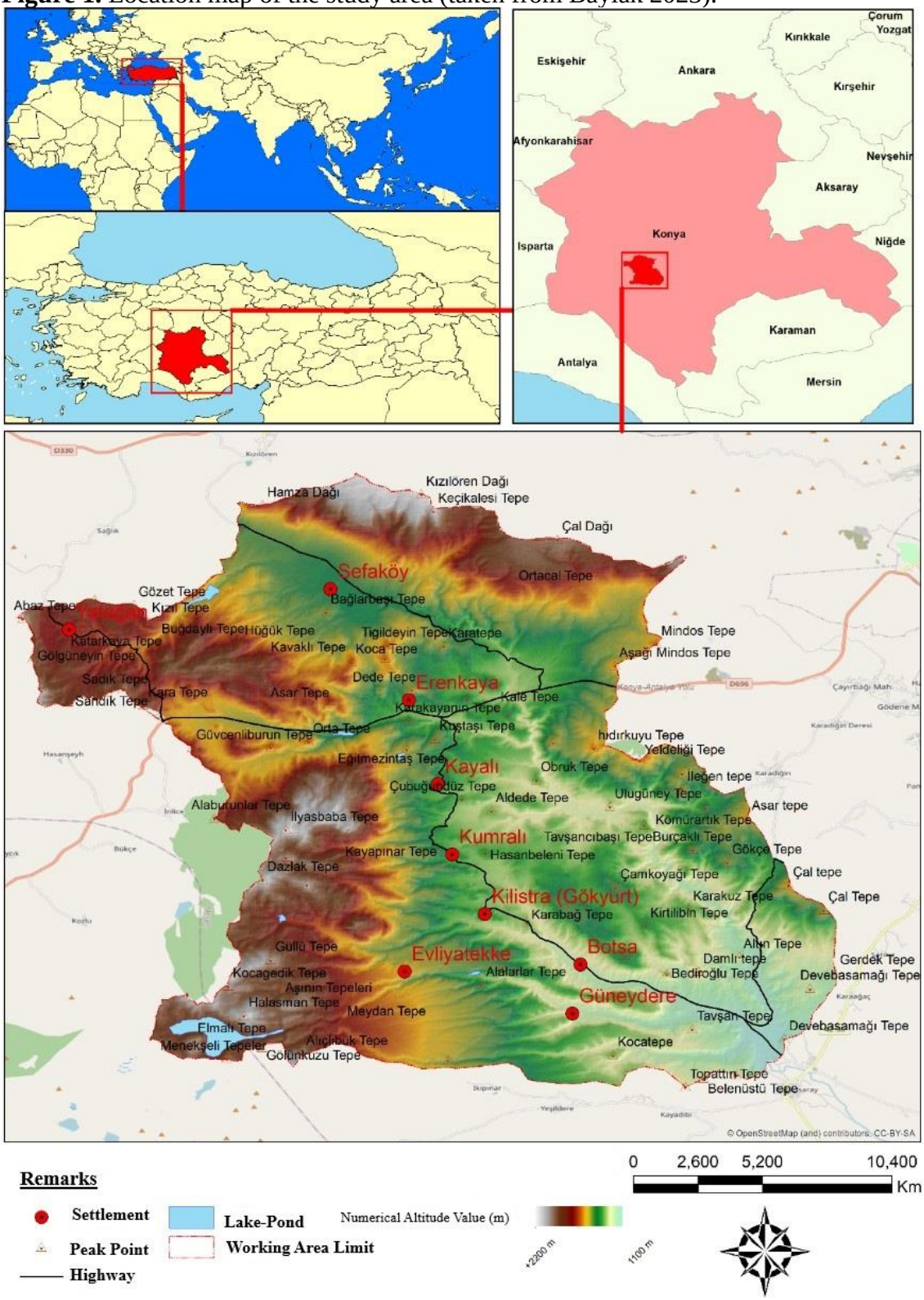
Güneydere (Botsa) neighbourhoods.

The study area is from the north; Keçikalesi Hill, Çal Mountain, Kızılören Mountain, from the east; Midos Tepe and Çal Tepe, from the west; From the south with Güvenbrun Hill, Sadık Hill, Dazlak Hill, Alaburunlar Hill and Kovagedik Hill; Alıçlıbük Hill, Gölnkuzu Hill, Menekşeliler Hill, Topattın Hill etc. It is surrounded by elevations and Hatunsaray Plain (Figure 1).

The study area was classified as Urban Site, Archaeological Urban Site, First Degree Archaeological Site and III. by the decision of Konya Provincial Cultural Heritage Preservation Regional Board dated 29.04.2016 and numbered 3605. It has been declared as a First Degree Archaeological Site and the protection principles and usage conditions of these areas have been determined.

The economic source of income of the population between Loras Mountain and Hatunsaray generally consists of agriculture and animal husbandry activities. Another economic activity is the production of charcoal in Yatağan District. The numerical value of the population in the field tends to decrease, adapting to the wave of migration from villages to cities that was seen in the general population of Turkey, especially in the 1950s. Considering the population data of 2022, the male population in Kayalı, Evliyatekke, Güneydere neighborhoods is low and the female population is high due to migration to other cities for work purposes. Today, the residential area with the highest population is Sefaköy with 2509 people, followed by Güneydere neighborhood with 633 people and Kilistra (Gökyurt) with 510 people. The neighborhood with the lowest population is Kumralı with 68 people (NVİ Statistics, 2022).

