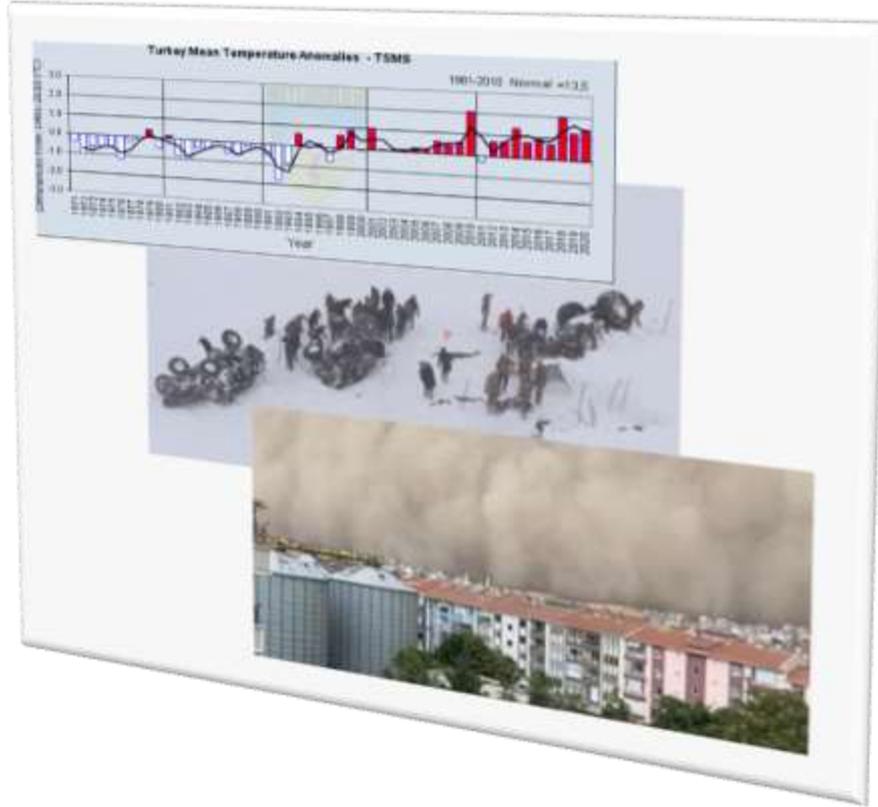




REPUBLIC OF TURKEY
MINISTRY OF AGRICULTURE AND FORESTRY
TURKISH STATE METEOROLOGICAL SERVICE



State of the Turkey's Climate in 2020



**Climate and Agricultural Meteorology Department
&
Research Department**

January 2021

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Ankara**

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1. Introduction

Turkey's mean temperature in 2020 was 14.9°C. This value is 1.4°C above from 1981-2010 normal (13.5°C) which makes 2020 the third warmest year since 1971.

In general, most of the country had above normal temperatures while Bitlis, Batman Doğubayazıt had below normal. Temperature anomalies in Ankara, Kırıkkale, Çorum and Ardahan were greater than 3.0°C.

Monthly mean temperatures of 2020 were above their normal except for April. The highest temperature anomaly occurred in September with 3.4°C and in October with 3.2°C. September and October of 2020 marked as the warmest months of the last 50 years since 1971.

All seasonal temperatures were above their normal (1981-2010). The highest temperature anomaly occurred in autumn with 2.5°C. The autumn of 2020 marked as the warmest autumn in the last 50 years since 1971.

The lowest minimum temperature in 2020 was observed in February with -40.0°C in Ardahan, while the highest maximum temperature was observed in July with 47.3°C in Cizre. A total of 201 stations broke their monthly extreme maximum temperature records while only two stations broke their monthly extreme minimum records.

Turkey mean areal precipitation in 2020 was 500 mm. This value is 13 % below from 1981-2010's normal (574 mm).

Geographically, Mersin, Giresun, Trabzon, Şırnak, Adıyaman, Diyarbakır, Hakkari, Batman Kırklareli and Lakes Region had below normal precipitation in 2020.

Monthly precipitation in 2020 was above normal in February, March, May and June, and below normal in other months.

The year 2020 was the year in which the most extreme events were seen, with the total number of 984. Most hazardous extreme events recorded in 2020 were heavy rain and floods (30%), wind storms/tornadoes (27%) and hail (23%). The others were lightning (7%), heavy snow (5%), frost and landslide (2%), avalanche, forest fire, fog and heat wave (1%).

41 people died in two avalanches which occurred on February 4 and 5 in Bahçesaray, Van. 5 people died due to floods occurred in Bursa on 21 June and 4 people died in Giresun on 22 August due to floods. Agricultural lands were flooded. A large number of cars, tractors, vans and trailers were damaged. 2 people died due to lightning struck on 12 September afternoon hours in Torul, Gümüşhane. On September 12, the dust storm negatively affected life in Polatlı district of Ankara.

2. Temperature

Turkey's mean temperature in 2020 was 14.9°C. This value is 1.4°C above from 1981-2010 normal (13.5°C) which makes 2020 the third warmest year since 1971 (Fig.2.1).

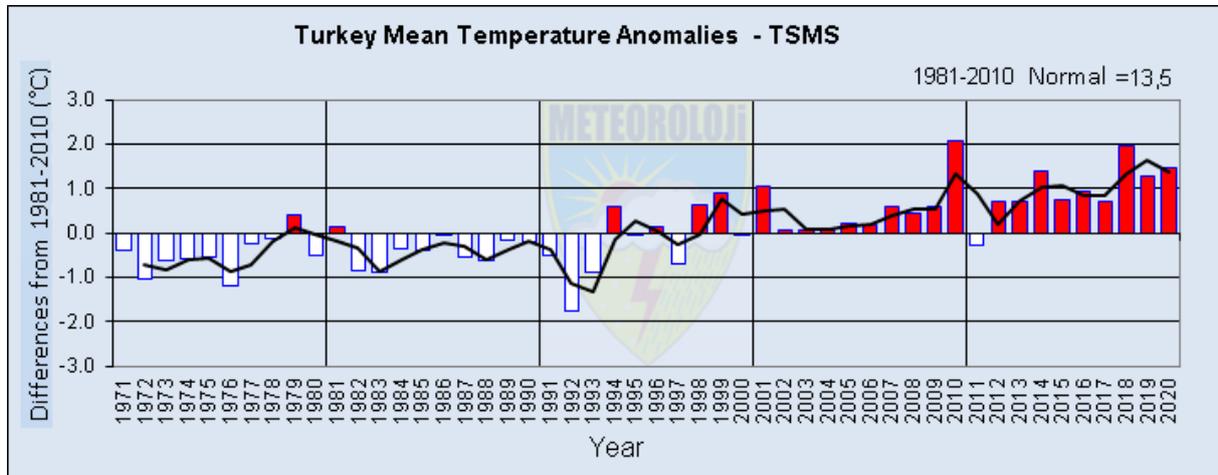


Figure 2. 1 Annual mean temperature anomalies in Turkey (URL 1)

