



State of Türkiye's Climate in 2021



Climate and Agricultural Meteorology Department

Research Department

2022
Ankara

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

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1. Introduction

The mean temperature of Türkiye in 2021 was 14.9°C, 1.4°C above the 1981-2010 mean annual temperature (13.5°C). This made 2021 the 4th warmest year. The new normal period (1991-2020) indicates that the average temperature of Türkiye in 2021 has risen by 1°C considering the new mean annual temperature is 13.9°C.

Temperatures of all months were above the normal except for March, September and October. In particular, May was the hottest May ever has been recorded for the last 50 years with an anomaly of 2.6 °C, whereas January and July were the second warmest of their respective months.

Temperature differences from normal in all seasons of 2021 were positive. Especially the winter season was the 3rd warmest winter of the last 50 years with an anomaly of 2.6°C (Fig. 2.4).

The lowest temperature was measured in Ağrı with -34.5°C on January 23, 2021, and the highest temperature was measured in Cizre, Şırnak with 49.1°C on July 20, 2021. 168 stations recorded new monthly extreme maximum and 4 stations recorded new monthly extreme minimum temperature.

Türkiye areal mean precipitation in 2021 was 524.8 mm. This value is approximately 9 % below from both 1991-2020's normal (573.4 mm), and 1981-2010's normal (574mm).

In 2021, while Marmara, Black Sea, and İzmir received 40-60% more precipitation than normal, Southeastern Anatolia Region received 40-80% less precipitation than normal.

The monthly areal precipitation totals for 2021 were below the normal in February, April, May, October and November, and above the normal in other months.

While the number of rainy days was around 150 days in the Black Sea Region, it was around 25 days in the Southeastern Anatolia Region.

In 2021, the number of extreme events have been registered on TSMS's Kardelen Database were 1024.

Percentage of extreme events recorded in 2021 were; wind storm 40%, heavy rain/floods 28%, hail 13%, heavy snow %7, lightning 5%, forest fire %3, frost 2%, and landslide 2%, avalanche, dust storm, fog, severe cold and drought less than 1%.

The forest fires started in Manavgat, Antalya on 28 July 2021 and spread to 197 locations in 44 provinces, and lasted until 12 August. 3 people died in the fires, 271 people were injured, and hundreds of thousands of hectares of forest and residential areas were burned.

In the flood events that occurred on 10 August due to torrential rains in Kastamonu province and its districts, according to the statement made by the Ministry of Interior, 71 people lost

their lives, 10 people were lost, 1480 people were evacuated, and many houses and workplaces became unusable.

Due to the flood occurred from 9 to 12 August in Sinop, 10 people lost their lives, 6 people were lost and 639 people were evacuated.

2. Temperature

The mean temperature of Türkiye in 2021 was 14.9°C, 1.4°C above the 1981-2010 mean (13.5°C). This made 2021 the 4th warmest year. According to the 1991-2020 new normal (13.9°C), the anomaly was 1°C (Fig.2.1).

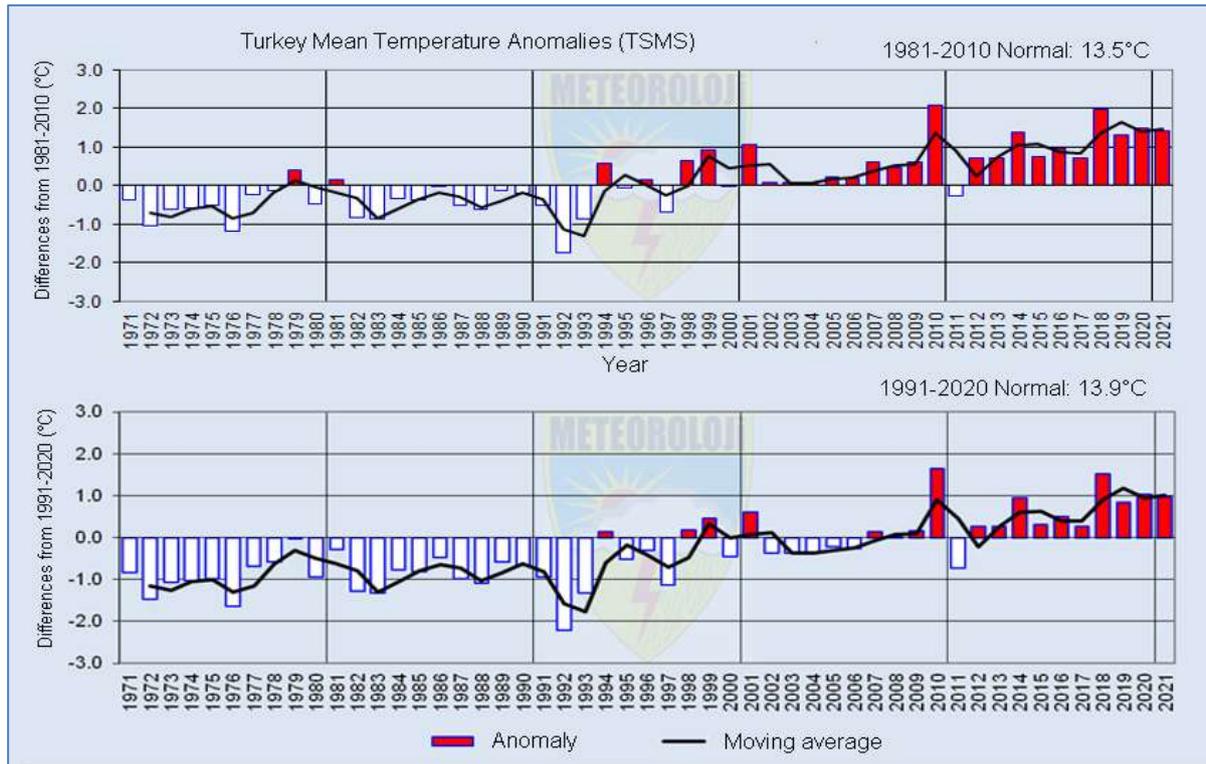


Figure 2.1 Annual mean temperature anomalies according to two normal periods (URL 1)

