

SIGNIFICANT WEATHER & CLIMATE EVENTS in GREECE during 2018



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The significant weather and climatic events in Greece during 2018 are described in the present report - bulletin. Information on anomalies of temperature and precipitation with respect to the monthly normal values (1971-2000) represented graphically, as well as tables and brief summaries of the significant weather events are included.

BRIEF CATALOGUE

DUST

- March 2018

DROUGHT

- April 2018
- October 2018

EXTRA-TROPICAL CYCLONE

- September 2018

EXTREME PRECIPITATION

- July 2018

FOREST FIRES-WILDFIRES

- July 2018

WARM SPELL

- April 2018
- May 2018

WET SPELL

- February 2018
- June 2018

Wet February

Description

Intensive / heavy precipitation events in February resulted in high water balance surplus over central and northwest Greece where locally monthly precipitation amounts exceeded 200 mm. Precipitation anomalies with respect to normal values (1971-2000) are given in Figure 1. The total precipitation amounts account for 240 - 320 % of climatological normals (1971-2000) for central and northwest Greece, while precipitation totals were below climatological normals (1971-2000) for south Aegean islands.

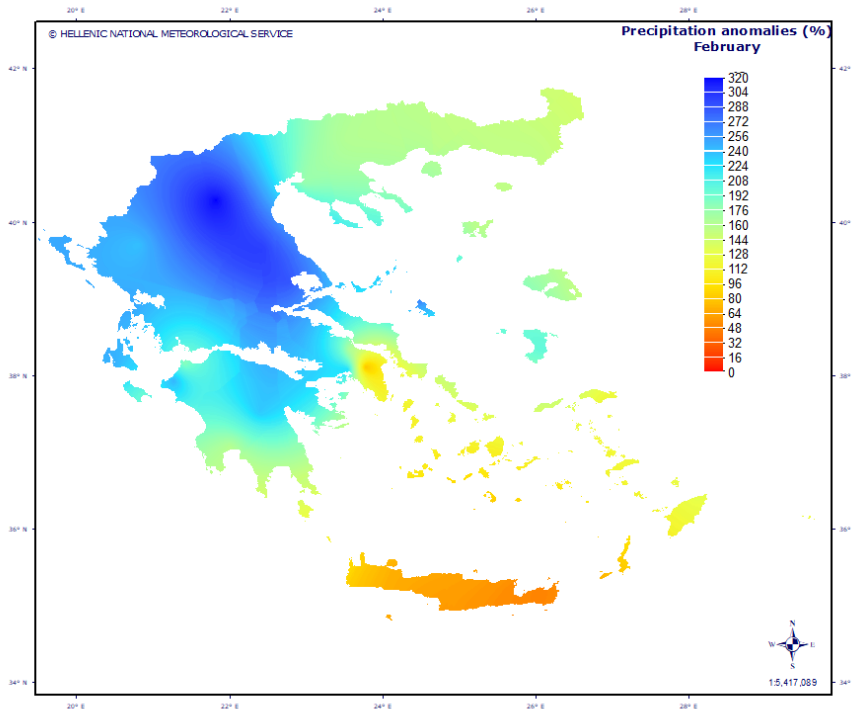


Figure 1. February 2018 precipitation anomalies given in percentages according to the 1971-2000 climatology

The highest monthly precipitation totals were recorded in:

Station	Monthly precipitation (mm)	Normal values (1971-2000)
Kerkyra	304	122
Ioannina	248	103
Preveza	278	111
Zakynthos	209	107

High Impacts Events

The intensive rainfall caused floods, landslides and damages to infrastructure in Thessaly as well as one fatality in Evia.

Dust in March

In 2018, Greece experienced 4 major dust transfer episodes during 2-6/3/2018, 17-18/3/2018, 22/3/2018 and 26/3/2018.

During the above mentioned episodes, high values of dust concentration were recorded mostly in the southern and central parts of the country.

According to the measurements of the dust collection station of the National Observatory in the city of Chania, in the island of Crete, the concentration in the evening of Friday 02/03/2018 reached $495 \mu\text{g}/\text{m}^3$.

