

TURKISH STATE METEOROLOGICAL SERVICE

REPUBLIC OF TÜRKİYE MINISTRY OF ENVIRONMENT, URBANIZATION AND CLIMATE CHANGE TURKISH STATE METEOROLOGICAL SERVICE

The State of the Türkiye's Climate in 2023

CLIMATE and AGRICULTURAL METEOROLOGY DEPARTMENT RESEARCH DEPARTMENT

January 2024 Ankara

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1. Summary

Climate refers to the total and average of weather events that occur every day in a place a long period. In the study, the average temperatures of 2023 were compared with the data of normal (1991-2020) by taking 220 stations used in climate evaluation, which had 30 years of complete data and were distributed homogeneously in Turkey.

In 2023, Türkiye's mean temperature was 15.1°C, this is 1.2°C above the 1991-2020 mean value (13.9°C). There are positive temperature anomalies in Türkiye's mean temperatures since 2007 (except in 2011). The hottest year was 2010 with 15.5°C. The year 2023 was the third warmest year with 15.1°C.

In 2023, while the mean temperatures in Türkiye are below the long-term mean in 1 center; it was above the long-term mean in 219 stations.

In 2023, monthly mean temperatures were above normal except in February, April (monthly mean temperature equal April normal), May and June.

Seasonal temperatures were above normal. The mean temperatures of 2023 were above the seasonal normal (1991-2020) in all geographic regions.

In 2023, the lowest temperature was -31.3°C in Erzurum in February, and the highest temperature was 49.5°C in Sarıcakaya (Eskişehir) in August. This value became Turkey's new extreme.

Türkiye's mean areal precipitation in 2023 was 641.5 mm. This value is 12% above the 1991-2020's normal (573.4 mm).

While the Western Black Sea and Eastern Black Sea coastal areas and the east of Antalya received over 1000 mm of precipitation in 2023, the precipitation in Giresun, Rize and Artvin exceeded 1600 mm. The west of Ankara, Konya, Karaman, Aksaray, Niğde, Nevşehir, Kırıkkale, Iğdır, Kilis, south of Şanlıurfa and the east of Ağrı and Van received less than 400 mm of rainfall.

Monthly total precipitation in 2023 were below normal in January, February, August, September, October and December while they remained above the normal in other months.

The number of extreme events reached 1475 in 2023 according to TSMS's Database. In 2023, the most hazardous extreme events were heavy rainfall and floods with 38%, storms with 23%, hail with 16%, lightning strikes with 6%, heavy snow with 6%, landslides with 5% and tornadoes with 2%. Extreme events such as avalanches, frost, wildfires, fog and sandstorms accounted for 1% or less of the total

2. Temperature

In 2023, Türkiye's mean temperature was 15.1 °C, this is 1.2°C above the 1991-2020 mean value (13.9°C) (Fig. 2.1).

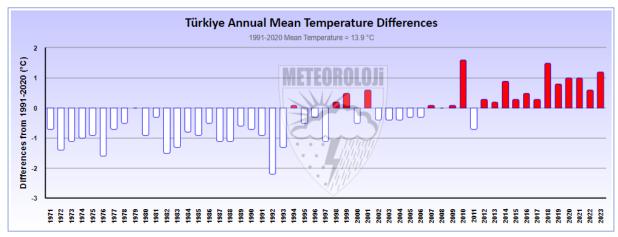


Figure 2. 1 Annual Mean Temperature Differences (URL 1)

There are positive temperature anomalies in Türkiye's mean temperatures since 2007 (except in 2011). The hottest year was 2010 with 15.5°C. The year 2023 was the **third warmes**t year with 15.1 °C (Fig. 2.2).

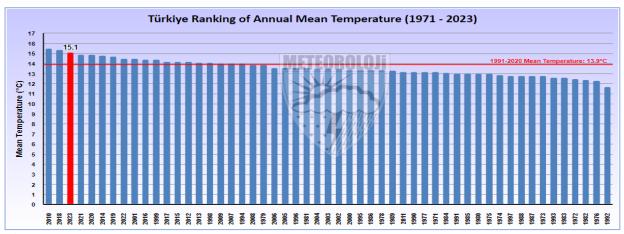


Figure 2.2. Ranking of Annual Mean Temperature (URL 1).

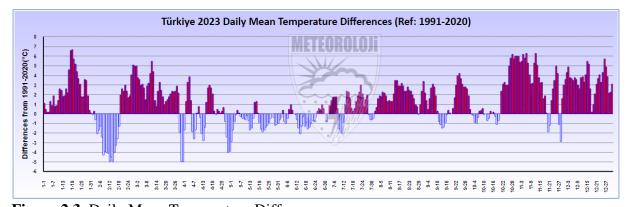


Figure 2.3. Daily Mean Temperature Differences

365-daily mean temperature differences in 2023, 116 days were negative and 249 days were positive. Daily difference values are between -5.1°C and 6.8°C. The average of positive differences was 2.5°C, and the average of negative differences was -1.4°C (Figure 3).

