



Republic of TURKEY  
MINISTRY OF AGRICULTURE AND FORESTRY  
TURKISH STATE METEOROLOGICAL SERVICE



# State of the Climate in Turkey in 2018



Research Department

January 2019  
Ankara

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in 2018**

**RESEARCH DEPARTMENT**

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## **CONTENT**

1. Introduction.....	1
2. Temperature .....	2
2.1 Monthly temperature .....	3
2.2 Seasonal temperature .....	3
2.3 Extreme temperatures in 2018.....	5
2.4 Heat and cold waves indices in 2018.....	7
3. Precipitation .....	8
3.1 Monthly precipitation .....	9
3.2 Seasonal precipitation.....	9
4. Extreme Meteorological Events.....	10
4.1 Heavy rain/floods .....	11
References .....	11

## 1. Introduction

Turkey's annual mean temperature in 2018 was 15.4°C. This value is 1.9°C above from 1981-2010 normal (13.5°C), which makes 2018 the second warmest year since 1971.

In general, all of the country had above normal temperatures. Temperature anomalies in some eastern parts of Anatolian locations are greater than 3.0°C.

2018 mean temperatures were above normal in all months. All the seasonal temperatures were above the normal (1981-2010). The winter and spring temperature anomalies were exceptionally above normal which caused shift in plant phenology.

Lowest minimum temperature in 2018 was in December with -32.4°C in Askale, Erzurum, while highest maximum temperature was observed in July with 47.4°C in Cizre, 2018. 36 stations has been broken their monthly extreme maximum temperature records

Turkey annual mean areal precipitation in 2018 was 658.7 mm. This value is 14.8 % above from 1981-2010's normal (574 mm). Geographically, 2018 precipitation anomalies were above normal in most of the country. 2018 precipitation were slightly below normal in Antalya, Denizli, Manisa, Bursa, western Black Sea Region, Artvin Sivas, Nevsehir, Mus, Van. 2018 Precipitation were exceptionally greater than their normal in Adana, Kirklareli, Adiyaman, Sanliurfa, Giresun and Cizre.

Monthly precipitations in 2018 were below from the 1981-2010's normal in February, April, November, near normal in September and above normal in the other months. May and December precipitations were exceptionally above their normal.

The winter precipitation was below normal, spring and summer precipitations were above normal and autumn precipitation was near normal.

Daily maximum rainfall record has broken in Ovacik, Kemer, Antalya as 490.8 mm.

The number of extreme events in 2018 reached 840. There is an increasing trend in occurrences of extreme events (11 events/year). Most hazardous extreme events recorded in 2018 were heavy rain and floods (41%), wind storm and tornadoes (29%) The others were hail (16%), heavy snow and lightning (5%).

## 2. Temperature

Turkey's annual mean temperature in 2018 was 15.4°C. This value is 1.9°C above from 1981-2010 normal (13.5°C) (Fig.2.1).

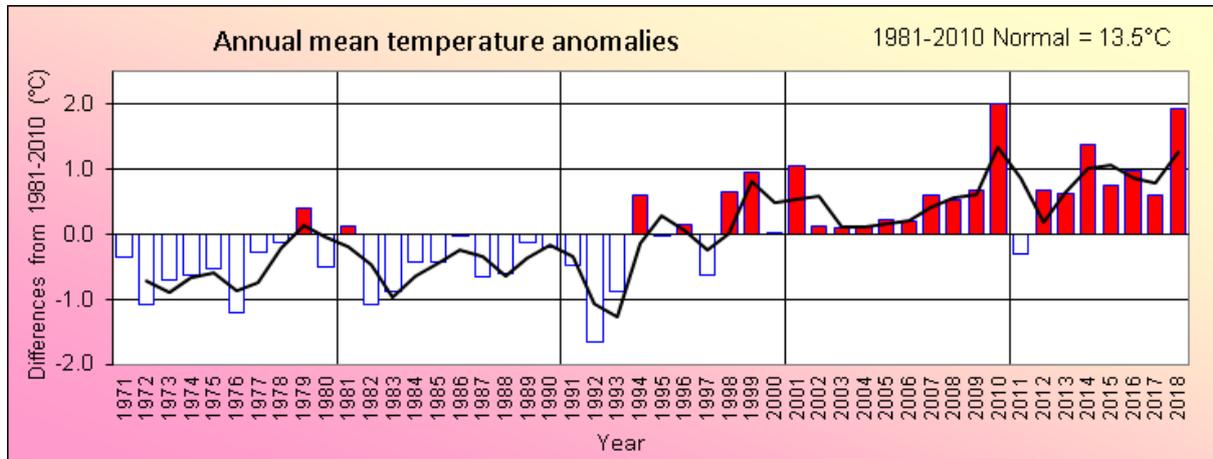


Figure 2. 1 Annual mean temperature anomalies in Turkey (URL 1)

Since 1998, there are consistent positive anomalies in Turkey's mean temperatures except year 2011. The warmest year was 2010 with 2.0°C temperature anomaly (Fig.2.1).