Figure 1. Location map of the study area (taken from Baylak 2023).



General Air Circulation Features

In the study area, the effects of polar air masses are observed in the winter months, and the effects of tropical air masses are observed in the summer months. cP (Siberian origin) continental polar and mP (Atlantic and Baltic Sea origin) maritim polar air masses affect the area in winter.

In our country, generally, W-E directional depression areas are formed due to the encounter of north-oriented cold air masses descending to the Mediterranean Basin and tropical (mT, cT) air masses of continental origin and maritime character effective from the south (Türkeş, 1990:39). Due to these depressions, pile masses cross the Mediterranean coastal region and deposit precipitation between Lorasdağı and Hatunsaray and its surroundings during the winter months.

Warm and dry air currents resulting from the dominance of the Asor High Pressure over the Mediterranean Basin during the summer months reach our country and therefore our study area, causing very little summer precipitation. However, due to the orographic features of the area in the northern and western parts, where the altitude increases, it allows for a small amount of precipitation in the summer season.

Warmness

The annual average temperature in the research area was determined as 11.2 °C. When the distribution of temperature values according to months during the year is examined, it is seen that the coldest month in January is -0.6 °C, and the month with the highest temperature is July with 22.3 °C (Table 1, Figure 2.).

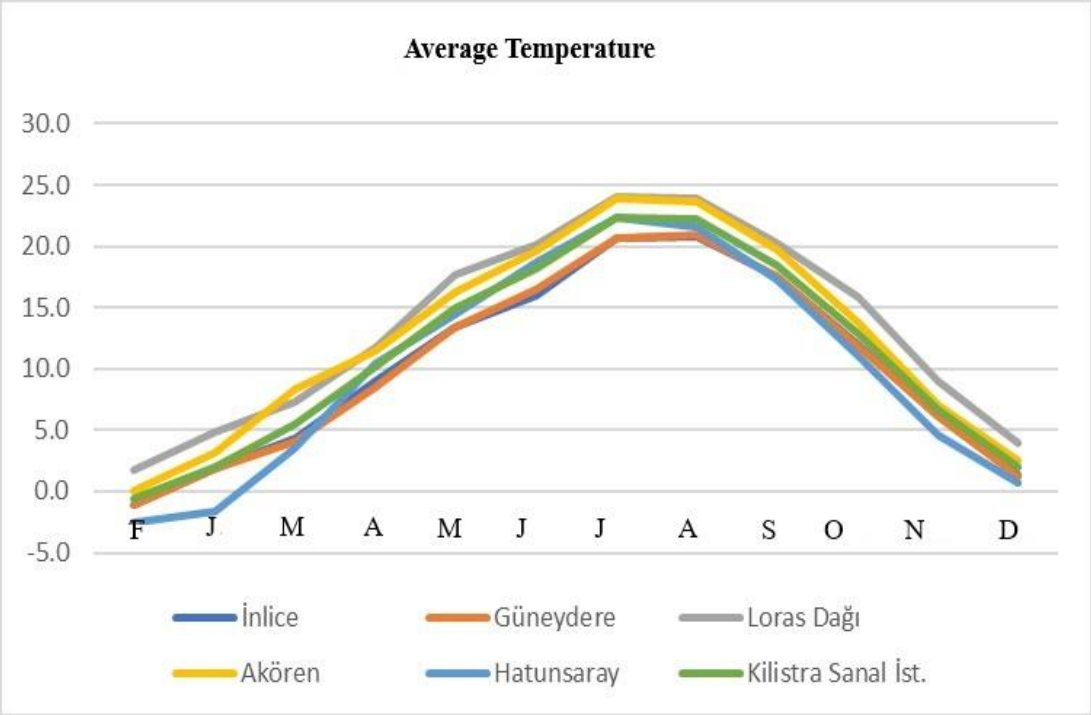
Table 1. Field annual average temperature data (°C)

Data Station Ordinary	F	J	M	A	M	J	J	A	S	O	N	D	Avg.
Akören	*0,0*	*3,2*	*8,3*	*11,4*	*16,2*	*19,6*	*23,9*	*23,7*	*19,7*	*13,8*	*7,1*	*2,5*	*12,5*
Hatunsaray	*-2,6*	*-1,6*	*3,6*	*10,4*	*14,4*	*18,7*	*22,3*	*21,6*	*17,3*	*11,1*	*4,6*	*0,7*	*10,0*

Kilistra Virtual Station	*-0,6*	*2,0*	*5,5*	*10,2*	*15,0*	*18,2*	*22,3*	*22,2*	*18,5*	*12,9*	*6,6*	*2,0*	*11,2*
İnlice	*-1,1*	*1,9*	*4,3*	*9,0*	*13,4*	*16,0*	*20,7*	*20,8*	*17,5*	*12,0*	*6,2*	*1,4*	*10,2*
Güneydere	*-1,1*	*1,9*	*4,1*	*8,5*	*13,4*	*16,5*	*20,7*	*20,9*	*17,6*	*11,8*	*6,1*	*1,2*	*10,1*
Loras Dağı	*1,8*	*4,8*	*7,3*	*11,7*	*17,7*	*20,1*	*24,0*	*23,9*	*20,3*	*15,8*	*9,0*	*4,0*	*13,4*

Source: MGM 2022 Meteorology Bulletin**.**

Figure 2. Distribution of annual average temperature (taken from Baylak 2023).