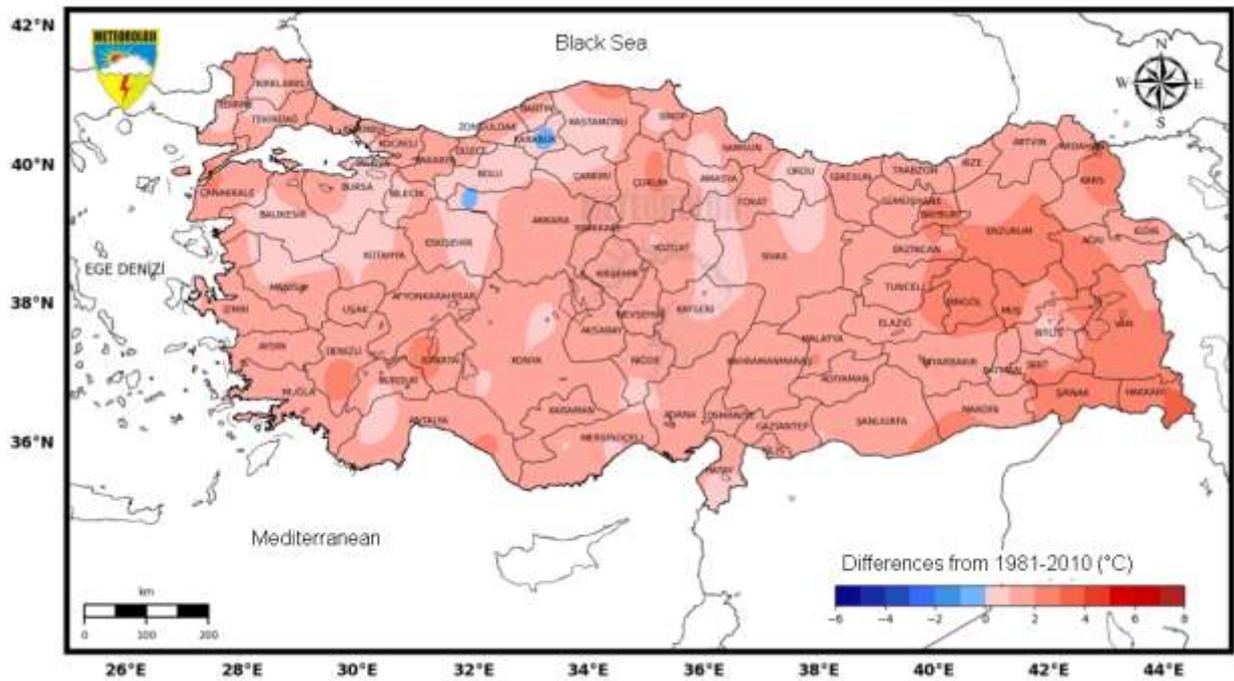


Figure 2.2. Spatial distribution of mean temperature differences in Türkiye in 2021 (URL 1)

Mean temperatures in 2021 were above the normal, except for 2 centres. Eastern parts anomaly was greater than the other regions (Fig. 2.2).

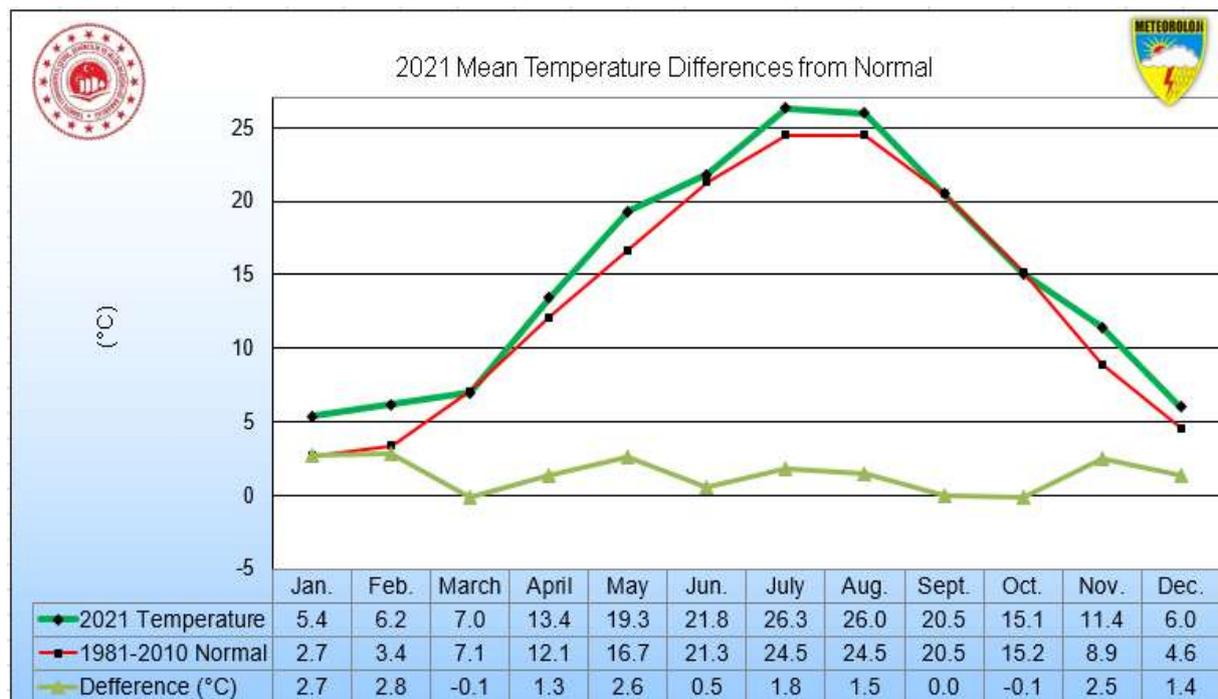


Figure 2. 3 The difference of the monthly mean temperature in 2021 from normal (1981-2010) (URL 1)

Temperatures of all months were above the normal except for March, September and October. In particular, May was the hottest May ever has been recorded for the last 50 years with an anomaly of 2.6 °C, whereas January and July were the second warmest of their respective months (Fig. 2.3).