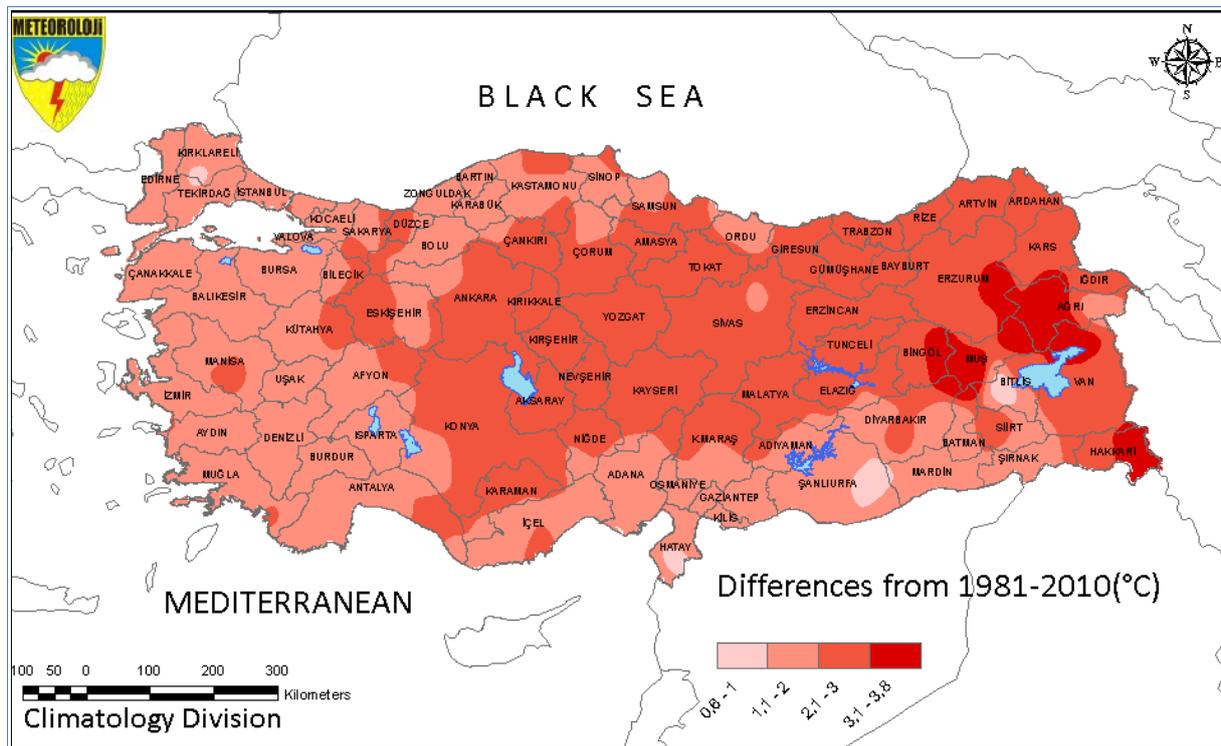


Figure 2. 2 Spatial distribution of mean temperature differences in Turkey in 2018 (URL 1).

In general, all of the country had above normal temperatures. Temperature anomalies in some eastern parts of Anatolian locations were greater than 3.0°C (Fig.2.2).

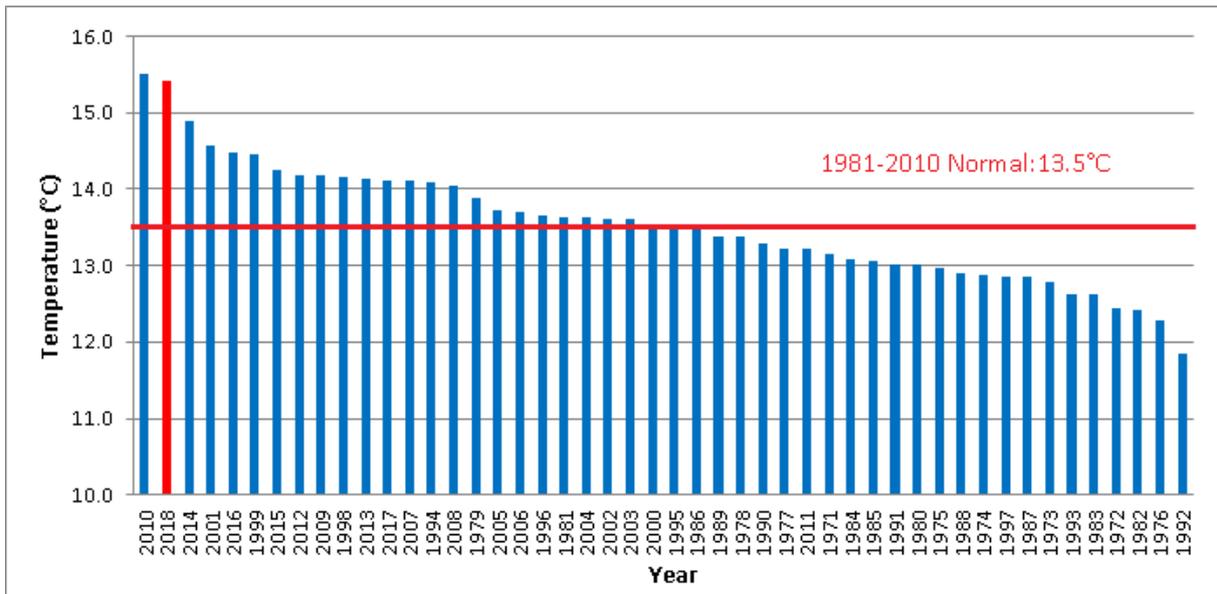


Figure 2. 3 Rank of warmest years to coldest (URL 1)

2019 has been second warmest year since 1971 (Figure 2.3).

