



REPUBLIC of TURKEY
MINISTRY of FORESTRY & WATER AFFAIRS
TURKISH STATE METEOROLOGICAL SERVICE



State of the Climate in Turkey in 2016



Research Department

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Erdoğan Bölük, Hüseyin Arabacı, Osman Eskioğlu, Sefer Kervankıran

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CONTENT

	<u>Page</u>
1. Introduction	1
2. Temperature.....	2
2.1. Monthly temperature	3
2.2. Seasonal temperature	3
2.3. Heat and cold waves in 2016.....	4
2.4. Extreme temperatures in 2016.....	5
3. Areal Precipitation	7
3.1. Monthly precipitation	8
3.2. Seasonal precipitation	8
4. Notable events	9
4.1. Heavy Rain, Floods.....	10
4.2. Hail.....	10
References	11

1. Introduction

Turkey annual mean temperature in 2016 has been 14.5°C. This value is 1.0°C above from 1981-2010 normal (13.5°C). This makes 2016 the fourth warmest year since 1971. Generally most of the country had above normal temperature except for Bitlis, Batman and Ağrı where they were slightly below anomaly. Temperature anomaly in İstanbul, Tekirdağ, Antalya, Aksaray, Eskişehir, Konya, Erzurum and Diyarbakır are greater than 1.5°C (Fig. 2.2).

Monthly mean temperatures of 2016 were above normal in most of the months except April, June and December which they were below it (Fig. 2.3).

All the seasons temperatures were above normal (1981-2010). Among them, spring temperature anomalies were particularly striking with 1.8°C.

200 stations had heat waves in 2016. Total number of heat wave is 561 (some of the stations had more than once). There was no cold wave in 2016.

Lowest minimum temperature in 2016 was in December with -35.1°C in Ağrı while highest maximum temperature was in July with 47.2°C in Cizre. 85 stations have broken their monthly extreme maximum temperature records and one station (Bitlis) has broken its monthly extreme minimum temperature records in 2016 (Table 1).

Annual mean areal precipitation in 2016 has been 598 mm. This value is 4% above from 1981-2010 normal (574 mm) (Fig. 3.1).

Generally northern part of Turkey received above normal precipitation while southern part received below it in 2016. The highest rainfall was observed in January.

Monthly precipitations in 2016 were above the 1981-2010's average in January, March, May, June, August and September while below it in February, April, July, October, November and December (Fig. 3.3).

Spring and summer precipitations were above normal while winter and autumn below it.

The number of extreme events in 2016 reached 1313 (Fig. 4.1). There is an increasing trend in extreme event (17.0 events/year). Extreme event database updated with heat and cold waves.

During 2016 most hazardous extreme events were heat waves (43%), wind storm (22%), heavy rain/floods (11%), hail (8%), heavy snow (4%), tornado (4%), avalanche (3%), frost (3%) and lightning (2%). And also 8 forest fire occurred in 2016.

2. Temperature

Turkey annual mean temperature in 2016 has been 14.5°C. This value is 1.0°C above from 1981-2010 normal (13.5°C) (Fig.2.1). This makes 2016 the fourth warmest year since 1971 (Fig. 2.2).

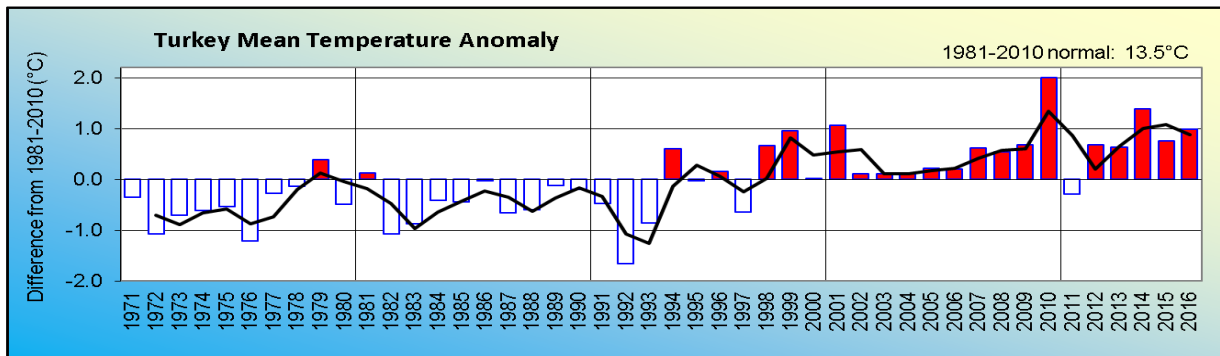


Figure 2.1 Annual mean temperature anomalies in Turkey (URL 1).

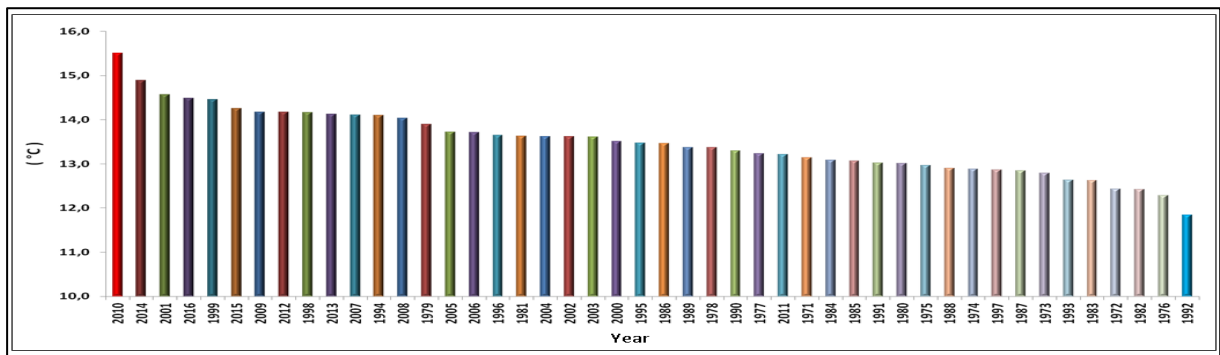


Figure 2.2 Rank of hottest years to coldest (URL 1).