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

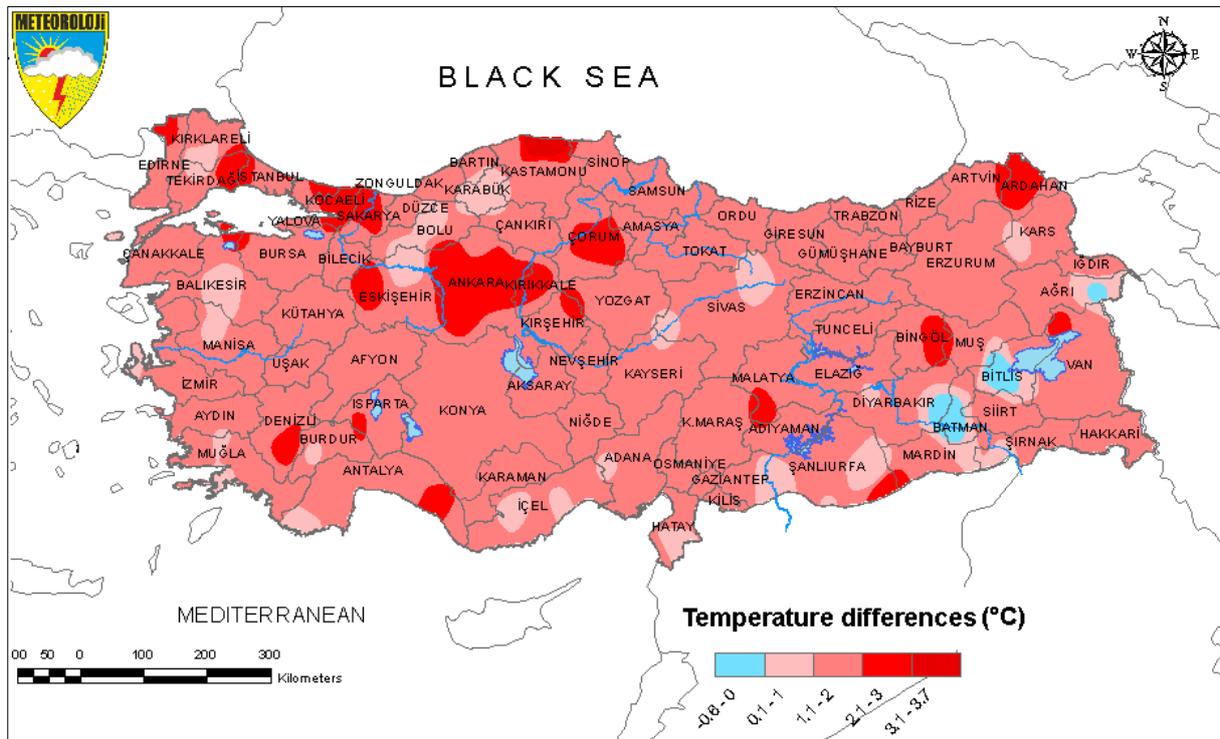


Figure 2. 2 Spatial distribution of mean temperature differences in Turkey in 2020 (URL 1).

In general, most of the country had above normal temperatures while Bitlis, Batman Doğubayazıt had below normal. Temperature anomalies in Ankara, Kırıkkale, Çorum and Ardahan were greater than 3.0°C (Fig.2.2).

2.1 Monthly temperature

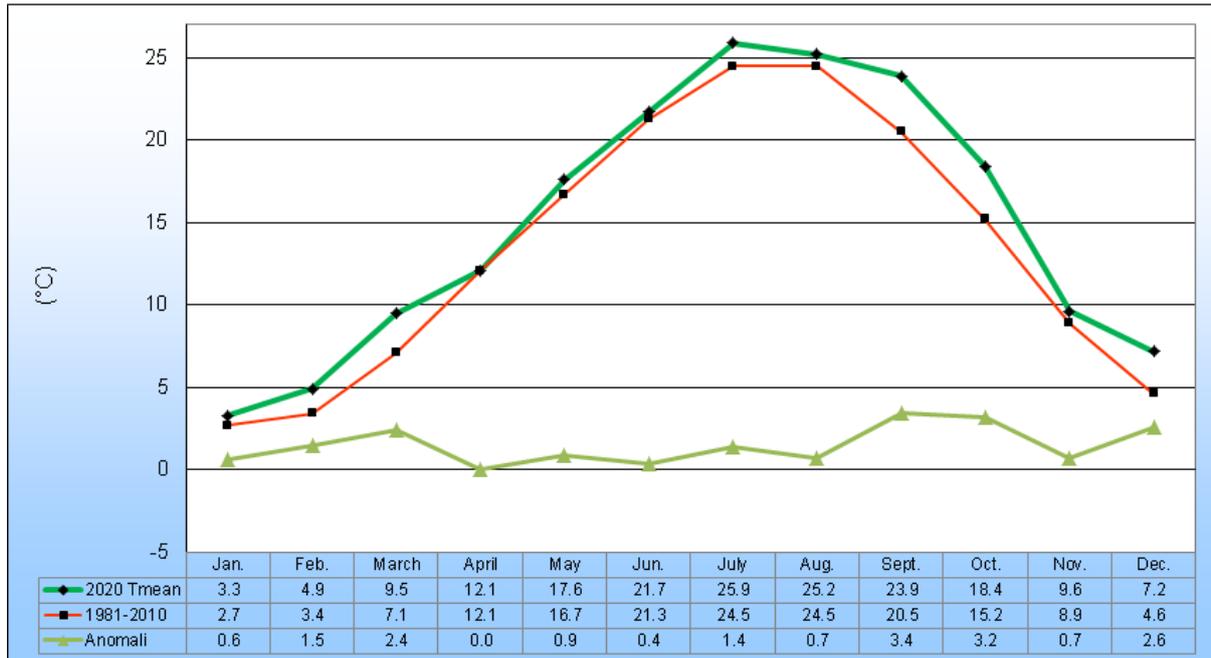
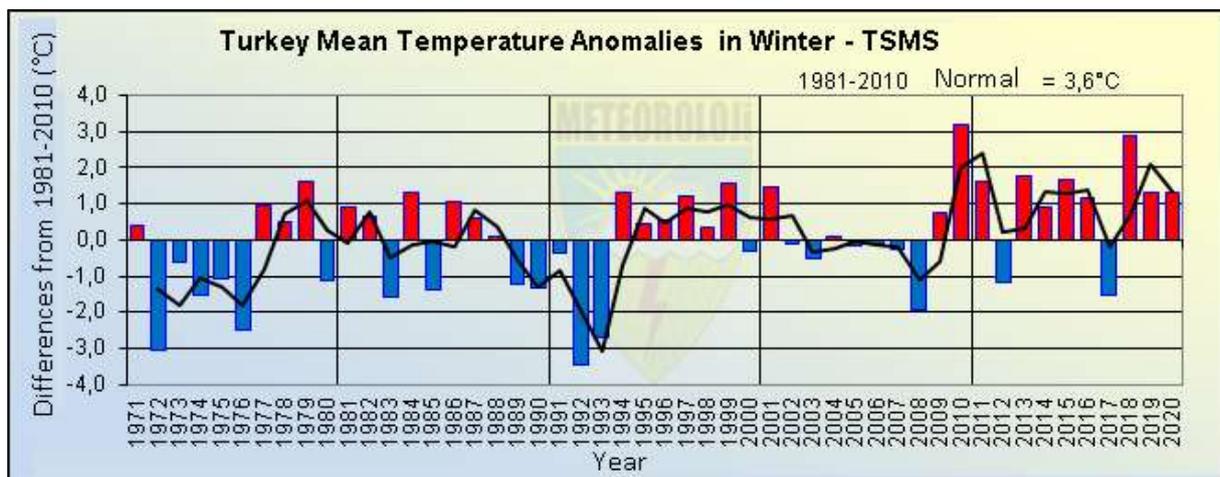