## 2.1 Monthly temperature

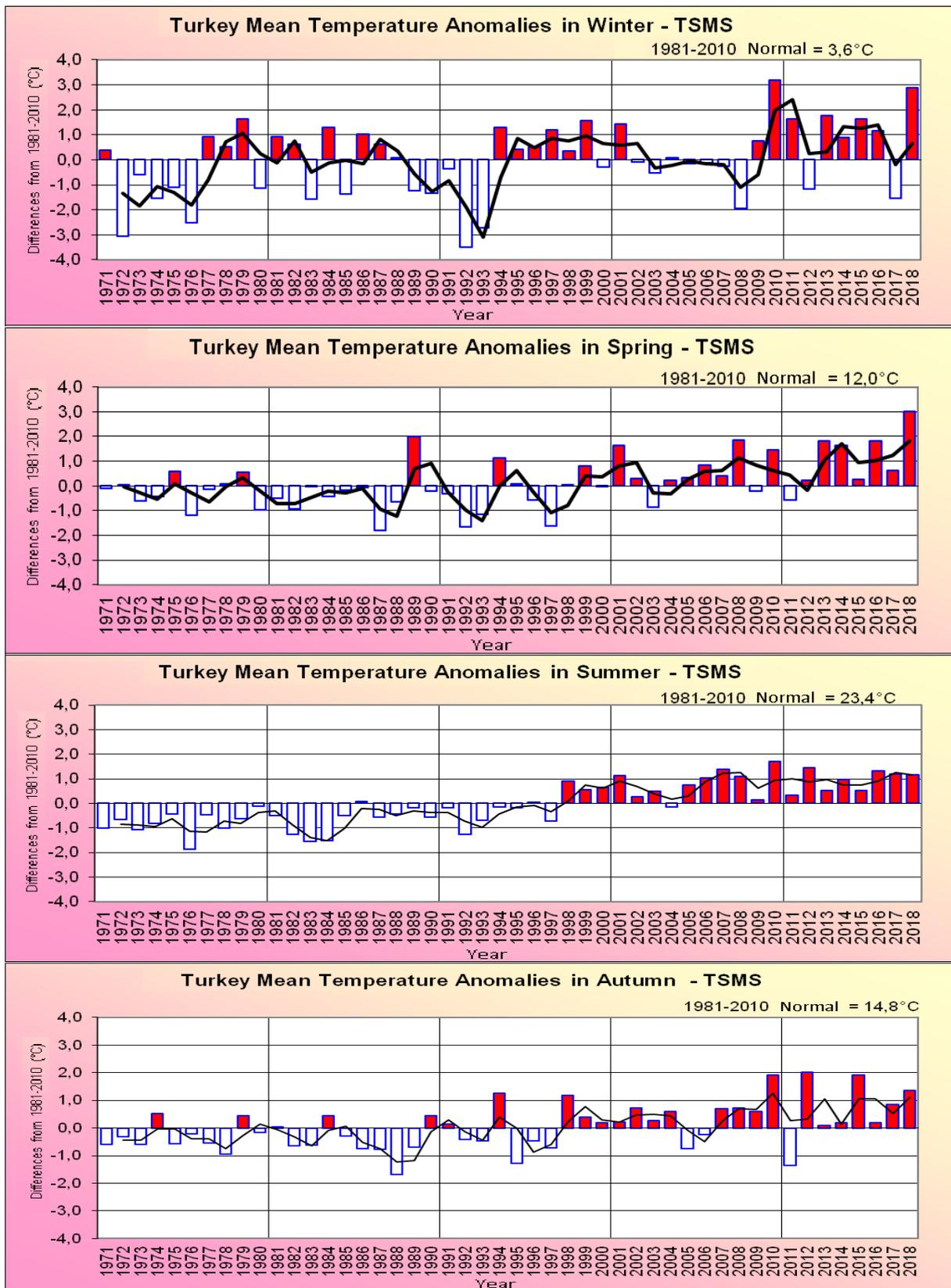


Figure 2. 4 Monthly mean temperature differences in Turkey in 2017 (URL 1)

Monthly mean temperatures of 2018 were above their normal in all months. January-May temperatures were exceptionally greater than their normal (Fig. 2.4).

## 2.2 Seasonal temperature

All the seasonal temperatures were above the normal (1981-2010). The winter and spring temperature anomalies were exceptionally above normal which caused shift in plant phenology. (Figure 2.5)



2. 5 (from top to bottom) winter, spring, summer and autumn temperature anomalies in Turkey in 2018 (URL 1)

2017-2018 winter mean temperature was 6.4°C, 2.8°C above their normal (3.6°C). 2018 mean spring temperature was 15.0°C, 3.0°C above their normal (12.0°C), summer mean temperature was 24.6°C, 1.2°C above their normal (23.4°C) and autumn mean temperature was 16.2°C, 1.4°C above their normal (14.8°C) (Figure 2.5).

### 2.3 Extreme temperatures in 2018

Lowest minimum temperature in 2018 was in December with  $-32.4^{\circ}\text{C}$  in Askale, Erzurum while highest maximum temperature was observed in July with  $47.4^{\circ}\text{C}$  in Cizre (Fig 2.6, Fig. 2.7).