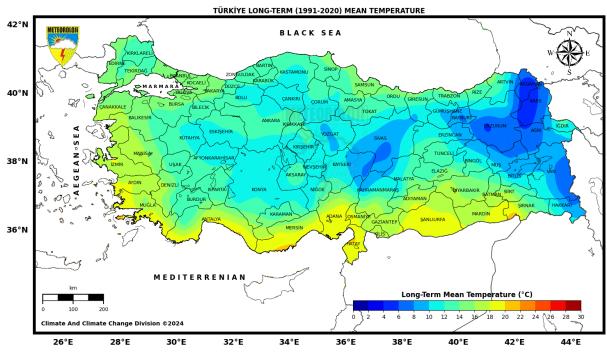


Figure 2.4. Türkiye's Long-Term (1991-2020) Mean Temperature Map

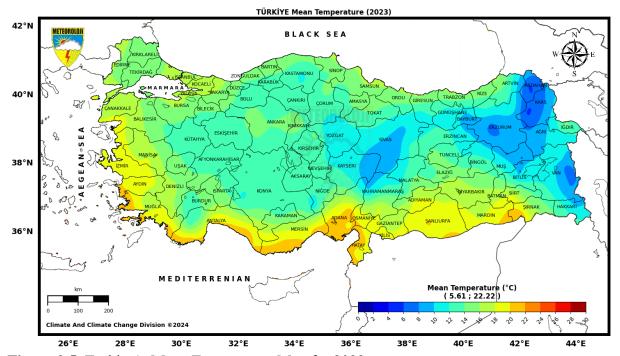


Figure 2.5. Türkiye's Mean Temperature Map for 2023

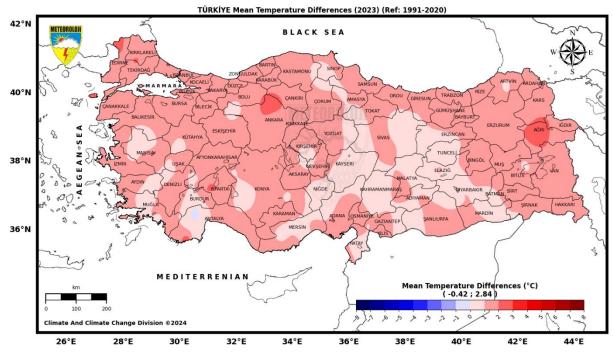


Figure 2.6. Türkiye's 2023 Mean Temperature Differences from 1991-2020 Normal.

In 2023, while the mean temperatures in Türkiye are below the long-term mean in 1 center; it was above the long-term mean in 219 stations (Fig 2.6).



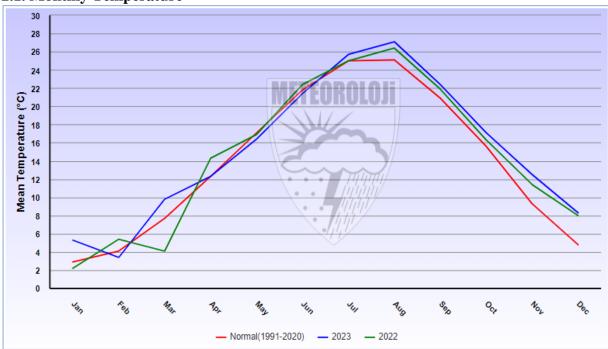


Figure 2.7. Comparison of monthly mean temperatures with normal and last year (URL 1).

In 2023, monthly mean temperatures were above normal except in February, April (monthly mean temperature equal April normal), May and June (Fig. 2.7).

2.2. Seasonal Temperature Assessment

2.2.1. Winter Temperature

The winter mean temperature of the years 2022-2023 was 5.5°C, which was 1.6 °C above the seasonal normal (3.9°C) (Fig. 2.8). The winter season of 2023 was the **fourth warmest** season of the past 53 years.

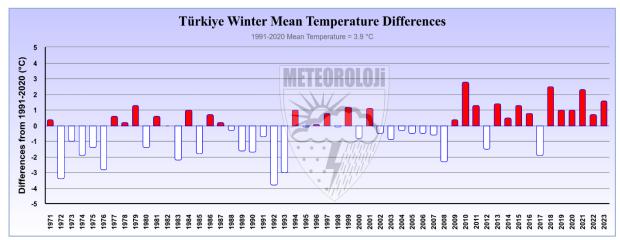


Figure 2.8. Türkiye's Winter Mean Temperature Differences

2.2.2. Spring Temperature

The spring mean temperature in 2023 was 12.8°C, which was 0.4 °C above the seasonal normal (12.4°C), (Figure 2.9).