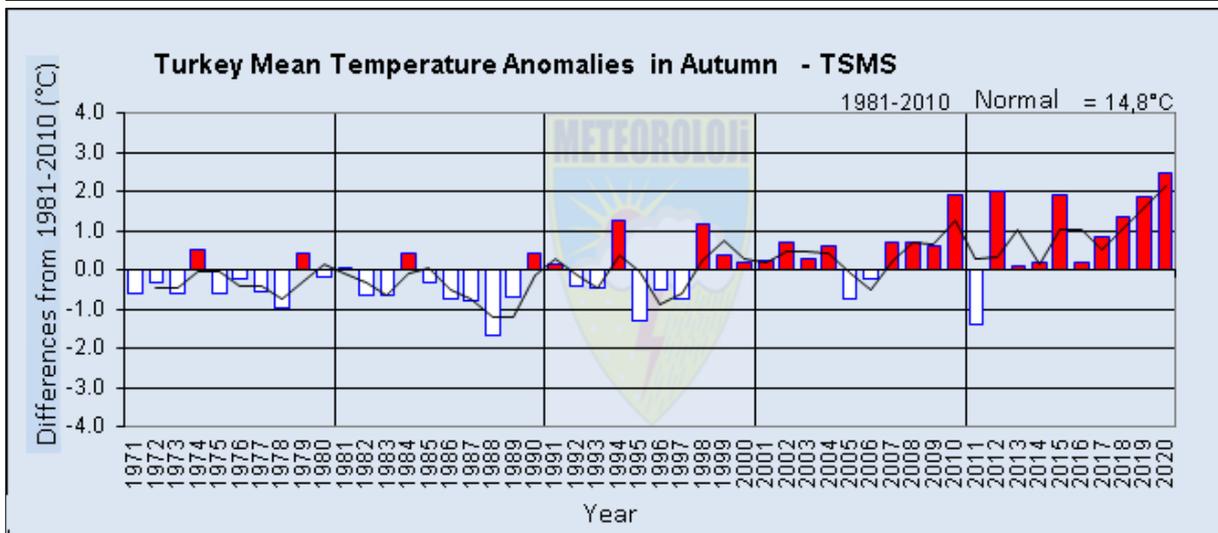
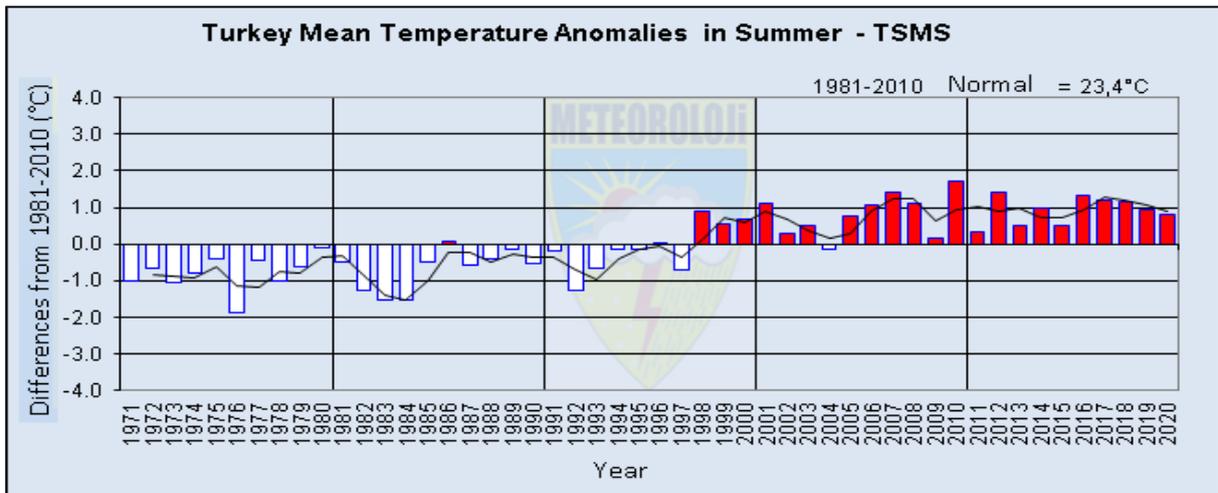
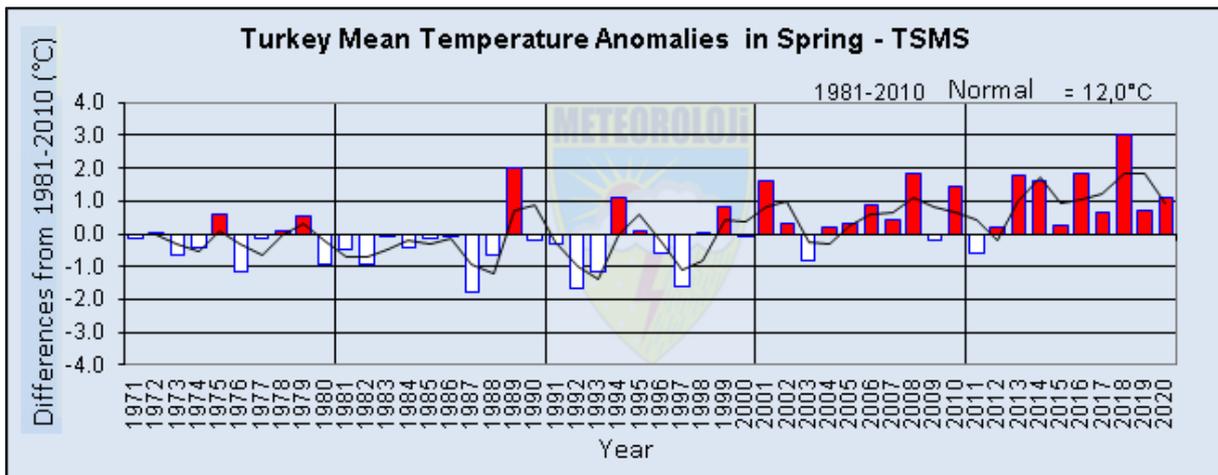
Figure 2. 4 Monthly mean temperature differences in Turkey in 2020 (URL 1)

Monthly mean temperatures of 2020 were above their normal except for April. The highest temperature anomaly occurred in September with 3.4°C and in October with 3.2°C. September and October of 2020 marked as the warmest months of the last 50 years since 1971 (Fig. 2.4).