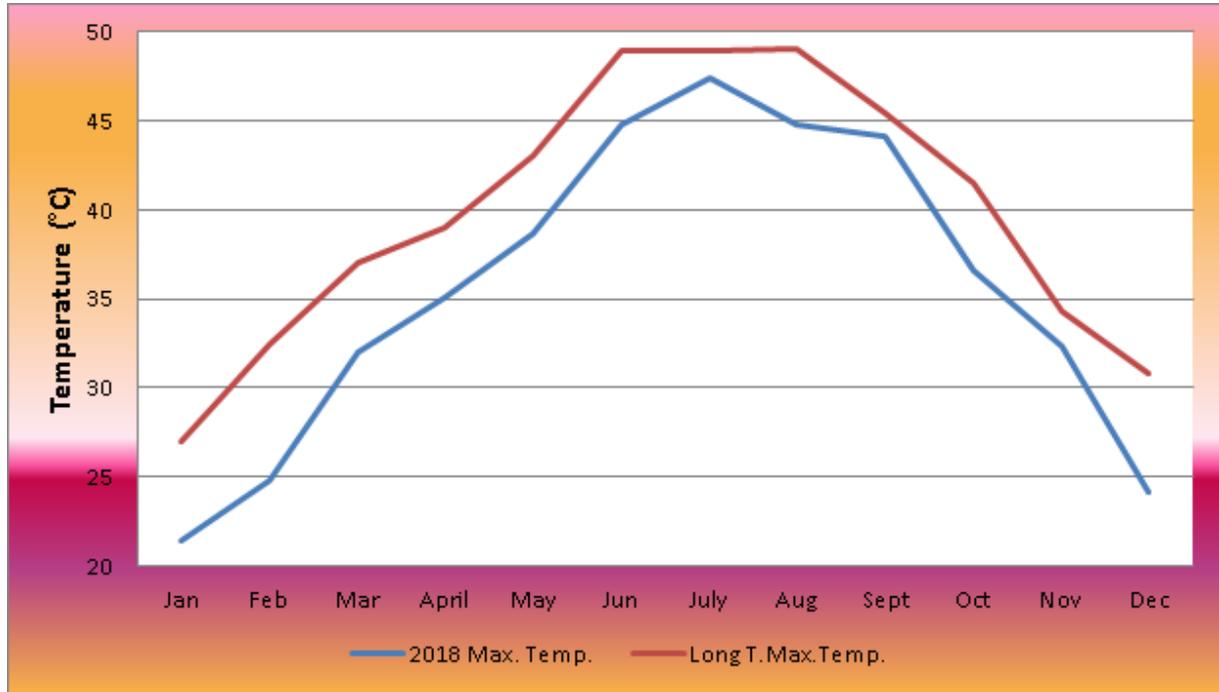


Figure 2. 6 Comparison of 2018 maximum temperatures with their long term maximums (URL 1)

2018 maximum temperatures were below their long term maximums (Figure 2.6).

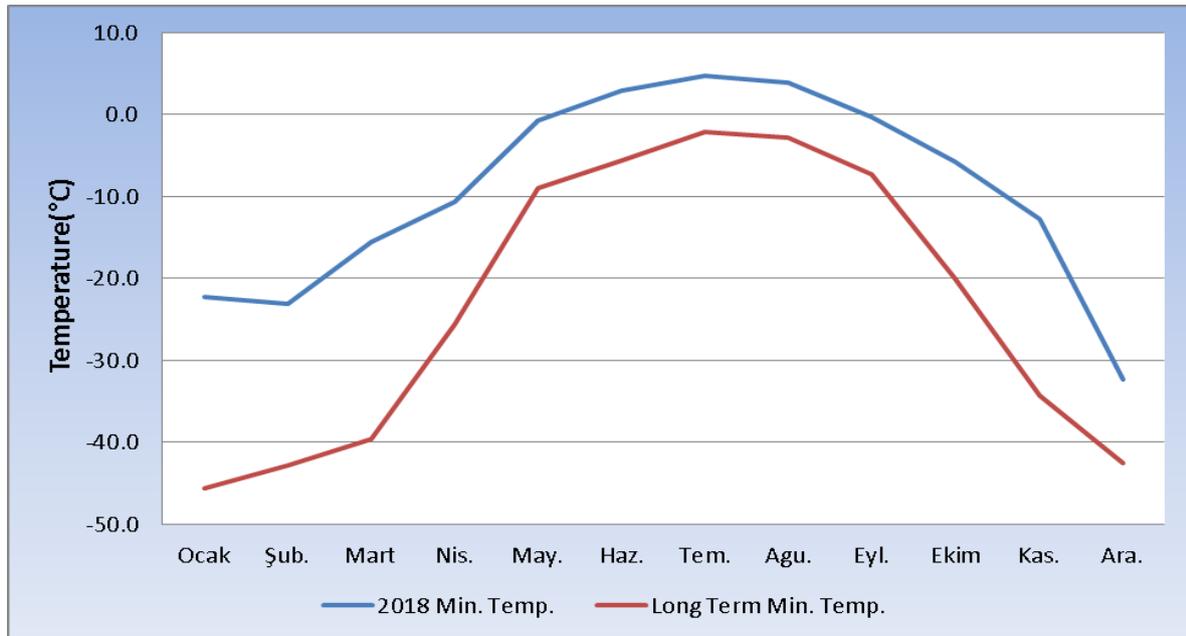


Figure 2. 7 Comparison of 2018 minimum temperatures with their long term minimums (URL 1)

2018 minimum temperatures were above their long term minimums (Figure 2.7).

A total of 36 stations has been broken their monthly extreme maximum temperature records at the following date (Table 1)

**Table 1.** New extreme maximum temperature records in 2018.

Day	Month	Station	2018 Maximum Temperature (°C)	Long Term Maximum Temperature (°C)
9	01	KORKUTELI	18,9	18,0
11	02	NEVSEHIR	19,6	19,3
5	02	HAKKARI	12,9	12,2
17	02	HINIS	9,5	9,4
23	03	KARATAS	28,9	28,4
27	03	SAMANDAG	32,0	30,7
24	03	KARS	19,1	18,8
24	03	IGDIR	29,5	27,0
23	03	YUKSEKOVA	18,4	17,6
27	04	UZUNKOPRU	32,4	30,6
27	04	IPSALA	30,4	30,2
28	04	AYVALIK	31,1	30,7
26	04	BODRUM	32,8	31,3
29	04	BERGAMA	33,4	32,9
29	04	ODEMIS	34,6	34,5
28	04	YATAGAN	33,2	33,0
23	06	ZARA	34,5	33,5
29	06	BAYBURT	32,9	32,5
30	06	ARDAHAN	29,1	29,0
29	06	ERZINCAN	37,0	35,8
29	06	ERCIS	34,0	33,6
29	06	MURADIYE VAN	35,1	34,0
28	06	SIRNAK	36,8	36,7
28	06	SIVEREK	41,1	40,2
31	07	SAMANDAG	37,0	36,5
11	07	BAYBURT	37,0	36,2
12	07	SARIKAMIS	32,8	32,7
11	07	MURADIYE VAN	38,8	38,2
11	07	AHLAT	36,5	35,6
2	09	AYVALIK	37,7	37,2
3	09	MANAVGAT	41,6	40,5
1	11	DATCA	30,3	30,1
1	11	BURHANIYE	30,3	28,3
1	11	MILAS	32,3	31,5
4	11	ALANYA	30,3	30,0
1	11	KORKUTELI	27,0	26,4

## 2.4 Heat and cold waves indices in 2018

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

Heat and cold waves indices calculated from 224 stations based on 1981-2010 reference period for 2018. 175 stations were identified with heat wave occurrences while there were no cold wave occurrences in 2018. Heat wave duration is longer in inland areas (Figure 2.8).