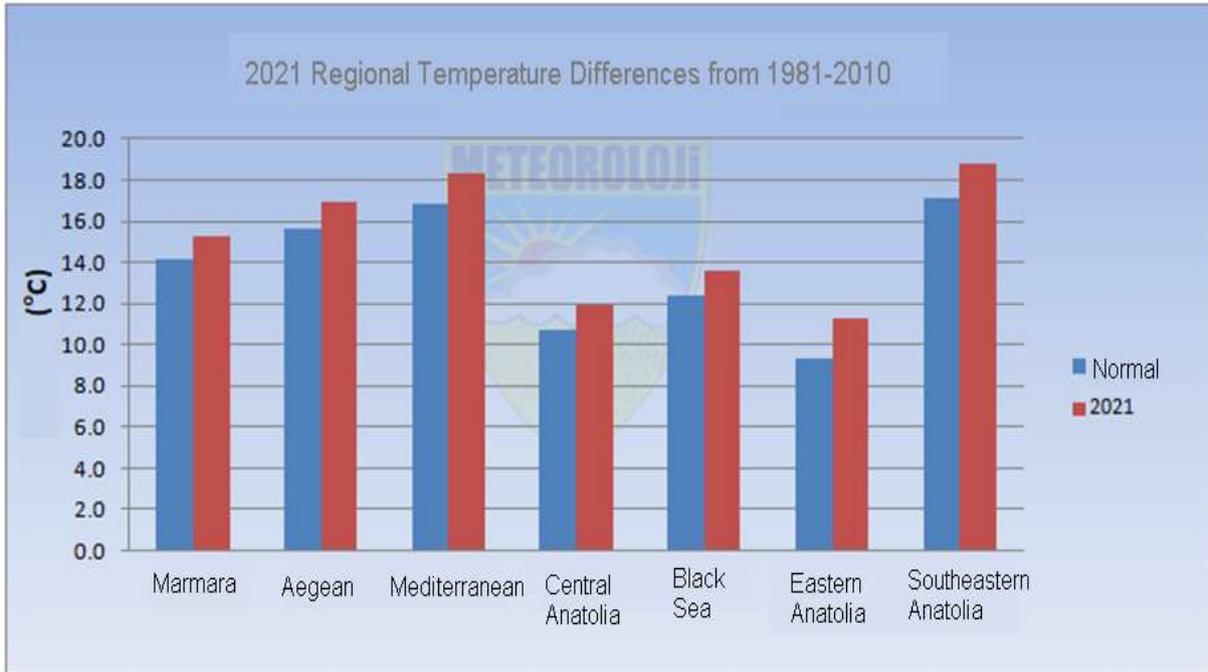


Figure 2. 4 Regional temperature difference in 2021 from normal (1981-2010) (URL 1)

Mean temperatures for 2021 were above normal in all geographic regions (Fig 2.4).

2.1 Seasonal temperature

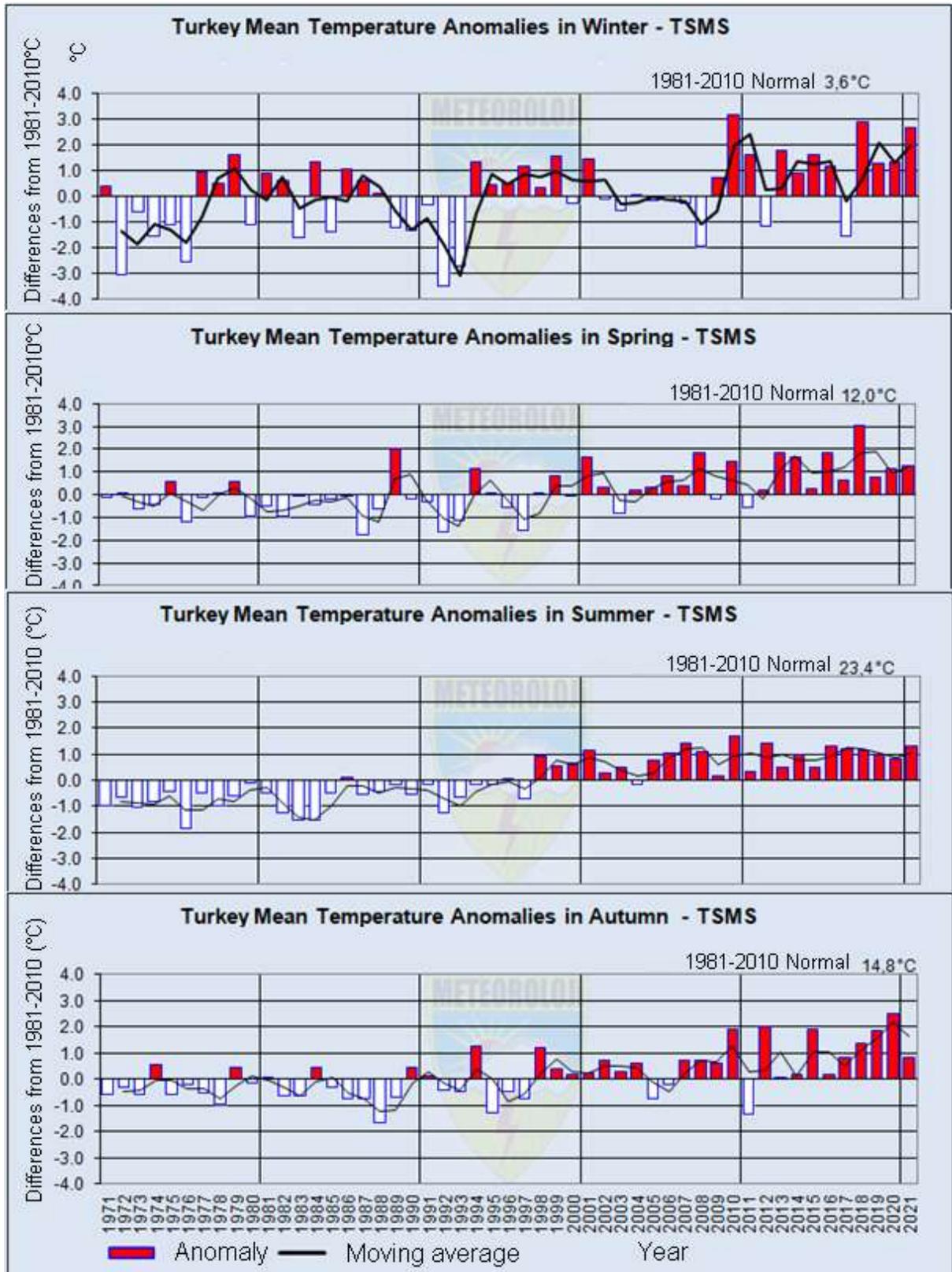


Figure 2. 5 Seasonal mean temperature differences in 2021 (URL 1)

Temperature differences from normal in all seasons of 2021 were positive. Especially, the winter season was the 3rd warmest winter of the last 50 years with an anomaly of 2.6°C (Fig. 2.5).