2.2 Seasonal temperature

All seasonal temperatures were above their normal (1981-2010). The highest temperature anomaly occurred in autumn with 2.5°C. The autumn of 2020 marked as the warmest autumn in the last 50 years since 1971 (Figure 2.5).





2. 5 (from top to bottom) winter, spring, summer and autumn temperature anomalies in Turkey in 2020 (URL 1)

2019-2020 winter mean temperature was 4.9°C, 1.3°C above its normal (3.6°C). 2020 spring mean temperature was 13.1°C, 1.17°C above its normal (12.0°C). 2020 summer mean temperature was 24.3°C, 0.9°C above its normal (23.4°C). 2020 autumn mean temperature was 17.3°C, 2.5°C above its normal (14.8°C) (Figure 2.5).

2.3 Extreme temperature

The lowest minimum temperature in 2020 was observed in February with -40.0°C in Ardahan, while the highest maximum temperature was observed in July with 47.3°C in Cizre. A total of 201 stations broke their monthly extreme maximum temperature records (Table 1) while only two stations broke their monthly extreme minimum records (Table 2).

Table 1. New monthly extreme maximum temperature records in 2020.

Day	Month	Station	2020	Long term
26	FEBRUARY	CIDE	24.9	24.8
15	MAY	BANDIRMA	35.4	35.0
20	MAY	BİLECİK	36.6	35.8
20	MAY	GEYVE	39.1	37.2
15	MAY	GÖNEN/BALIKESİR	37.5	36.2
17	MAY	EDREMİT	36.3	35.2
20	MAY	KÜTAHYA	34.3	33.8
17	MAY	AKHİSAR	42.6	39.2
16	MAY	MANİSA	40.6	39.5
16	MAY	UŞAK	34.5	33.2
18	MAY	AFYONKARAHİSAR	33.9	33.0
17	MAY	KUŞADASI	35.8	35.0
17	MAY	AYDIN	42.6	40.2
20	MAY	DENİZLİ	39.5	37.8
18	MAY	MUĞLA	39.4	36.0
17	MAY	MARMARİS	41.7	39.2
17	MAY	DURSUNBEY	35.7	34.5
17	MAY	TAVŞANLI	35.4	33.8
17	MAY	BURHANİYE	36.6	36.0
17	MAY	BERGAMA	40.4	38.4
19	MAY	SİMAV	35.6	33.6
18	MAY	GEDİZ	37.8	35.8
17	MAY	SALİHLİ	41.2	39.5
17	MAY	SEFERİHİSAR	37.0	34.1
17	MAY	ÖDEMİŞ	42.1	39.2
18	MAY	GÜNEY	36.9	33.7
20	MAY	SELÇUK	39.2	37.0
19	MAY	NAZİLLİ	43.2	40.7
17	MAY	MİLAS	42.3	38.2
18	MAY	YATAĞAN	40.8	37.8
18	MAY	BURDUR	35.4	34.6
18	MAY	ISPARTA	35.4	33.6
17	MAY	DALAMAN	43.2	38.0
17	MAY	FETHİYE	40.1	39.0
17	MAY	ANTALYA	41.6	38.7
17	MAY	ALANYA	37.8	35.5
17	MAY	ANAMUR	39.3	37.5
16	MAY	SİLİFKE	39.2	38.3
17	MAY	FİNİKE	40.9	38.1
17	MAY	KAŞ	38.1	36.2
18	MAY	SENİRKENT	35.3	33.6
18	MAY	DİNAR	35.1	33.6
18	MAY	EĞİRDİR	34.2	32.9
18	MAY	TEFENNİ	34.7	33.1
18	MAY	KOZAN	42.0	41.5
17	MAY	KÖYCEĞİZ	41.1	39.0
16	MAY	KORKUTELİ	35.4	33.6
18	MAY	ELMALI	36.5	33.8
17	MAY	MANAVGAT	42.1	37.5
18	MAY	MUT	40.4	39.8
18	MAY	CEYHAN	41.3	40.8
17	MAY	KALE-DEMRE	39.0	37.7

17	MAY	GAZİPAŞA	38.8	35.9
20	MAY	ÇANKIRI	35.2	34.8
15	MAY	ESKİŞEHİR	35.3	34.3
20	MAY	BOLU	34.6	34.4
20	MAY	DÜZCE	39.5	39.0
21	MAY	MERZİFON	34.7	34.3
21	MAY	BOYABAT	37.1	36.9
20	MAY	ÜNYE	32.3	30.0
16	MAY	OSMANCIK	36.7	36.4
16	MAY	BEYPAZARI	35.9	35.6
28	MAY	HINIS	29.5	27.3
21	MAY	ŞIRNAK	31.8	31.4
30	AUGUST	SİMAV	38.7	38.1
3	SEPTEMBER	KÜTAHYA	38.4	36.1
3	SEPTEMBER	KÜTAHYA	38.4	36.1
3	SEPTEMBER	UŞAK	36.6	36.5
3	SEPTEMBER	AFYONKARAHİSAR	37.2	36.1
3	SEPTEMBER	MUĞLA	39.2	38.8
3	SEPTEMBER	SİMAV	39.1	37.0
1	SEPTEMBER	GEDİZ	40.4	39.5
3	SEPTEMBER	EMİRDAĞ	38.3	37.0
3	SEPTEMBER	GÜNEY	38.0	37.7
4	SEPTEMBER	ISPARTA	37.4	37.1
4	SEPTEMBER	BEYŞEHİR	36.5	34.6
3	SEPTEMBER	SİLİFKE	41.6	41.1
3	SEPTEMBER	MERSİN	41.5	39.0
3	SEPTEMBER	ADANA	45.1	43.2
3	SEPTEMBER	OSMANİYE	45.3	41.2
3	SEPTEMBER	İSKENDERUN	43.7	43.0
3	SEPTEMBER	ANTAKYA	43.5	42.6
3	SEPTEMBER	SENİRKENT	38.5	37.0
3	SEPTEMBER	DİNAR	38.1	37.3
4	SEPTEMBER	GÖKSUN	36.3	34.6
3	SEPTEMBER	EĞİRDİR	36.0	34.1
3	SEPTEMBER	ACIPAYAM	38.0	37.8
4	SEPTEMBER	TEFENNİ	37.0	35.2
3	SEPTEMBER	KOZAN	47.1	43.4
4	SEPTEMBER	KORKUTELİ	37.6	37.4
3	SEPTEMBER	KARASALI	44.4	41.8
4	SEPTEMBER	ELMALI	39.2	36.5
4	SEPTEMBER	MUT	44.3	41.6
3	SEPTEMBER	ERDEMLİ	41.1	40.4
3	SEPTEMBER	CEYHAN	45.4	42.4
3	SEPTEMBER	DÖRTYOL	45.4	43.0
4	SEPTEMBER	ISLAHIYE	44.1	40.5
4	SEPTEMBER	KALE-DEMRE	39.4	39.2
3	SEPTEMBER	YUMURTALIK	45.4	39.4
3	SEPTEMBER	KARATAŞ	42.4	39.5
3	SEPTEMBER	SAMANDAĞ	43.6	41.0
3	SEPTEMBER	ÇANKIRI	39.8	37.9
4	SEPTEMBER	SİVAS	36.6	35.7
3	SEPTEMBER	ESKİŞEHİR	38.0	36.4
3	SEPTEMBER	ANKARA BÖLGE	39.1	37.7
3	SEPTEMBER	KIRIKKALE	40.6	38.2
3	SEPTEMBER	YOZGAT	35.4	34.6