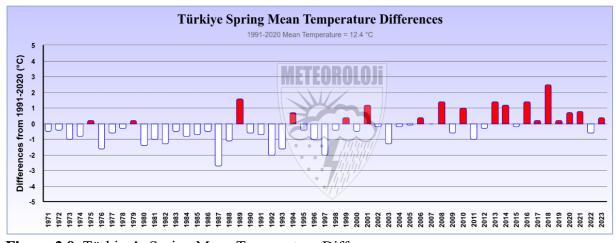


Figure 2.9. Türkiye's Spring Mean Temperature Differences

2.2.3. Summer Temperature

The summer mean temperature of 2023 was 24.7 $^{\circ}$ C, which was 0.7 $^{\circ}$ C above the seasonal normal (24.0 $^{\circ}$ C). The summer season of 2023 was the **seventh warmest** season of the past 53 years (Fig. 2.10).

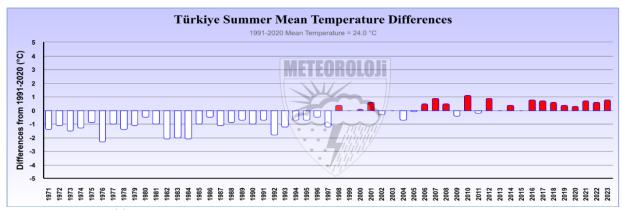


Figure 2.10. Türkiye's Summer Mean Temperature Differences

2.2.4. Autumn temperature

The mean temperature of the autumn season in 2022 was 17.4 °C, which was 2.1 °C above the seasonal normal (15.3 °C) (Fig. 2.11. The autumn season of 2023 was the **second warmest** season of the past 53 years). The **November** was the **first warmest** of the past 53 years.

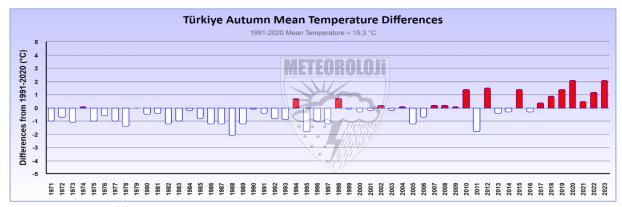


Figure 2.11. Türkiye's Autumn Mean Temperature Differences

2.3. Regional Temperature Assessment

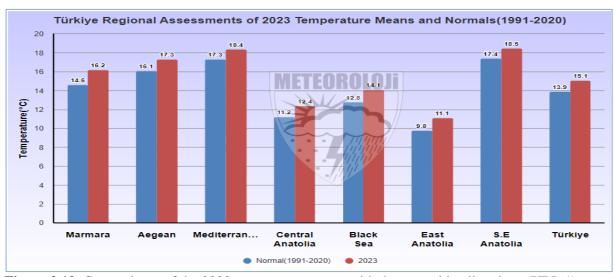


Figure 2.12. Comparisons of the 2023 mean temperatures with the normal in all regions (URL 1).

The mean temperatures of 2023 were above normal (1991-2020) in all geographic regions (Fig. 2.12).

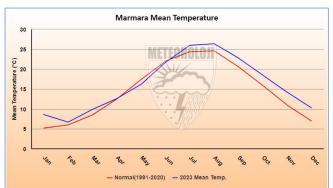


Figure 2.13. Mean Temperature in Marmara

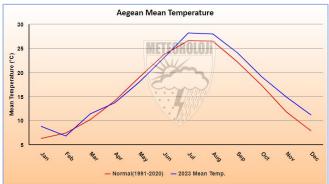


Figure 2.14. Mean Temperature in Aegean

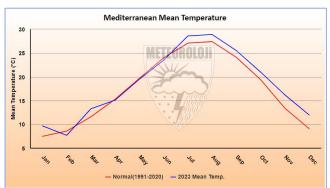


Figure 2.15. Mean Temperature in the Mediterranean

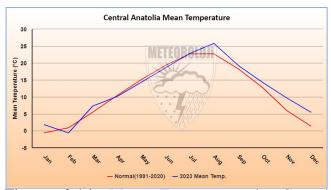


Figure 2.16. Mean Temperature in Central Anatolia

2.3.1. Marmara Region

In 2023, the monthly mean temperatures of the region were below normal in May, June and above normal in other months (Fig. 2.13).

2.3.2. Aegean Region

In 2023, the mean monthly temperatures of the region were below normal in February, April, May, June and above normal in other months (Fig. 2.14).