2.2 Extreme Temperature

The lowest temperature was measured in Ağrı with -34.5°C on January 23, 2021, and the highest temperature was measured in Cizre, Şırnak with 49.1°C on July 20, 2021. This value has been recorded as Türkiye's new extreme maximum temperature. New monthly extreme maximum temperatures recorded in 168 centers are shown in Table 1, and new monthly minimum temperatures are depicted in Table 2.

Table 1. New monthly extreme maximum temperatures recorded in 2021 (URL 1)

Date	Station	2021 Max. Temp (°C)	Previous Monthly Max. Temp (°C) recorded
12 JANUARY	SAKARYA	26.5	25.8
11 JANUARY	ÇANAKKALE	20.6	20.0
12 JANUARY	YALOVA	25.9	25.0
11 JANUARY	BİLECİK	22.3	22.0
11 JANUARY	FLORYA	20.5	19.4
11 JANUARY	GÖNEN/BALIKESİR	23.6	22.7
12 JANUARY	KÜTAHYA	19.1	17.1
11 JANUARY	AYVALIK	21.0	20.5
11 JANUARY	MANİSA	24.2	24.0
11 JANUARY	AFYONKARAHİSAR	18.1	18.0
11 JANUARY	İZMİR	22.5	22.4
11 JANUARY	KUŞADASI	23.7	22.5
11 JANUARY	TAVŞANLI	19.3	18.8
12 JANUARY	SALİHLİ	26.0	25.2
10 JANUARY	SEFERİHİSAR	21.0	20.8
12 JANUARY	BEYŞEHİR	17.2	16.7
12 JANUARY	OSMANİYE	24.9	23.7
12 JANUARY	SENİRKENT	17.6	16.9
11 JANUARY	GÖKSUN	17.5	13.9
10 JANUARY	TEFENNİ	16.9	16.8
12 JANUARY	ÇANKIRI	17.6	15.0
12 JANUARY	SİVAS	18.6	14.6
12 JANUARY	ESKİŞEHİR	19.8	19.2
12 JANUARY	ANKARA BÖLGE	18.4	16.6
12 JANUARY	KIRIKKALE	18.0	17.0
12 JANUARY	GEMEREK	19.4	16.0
12 JANUARY	CİHANBEYLİ	18.5	18.3
12 JANUARY	AKSARAY	20.4	19.4
12 JANUARY	NEVŞEHİR	19.8	18.6
12 JANUARY	KAYSERİ	19.3	18.0
12 JANUARY	AKŞEHİR	19.7	18.0
12 JANUARY	KONYA	19.3	17.6
12 JANUARY	EREĞLİ	21.6	21.0
12 JANUARY	NİĞDE	19.9	18.6
12 JANUARY	POLATLI	18.2	17.8

12 JANUARY	ÇİÇEKDAĞI	20.5	18.8
12 JANUARY	KULU	16.6	15.4
12 JANUARY	KAMAN	15.8	15.2
12 JANUARY	BOĞAZLIYAN	20.3	17.5
12 JANUARY	KANGAL	13.1	12.5
12 JANUARY	PINARBAŞI/KAYSERİ	15.8	14.2
11 JANUARY	SEYDİŞEHİR	17.0	16.5
12 JANUARY	ÇUMRA	19.9	19.0
12 JANUARY	KARAPINAR	20.0	19.6
12 JANUARY	İNEBOLU	25.5	24.4
13 JANUARY	GİRESUN	25.9	24.9
13 JANUARY	TRABZON	27.0	25.9
13 JANUARY	RİZE	26.6	24.0
13 JANUARY	HOPA	25.0	24.2
12 JANUARY	DÜZCE	26.1	24.5
12 JANUARY	KASTAMONU	19.2	17.3
12 JANUARY	MERZİFON	20.2	18.0
12 JANUARY	ÇORUM	20.6	17.5
12 JANUARY	AMASYA	23.5	21.3
12 JANUARY	TOKAT	21.9	20.2
13 JANUARY	GÜMÜŞHANE	15.5	14.8
13 JANUARY	BAYBURT	11.0	10.3
12 JANUARY	TOSYA	17.2	14.6
12 JANUARY	OSMANCIK	21.9	19.8
12 JANUARY	OLTU	15.1	14.0
12 JANUARY	BEYPAZARI	18.5	18.2
12 JANUARY	ZİLE	21.6	20.0
12 JANUARY	ŞEBİNKARAHİSAR	14.8	14.2
12 JANUARY	ARDAHAN	11.1	11.0
13 JANUARY	ERZİNCAN	14.6	14.0
12 JANUARY	KARS	9.1	8.4
13 JANUARY	HORASAN	11.8	10.5
03 JANUARY	KARAKOÇAN	12.5	11.9
11 JANUARY	SARIZ	13.6	13.0
12 JANUARY	DOĞANŞEHİR	13.8	12.0
03 JANUARY	AKÇAKALE	20.5	20.2
24 FEBRUARY	DALAMAN	26.6	25.4
05 FEBRUARY	ANAMUR	23.9	23.2
08 FEBRUARY	CİDE	25.3	24.9
09 FEBRUARY	OLTU	21.5	16.8
10 FEBRUARY	ŞEBİNKARAHİSAR	25.6	16.4
14 FEBRUARY	HINIS	10.0	9.5
30 APRİL	MUĞLA	31.6	31.2
30 APRİL	YATAĞAN	33.4	33.2
20 APRİL	ŞEBİNKARAHİSAR	31.0	29.3
26 APRİL	VİRANŞEHİR	34.3	33.3
21 MAY	SİVAS	33.5	32.0