3	SEPTEMBER	KIRŞEHİR	39.0	36.2
4	SEPTEMBER	CİHANBEYLİ	39.6	37.7
3	SEPTEMBER	AKSARAY	38.7	37.3
3	SEPTEMBER	NEVŞEHİR	37.4	35.7
4	SEPTEMBER	KAYSERİ	38.4	36.0
4	SEPTEMBER	AKŞEHİR	38.7	35.9
4	SEPTEMBER	KONYA	38.0	36.1
3	SEPTEMBER	KARAMAN	39.1	37.9
4	SEPTEMBER	EREĞLİ	39.6	37.8
3	SEPTEMBER	NİĞDE	37.3	35.1
1	SEPTEMBER	ZARA	34.8	34.3
3	SEPTEMBER	POLATLI	40.2	37.7
4	SEPTEMBER	ÇİÇEKDAĞI	39.6	38.9
3	SEPTEMBER	KULU	37.7	37.0
3	SEPTEMBER	KAMAN	37.0	36.9
4	SEPTEMBER	KANGAL	34.5	34.3
3	SEPTEMBER	YUNAK	36.4	35.0
4	SEPTEMBER	PINARBAŞI/KAYSERİ	35.4	33.6
3	SEPTEMBER	ILGIN	38.0	35.5
3	SEPTEMBER	SEYDİŞEHİR	37.1	35.9
4	SEPTEMBER	KARAPINAR	39.0	37.2
3	SEPTEMBER	ULUKIŞLA	35.6	33.7
3	SEPTEMBER	SİVRİHİSAR	37.0	35.2
2	SEPTEMBER	RİZE	35.0	34.6
3	SEPTEMBER	BOLU	38.5	37.3
3	SEPTEMBER	KASTAMONU	39.3	36.5
3	SEPTEMBER	KARABUK	40.9	40.8
4	SEPTEMBER	MERZİFON	39.7	37.5
4	SEPTEMBER	AMASYA	43.5	40.3
4	SEPTEMBER	TOKAT	40.7	38.8
1	SEPTEMBER	GÜMÜŞHANE	37.1	37.0
5	SEPTEMBER	BAYBURT	34.0	33.7
3	SEPTEMBER	BOYABAT	43.1	38.9
3	SEPTEMBER	TOSYA	39.1	37.7
4	SEPTEMBER	OSMANCIK	40.0	39.6
3	SEPTEMBER	KIZILCAHAMAM	37.1	35.9
3	SEPTEMBER	BEYPAZARI	41.3	38.2
4	SEPTEMBER	ZİLE	40.4	38.0
1	SEPTEMBER	ŞEBİNKARAHİSAR	35.6	35.0
1	SEPTEMBER	ERZİNCAN	37.2	36.6
4	SEPTEMBER	MALATYA	39.5	38.8
1	SEPTEMBER	ELAZIĞ	39.0	37.8
4	SEPTEMBER	DİVRİĞİ	37.7	37.5
3	SEPTEMBER	SARIZ	33.8	33.0
4	SEPTEMBER	ELBİSTAN	38.1	36.4
4	SEPTEMBER	DOĞANŞEHİR	37.6	36.0
1	SEPTEMBER	SİİRT	40.0	39.9
4	SEPTEMBER	KİLİS	42.5	41.4
1	SEPTEMBER	ŞANLIURFA	43.9	42.1
4	SEPTEMBER	KAHTA	41.1	40.9
5	SEPTEMBER	SİVEREK	41.1	40.3
6	OCTOBER	KUMKÖY-KİLYOS	34.5	33.6

5	OCTOBER	ÇANAKKALE	31.8	31.7
6	OCTOBER	BALIKESİR	38.1	36.4
5	OCTOBER	FLORYA	32.3	31.5
6	OCTOBER	KÜTAHYA	31.9	31.6
5	OCTOBER	DİKİLİ	32.7	32.6
6	OCTOBER	AKHİSAR	38.3	38.0
6	OCTOBER	MANİSA	38.2	37.3
5	OCTOBER	KUŞADASI	36.2	34.5
6	OCTOBER	AYDIN	39.5	38.0
6	OCTOBER	DENİZLİ	36.9	34.4
6	OCTOBER	MUĞLA	36.8	36.1
6	OCTOBER	DURSUNBEY	35.2	34.0
5	OCTOBER	SİMAV	35.0	33.3
5	OCTOBER	GEDİZ	36.2	34.5
6	OCTOBER	ÖDEMİŞ	38.1	37.5
5	OCTOBER	SELÇUK	36.4	35.3
6	OCTOBER	YATAĞAN	39.2	36.6
6	OCTOBER	BURDUR	32.7	32.4
6	OCTOBER	ISPARTA	33.1	32.2
7	OCTOBER	KAHRAMANMARAŞ	38.6	37.2
6	OCTOBER	KAŞ	34.6	34.1
6	OCTOBER	SENİRKENT	33.4	32.2
5	OCTOBER	ACIPAYAM	33.3	32.8
7	OCTOBER	TEFENNİ	31.9	31.4
7	OCTOBER	KORKUTELİ	33.5	32.0
5	OCTOBER	ELMALI	32.6	32.3
7	OCTOBER	MUT	38.0	36.7
6	OCTOBER	ESKİŞEHİR	33.4	33.0
7	OCTOBER	KIRIKKALE	33.5	33.0
6	OCTOBER	AKŞEHİR	31.9	31.7
8	OCTOBER	ÇUMRA	32.1	31.8
6	OCTOBER	SİVRİHİSAR	31.2	31.1
1	NOVEMBER	GÜMÜŞHANE	22.2	22.1
1	NOVEMBER	ARDAHAN	18.7	18.2
1	NOVEMBER	MUŞ	22.8	21.6
1	NOVEMBER	AHLAT	18.9	18.8
1	NOVEMBER	ŞIRNAK	23.0	22.6
1	NOVEMBER	GÜMÜŞHANE	22.2	22.1
1	NOVEMBER	ARDAHAN	18.7	18.2
1	NOVEMBER	MUŞ	22.8	21.6
1	NOVEMBER	AHLAT	18.9	18.8
1	NOVEMBER	ŞIRNAK	23.0	22.6

Table 2. New monthly extreme minimum temperature records in 2020.