2.3.3 Mediterranean Region

In 2023, the mean monthly temperatures of the region were below normal in February, April, May, June and above normal in other months. (Fig. 2.15).

2.3.4. Central Anatolia Region

In 2022, the monthly mean temperatures of the region were below normal in February, April, May, June and above normal in other months. (Fig. 2.16).

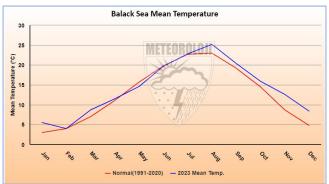


Figure 2.17. Mean Temperature in the Black Sea

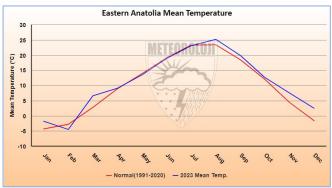


Figure 2.18. Mean Temperature in Eastern Anatolia

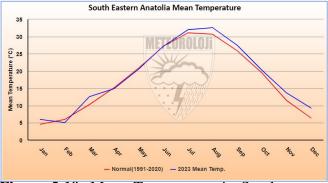


Figure 2.19. Mean Temperature in Southeastern Anatolia

2.3.5. Black Sea Region

In 2022, the monthly mean temperatures of the region were below normal in May, June; it was equal to the normal temperatures in February and above normal in other months (Fig. 2.17).

2.3.6. Eastern Anatolia Region

In 2022, the mean monthly temperatures of the region were below normal in February, May, June, July and above normal in other months (Fig. 2.18.

2.3.7. Southeastern Anatolia Region

In 2022, the mean monthly temperatures of the region were below normal in February, April, May; it was equal to the normal temperatures in June and above normal in other months (Fig. 2.19).

2.4. Extreme Temperature

In 2023, the lowest temperature was -31.3°C in Erzurum in February, and the highest temperature was 49.5°C in Sarıcakaya (Eskişehir) in August (Fig. 2.19-2.20).

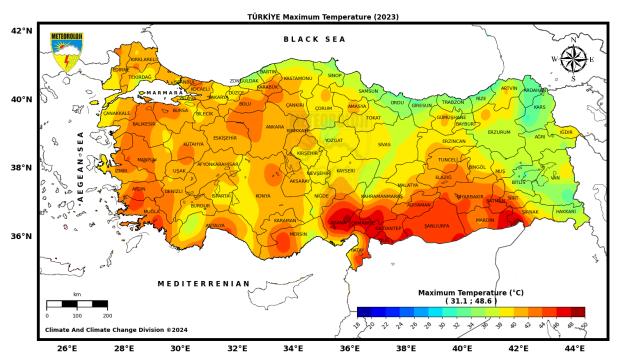


Figure 2.20. Maximum Temperature Map of 2023

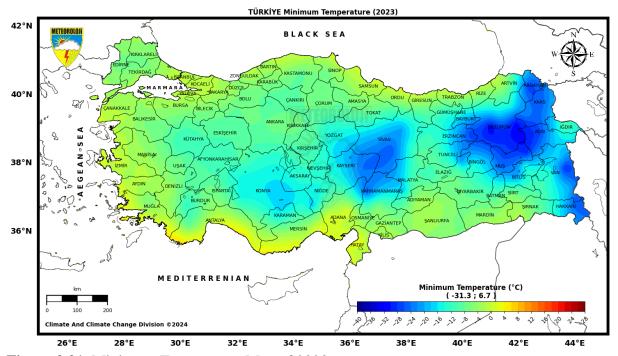


Figure 2.21. Minimum Temperature Map of 2023

In 2023, 155 centers broke their own records for the highest temperatures for the dates given in the Table 1; 1 centers broke their own records for the lowest temperatures for the dates given in the Table 2, and new values were recorded (Table 1,2).