Source: (Obtained using MGM 2022 Meteorology bulletin data)

Considering the average values of maximum temperatures in the field as of January, it is seen that the temperature increased continuously until the end of August and reached 28.1 °C in August. Temperatures begin to decrease continuously from the beginning of September, dropping to 3.9 °C in January (Table 2).

Table 2. Maximum Monthly average temperatures (°C)

Data Station Ordinary	F	J	M	A	M	J	J	A	S	O	N	D	Avg.
İnlice	3,3	6,6	9,2	14,2	19,0	22,5	27,1	27,1	23,6	17,9	11,0	5,7	15,6
Hatunsaray	4,2	5,4	11,4	18,6	22,4	26,9	30,5	30,8	27,1	19,7	12,6	7,3	18,1
Kilistra Virtual Station	3,9	6,8	10,3	15,6	20,8	24,0	28,1	28,1	24,6	18,6	11,5	6,2	16,5
Loras Dağı	5,2	8,9	12,1	16,5	23,1	25,2	28,9	28,5	25,0	20,2	12,3	7,2	17,7

Source: MGM 2022 Meteorology Bulletin**.**

The average values of low temperatures increase starting from January and are 15.5°C in August. Starting from the beginning of August, temperatures begin to decrease, dropping to -4.4°C in January. It is observed that the average low temperatures during the winter months are below 0°C (Table 3).

Table 3. Minimum monthly average temperatures (°C)

Station Ordinary	F	J	M	A	M	J	J	A	S	O	N	D	Avg.
Hatunsaray	-7,5	-6,7	-2,5	3,3	5,7	10,2	13,6	12,3	8,5	4,3	-0,6	-3,7	3,1
Kilistra Virtual Station	-4,4	-2,1	0,4	5,0	9,0	12,1	15,5	15,5	12,2	7,9	2,4	-1,3	6,0
İnlice	-4,5	-1,5	0,3	4,7	8,4	11,5	14,9	15,2	11,9	7,5	2,1	-1,5	5,7
Güneydere	-4,5	-1,5	0,5	4,4	8,9	11,1	14,5	15,5	12,8	7,7	2,3	-1,7	5,8
Loras Dağı	-1,0	1,5	3,5	7,7	12,9	15,4	18,8	19,0	15,8	12,1	5,6	1,9	9,4

Source: MGM 2022 Meteorology Bulletin**.**

When the average temperature values in the field are examined on a seasonal basis, it is observed that the average temperature is 1.1 °C in winter and 20.9 °C in summer. While this value is 10.2°C in spring, it is 12.7°C in autumn. Autumn months are higher in terms of temperature values than spring (Table 4).

Table 4. Average temperature according to seasons (°C)

	Winter	*Spring*	*Summer*	*Autumn*	*Avg.*
Seasonal Average Temperature (°C)	*1,1*	*10,2*	*20,9*	*12,7*	*11,2*