Day	Month	Station	2020	Long term
11	FEBRUARY	CİZRE	-9.4	-9.3
2	JUNE	ACIPAYAM	3.6	3.8

3. Precipitation

Turkey mean areal precipitation in 2020 was 500 mm. This value is 13 % below from 1981-2010's normal (574 mm) (Figure 3.1).

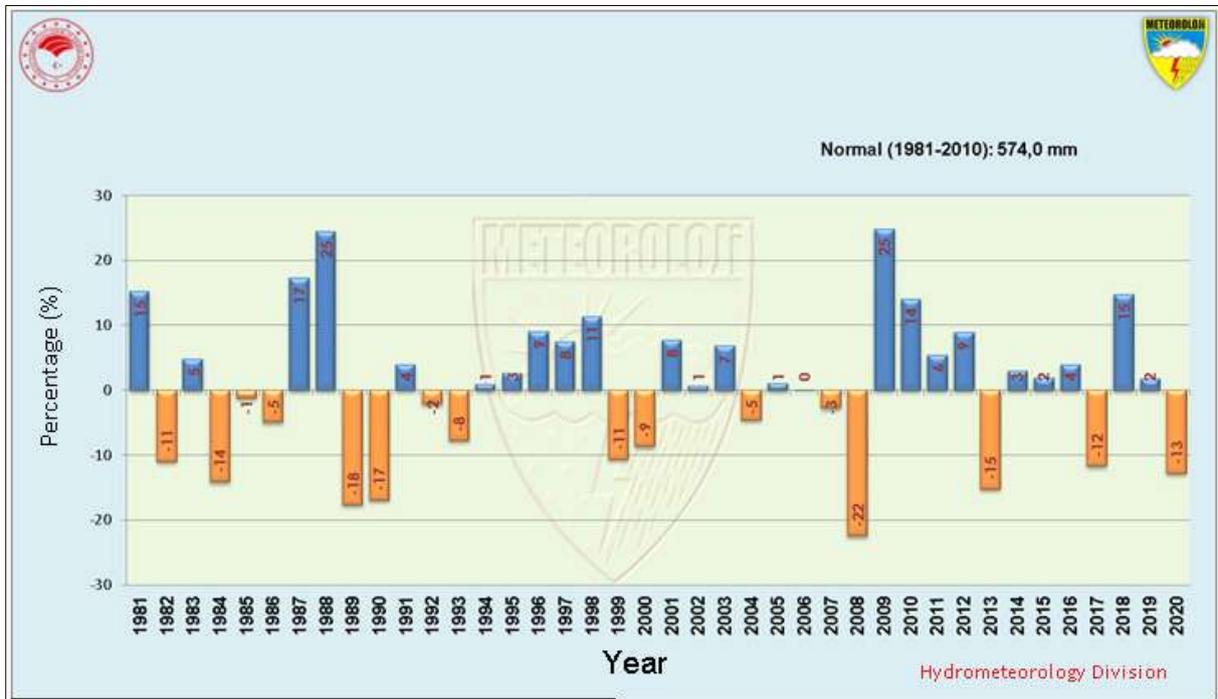


Figure 3. 1 Annual areal precipitation anomaly in Turkey (URL 2)

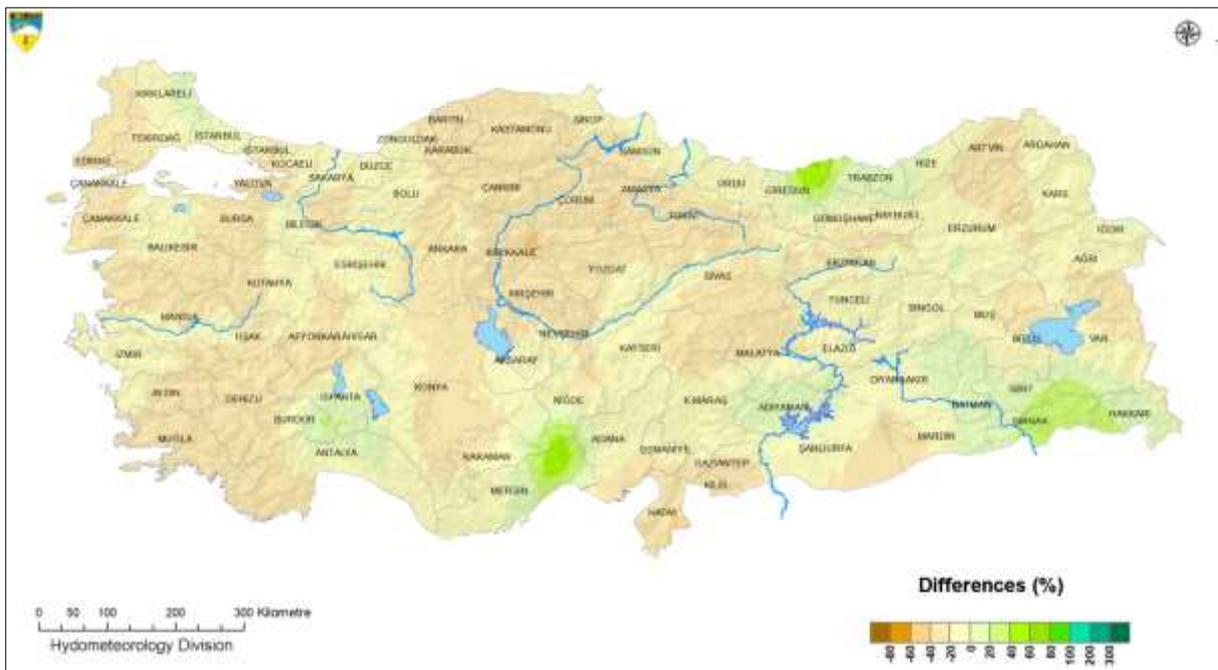


Figure 3. 2 Spatial distribution of mean precipitation anomalies in Turkey in 2020 (URL 2).

Geographically, Mersin, Giresun, Trabzon, Şırnak, Adıyaman, Diyarbakır, Hakkari, Batman Kırklareli and Lakes Region had below normal precipitation in 2020 (Figure 3.2).

3.1 Monthly precipitation

Monthly precipitation in 2020 was above normal in February, March, May and June, and below normal in other months (Figure 3.3).