Table 1. The highest temperatures recorded in 2023

D	M4b	Otation	2023 Mars Asses (9C)	Long term
Day	Month	Station	Max. temp (°C)	Max. temp (°C)
19	January January	KIRKLARELİ LÜLEBURGAZ	18.9	18.6
19	January		21.7	21.2
21	January	ERZURUM	10.4	8.0
19	January	KARS	9.3	9.1
20	•	BİNGÖL	13.8	13.3
28	February February	MARMARIS	24.4	24.0
28	February	ANAMUR	24.6	23.9
28	February	FİNİKE	26.0	25.5
28		MANAVGAT	25.7	25.6
28	February	KALE-DEMRE	25.5	24.7
28	February	SARIKAMIŞ	10.2	9.0
28	February	ŞIRNAK	18.2	17.5
28	February	CİZRE	24.9	24.5
3.0	March	ANAMUR	27.8	27.5
26	July	BOZCAADA	39.1	36.5
23	July	ÇANAKKALE	39.2	39.1
26	July	BANDIRMA	43.3	42.4
26	July	FLORYA	40.5	37.4
26	July	GÖNEN/BALIKESİR	44.0	42.2
26	July	İZMİR	43.2	42.6
26	July	ÇEŞME	38.8	38.1
24	July	SİLİFKE	42.6	42.3
15	July	MANAVGAT	44.7	44.5
25	July	SAMANDAĞ	38.9	37.0
27	July	İNEBOLU	37.1	35.2
27	July	CİDE	35.9	35.3
15	August	КÜТАНҮА	41.4	38.8
18	August	UŞAK	41.9	38.2
14	August	AFYONKARAHİSAR	39.6	38.2
5	August	SİMAV	39.3	38.7
18	August	GEDİZ	43.8	42.4
14	August	EMİRDAĞ	41.1	39.3
16	August	BURDUR	41.6	41.0
15	August	BEYŞEHİR	39.0	37.6
14	August	KAHRAMANMARAŞ	47.2	44.4
13	August	ADANA	45.7	45.6
13	August	OSMANİYE	45.6	43.6
13	August	ANTAKYA	45.2	43.9
17	August	SENİRKENT	41.1	39.2
17	August	DİNAR	41.4	40.7
18	August	EĞİRDİR	38.9	37.5

Day	Month	Station	2023 May tamp (%C)	Long term	
Day	August	Station	Max. temp (°C)	Max. temp (°C)	
13 13	August	KOZAN KARAİSALI	48.4 46.4	45.6 45.0	
13	August	CEYHAN	46.4	45.0 45.0	
14	August	ISLAHIYE	47.4		
15	August	ESKİŞEHİR	41.5	45.4 39.0	
15	August	ANKARA BÖLGE	40.5	40.4	
15	August	KIRIKKALE	42.0	40.4	
15	August	CİHANBEYLİ	42.0		
	August			40.0	
15	August	AKSARAY	40.8	38.8	
14	August	AKŞEHİR	40.6	40.5	
14	August	KONYA	40.9	39.0	
14	August	KARAMAN	41.4	40.4	
14	August	EREĞLİ	41.0	39.8	
13	August	NIĞDE	39.7	38.5	
14	August	POLATLI	42.4	39.7	
15	August	ÇİÇEKDAĞI	40.5	39.5	
15	August	KULU	40.3	40.2	
14		KAMAN	39.7	39.2	
15	August August	ILGIN	39.9	38.2	
15		ÇUMRA	40.5	39.2	
14	August	KARAPINAR	40.5	40.0	
13	August	ULUKIŞLA	37.0	36.8	
15	August	SIVRIHISAR	41.0	39.0	
15	August	SİNOP	33.3	33.2	
15	August	BOLU	42.8	39.8	
16	August	KIZILCAHAMAM	41.2	38.7	
11	August	İSPİR	41.8	40.6	
15	August	NALLIHAN	43.2	40.8	
15	August	BEYPAZARI	43.4	41.5	
11	August	TORTUM	37.5	37.0	
11	August	HINIS	36.4	36.0	
14	August	KARAKOÇAN	42.0	41.9	
14	August	PALU	43.3	42.6	
17	August	ÖZALP	40.1	38.8	
14	August	ELBİSTAN	40.6	40.0	
14	August	GAZİANTEP	44.0	42.8	
14	August	KİLİS	47.6	45.0	
14	August	ADIYAMAN	45.2	44.5	
10	August	ŞIRNAK	40.4	40.3	
10	August	CİZRE	48.6	47.8	
14	August	BİRECİK	46.4	46.3	
23	September	LÜLEBURGAZ	39.2	39.1	
28	September	KUŞADASI	39.1	37.4	