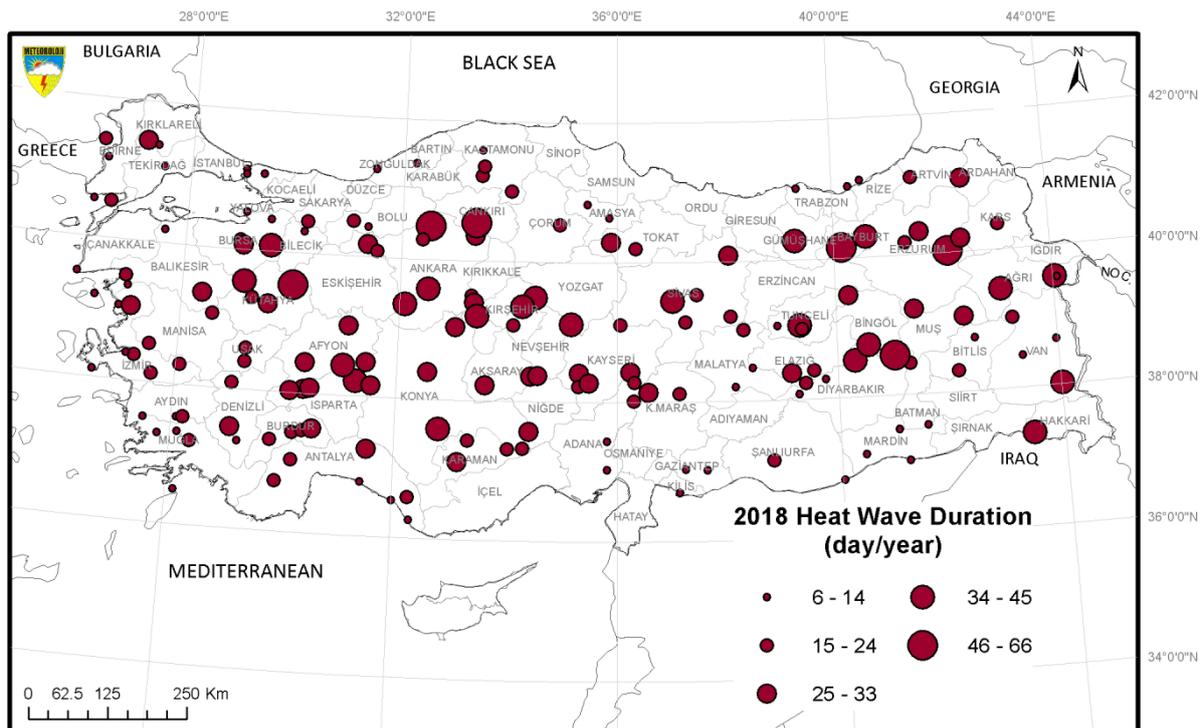


Figure 2. 8 Spatial distribution of heat wave occurred locations and its duration in 2018

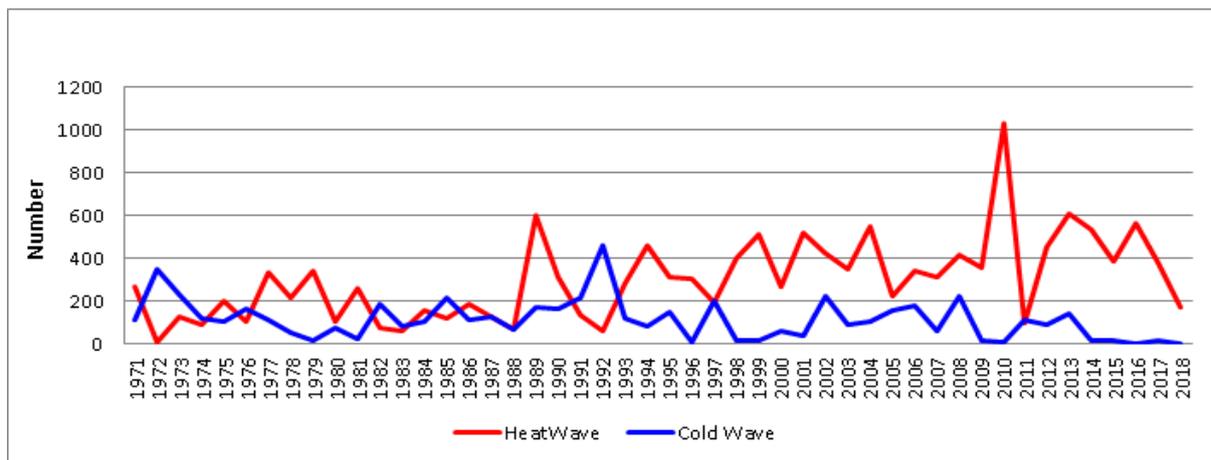


Figure 2. 9 Annual Number of Heat & Cold Waves in Turkey

Historically, highest number of heat waves was observed was 1027, which occurred in 2010. Highest number of cold wave incidents was reported in 1992 which was the coldest year in Turkey after Pinatubo Volcano eruption. There is increasing trend in heat waves while decreasing it in cold waves. (Figure 2.9).

### 3. Precipitation

Turkey annual mean areal precipitation in 2018 was 658.7 mm. This value is 14.8 % above from 1981-2010's normal (574 mm) (Figure 3.1).