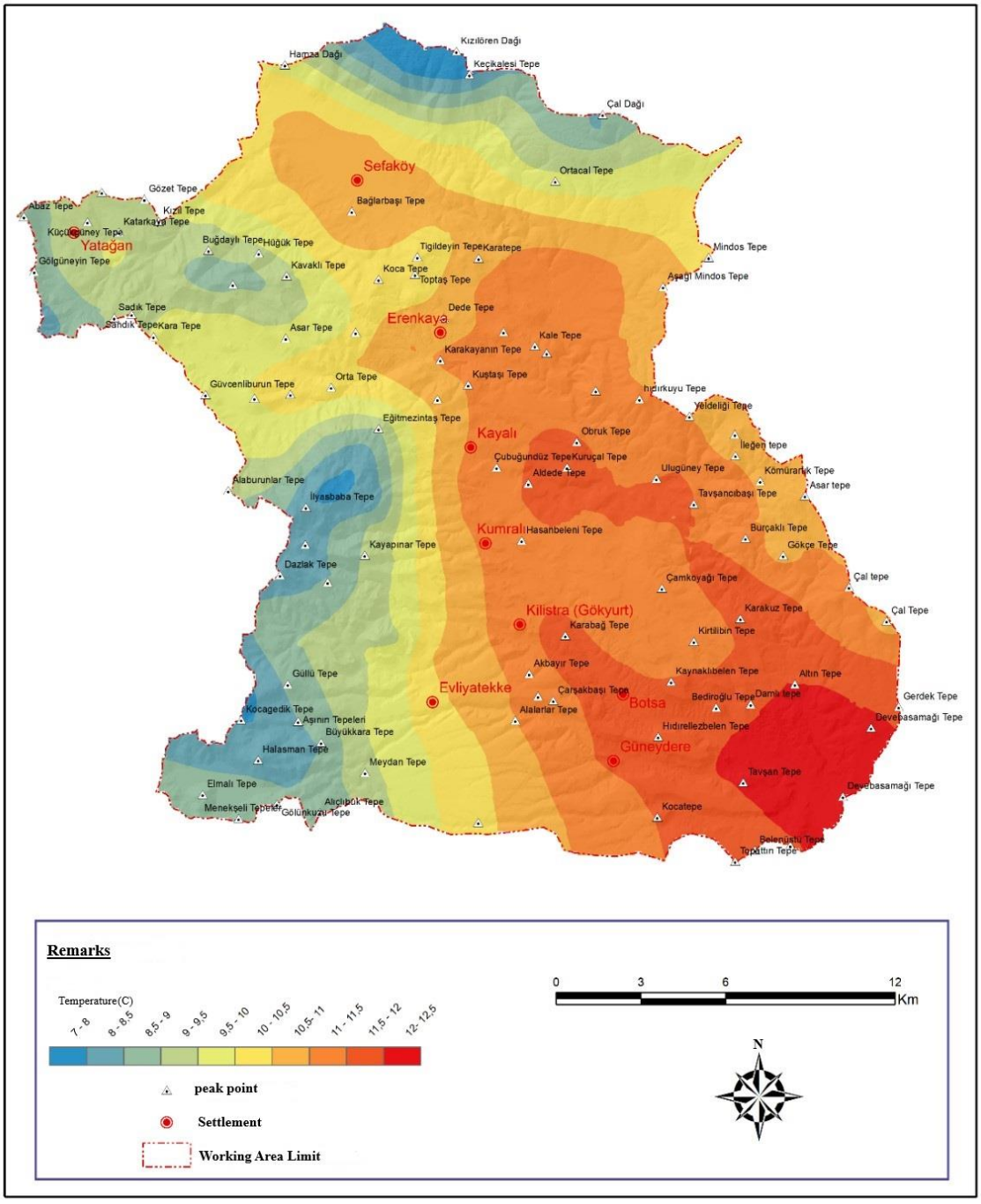
Source: MGM 2022 Meteorology Bulletin**.**

When the distribution of temperature values in the research area is examined, negative variations appear in the western and northern parts due to the high altitude (Figure 3).

Pressure and Winds

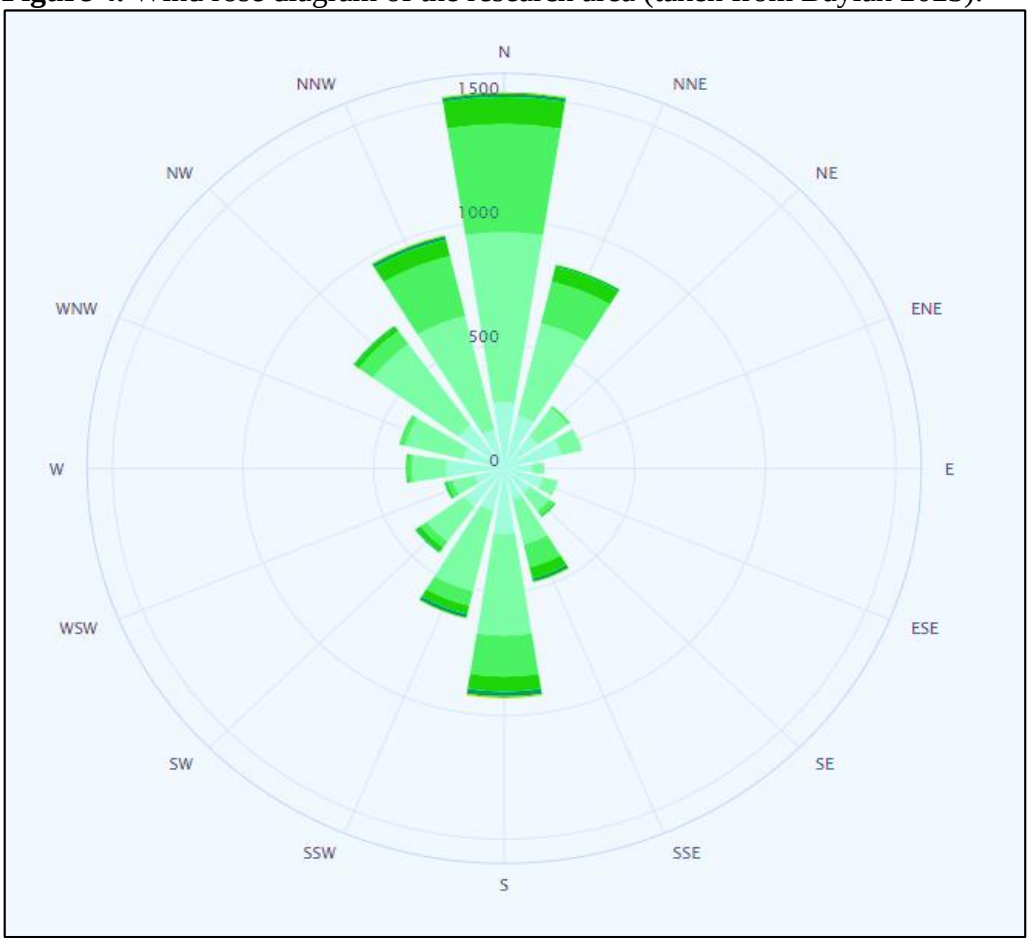
Evaluations regarding wind speed and direction observations between Mount Loras and Hatunsaray were obtained by examining the data of Hatunsaray meteorology station, which is the closest station to the study area. Accordingly, among all months, February is the month when the wind blows at the highest frequency, while September and October are the months when it blows the slowest (Table 5). The winds blow in accordance with the general topographic condition of the research area (Figure 4). However, when wind blowing directions are considered on a seasonal basis, differences become apparent.