Day	Month	Station	2023 Max. temp (°C)	Long term Max. temp (°C)
4	November	ÇORLU	27.9	27.7
4	November	TEKİRDAĞ	28.2	27.9
4	November	SARIYER	28.9	26.5
4	November	İSTANBUL	29.6	27.2
4	November	KOCAELİ	30.0	29.3
4	November	ÇANAKKALE	27.7	26.2
4	November	BURSA	32.1	31.0
4	November	YALOVA	32.8	29.7
4	November	BİLECİK	28.6	27.4
4	November	BALIKESIR	31.2	29.0
4	November	UZUNKÖPRÜ	28.4	27.1
4	November	ŞİLE	32.0	29.3
4	November	LÜLEBURGAZ	31.8	28.6
4	November	İPSALA	27.2	26.3
4	November	FLORYA	27.3	26.4
4	November	GEYVE	29.6	29.5
4	November	GÖNEN/BALIKESİR	31.2	29.1
4	November	KÜTAHYA	26.0	25.4
4	November	AKHİSAR	31.6	30.7
4	November	MANISA	31.6	29.9
4	November	UŞAK	26.6	26.0
4	November	AFYONKARAHİSAR	26.3	25.3
4	November	DENİZLİ	31.6	29.9
4	November	BURHANİYE	30.7	30.3
4	November	BERGAMA	31.1	31.0
4	November	GEDİZ	27.4	27.2
4	November	EMİRDAĞ	26.2	25.4
4	November	SALİHLİ	32.9	29.9
4	November	SEFERİHİSAR	29.3	28.6
4	November	GÜNEY	26.4	25.4
4	November	SELÇUK	31.3	30.0
1	November	ALANYA	31.5	30.3
1	November	OSMANİYE	31.7	31.0
4	November	TEFENNİ	25.1	25.0
1	November	ERDEMLİ	31.4	31.0
5	November	ÇANKIRI	25.1	24.4
4	November	ESKİŞEHİR	26.7	25.6
1	November	GEMEREK	23.9	23.6
4	November	AKŞEHİR	26.6	25.6
6	November	KARAMAN	26.2	25.8
4	November	POLATLI	26.0	24.3
4	November	ÇİÇEKDAĞI	25.6	25.3
4	November	YUNAK	24.1	23.8

Day	Month	Station	2023 Max. temp (°C)	Long term Max. temp (°C)	
4	November	ILGIN	26.0	25.3	
4	November	ÇUMRA	27.1	25.0	
4	November	SIVRIHISAR	26.0 24.6		
4	November	BARTIN	31.2	30.6	
4	November	ZONGULDAK	30.9	29.9	
4	November	SINOP	29.6	27.9	
4	November	DÜZCE	31.3	30.2	
1	November	KASTAMONU	25.3	24.7	
5	November	GÜMÜŞHANE	22.3	22.2	
1	November	BAYBURT	20.7	20.0	
4	November	CİDE	30.8	29.7	
5	November	BOYABAT	25.2	24.6	
6	November	OSMANCIK	26.3	26.1	
1	November	ISPIR	24.4	22.7 24.2	
1	November	BEYPAZARI	24.9		
1	November	TORTUM	21.5	21.0	
1	November	TERCAN	21.7	21.4	
1	November	ÇEMİŞGEZEK	23.7	23.3	
1	November	KARAKOÇAN	24.7	22.4	
1	November	PALU	27.1	24.6	
1	November	BASKİL	21.8	21.2	
1	November	ŞIRNAK	23.6	23.0	
1	November	ÇERMİK	27.5	27.0	
1	November	CİZRE	31.1	30.4	
3	December	EDİRNE	22.9	22.8	
27	December	GÖKÇEADA	24.9	22.4	
3	December	SİNOP	27.4	27.3	
15	December	KIZILCAHAMAM	19.5	17.4	

Table 2. The lowest temperatures recorded in 2023

Day	Month	Station	2023 Min. temp	Long term Min. temp
12	June	SENİRKENT	0.0	1.9

3. Precipitation

Türkiye's mean areal precipitation in 2023 was 641.5 mm. This value is 12% above the 1991-2020's normal (573.4 mm) (Figure 3.1).

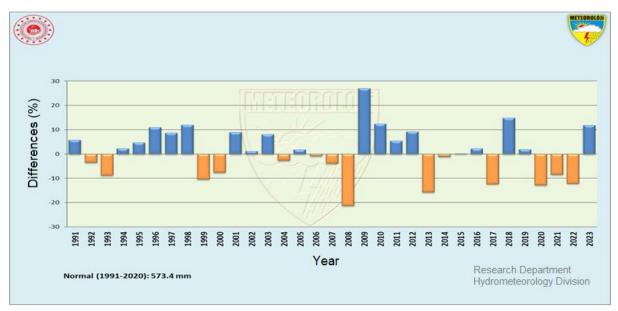


Figure 3. 1. Annual areal precipitation anomaly in Türkiye (URL 2

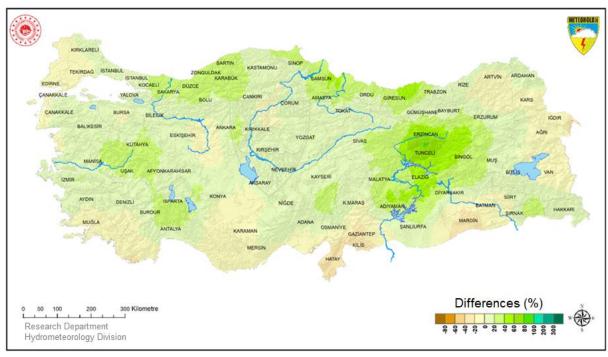


Figure 3. 2 Spatial distribution of mean precipitation anomalies in Türkiye in 2023 (URL 2).