20 MAY	AKSARAY	34.4	34.1
21 MAY	ARTVİN	36.7	36.4
20 MAY	AMASYA	37.9	37.5
21 MAY	TOKAT	37.2	36.4
21 MAY	GÜMÜŞHANE	34.4	32.6
21 MAY	BAYBURT	31.3	29.6
21 MAY	ZİLE	35.9	35.0
21 MAY	ARDAHAN	28.9	26.6
22 MAY	KARS	28.3	27.0
21 MAY	IĞDIR	35.9	35.0
21 MAY	VAN BÖLGE	29.3	28.3
21 MAY	MALATYA	36.3	36.0
21 MAY	ELAZIĞ	36.6	34.4
21 MAY	BİNGÖL	33.9	33.4
21 MAY	MUŞ	32.2	31.2
21 MAY	HAKKARİ	30.7	28.7
21 MAY	TORTUM	31.5	30.5
21 MAY	HORASAN	31.0	29.4
21 MAY	SARIKAMIŞ	25.9	24.0
21 MAY	TERCAN	31.7	31.0
21 MAY	DİVRİĞİ	33.9	33.1
21 MAY	ARAPGİR	33.7	33.2
21 MAY	ÇEMİŞGEZEK	35.9	34.7
21 MAY	KARAKOÇAN	33.6	33.1
21 MAY	SOLHAN	31.9	31.0
21 MAY	ERGANİ	36.6	35.4
22 MAY	YÜKSEKOVA	28.0	27.1
21 MAY	SİİRT	36.8	36.2
21 MAY	ŞANLIURFA	40.4	40.3
21 MAY	MARDİN	36.1	35.4
21 MAY	ŞIRNAK	34.1	31.8
21 MAY	ÇERMİK	38.2	38.1
21 MAY	KAHTA	38.2	37.8
21 MAY	SİVEREK	38.4	37.7
21 MAY	VİRANŞEHİR	41.7	39.3
21 MAY	CİZRE	41.9	40.5
21 MAY	CEYLANPINAR	44.3	42.1
21 MAY	AKÇAKALE	41.4	40.7
30 JUNE	ÇANAKKALE	38.5	36.8
19 JUNE	BAYBURT	34.7	32.9
20 JUNE	İSPİR	38.5	37.5
20 JUNE	OLTU	36.6	36.5
24 JUNE	ARDAHAN	33.1	29.1
19 JUNE	ERZURUM	32.3	32.2
24 JUNE	KARS	33.9	31.6
19 JUNE	TORTUM	35.0	34.0
20 JUNE	HORASAN	34.8	34.3

19 JUNE	TERCAN	35.6	34.0
19 JUNE	HINIS	33.3	32.2
19 JUNE	SOLHAN	35.8	35.3
19 JUNE	MALAZGİRT	36.5	34.8
19 JUNE	AHLAT	33.8	32.0
18 JULY	ÇANAKKALE	39.1	39.0
28 JULY	YUMURTALIK	42.1	40.0
21 JULY	KARS	35.6	35.4
20 JULY	ELAZIĞ	42.4	42.2
20 JULY	VİRANŞEHİR	46.7	46.0
20 JULY	CİZRE	49.1	48.9
03 AUGUST	TEKİRDAĞ	39.4	37.5
01 AUGUST	ÇANAKKALE	39.7	39.1
03 AUGUST	AKHİSAR	44.8	44.5
03 AUGUST	MANİSA	44.7	44.5
03 AUGUST	AYDIN	45.1	43.8
03 AUGUST	DATÇA	42.0	41.2
03 AUGUST	MARMARİS	45.5	43.0
03 AUGUST	DURSUNBEY	39.8	39.4
03 AUGUST	BERGAMA	43.6	41.8
03 AUGUST	ÖDEMİŞ	44.3	43.8
03 AUGUST	NAZİLLİ	45.3	44.3
04 AUGUST	MİLAS	44.5	43.6
03 AUGUST	DALAMAN	45.5	44.0
03 AUGUST	FETHİYE	44.0	43.7
03 AUGUST	ANTALYA	44.8	44.6
04 AUGUST	FİNİKE	43.3	42.4
03 AUGUST	KAŞ	41.0	40.3
06 AUGUST	EĞİRDİR	37.5	36.3
04 AUGUST	KÖYCEĞİZ	46.1	44.3
03 AUGUST	MANAVGAT	43.9	43.2
03 AUGUST	KALE-DEMRE	43.4	42.8
02 AUGUST	GAZİPAŞA	40.2	40.0
24 SEPTEMBER	HORASAN	-4.7	-4.6
03 NOVEMBER	BANDIRMA	29.9	28.8
06 NOVEMBER	AYDIN	31.1	30.7
07 NOVEMBER	BURDUR	26.5	25.6
07 NOVEMBER	EĞİRDİR	23.9	22.6
05 NOVEMBER	BARTIN	30.6	29.0

Table 2. New monthly extreme minimum temperatures recorded in 2021 (URL 1)

Date	Station	2021 Minimum Temperature (°C)	Previous Monthly Min. Temp (°C) recorded
10 MAY	ZARA	-5.7	-3.2
27 OCTOBER	HORASAN	-9.9	-9.8
24 DECEMBER	BEYŞEHİR	-20.0	-19.4
02 DECEMBER	BİTLİS	-24.4	-21.9

3. Precipitation

Türkiye areal mean precipitation in 2021 was 524.8 mm. This value is approximately 9 % below from both 1991-2020's normal (573.4 mm) and 1981-2010's normal (574mm) (Fig. 3.1).