Figure 3. Distribution of average temperature in the study area (taken from Baylak 2023).



Source: (Obtained using MGM 2022 Meteorology bulletin data)

Figure 4. Wind rose diagram of the research area (taken from Baylak 2023).



Source: (https://meteoblue.com/tr)

Table 5. Distribution of wind speed (Kph) by month

Data Station Ordinary	F	J	M	A	M	J	J	A	S	O	N	D
Hatunsaray	*12, 6*	*13, 6*	*13, 5*	*12, 6*	*10, 9*	*11, 5*	*12, 6*	*11, 9*	*10, 8*	*10, 8*	*11, 7*	*12, 3*

Source: MGM 2022 Meteorology Bulletin**.**

It has been observed that northerly winds blow longer during the winter months. In February (winter season), the winds effective from the north have reached their maximum blowing period. The duration of these northerly winds is longer in the summer months. Northern sector winds reach their highest blowing frequency in July.

Humidity and Precipitation

When average annual relative humidity values are examined; In the study area, the average annual relative humidity is highest in December (81.3%), the lowest is August with a value of 43.1%, and the average annual relative humidity is 61% (Table 6).

Table 6. Monthly average relative humidity (%)

Data Station Ordinary	F	J	M	A	M	J	J	A	S	O	N	D	Avg.
Loras Dağı	*80,7*	*68,5*	*62,9*	*56,2*	*47,9*	*53,4*	*42,0*	*39,5*	*47,1*	*52,6*	*68,1*	*84,1*	*58,6*
Kilistra Virtual Station	*81,3*	*71,3*	*66,8*	*57,4*	*54,4*	*57,5*	*43,7*	*43,1*	*48,3*	*56,7*	*68,7*	*82,2*	*61,0*
İnlice	*82,3*	*74,3*	*69,6*	*58,1*	*59,4*	*61,6*	*44,9*	*45,3*	*49,5*	*59,4*	*69,5*	*81,5*	*62,9*
Güneydere	*81,0*	*71,2*	*67,8*	*57,9*	*55,8*	*57,5*	*44,3*	*44,4*	*48,4*	*58,3*	*68,4*	*81,0*	*61,3*

Source: MGM 2022 Meteorology Bulletin**.**

The average annual precipitation between Mount Loras and Hatunsaray is 399.8 mm. There is an irregular rainfall regime in the field. In addition, the increase seen in May precipitation values in the research area is not seen in May precipitation values at Central Anatolian meteorological observation stations, and the increase values extend to June. December is the month with the highest rainfall with 63.1 mm, and August is the month with the least rainfall with 7.0 mm. There are irregularities in the distribution of annual average precipitation over months. The amount of precipitation, which decreases from January to March, increases in March (Baylak, 2003) and decreases from this month to August (Table 7, Figure 5).

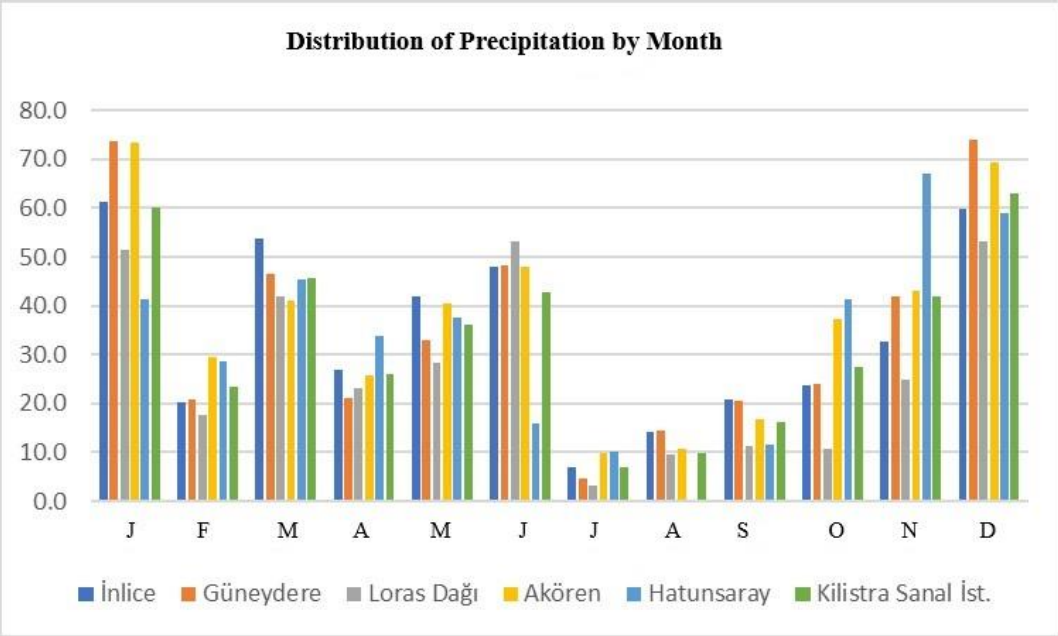
Table 7. Monthly average precipitation values (mm)