While the Western Black Sea and Eastern Black Sea coastal areas and the east of Antalya received over 1000 mm of precipitation in 2023, the precipitation in Giresun, Rize and Artvin surroundings exceeded 1600 mm. The west of Ankara, Konya, Karaman, Aksaray, Niğde, Nevşehir, Kırıkkale, Iğdır, Kilis, south of Şanlıurfa and the east of Ağrı and Van received less than 400 mm of rainfall (Fig. 3.2).

3.1 Monthly precipitation

Monthly total precipitation in 2023 were below normal in January, February, August, September, October and December while they remained above the normal in other months (Figure 3.3).



Figure 3. 3 Monthly areal rainfall anomaly in Türkiye in 2023 (URL 2)

3.2. Number of Rainy Days

The average number of rainy days was 111 days in 2023. While there are 50-75 days of rain in Mersin, Karaman, the south of Adana, Hatay, Gaziantep, Kilis, Şanlıurfa, Mardin, Batman and Şırnak, Eastern Black Sea Region and Düzce, Samsun and Ardahan have more than 150 days of rainfall (Fig. 3.4).

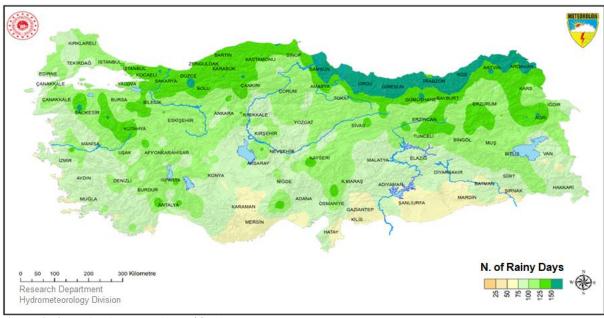


Figure 3. 4 N. of Rainy Days in Türkiye in 2023 (URL 2)

3.3. Standardized Precipitation Index

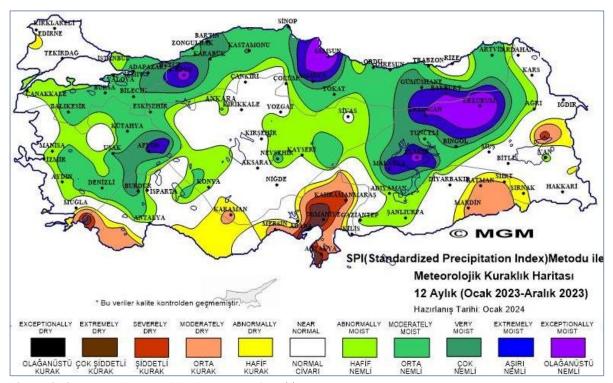


Figure 3. 4 Standardized Precipitation Index of Türkiye (URL 3)

According to the 12 Month Standardized Precipitation Index (SPI) values meteorological drought of varying severity is effective in

- Edirne (Uzunköprü) in the Marmara Region,
- Muğla (Köyceğiz, Bodrum and Marmaris) in the Aegean Region,
- Antalya (Elmalı, Finike, Alanya, Manavgat and Gazipaşa), Mersin, Adana (Yumurtalık and Kozan), Kahramanmaraş, Antakya, Osmaniye, in the Mediterranean Region,
- Karaman, Konya (Cumra and Hadim), in the Central Anatolia Region
- Van (Erciş and Başkale) in the Eastern Anatolia Region,
- Batman, Mardin, Siirt, Şırnak (Cizre) in the Southeastern Anatolia Region (Fig. 3.4).

4. Extreme Meteorological Events

The number of extreme events reached 1475 in 2023 according to TSMS's Database (Fig. 4.1).

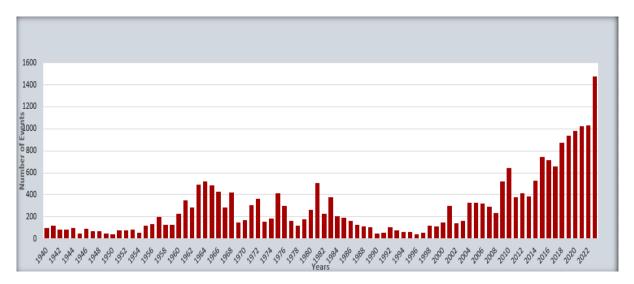


Figure 4. 1 Annual number of extreme events in Türkiye (URL 4)