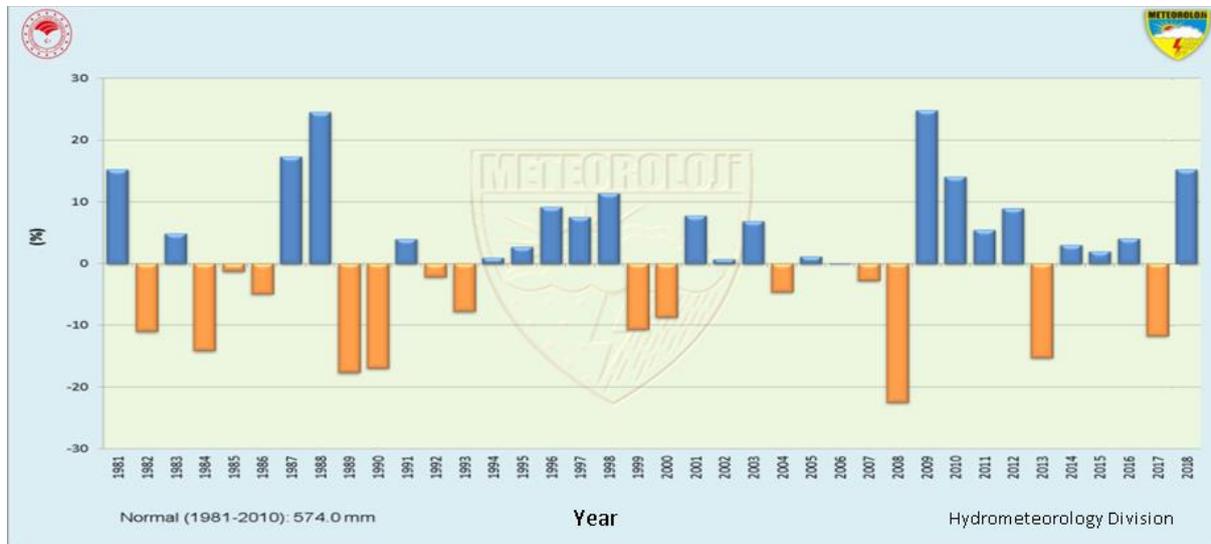


Figure 3. 1 Annual areal precipitation anomaly in Turkey (URL 2)

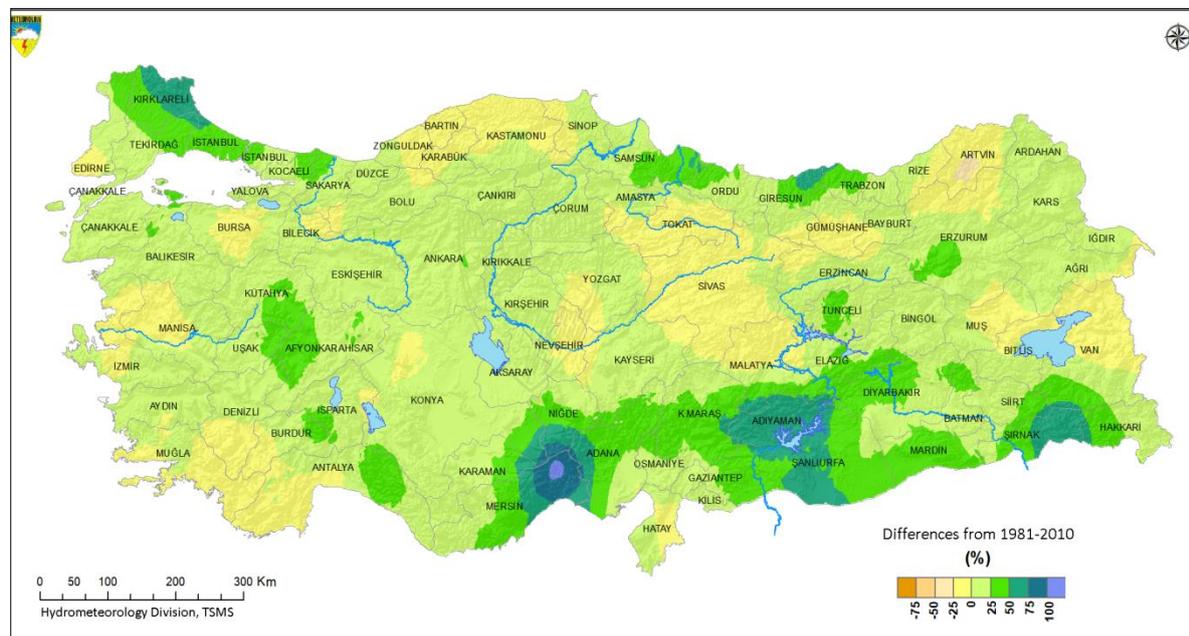


Figure 3. 2 Spatial distribution of mean precipitation anomalies in Turkey in 2018 (URL 2).

Geographically, 2018 precipitation anomalies were above normal in most of the country. 2018 precipitation were slightly below normal in Antalya, Denizli, Manisa, Bursa, western Black Sea Region, Artvin Sivas, Nevşehir, Mus and Van. 2018 Precipitation were exceptionally greater than their normal in Adana, Kırklareli, Adıyaman, Şanlıurfa, Giresun and Cizre (Figure 3.2).

### 3.1 Monthly precipitation

Monthly precipitations in 2018 were below from the 1981-2010's normal in February, April, and November, near normal in September and above normal in the other months. May and December precipitations were exceptionally above their normal (Figure 3.3).