Station Ordinary	F	J	M	A	M	J	J	A	S	O	N	D	Avg.
İnlice	61,4	20,1	53,9	27,0	42,0	48,1	7,0	14,1	20,7	23,8	32,6	59,9	410,6

Güneydere	73,7	20,7	46,6	21,0	33,0	48,4	4,6	14,5	20,6	23,9	41,8	74,0	422,8
Loras Dağı	51,6	17,7	41,8	23,0	28,2	53,2	3,3	9,5	11,3	10,8	24,9	53,1	328,4
Akören	73,3	29,6	41,0	25,6	40,6	48,1	9,8	10,7	16,9	37,3	43,0	69,5	445,4
Hatunsaray	41,2	28,7	45,5	33,9	37,5	16,0	10,1	0,1	11,5	41,4	67,0	59,0	391,9
Kilistra Virtual Station	60,2	23,4	45,8	26,1	36,3	42,8	7,0	9,8	16,2	27,4	41,9	63,1	399,8

Source: MGM 2022 Meteorology Bulletin**.**

Figure 5. Average monthly distribution of precipitation



Source: (Obtained using MGM 2022 Meteorology bulletin data)

When the distribution of precipitation according to seasons is examined, the maximum precipitation occurs in winter (6.7%), the minimum precipitation occurs in summer (14.9%), and 27.0% is in spring and 21.4% is in autumn (Table 8).). The rainfall regime of the study area is irregular. In addition, since the area is affected by continental climate conditions, precipitation is generally in the form of

snow during the winter months. Snow can be seen on the tops of hills with high altitude, especially until August.

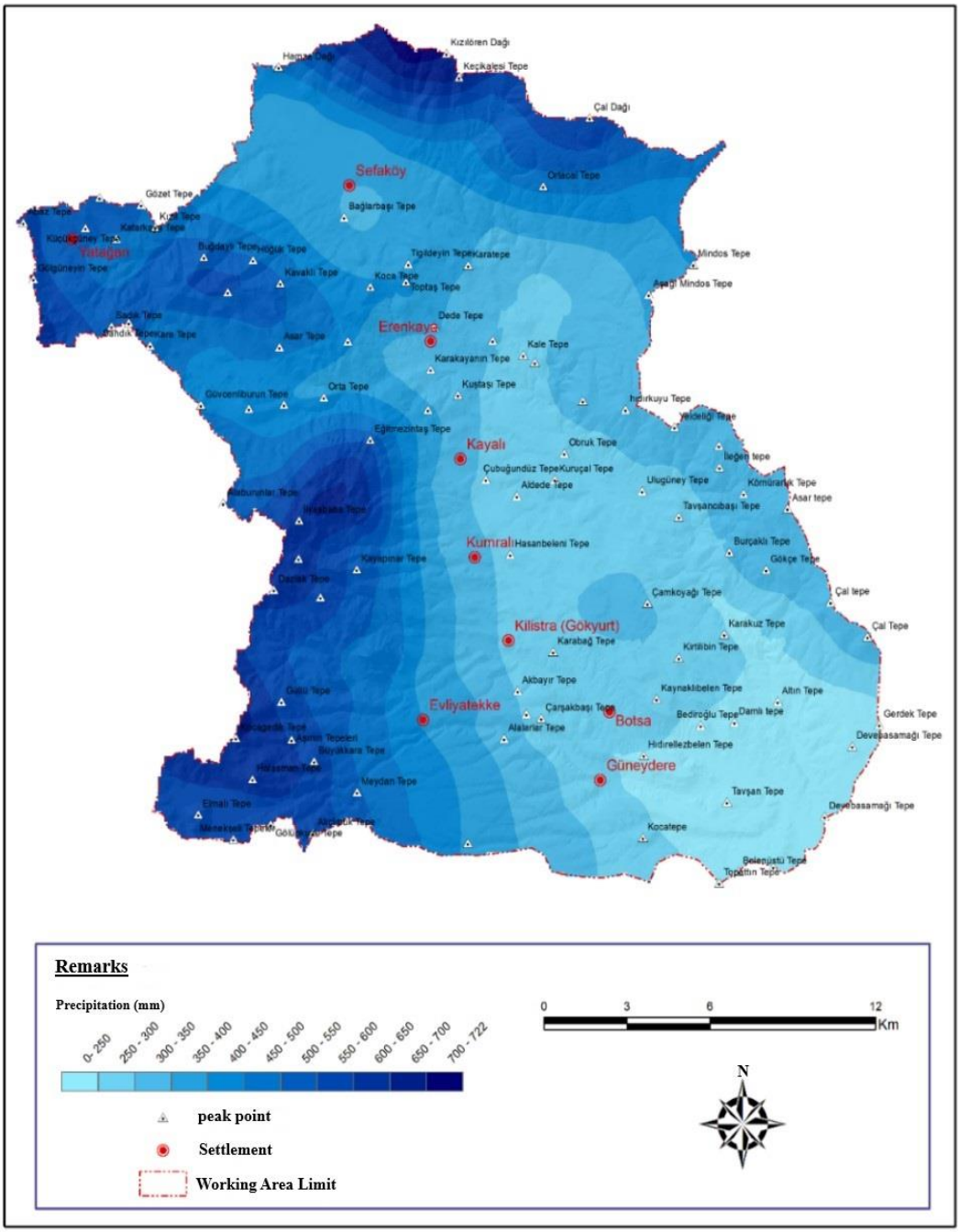
Table 8. Distribution of precipitation according to seasons (%)