On Sunday 18/3/2018 values of $120 \mu\text{g}/\text{m}^3$ were recorded in the dust station of the National Observatory in the area of Methoni in the southwest part of the prefecture of Peloponese and $180 \mu\text{g}/\text{m}^3$ in Chania/Crete. On 22 March 2018, the transfer episode of African dust that affected mostly the southern and central parts of the country was one of the strongest of the last decade, while strong south gale winds prevailed. The maximum PM10 particle concentration exceeded $500 \mu\text{g}/\text{m}^3$ and as a result, the solar radiation to the ground was limited. The island of Crete, was mostly affected, where the visibility reduction caused suspension of operations at Heraklion Airport.



Fig.

Figure 2: High concentration of dust at the harbor of Heraklion, Crete, at noon on Thursday, March 22, 2018. Photo by Thodoris Tzimopoulos.

Additionally, on 26/03/2018, the values of dust concentration at the stations of the National Observatory at Methoni and Chania/Crete at 14:30 UTC were 182 and $345 \mu\text{g}/\text{m}^3$ respectively.

Warm and Dry April

Description

Many Greek weather stations registered the warmest April since 1960. Maximum temperatures in April 2018 were extremely high mainly in continental Greece. Monthly maximum temperatures anomalies were 4 to 5 °C above normal values (1971-2000) in mainland while locally in northern parts anomalies exceeded 6 - 7 °C (Figure 3). The lowest positive max temperature anomalies (2 -3 °C) were found in Aegean islands and Crete.

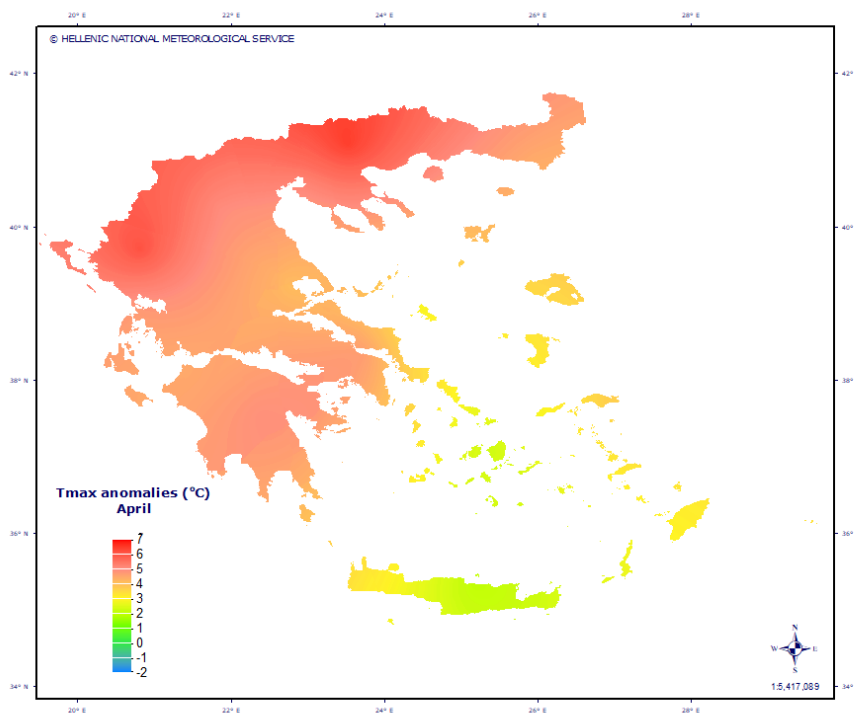


Figure 3: Monthly maximum temperature anomalies (°C) in April 2018 according to normal values 1971-2000

The maximum daily temperature was above 28 °C at several days and in some stations reached more than 31 °C e.g.