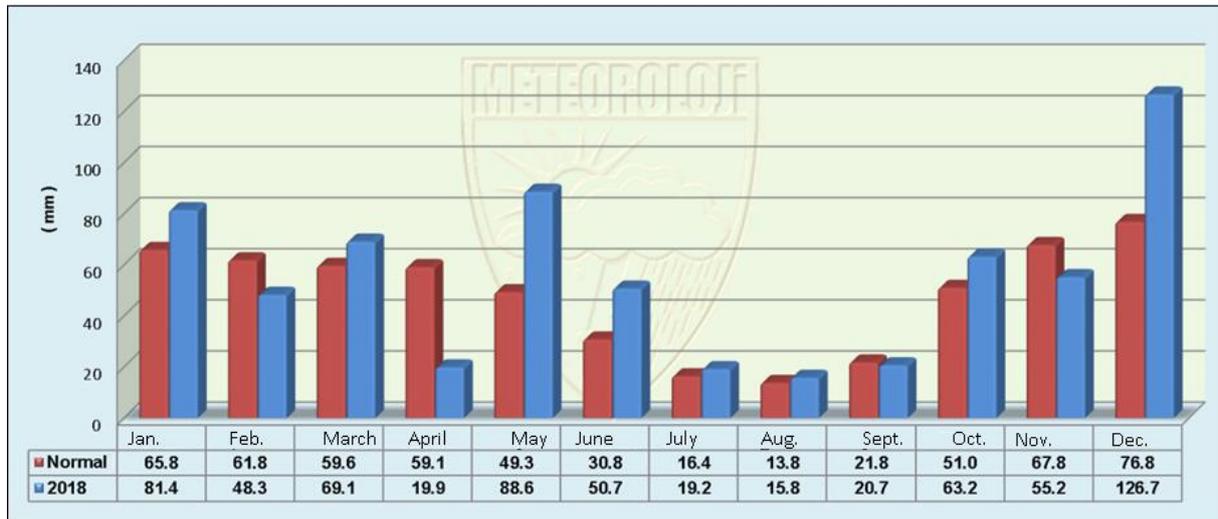


Figure 3. 3 Monthly areal rainfall in Turkey in 2018 (URL 2)

### 3.2 Seasonal precipitation

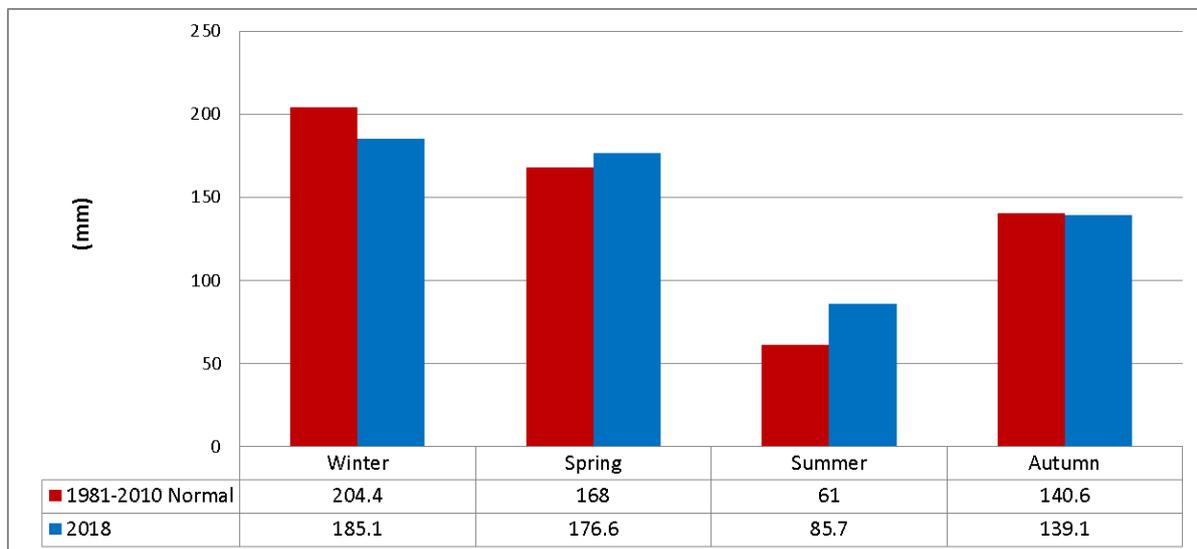


Figure 3. 4 Seasonal areal rainfall differences in Turkey in 2018 (URL 2)

The winter precipitation was below normal, spring and summer precipitations were above normal and autumn precipitation was near normal (Figure 3.4).

#### 4. Extreme Meteorological Events

The number of extreme events in 2018 reached 840 (Fig. 4.1). There is an increasing trend in extreme event occurrences especially during the last two decades (5events/year).

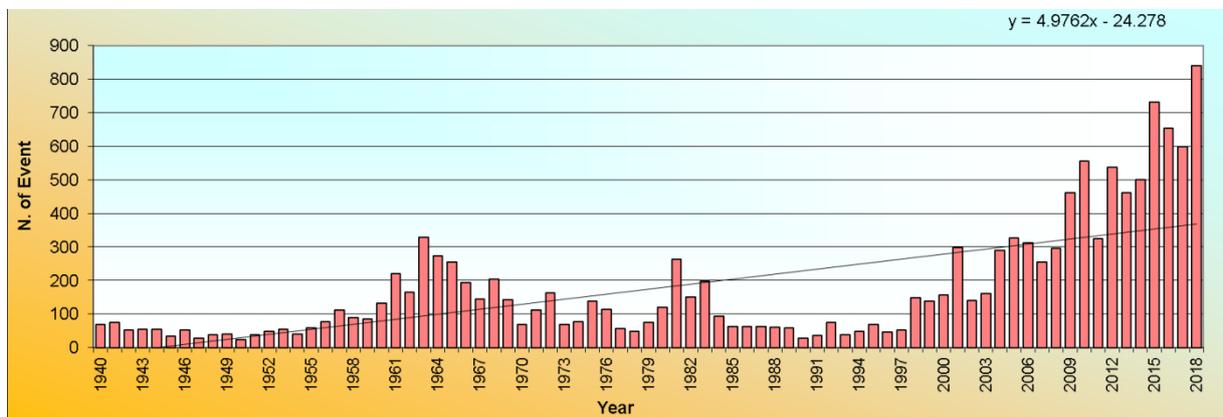


Figure 4. 1 Annual number of extreme events in Turkey in 2018 (URL 3)