	Winter	**Spring**	**Summer**	**Autumn**	**Total**
Precipitation (mm)	*146,7*	*108,1*	*59,5*	*85,5*	*399,8*
Rate (%)	*36,7*	*27,0*	*14,9*	*21,4*	*100,0*

Source: MGM 2022 Meteorology Bulletin**.**

The average number of days with snowfall in the research area was determined as 20.5 days. January is the month with the most snowfall, with 5.5 days. When the distribution of precipitation values is examined, negative variations appear in the northern and western parts due to the high altitude (Figure 6).

Figure 6. Distribution of annual average precipitation in the study area (taken from Baylak 2023).



Source: (Obtained using MGM 2022 Meteorology bulletin data)

Water Balance Sheet

According to the data obtained from the research area's water balance table (Table 8) and graph (Figure 7), water begins to accumulate in the soil starting from November. The accumulation of water in the soil continues throughout December. The amount of precipitation reaches its highest value in November throughout the year, and as a result of the decrease in temperature values, evaporation decreases in quantity and an excess of water is observed in December. The excess water continues until the end of March. Water consumption from the soil begins in May due to evaporation, and the amount of reserve water disappears in June. As a result of this situation, there is a lack of water from June to November.

According to this general perspective, in the study field; The microclimate type is dominant due to the difference in the direction of arrival of air masses, ruggedness and hydrological effects. According to Thornthwaite's climate classification in Kilistra (Gökyurt) Region; The climate type is arid-less humid, with water deficiency in summer and very strong, first-order mesothermal, close to marine influence (C$_1$ B$_1$1 S2 bs1) (Baylak, 2023).

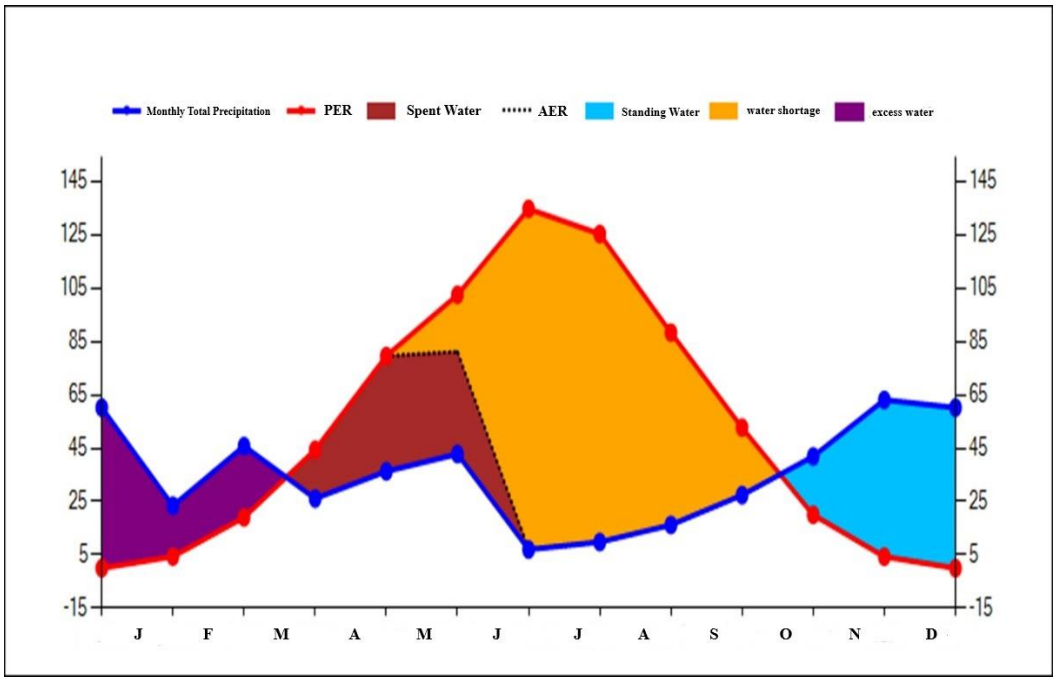
Table 8. Thornthwaite water balance table for the study area