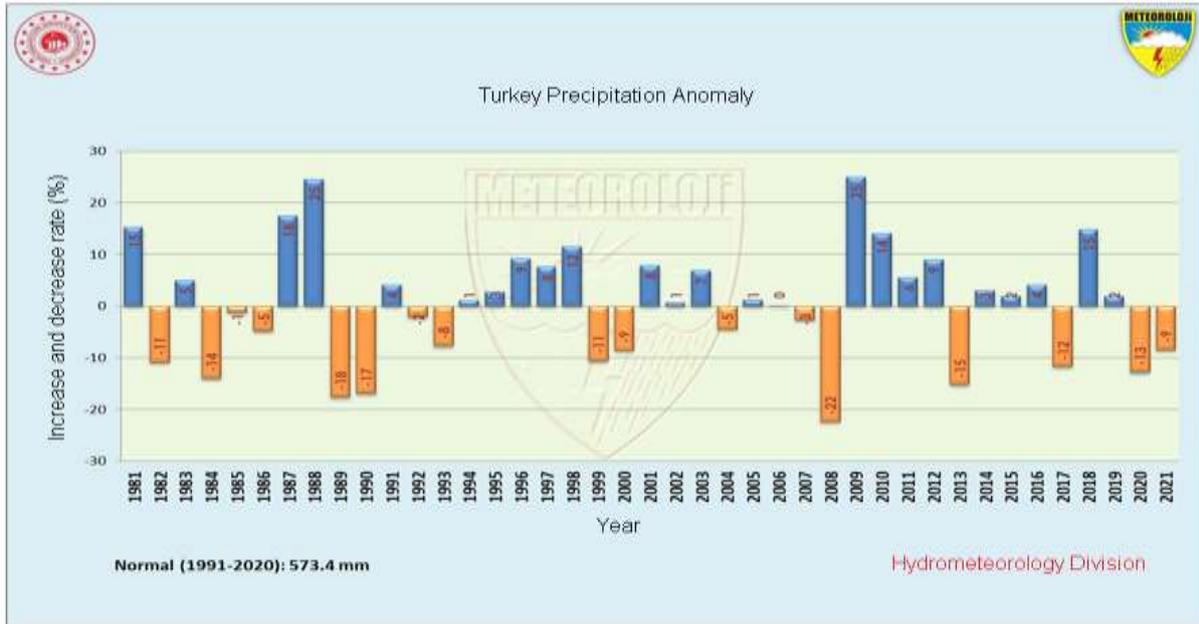


Figure 3. 1 Areal precipitation anomaly in 2021 for Türkiye (URL 2)



Figure 3. 2 Spatial distribution of mean precipitation anomalies in 2021 (URL 2)

In 2021, while Marmara, Black Sea, and İzmir received 40-60% more precipitation than normal, Southeastern Anatolia Region received 40-80% less precipitation than normal (Fig. 3.2).

3.1. Monthly precipitation

The monthly areal precipitation totals for 2021 were below the normal in February, April, May, October and November, and above the normal in other months. While the maximum decrease in precipitation occurred in May with 59%, the maximum increase in precipitation occurred in August with 40.9% (Fig.3.3).

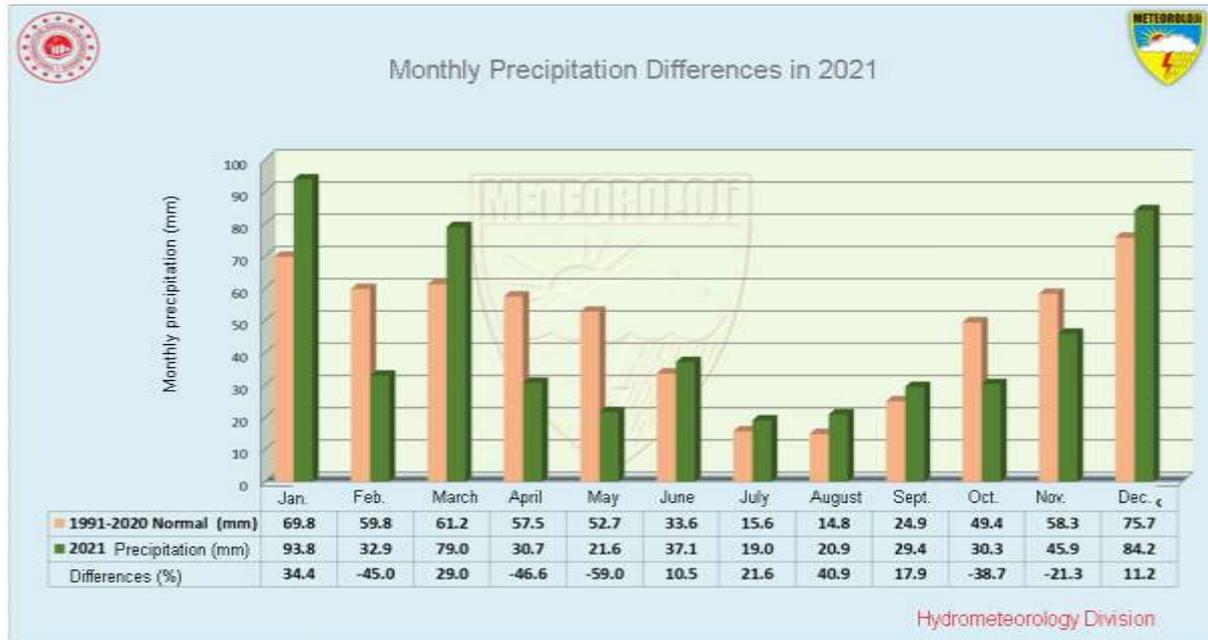


Figure 3. 3 Monthly Precipitation Differences in 2021 (URL 2)

3.2. Rainy days

While the number of rainy days was around 150 days in the Black Sea Region, it was around 25 days in the South-eastern Anatolia Region (Fig. 3.4).

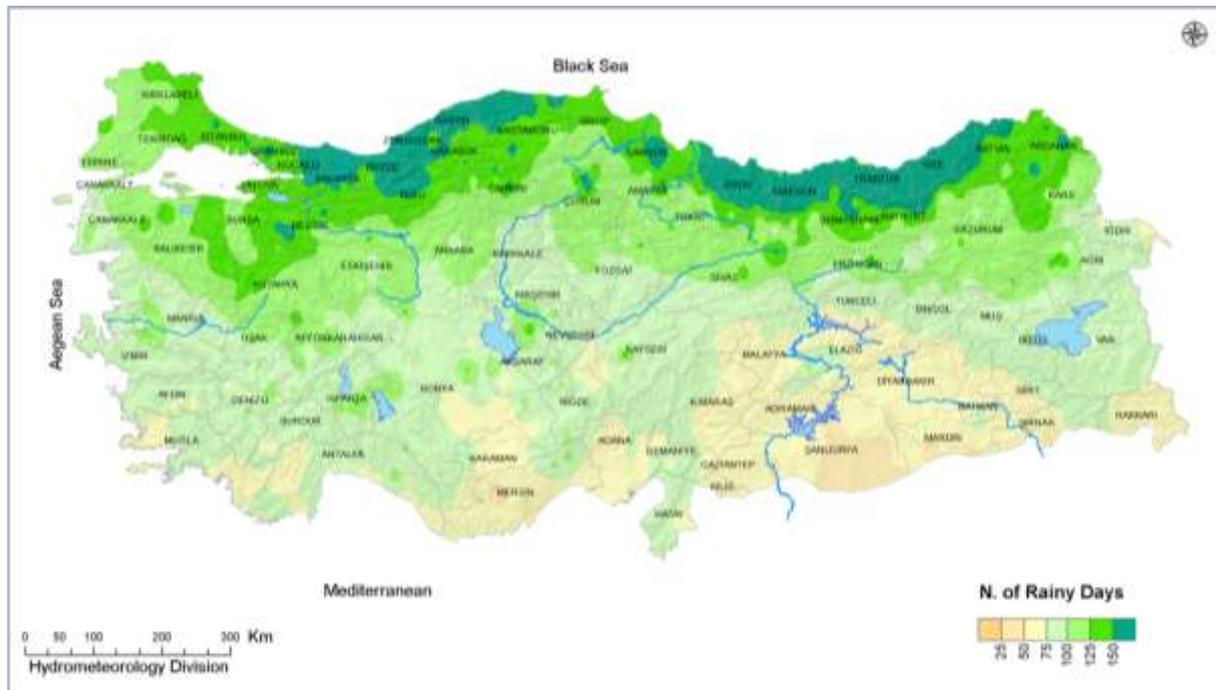


Figure 3. 4 Number of rainy days in 2021 (URL 2)

4. Extreme Meteorological Events

In 2021, the number of extreme meteorological events have been registered on TSMS's Kardelen Database were 1024 (Fig. 4.1).