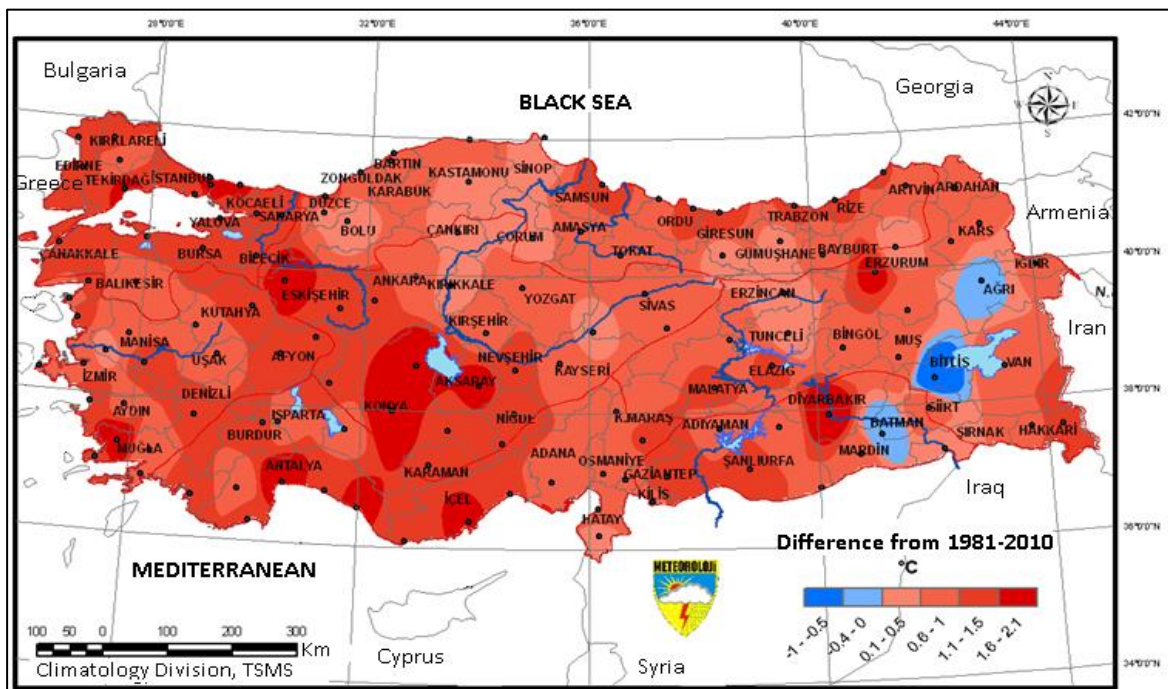


Figure 2.3 Spatial distribution of mean temperature differences in Turkey in 2016 (URL 1).

Generally most of the country had above normal temperature except for Bitlis, Batman and Ağrı which they were slightly below normal (Fig. 2.3). Temperature anomaly in İstanbul, Tekirdağ, Antalya, Aksaray, Eskişehir, Konya, Erzurum and Diyarbakır are greater than 1.5°C.

2.1. Monthly temperature

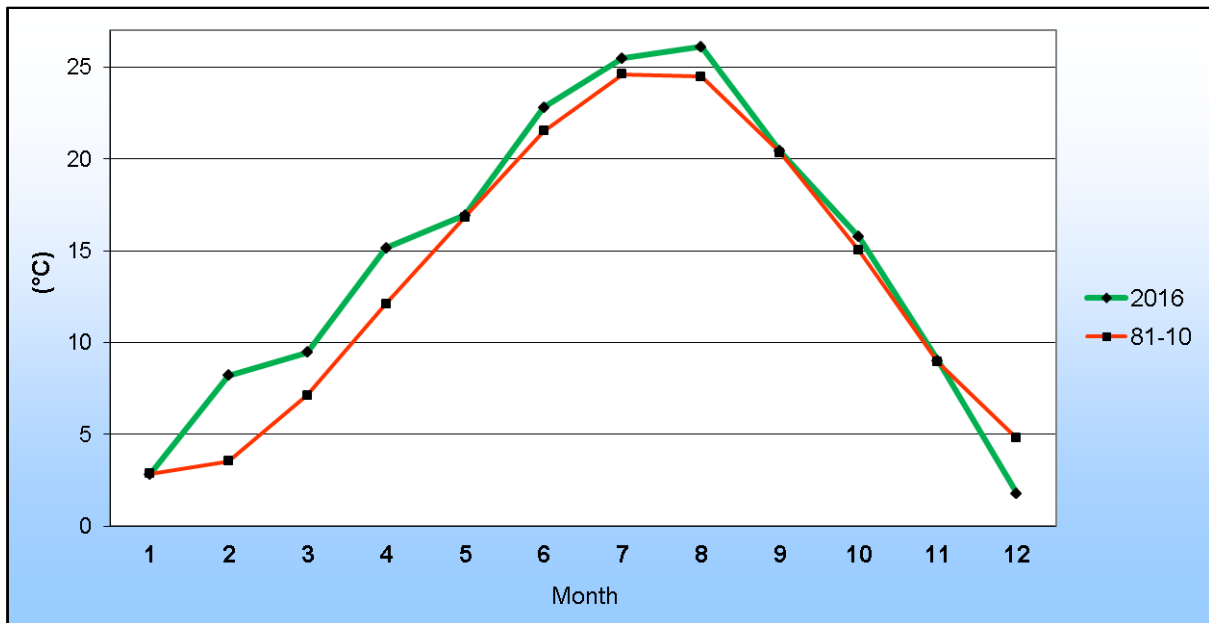


Figure 2.4 Monthly mean temperature differences in Turkey in 2016 (URL 1).