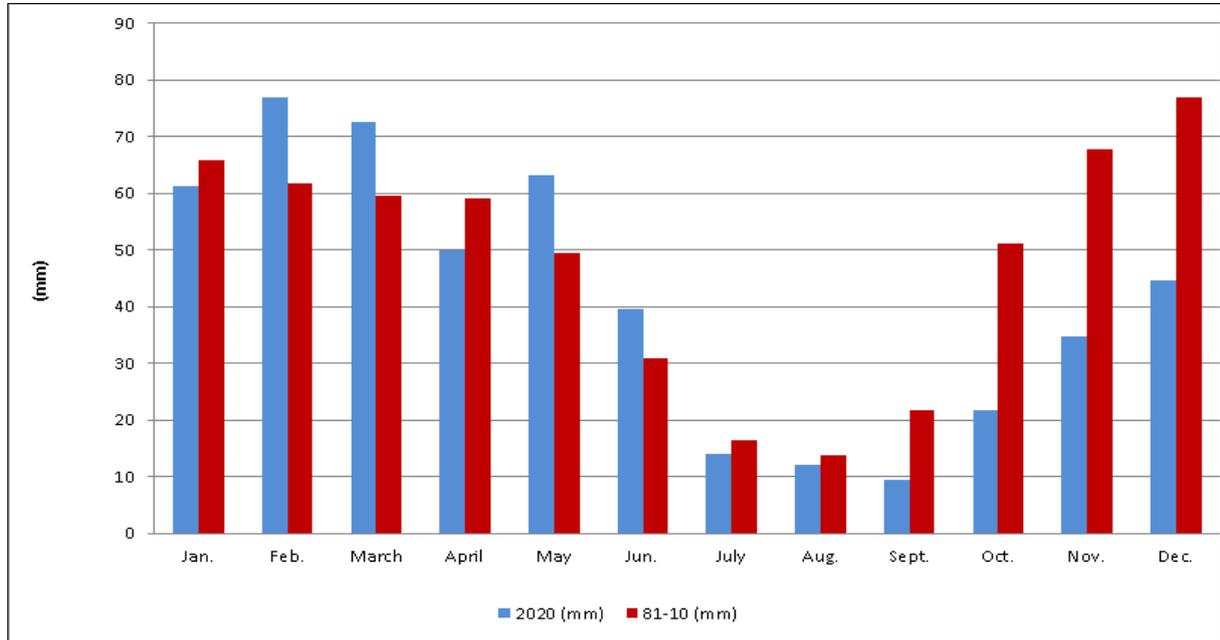


Figure 3. 3 Monthly areal rainfall anomaly in Turkey in 2020 (URL 2)

3.2 Standardized Precipitation Index

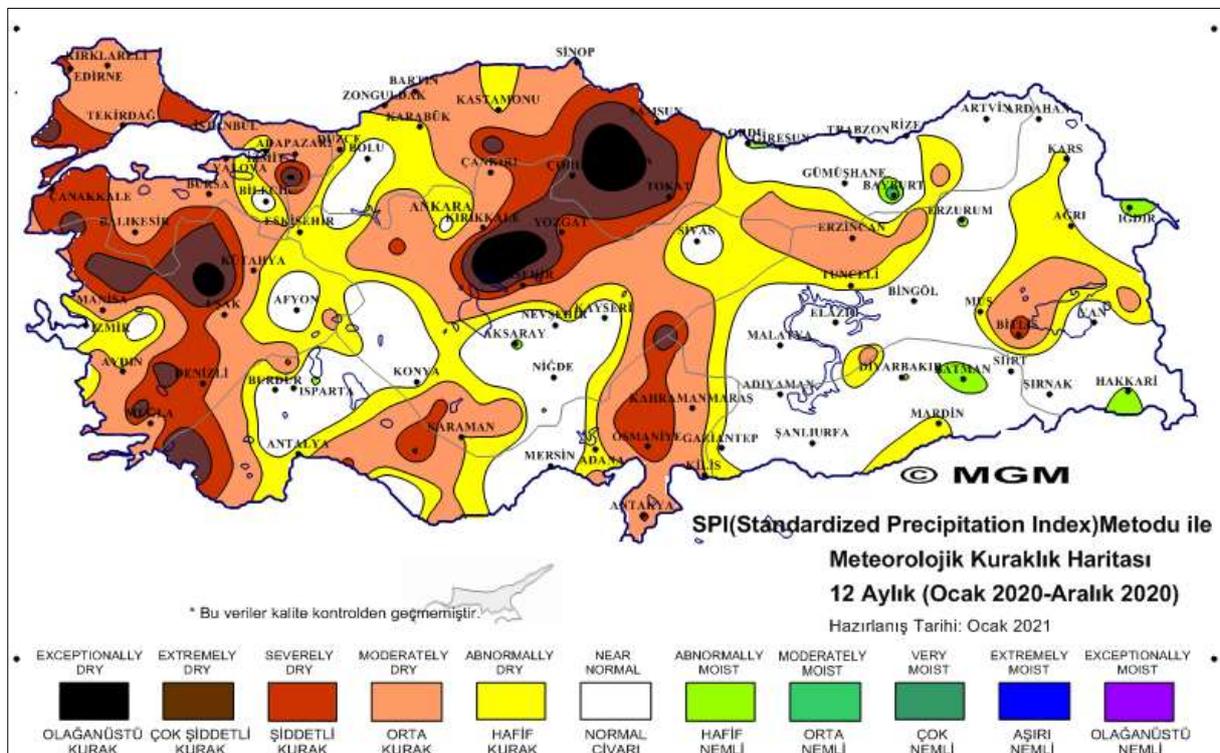


Figure 3. 4 Standardized Precipitation Index of Turkey (URL 5)

Twelve month standardized precipitation index shows moderate, severe and very severe drought in western and central parts of Turkey (Fig. 3.4).

4. Extreme Meteorological Events

The year 2020 was the year in which the most extreme events were seen, with the total number of 984. There is an increasing trend in extreme event occurrences especially during the last two decades (Fig. 4.1).

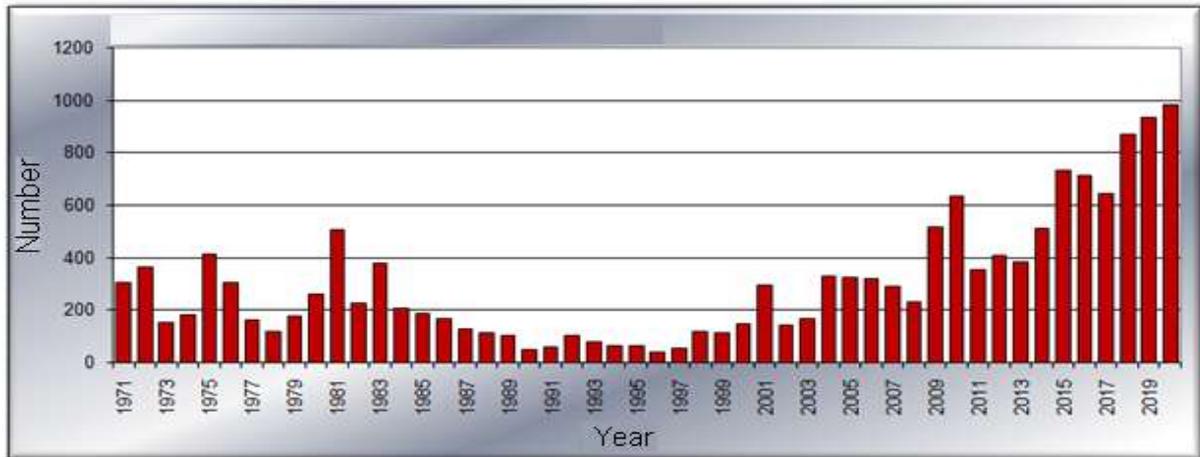


Figure 4. 1 Annual number of extreme events in Turkey in 2020 (URL 3)