Station	Date	Max Temperature (°C)
Nea Filadelfeia	27/4	32.2
	28/4	31.0
	29/4	31.3
Serres	23/4	32.2
	24/4	32.5
	25/4	33.3
	26/4	33.2
	27/4	32.7
	28/4	32.5
Argos	28/4	32.6
Andravida	29/4	32.2
Eleusina	28/4	31.4
Tithorea	24/4	31.2

	25/4	31.3
	27/4	31.3
Astros	28/4	31.0
Sofades	27/4	31.1
	25/4	30.8
Araxos	28/4	30.9
Helliniko	25/4	30.9
	27/4	30.8
Kalamata	25/4	30.9
Kerkyra	29/4	30.8
Thessaloniki	27/4	30.7
Larisa	24/4	30.4
Preveza	29/4	30.2
Argostoli	29/4	30.2

These high temperatures were accompanied by outstanding rain deficit. In many stations the total monthly precipitation was almost zero. The monthly precipitation ratios to the normal values (1971-2000) are given in percentages in Figure 4. Total monthly precipitation amounts were 80 - 100 % below climatological normals (1971-2000) for the greatest part of Greece

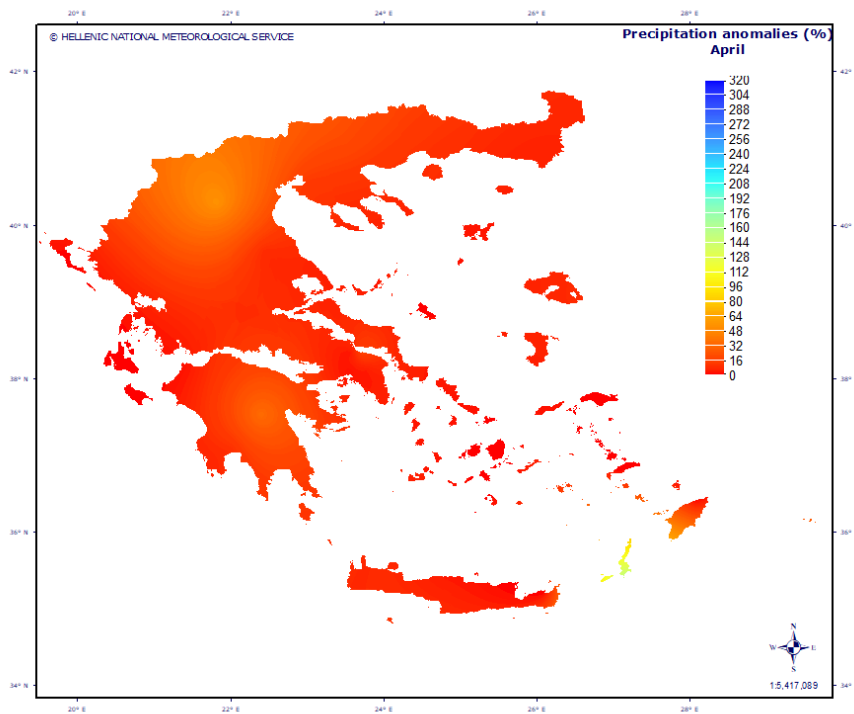


Figure 4. April 2018 precipitation anomalies given in percentages according to the 1971-2000 climatology

Warm May

After the warmest April 2018, May 2018 continues with positive normal temperature anomalies. These positive monthly maximum temperature anomalies varied from 2 to 4 °C for the greatest part of the country (Figure 5). The greatest positive anomalies were reported at stations located in northeastern regions.