Monthly mean temperatures of 2016 were near normal in January, May, September and November, above normal in February, March, April, June, July, August, October and below normal in December (Fig. 2.4).

2.2. Seasonal temperature

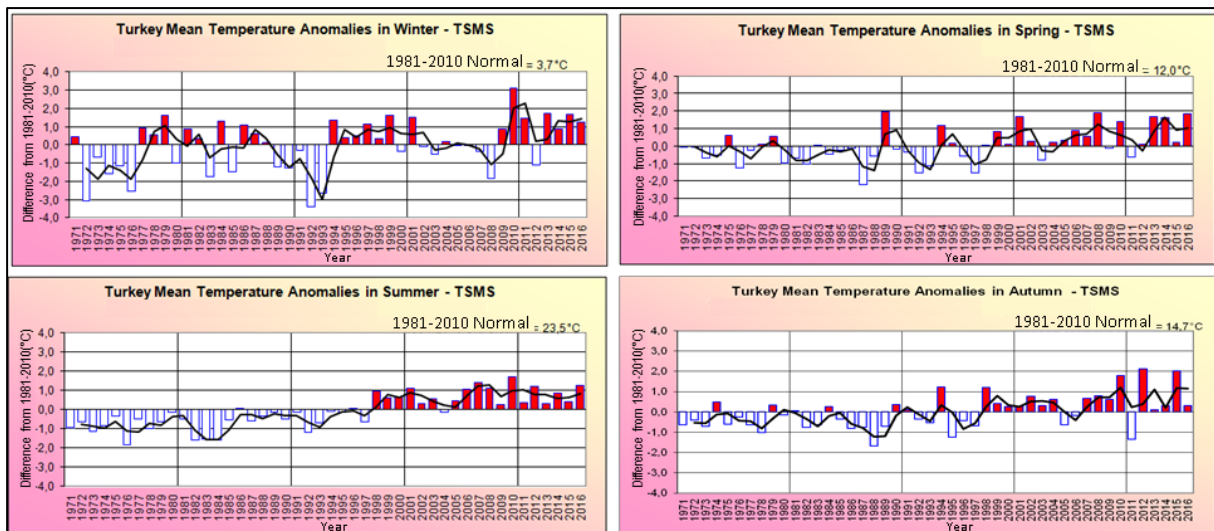


Figure 2.5 Seasonal temperature anomalies in Turkey in 2016 (URL 1).

All the seasons temperatures were above normal (1981-2010). Among them spring temperature anomalies were particularly striking with 1.8°C.

2015-2016 mean winter temperature was 4.9°C which is 1.2°C above normal (3.7°C).

2016 mean spring temperature was 13.8°C which is 1.8°C above normal (12.0°C).

2016 mean summer temperature was 24.8°C which is 1.3°C above normal (23.5°C).

2016 mean autumn temperature was 15.1°C which is 0.4°C above normal (14.7°C).

2.3. Heat and cold waves in 2016

Heat wave is daily maximum temperature on more than five consecutive days exceeding the average maximum temperature by 5°C. Cold wave is daily minimum temperature on more than five consecutive days below the average minimum temperature by 5°C (Frich et al., 2002).