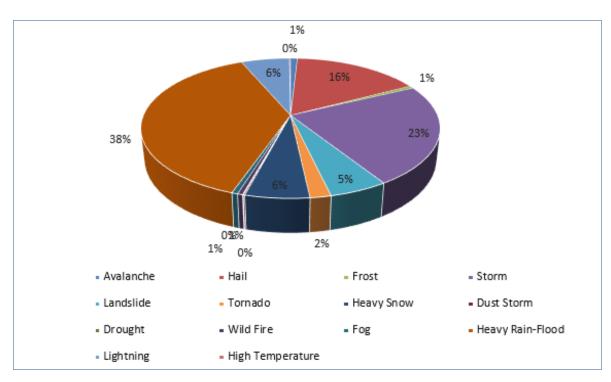


Figure 4. 2 Proportional distribution of extreme events in 2023 (URL 4)

In 2023, the most hazardous extreme events were heavy rainfall and floods with 38%, storms with 23%, hail with 16%, lightning strikes with 6%, heavy snow with 6%, landslides with 5% and tornadoes with 2%. Extreme events such as avalanches, frost, wildfires, fog and sandstorms accounted for 1% or less of the total (Figure 4.2).

4.1 Heavy rain / floods

On 14 March 2023 and 15 March 2023, heavy rain and thunderstorms occurred in Adıyaman and Şanlıurfa provinces affected by the major earthquakes on February 6, 2023. As a result of thunderstorms, floods, flashfloods and landslides were experienced.

A record rainfall was observed in Şanlıurfa. The total daily precipitation of 119 mm exceeded the long-term daily maximum precipitation of 90.5 mm.

Streams overflowed, flooding the tents and containers where earthquake victims lived. Agricultural lands were damaged. Asphalt roads and many bridges collapsed. There were disruptions in transportation and accidents (Figure 4.3.).





Source: Anadolu Agency

Figure 4.3. 14-15 March 2023, Floods in Şanlıurfa (Url 10)

Serious traffic accidents occurred in Adıyaman and its districts due to strong winds time to time and airplanes were unable to land. Water shortages occurred due to contamination of dams from rainfall. Cultural, historical and touristic sites were negatively affected (Figure 4.4.).



Source: Anadolu Agency

Figure 4.4. Heavy rainfall in Şanlıurfa since March 14, 2023 caused flooding in Balıklıgöl settlement, one of the most popular touristic attractions.

There were prolonged power outages due to damage to power transmission lines. More than 3000 people's houses, workplaces, vehicles and various household goods were damaged by floods and overflows. 21 people lost their lives in the flood disaster (URL 5).

4.2. Wild fires

A forest fire broke out in the Damyeri area of Çanakkale on August 22, 2023. The fire started near settlements and spread rapidly due to strong winds. Places (universities, villages) near the fire, where hot weather conditions were also effective, were evacuated for security reasons. Roads were closed to transportation. The Dardanelles was temporarily closed to maritime traffic in both directions for safety reasons (URL6, URL7). 11 villages were affected by the fire, which was brought under control on August 24, and 303 families were affected (URL8). A total area of 4080 ha was burned in the fire (URL9).



Figure 4.5. 22-24 Ağustos 2023, Çanakkale wild fire

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4.3. Heat Wave

In August 2023, a heat wave were experienced across a wide area in Türkiye. Temperature records were broken at many stations. In 22 stations in the central and inner western parts of Türkiye, heat waves lasting 5°C or more above the 1991-2020 average and lasting for periods ranging between 5-10 days occurred (Table 3).

Table 3. Meteorology stations experienced August 2023 heat wave

Station Name	Starting Date	Endind Date	Duration (Day)
Boğazlıyan	11/08/2023	15/08/2023	5
Kızılcahamam	13/08/2023	22/08/2023	10
Aksaray	13/08/2023	20/08/2023	8
Polatlı	13/08/2023	20/08/2023	8
Ankara Regional Directorate	14/08/2023	20/08/2023	7
Kırıkkale	14/08/2023	20/08/2023	7
Cihanbeyli	14/08/2023	20/08/2023	7
Akşehir	14/08/2023	20/08/2023	7
Konya Airport	14/08/2023	20/08/2023	7
Yunak	14/08/2023	20/08/2023	7
Sivrihisar AWOS	14/08/2023	20/08/2023	7
Çankırı	14/08/2023	19/08/2023	6
Beyşehir	14/08/2023	19/08/2023	6
Nallıhan	14/08/2023	19/08/2023	6
Beypazarı	14/08/2023	19/08/2023	6
Kütahya	15/08/2023	20/08/2023	6
Afyonkarahisar Regional Directorate	15/08/2023	20/08/2023	6
Senirkent	15/08/2023	20/08/2023	6
Eskişehir Regional Directorate	15/08/2023	19/08/2023	5
Emirdağ	15/08/2023	19/08/2023	5
Acıpayam	15/08/2023	19/08/2023	5
Uşak	22/08/2023	26/08/2023	5

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