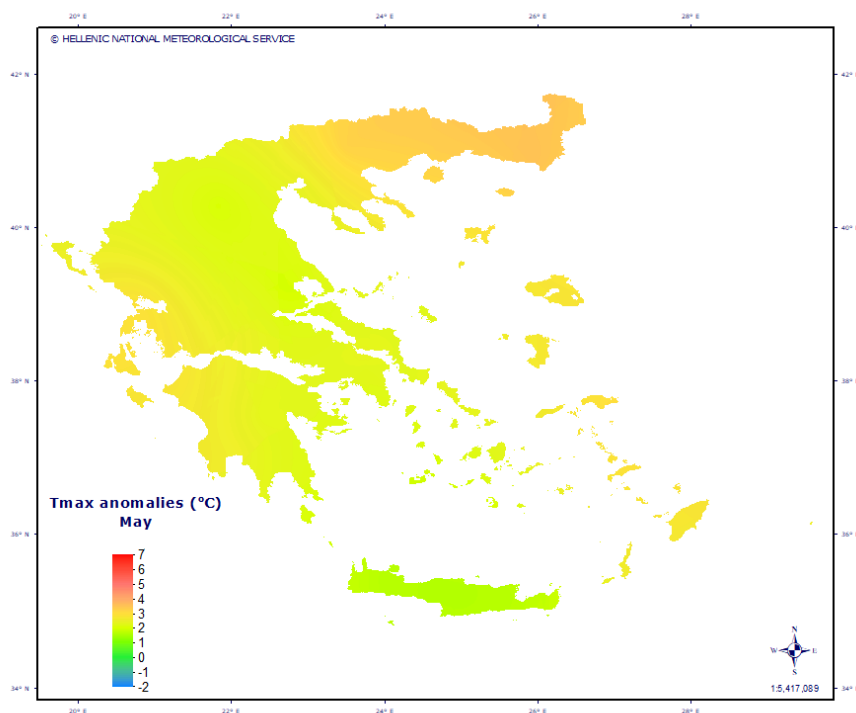


Figure 5: Monthly maximum temperature anomalies (°C) in May 2019, according to normal values 1971-2000

The maximum daily temperature in May exceeded 33 °C in some stations e.g.

Station	Date	Max Temperature (°C)
Heraklio	19/5	36.0
Serres	4/5	33.6
	5/5	34.2
Mytilini	19/5	33.4
Samos	4/5	33.2

Wet June

June 2018 was characterized by the prevailing of high pressure over the north Europe and lower than normal pressure anomalies over the southeastern Mediterranean, leading to several cyclones crossing the Mediterranean Sea from west to east. They were accompanied by thunderstorms and heavy precipitation. The higher monthly precipitation amounts exceeding 100mm were recorded in south Ionian Islands, Peloponnese, Thessaly and northeast Macedonia. On the other hand, monthly precipitation totals did not exceed 15-20 mm in south Aegean islands. Monthly precipitation totals are given in Figure 6.