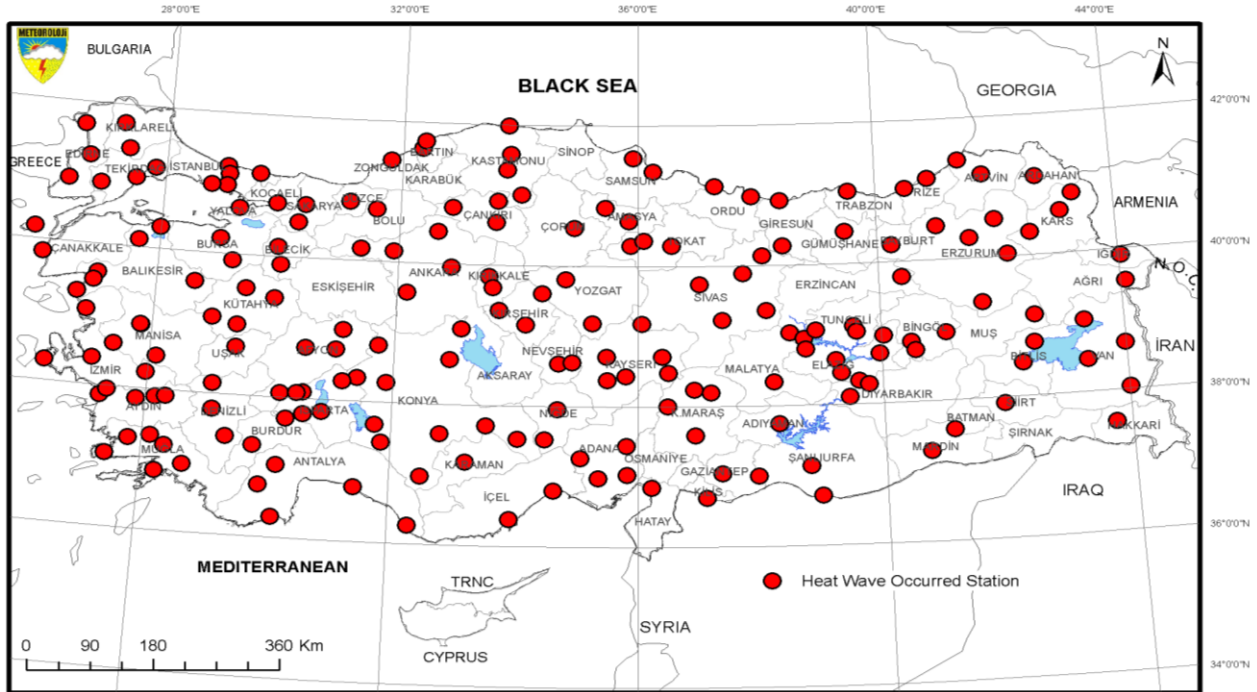


Figure 2.6 Areal distribution of heat wave occurred locations in 2016 (based on 1971-2000 normals).

200 stations had heat waves in 2016. Total number of heat wave is 561 (some of the stations had more than once) (based on 1971-2000 normals). There was no cold wave in 2016.

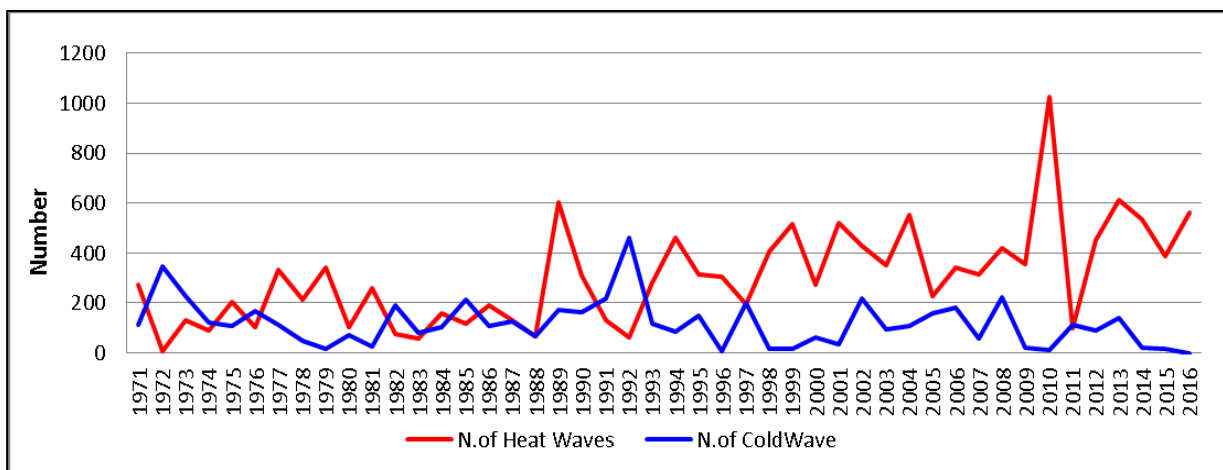


Figure 2.7 Annual Number of Heat & Cold Waves in Turkey.

Highest number of heat wave occurred in 2010 which was the warmest year in Turkey. Highest number of cold wave occurred in 1992 which was the coldest year in Turkey after Pinatubo Volcano eruption.

2.4. Extreme temperatures in 2016

Lowest minimum temperature in 2016 was in December with -35.1°C in Ağrı while highest maximum temperature was in July with 47.2°C in Cizre. 85 stations have broken their monthly extreme maximum temperature records and one station (Bitlis) has broken its monthly extreme minimum temperature records in 2016 (Table 1).

Table 1. Stations broken their extreme maximum and minimum temperature records in 2016.

Date	Station	Long Term Maximum Temperature ($^{\circ}\text{C}$)	2016 Maximum Temperature ($^{\circ}\text{C}$)	Difference
06.01.2016	MİLAS	22,5	23,6	1,1
16.02.2016	BALIKESİR	24,8	25,2	0,4
15.02.2016	BANDIRMA	23,4	24,9	1,5
16.02.2016	EDİRNE	23,2	23,3	0,1
16.02.2016	SARIYER	23,2	24,7	1,5
17.02.2016	KIRKLARELİ	21,0	23,1	2,1
16.02.2016	KOCAELİ	26,0	26,7	0,7
16.02.2016	KUMKOY	23,6	25,0	1,4
16.02.2016	SAKARYA	27,1	28,7	1,6
16.02.2016	ŞİLE	25,6	26,5	0,9
17.02.2016	UZUNKOPRU	20,8	22,0	1,2
18.02.2016	AFYONKARAHİSAR	20,2	21,8	1,6
16.02.2016	AKHİSAR	24,7	27,7	3,0
18.02.2016	AYDIN	25,2	27,4	2,2
16.02.2016	AYVALIK	22,4	23,9	1,5
18.02.2016	BODRUM	24,0	24,8	0,8
18.02.2016	ÇEŞME	22,4	25,1	2,7
18.02.2016	DİKİLİ	24,2	25,1	0,9
18.02.2016	EDREMİT	23,5	25,6	2,1
18.02.2016	İZMİR	23,9	27,0	3,1
18.02.2016	KUŞADASI	23,6	26,8	3,2
29.02.2016	KÜTAHYA	21,0	24,2	3,2
15.02.2016	MANİSA	24,8	26,4	1,6
16.02.2016	MILAS	24,9	32,4	7,5
17.02.2016	MUĞLA	21,2	25,5	4,3
15.02.2016	SALIHLI	26,5	27,4	0,9
18.02.2016	SİMAV	21,3	23,9	2,6
29.02.2016	UŞAK	20,1	23,6	3,5
18.02.2016	ADANA	26,7	28,5	1,8
18.02.2016	HATAY	25,0	26,6	1,6
16.02.2016	BURDUR	20,9	23,4	2,5
18.02.2016	FİNİKE	24,3	25,5	1,2
16.02.2016	ISPARTA	21,0	22,5	1,5
18.02.2016	ISLAHİYE	22,2	24,6	2,4
18.02.2016	KAHRAMANMARAŞ	22,4	25,3	2,9
17.02.2016	OSMANIYE	26,2	28,0	1,8
17.02.2016	SİLİFKE	26,3	28,1	1,8
18.02.2016	AKSARAY	21,6	21,8	0,2
18.02.2016	AKŞEHİR	20,2	23,1	2,9
18.02.2016	ANKARA	20,4	21,3	0,9
Date	Station	Long Term Maximum Temperature ($^{\circ}\text{C}$)	2016 Maximum Temperature ($^{\circ}\text{C}$)	Difference