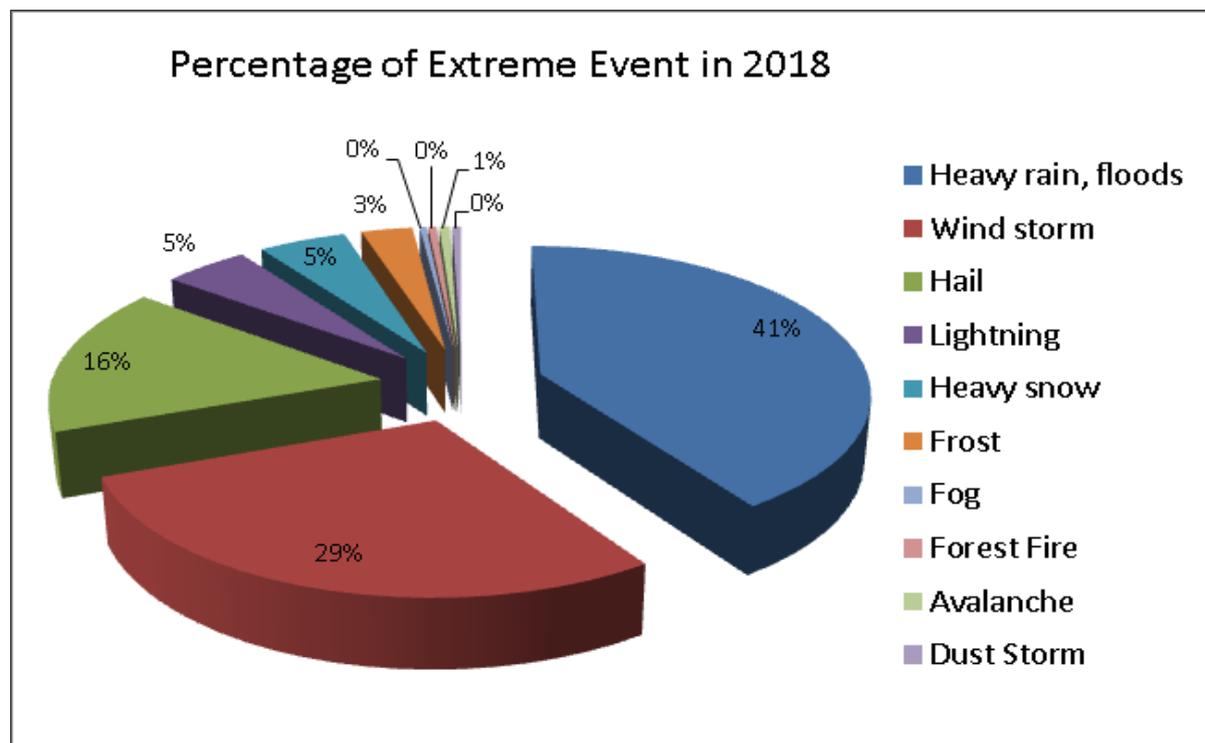
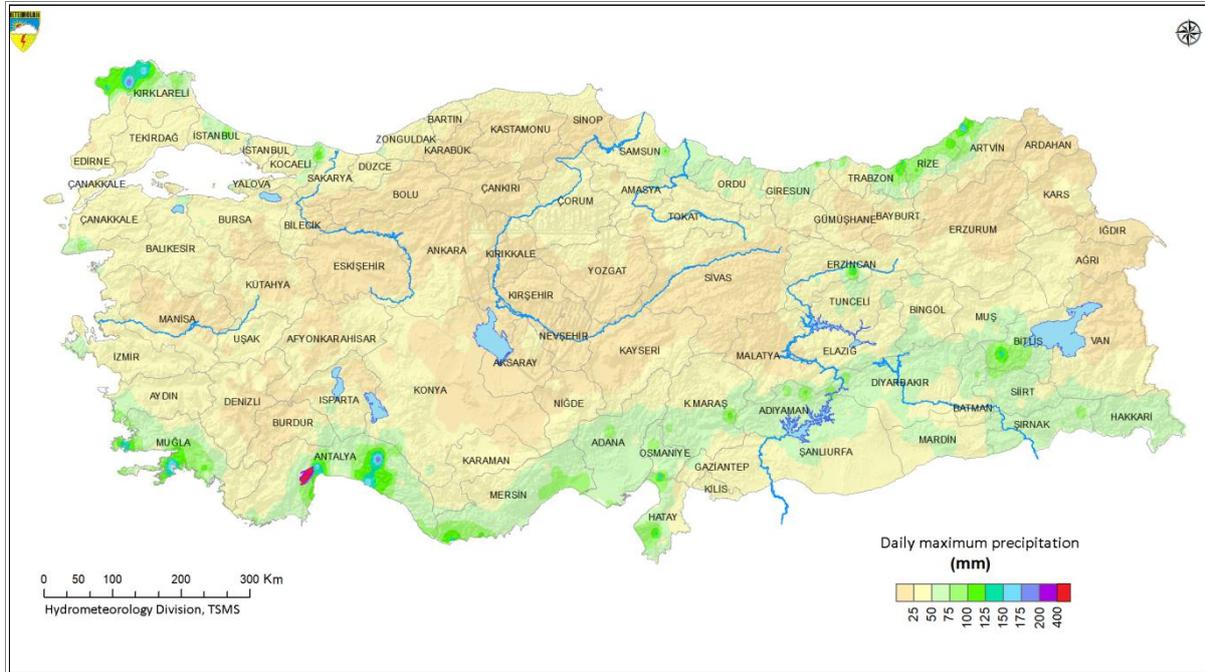


Figure 4. 2 Proportional distribution distribution of extreme events in 2018 (URL 3)

Most hazardous extreme events recorded in 2018 were heavy rain and floods (41%) and wind storm and tornadoes (29%). The others were hail (16%), heavy snow (5%), lightning (5%), frost (3%) and the others shown at the picture (<1%), (Figure 4.2).

## 4.1 Heavy rain/floods

In 2018, daily maximum rainfall exceeding 100mm was observed in Rize, Artvin, Bitlis, Kırklareli, İstanbul, Muğla, Antalya, Mersin, Hatay and Osmaniye (Fig.re 4.3). Daily maximum rainfall record has broken in Ovacık, Kemer, Antalya as 490.8 mm.



**Figure 4. 3** Spatial distribution of daily maximum precipitation in 2018

## References

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