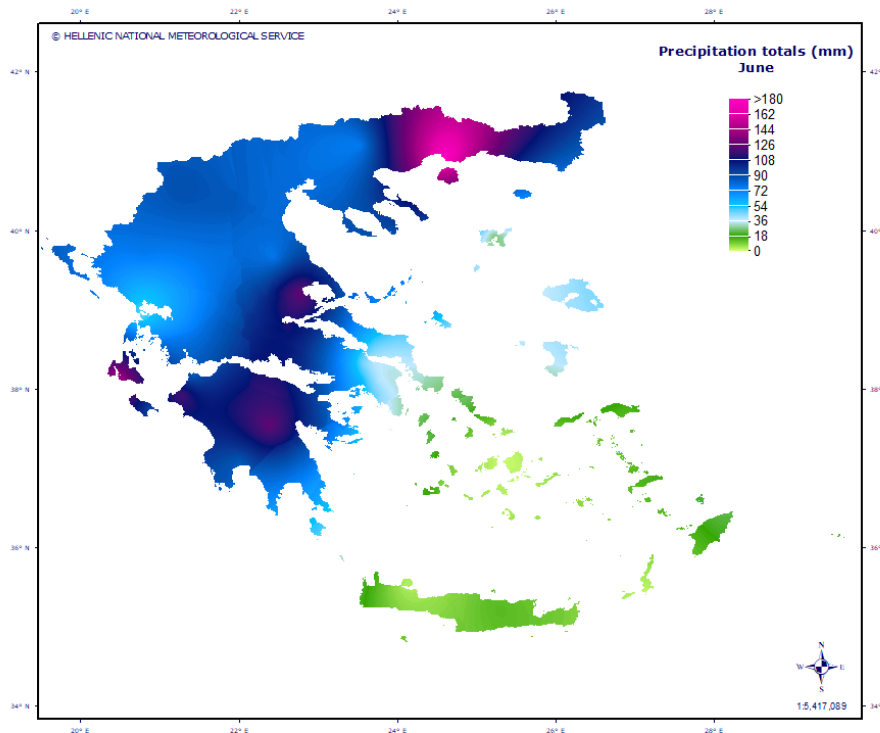


Figure 6: Monthly precipitation sums (mm) in June 2018

The higher monthly precipitation totals are given in the following table. It is also worth to notice that the accumulations over few days have sometimes been exceptional, as for example in 2 days between 26th and 27th of June at Argostoli where 83.5 mm was registered, twelve times the normal of the month.

Station	Monthly precipitation (mm)	48h precipitation (mm)	Normal values (1971-2000)
Argostoli	160	83.5 (26-27 June)	7
Aghialos	139	101.7 (26-27 June)	18
Tripoli	135	61.8 (26-27 June)	14
Andravida	133	42.9 (26-27 June)	6
Xrysoupoli	197	176.9 (27-28 June)	(stations operates since 1985)

Almost all stations registered monthly total precipitation of more than 200 % of the normal values (1971-2000) and wide areas reached monthly precipitation 20 - 30 times above normals (Figure 7).

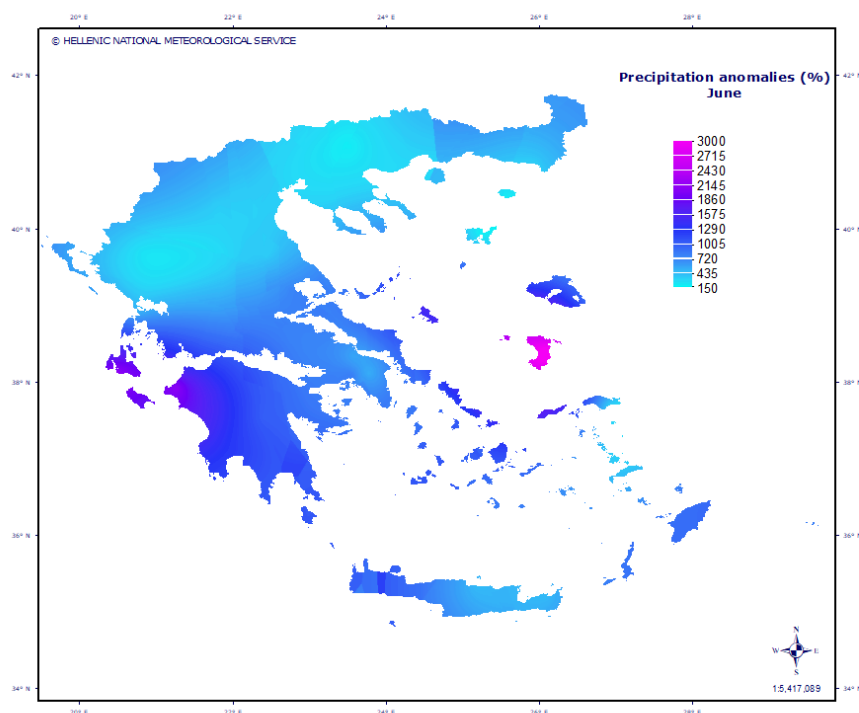


Figure 7. June 2018 precipitation anomalies given in percentages according to the 1971-2000 climatology

June 2018 was not only wet but it was rather cold. Monthly maximum temperatures anomalies were 1 to 2 °C below normal values (1971 -2000) in continental Greece. During the third ten days of June many stations recorded daily maximum temperature from 7 to 11 degrees below normal values (1971-2000) e.g.