	F	J	M	A	M	J	J	A	S	O	N	D	**Annual**
Monthly Avg. Heat (°C)	-1,1	1,9	4,1	8,5	13,4	16,5	20,7	20,9	17,6	11,8	6,1	1,2	10,13
Heat index	0	0,23	0,74	2,23	4,45	6,1	8,59	8,72	6,72	3,67	1,35	0,12	42,92
Uncorrected PE	0	6,15	15,16	35,65	60,79	77,59	101,23	102,38	83,69	52,37	24,16	3,59	
PE Correction Coefficient	0,87	0,85	1,03	1,1	1,21	1,22	1,24	1,16	1,03	0,97	0,86	0,84	
Corrected PE	0	5,23	15,61	39,22	73,56	94,66	125,53	118,76	86,2	50,8	20,78	3,02	633,37
Monthly Total Precipitation (mm)	73,7	20,7	46,6	21,0	33,0	48,4	4,6	14,5	20,6	23,9	41,8	74,0	422,8

Accumulated Monthly Change of Water	8	0	0	-18,22	-40,56	-41,22	0	0	0	0	21,02	70,98	
Standing Water	100	100	100	81,78	41,22	0	0	0	0	0	21,02	92	
Real Evaporation	0	5,23	15,61	39,22	73,56	89,62	4,6	14,5	20,6	23,9	20,78	3,02	310,64
Water Deficiency	0	0	0	0	0	5,04	120,93	104,26	65,6	26,9	0	0	322,73
Excess Water	65,7	15,47	30,99	0	0	0	0	0	0	0	0	0	112,16
Surface Flow	32,85	40,585	23,23	15,495	0	0	0	0	0	0	0	0	112,16
Humidity Rate (%)	0	2,96	1,99	-0,46	-0,55	-0,49	-0,96	-0,88	-0,76	-0,53	1,01	23,5	

PE: potential evaporation

Figure 7. Thornthwaite water balance chart (taken from Baylak 2023).



Conclusion and Recommendations

Climatic characteristics trigger erosion processes on the geomorphology of the Hatunsaray-Lorasdağı area, and in this case, the geomorphological formation is affected. The area between Loras Mountain and Hatunsaray is an area where

volcanic material covers a large area. As a result of the characteristics of the climate, the development of vegetation in the area has been affected by this situation. As a general view, high areas with poor vegetation feed the streams with flood regime during periods when the amount of precipitation increases, thus causing an increase in erosion in the area. As a natural result of this situation, kirgıbayır and fairy chimney formations find a place in the field.

In addition to the aspect effect, the research area is also highly exposed to the effects of changes in temperature values and rainfall on the southern slopes of the elevations (mountains and hills). This variability also has an effect on morphology. As a result, these areas can be considered as areas where slope and steepness increase.

As a result of the climate character that develops between Mount Loras and Hatunsaray, evaporation starts to consume water in the soil starting from May and the amount of reserve water ends in June. For this reason, there is a lack of water in the field, starting from June and continuing until November. This result causes the population to increase their intervention in the topography by building wells, canals and ponds in order to meet their agricultural irrigation and drinking and utility water needs. For this reason, planned water storage and sustainable water use studies need to be planned in order to meet the water need in periods when rainfall decreases in the field.

Bibliography

Baylak, H.M. (2023). Cultural Geomorphology of Kilistra (Gökyurt) Region, Konya. Çankırı Karatekin University Social Sciences Institute (Unpublished Doctoral Thesis), Çankırı.

Biricik, A. S. (1982). Structural and geomorphological study of Beyşehir Lake Basin. Istanbul University Faculty of Letters Publication No: 2867, Geography Institute Publication No: 119, Istanbul.

Çelik, M., Temel, A., Tunoğlu, C. and Orhan, H. (1994). “Examination of the properties of clay formations located between Konya-Akören-Seydişehir-

Doganbey and investigation of their economic importance", TÜBİTAK project, project no: YBAG 0040 / DPT.

Bozyiğit, R. and Güngör, Ş. (2011). Physical geography of Hatunsaray Stream Basin (Hatunsaray). [Notice]. H. Bahar (Ed.). Proceedings of the I. International Hatunsatray (Lystra) and Its Surroundings, History, Culture and Tourism Symposium, 2-4 October 2011, (pp. 49-68). Konya.

Güngör, Ş and Bozyiğit, R. (2013). (Konya) / Sub-village settlements that have undergone a change in function in Erenler Mountain and its surroundings (Konya). [Notice]. R. Efe, İ. Atalay and İ. Cürebal (ed.). 3rd International Geography Symposium- Geomed 2013 Proceedings, 10-13 June 2013, (pp.399-410). Belt.

Göğer, E. and Kral, K. (1973). General stratigraphy of Kızılören Region (West of Konya), M.T.A Compilation Report. no: 42137, Ankara.

Keller, J., Jung, D., Burgath, K., & Wolff, F. (1977). Geologie und petrologie des neogenen calc-alkali-vulcanismus vo Konya (Erenler Dağı-Alacadağ Massiv, Zentrel Anatolien). Geol. Jb., Reihe B. Heft 25, 37-117. Hanover.

General Directorate of Meteorology, (2022). Konya Province Climate Bulletin. Ankara

Türkeş, M. (1990). Dry regions and important years in Turkey. Ist. University of the Sea

Institute of Sciences and Geography (Unpublished Doctoral Thesis), Istanbul.

https://www.meteoblue.com.tr, Access Date: 25.01.2023, time: 01.16

www.nvi.gov.tr, Access Date: 19.04.2023, time; 22.15