16.02.2016	CİHANBEYLİ	20,0	22,4	2,4
29.02.2016	KARAMAN	22,1	22,3	0,2
19.02.2016	NEVŞEHİR	18,8	19,3	0,5
29.02.2016	NİĞDE	20,4	20,5	0,1
29.02.2016	POLATLI	20,0	21,0	1,0
29.02.2016	SİVRİHİSAR	19,9	20,8	0,9
19.02.2016	ULUKIŞLA	19,2	19,6	0,4
17.02.2016	YOZGAT	17,3	18,5	1,2
16.02.2016	AMASRA	25,0	25,1	0,1
15.02.2016	ARTVİN	21,2	21,5	0,3
29.02.2016	BOLU	21,8	24,1	2,3
29.02.2016	DÜZCE	25,6	26,9	1,3
16.02.2016	SİNOP	23,7	25,0	1,3
29.02.2016	ARAPGİR	16,7	16,9	0,2
18.02.2016	ELAZIĞ	17,4	18,6	1,2
16.02.2016	HAKKARİ	11,7	12,2	0,5
20.02.2016	HINIS	8,4	9,4	1,0
18.02.2016	MALATYA	18,9	20,3	1,4
29.02.2016	TUNCELİ	18,6	19,4	0,8
18.02.2016	ADİYAMAN	21,7	23,8	2,1
17.02.2016	DİYARBAKIR	21,3	22,8	1,5
18.02.2016	GAZİANTEP	22,7	24,3	1,6
18.02.2016	KİLİS	22,7	25,1	2,4
17.02.2016	MARDİN	18,4	19,5	1,1
18.02.2016	SİVEREK	20,0	22,6	2,6
18.02.2016	ŞANLIURFA	22,7	25,5	2,8
18.04.2016	KIRKLARELİ	30,5	31,5	1,0
19.04.2016	AKHİSAR	33,6	35,7	2,1
30.04.2016	MİLAS	33,7	35,8	2,1
20.04.2016	ORDU	36,5	36,8	0,3
20.04.2016	ÜNYE	34,2	34,5	0,3
08.04.2016	TORTUM	27,3	29,1	1,8
19.06.2016	AKHİSAR	43,3	43,9	0,6
18.06.2016	BODRUM	42,3	42,8	0,5
19.06.2016	DENİZLİ	42,4	44,1	1,7
20.06.2016	EDREMİT	40,1	41,4	1,3
21.06.0216	MİLAS	43,4	45,7	2,3
21.06.0216	ALANYA	37,8	38,2	0,4
27.06.2016	KIRŞEHİR	36	36,2	0,2
14.06.2016	RİZE	35,2	36,1	0,9
14.06.2016	TRABZON	36,6	36,7	0,1
26.06.2016	ADİYAMAN	40,7	41,5	0,8
20.09.2016	GİRESUN	32,8	32,9	0,1
20.09.2016	RİZE	33,4	34,6	1,2
20.09.2016	TRABZON	33,2	37,9	4,7
Date	Station	Long Term Minimum Temperature (°C)	2016 Minimum Temperature (°C)	Difference
28.01.2016	BİTLİS	-21,3	-24,1	2,8

3. Areal Precipitation

Turkey annual mean areal precipitation in 2016 has been 598 mm. This value is 4% above from 1981-2010 normal (574 mm) (Fig.3.1)