Station	Date	Max Temperature (°C)	Normal Values (°C)
Kozani	26/6	16.0	26.7
Elefsina	27/6	24.6	31.5
Serres	26/6	22.4	33.2
Thessaloniki	26/6	21.4	31.1
Tanagra	27/6	19.6	30.4

High Impacts Events

Unusual high precipitation amounts resulted in flooding rivers, streams, agricultural land and residential settlements. Floods occurred during 26-27 June in Attica (mainly Mandra), Halkidiki and Magnisia. Traffic in main roads had been halted due to floods. Some people were trapped in Thessaloniki and Magnisia. Also horses were trapped at the river bed in Volos (Magnisia) and landslides occurred in Larisa.

Extreme precipitation in July

Although July in Greece is warm and dry in general, there were some thunderstorms with extreme precipitation that caused problems and floods. Peloponnese, Attica and north Greece received the highest precipitation amounts. The monthly precipitation sums in July 2018 are given in Figure 8.

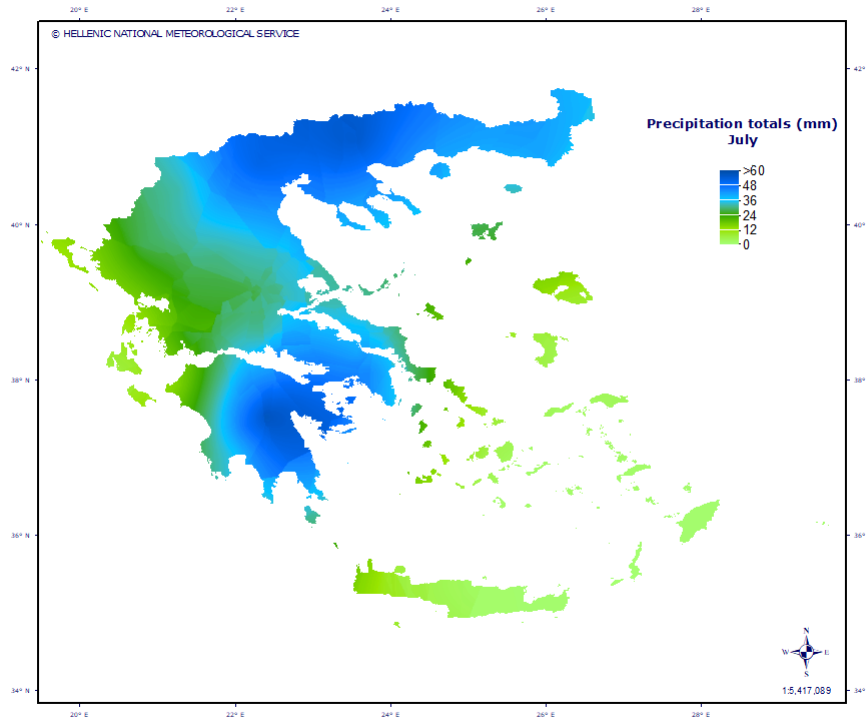


Figure 8: Monthly precipitation sums (mm) in July 2018

Some high monthly precipitation totals are given in the following table.

Station	Monthly precipitation (mm)	Normal values (1971-2000)
Tripoli	112	16
Tatoi	67	14.5
Alexandroupoli	60	22.6

Stations in eastern mainland registered monthly total precipitation of more than 150 % of the normal values (1971-2000) and stations in Attica exceeded monthly precipitation four times above normal values (Figure 9).