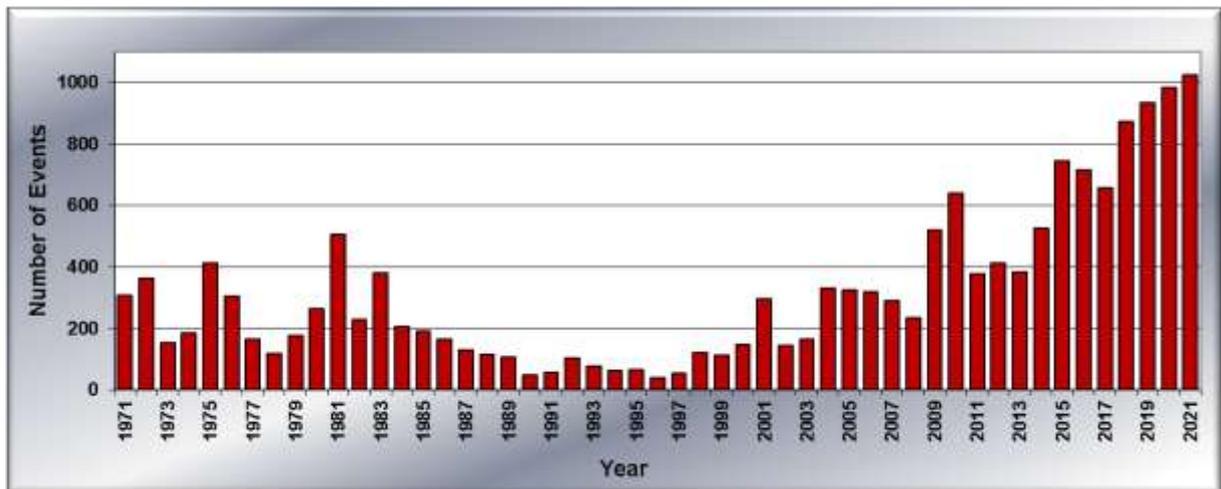


Figure 4.1. Number of extreme events occurred in Türkiye between 1971 and 2021(URL 3).

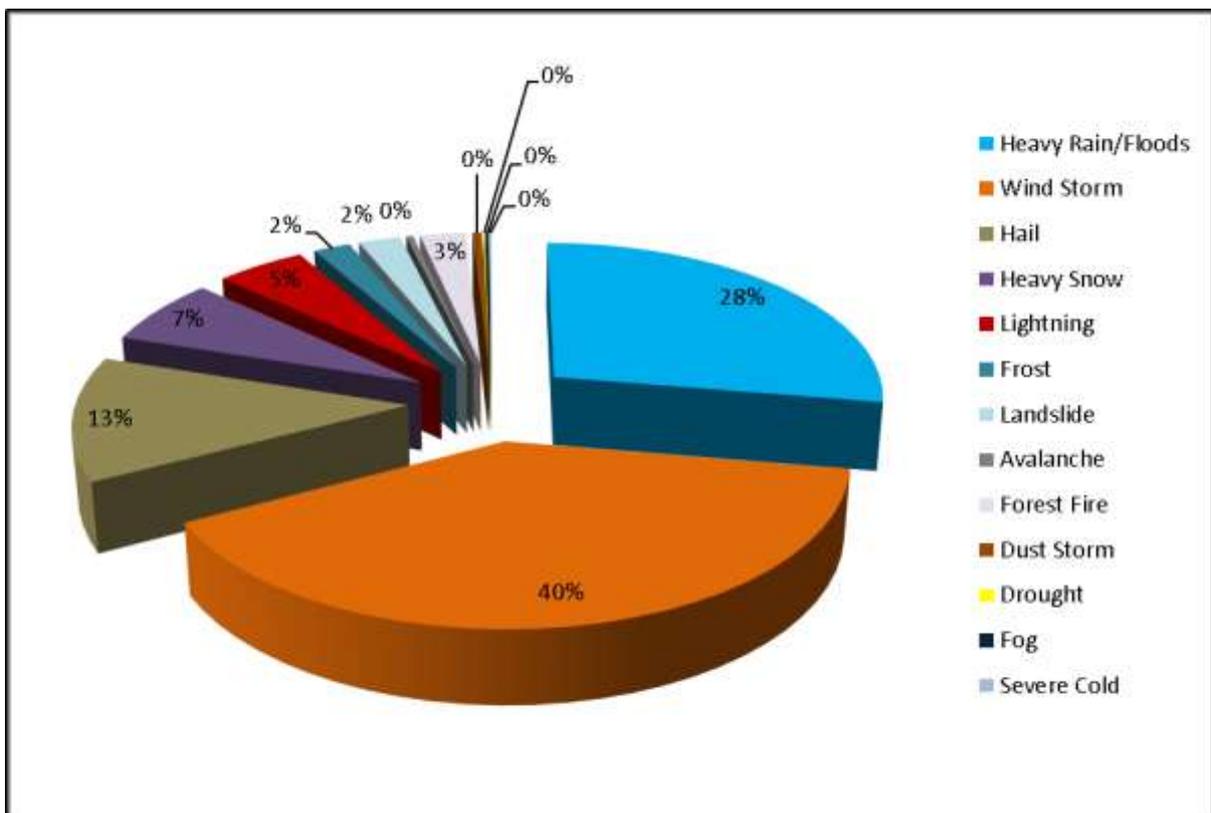


Figure 4.2. Percentage of extreme events in 2021 (URL 3)

Percentage of extreme events recorded in 2021 were; wind storm 40%, heavy rain/flood 28%, hail 13%, heavy snow %7, lightning 5%, forest fire %3, frost 2%, landslide 2%, and avalanche, dust storm, fog, severe cold and drought less than 1% (Fig. 4.2).