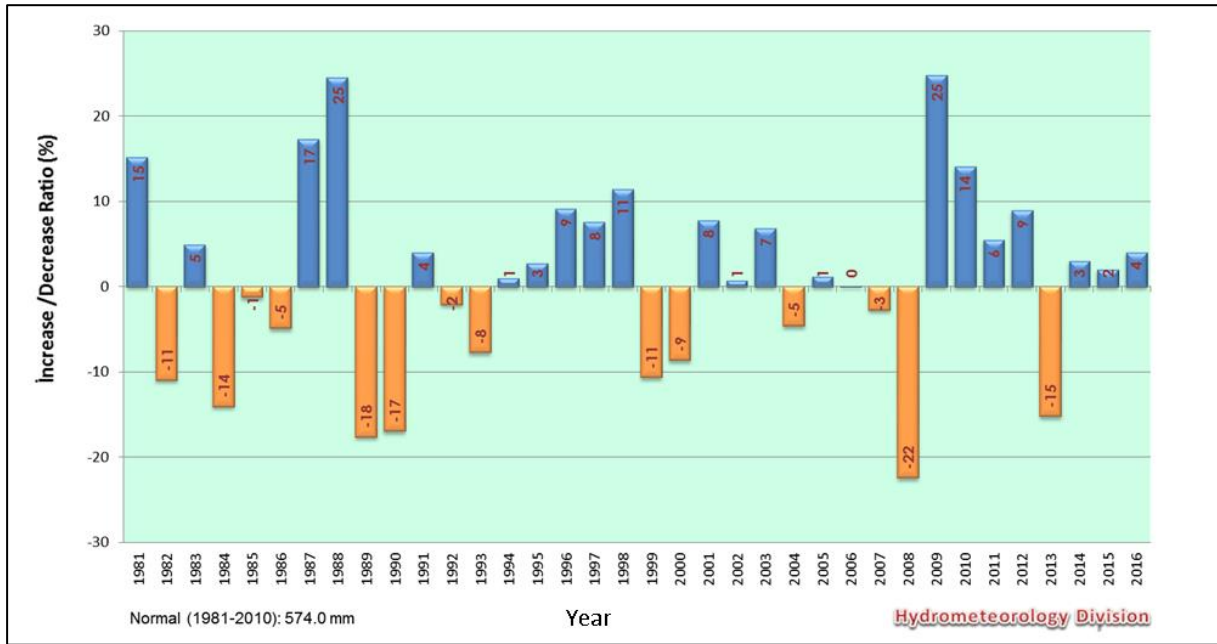


Figure 3.1 Annual areal precipitation anomaly in Turkey in 2016 (URL 2).

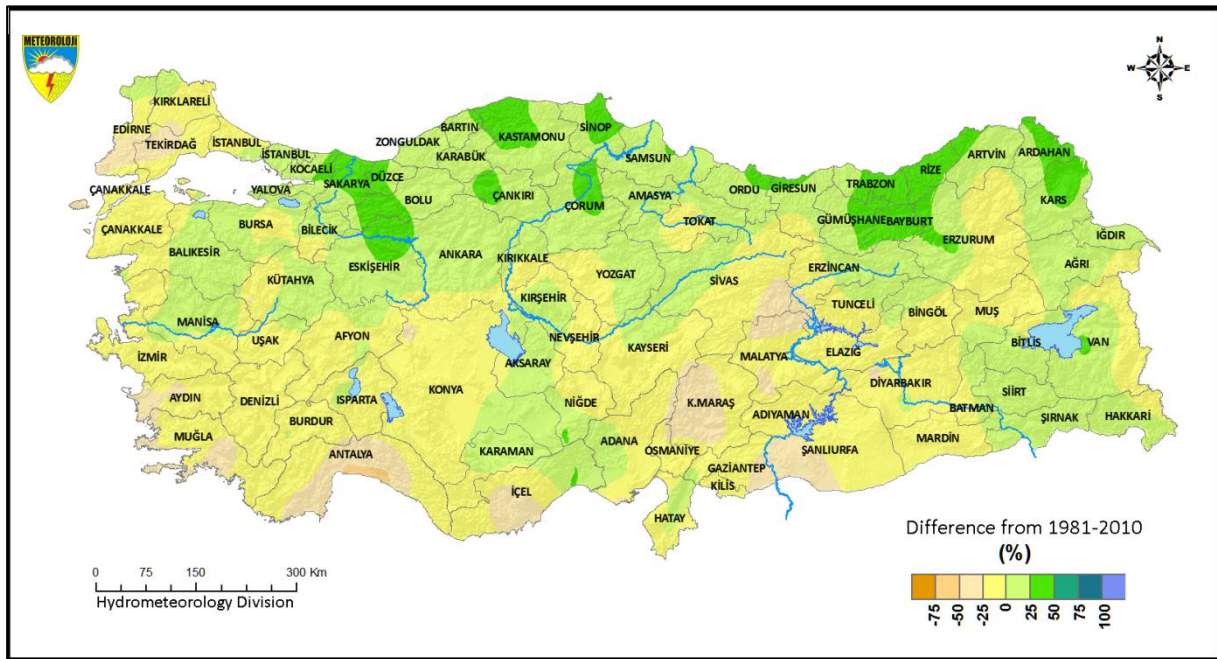


Figure 3.2 Spatial distribution of mean precipitation anomalies in Turkey in 2016 (URL 2).

Generally northern part of Turkey received above normal precipitation while southern part received below it in 2016. The highest positive rainfall anomaly was observed in January.