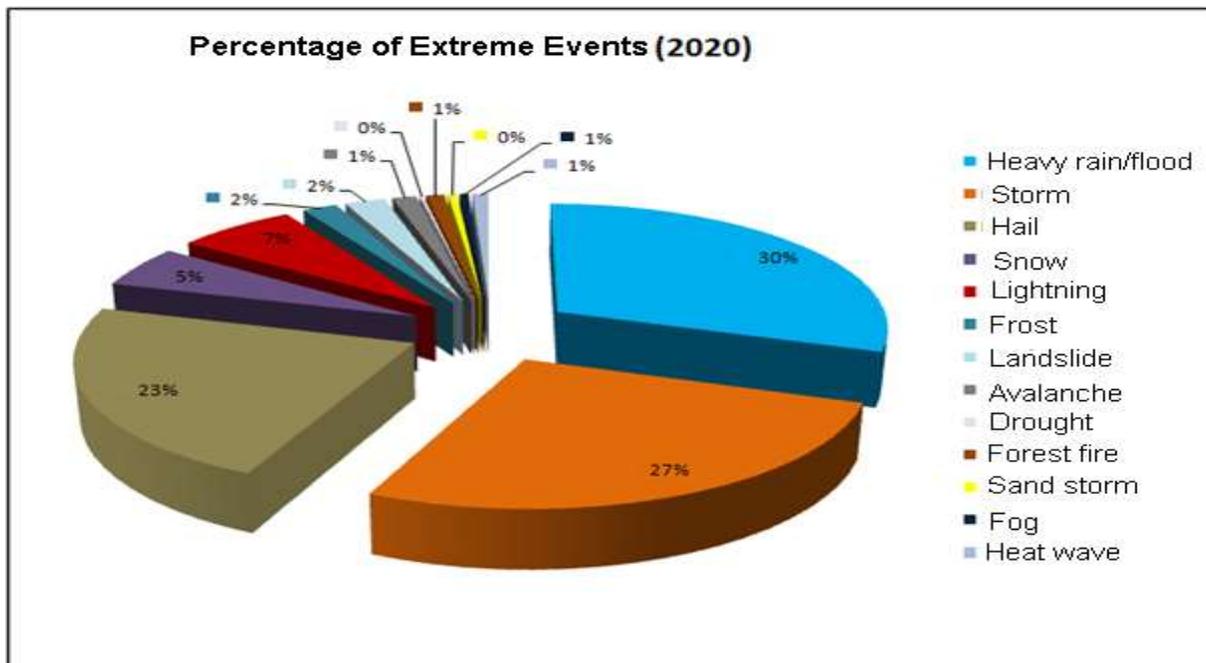


Figure 4. 2 Proportional distribution of extreme events in 2020 (URL 3)

Most hazardous extreme events recorded in 2020 were heavy rain and floods (30%), wind storms/tornadoes (27%) and hail (23%). The others were lightning (7%), heavy snow (5%), frost and landslide (2%), avalanche, forest fire, fog and heat wave (1%) (Figure 4.2).

4.1 Avalanche

Two avalanches occurred on February 4 and 5 in Bahçesaray district of Van. It was reported that 5 people died in the first avalanche incident, and 36 people died in the second avalanche (Fig. 4.3).



Figure 4.3. Avalanche in Bahçesaray, Van, Turkey on 5 February 2020 (Url 3).

4.2 Sand and dust storm

On September 12, the dust storm negatively affected life in Polatlı district of Ankara. With the dust storm, huge dust clouds formed in the sky. 6 people were injured due to falling down of roofs of homes and trees. Power supply to the town was disrupted due to the dust storm (Fig. 4.4).



Figure 4.4. Dust storm in Polatlı, Ankara, 12 September 2020 (URL 3).

4.3 Heavy rain/floods

Floods occurred as a result of heavy rainfall in Doğankent district of Giresun. Abdal and Dereli streams overflowed due to the heavy downpour. 4 people died and Giresun-Dereli-Sivas highway was closed due to rising of flood waters (Fig. 4.5).



Figure 4.6. Flood in Giresun, Dereli on 22 August 2020 (URL 4)

Table 3. Rainfall Intensity analysis in Giresun for 22 August 2020

Date	Start	End	Duration min	Amount mm	Intensity mm/h	Return Per. year
22.08.2020	20:44	20:48	5	10,2	122,76	4
22.08.2020	20:43	20:52	10	16,8	100,92	5
22.08.2020	20:43	20:57	15	22,4	89,6	5
22.08.2020	20:43	21:12	30	32,8	65,68	4
22.08.2020	20:39	21:38	60	51,6	51,63	6
22.08.2020	19:58	21:57	120	66,4	33,21	7
22.08.2020	18:54	21:53	180	92,6	30,86	16
22.08.2020	18:00	21:59	240	109,5	27,37	22
22.08.2020	17:01	22:00	300	120,5	24,1	33
22.08.2020	16:02	22:01	360	128,4	21,4	43
22.08.2020	14:10	22:09	480	133,1	16,64	48

The return period of 133.1 mm of precipitation, recorded in eight hours between 14:10 and 22:09 in Giresun on August 22, is determined as 48 years (Table 3).

On 21.06.2020 heavy rain occurred around 17:00 in Bursa, affected 5 districts (Kestel, Orhangazi, İznik, Yenişehir, and İnegöl) and 43 villages. The flood waters overflowing from nearby mountainous region to Bursa central, brought the life to a halt. Five people died due to the flood. 26 thousand acres of agricultural land was flooded and damaged (Fig 4.5). 17 lambs, 48 beehives and 400 poultry were killed in the flood and flood water inundation occurred. A large number of cars, tractors, vans and trailers were also damaged by being dragged in the flood waters.



Figure 4.5. Submerged agricultural land due to heavy rain and floods in Bursa on 21 June 2020 (URL 6)

4.4 Lightning

On 12 September afternoon hours, lightning struck on a mother and her daughter, who were collecting rose hips in the rural area of Gunay village of Torul district of Gümüşhane. The mother and daughter died at the place where lightning struck (Fig. 4.6).



Figure 4.6. Lightning caused two casualties on 12 September 2020, Torul, Gümüşhane, Turkey (URL 3)

4.5 Extreme Values of 2020



Figure 4.7. Extreme Values of 2020

References

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