4.1. Forest Fires

The forest fires started in Manavgat, Antalya on 28 July 2021 and spread to 197 locations in 44 provinces, and lasted until 12 August. 3 people died in the fires, 271 people were injured, hundreds of thousands of hectares of forest and residential areas were burned, thousands of animals died, thousands of tourists and citizens were evacuated (Fig. 4.3) (URL 5).



Figure 4.3. Forest fire in Manavgat/Antalya on 28 July 2021 (URL 5)

4.2 Heavy rain/floods

In the flood events that occurred on 10 August due to torrential rains in Kastamonu province and its districts, according to the statement made by the Ministry of Interior, 71 people lost their lives, 10 people were lost, 1480 people were evacuated, and many houses and workplaces became unusable (Fig. 4.4, Table 3) (URL 6).



Figure 4.4. Heavy rain/floods in Bozkurt, Kastamonu , 10 August 2021 (URL 6)

Table 3. Amount of precipitation in Kastamonu and its districts (URL 2)

District	Precipitation (mm)	District	Precipitation (mm)
Bozkurt/Mamatlar	451.7 mm	Araç Köyü	101.4 mm
Devrekani/Kuz	386.2 mm	Pınarbaşı Kar İst.	95.3 mm
Küre	386.2 mm	Taşköprü	93.0 mm
Abana	279.2 mm	İhsangazi/İnciğez	88.4 mm
İnebolu	275.0 mm	Şenpazar	86.5 mm
İnebolu/Yolüstü	221.0 mm	Çatalzeytin	79.0 mm
Azdavay	157.5 mm	Kastamonu	76.1 mm
Pınarbaşı	151.2 mm	Kastomonu/Mescit	73.2 mm
Devrekani	142.8 mm	İnebolu	71.8 mm
Ağlı	131.5 mm	Cide	47.8 mm
Kastamonu/Başören	121.0 mm	Tosya	36.6 mm
Orman Sahası	110.0 mm	Doğanyurt	32.8 mm
Seydiler	105.4 mm	Daday İhsangazi	60.3mm
Hanönü	105.1 mm		

Due to the flood occurred from 9 to 12 August in Sinop, 10 people lost their lives, 6 people were lost and 639 people were evacuated. In addition, settlements, energy and communication transmission lines and highways were damaged (Fig 4.5, Table 4).



Figure 4.5. Heavy rain/floods in Sinop and its districts, 10 August 2021 (URL 6)

Table 4. Amount of precipitation received in the province of Sinop and its districts

District	Precipitation
Ayancık	333,63 mm
Ayancık (Akören)	220,97 mm
Türkeli	227,66 mm
Ayancık (Çangal)	217,8 mm
Erfelek	180,10 mm
Sinop	166,6 mm
Sinop(Sazlı)	168,44 mm
Sinop(Sarıkm)	148,36 mm
Gerze	154,70 mm
Dikmen	90,15 mm

4.3. Drought

The twelve-month standardized precipitation index shows exceptionally dry conditions in the Southeastern Anatolia Region, and severe and moderate drought in the Eastern Anatolia, and around Denizli and Burdur. Central and western Black Sea, Marmara and northern Aegean had a moist year (Fig. 4.6).

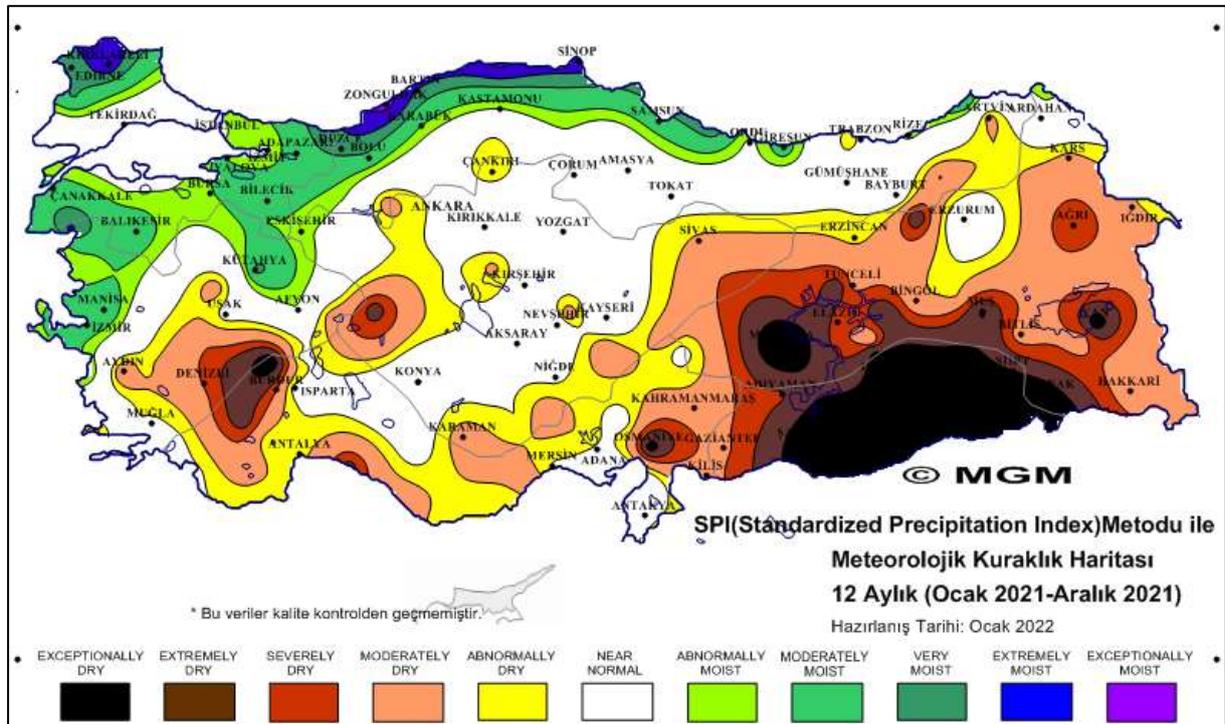


Figure 4.6. Twelve-month Standardized Precipitation Index in Türkiye in 2021 (URL 4)

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