3.1. Monthly precipitation

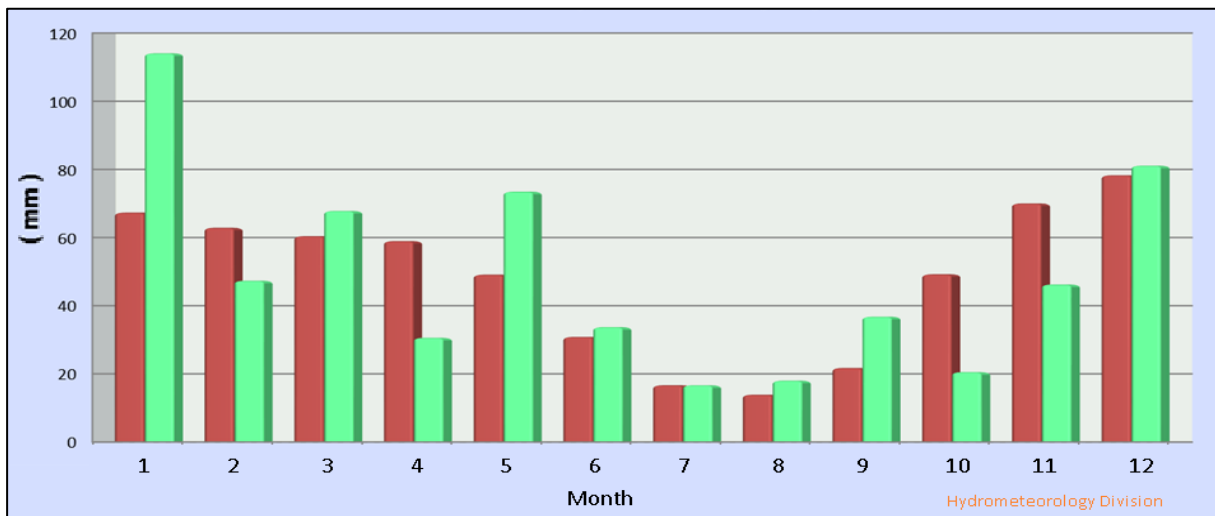


Figure 3.3 Monthly areal rainfall in Turkey in 2016 (URL 2).

Monthly precipitations in 2016 were above the 1981-2010's average in January, March, May, June, July, August, September and December while below it in February, April, October and November (Fig. 3.3).

3.2. Seasonal precipitation

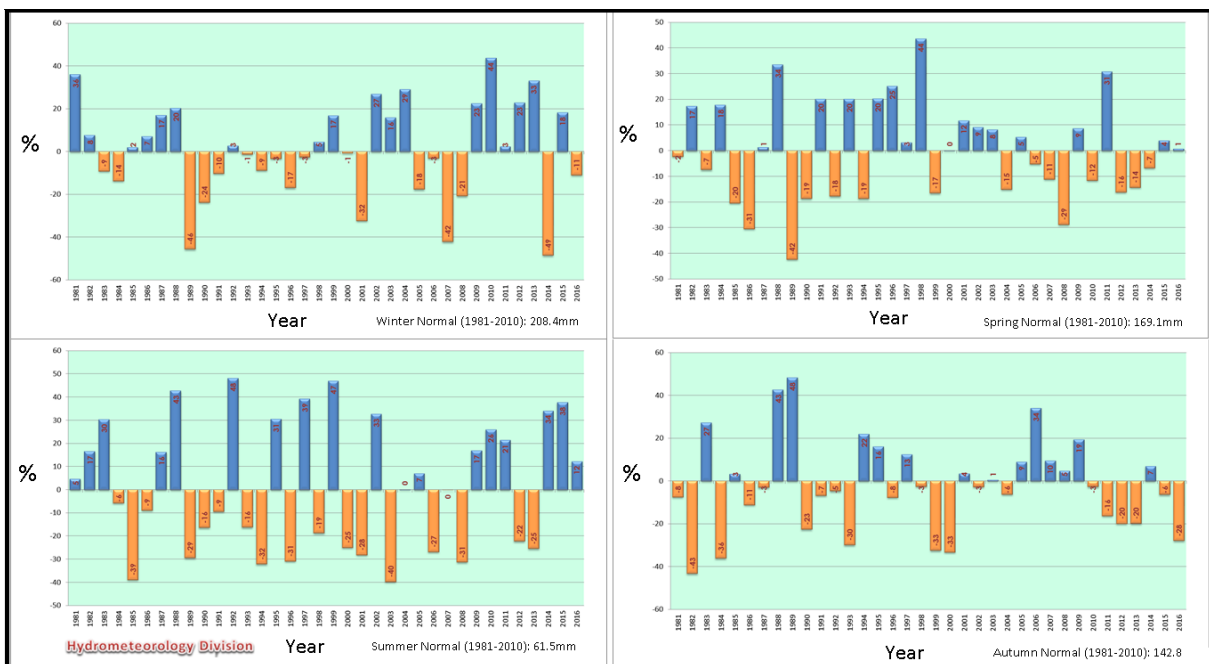


Figure 3.4 Seasonal areal rainfall differences in Turkey in 2016 (URL 2).

Spring and summer precipitations were above normal while winter and autumn below it.
 Average areal precipitation for winter season was 185 mm, 11% below normal (208.4 mm)
 Average areal precipitation for spring season was 171 mm, 1% above normal (169.1 mm)
 Average areal precipitation for summer season was 69 mm, 12% above normal (61.5 mm)
 Average areal precipitation for autumn season was 103 mm, 28% below normal (142.8 mm)

4. Notable events

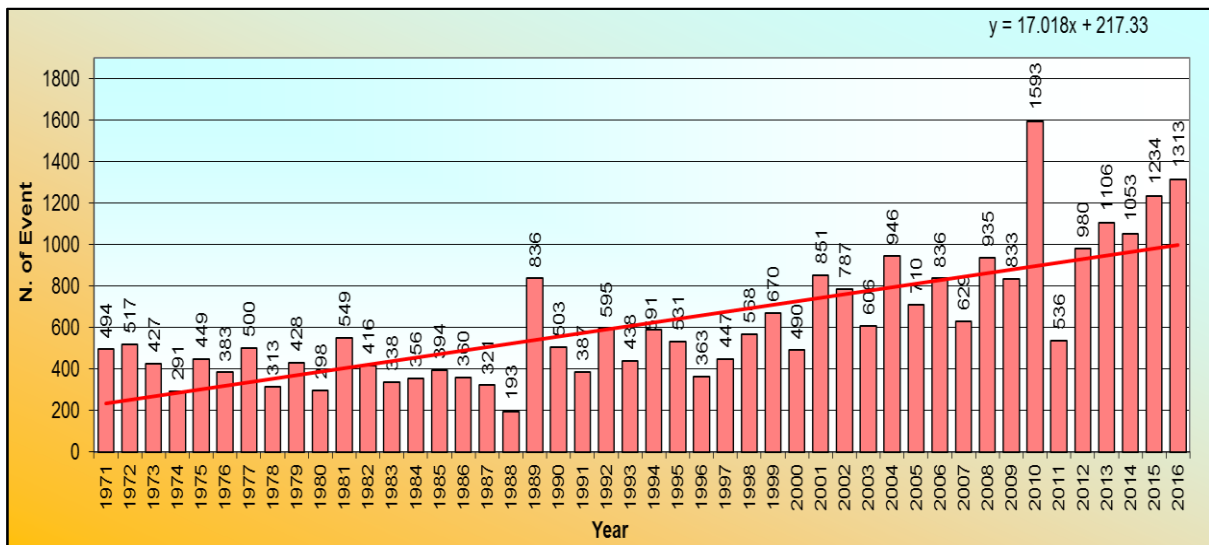


Figure 4.1 Annual count of extreme events in Turkey in 2016 (URL 3).

The number of extreme events in 2016 reached 1313 (Fig. 4.1). There is an increasing trend in extreme event (17.0 events/year). Extreme event database updated with heat and cold waves.

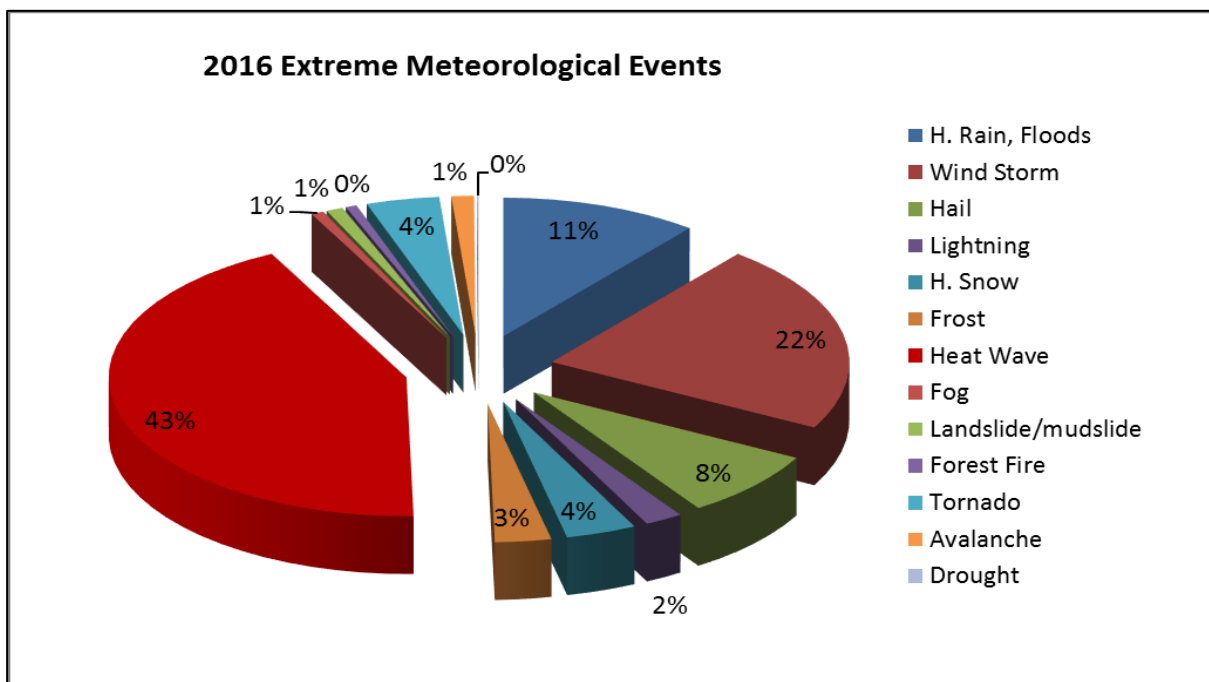


Figure 4.2 Distribution of extreme events types in Turkey in 2016 (URL 3).

During 2016 most hazardous extreme events were heat waves (43%), wind storm (22%), heavy rain/floods (11%), hail (8%), heavy snow (4%), tornado (4%), avalanche (3%), frost (3%) and lightning (2%). And also 8 forest fire occurred in 2016.

2 people died from floods in Ordu, 11 from chimney poisoning due to south-westerly wind (Lodos) in İzmir, Niğde, Elazığ, Rize, Kayseri, Gaziantep (URL 9). 4 people died from lightning in Diyarbakır and Van (URL 8). Also 2 people died from landslide in Trabzon, 3 people from avalanche in Palu (Elazığ) on 3 February (URL 10).

4.1. Floods, Landslide



Figure 4.5 Floods and landslide in Beşikdüzü (Trabzon) on 21 September 2016 (URL6).

2 people died from landslide in Beşikdüzü (Trabzon) occurred on 21 September 2016. Hail damaged to cultivated areas and fruit gardens and some cars.

4.2. Hail



Figure 4.6 Hails in Sivas on 8 July 2016 (URL7).

Citizens were surprised by the hail of walnut size in Sivas's Suşehri County on on 8 July 2016.

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