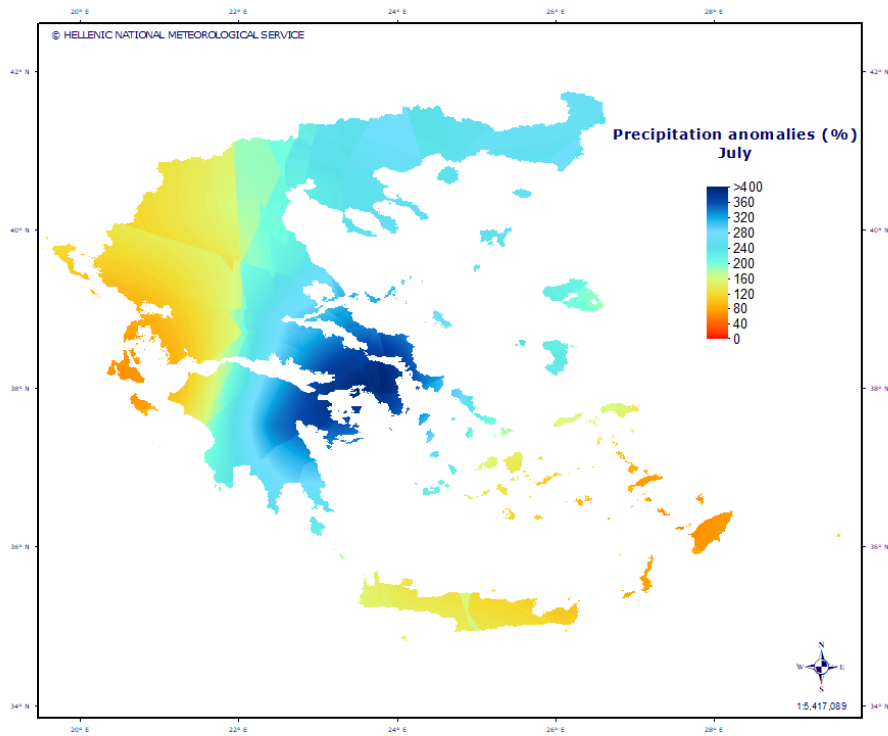


Figure 9. July 2018 precipitation anomalies given in percentages according to the 1971-2000 climatology

High Impacts Events

Summer storms between 26 and 29 July have caused floods in Athens and traffic problems.

Wildfires in July

On 23 July 2018, strong western gale winds that prevailed in the area of Attica, in combination with high temperatures at the coasts of Eastern Attica (39°C in Rafina) and dry air masses, caused the outbreak of wildfires in the area of Gerania mountain (west Attica) and eastern Parnitha mountain. The fires spread rapidly, due to the strong local western winds, in the areas of Attica, Kineta, Neos Voutzas, Mati and Kokkino Limanaki destroying hundreds of houses and settlements and leaving dozens of victims in Mati, Attica. The last official report refers to 100 deaths, with 164 injured, including 23 children, of whom 16 died.

The fires in Neos Voutzas, Mati and Kokkino Limanaki are the deadliest in the history of modern Greece and the second deadliest in the world in the 21st century.

Extra-Tropical Cyclone in September

On 27 September 2018 an extra-tropical cyclonic low pressure system formed firstly in the Gulf of Sirte with surface pressure 1014hPa. This extra-tropical cyclone moved north-northwest, deepened rapidly 22mbar in 24 hours (1.47 Bergeron approximately) and is characterized as an explosive cyclogenesis. Afterwards it gradually moved eastwards reaching the South Ionian Sea. At midday on 29 September 2018 the centre of this low pressure system was located over Kythira Sea (Kalamata station reported surface pressure 991hPa at 11:50UTC). In the following hours it continued its northeastern "journey" towards the Saronic Gulf and gradually weakened.

High precipitation values reported in the eastern Sterea region and mainly in Evia. The accumulated precipitation during 28/9-01/10/2018 at stations located in the eastern Sterea region (the table below) was even fifteen times the normal September's precipitation.

Station	Precipitation (mm) during 28/9/2018-01/10/2018	Normal values (1971-2000) September
Tanagra	179	11.8
Elefsina	105	8.7
Tatoi	94	10.2
Helliniko	79	6.9

High Impacts Events

The extra tropical cyclone activity in September 2018 caused extensive damages to the infrastructure network, sinking boats in Kalamata, overflowing rivers in many areas and flooding houses mainly in Evia, in south and east Peloponnese, in Attica and Fthiotida (east Sterea prefecture). Dozens of roads were closed due to flooding. Many people were trapped in homes or cars. Landslides occurred in the region of central Greece. Gale force winds knocked down hundreds trees and power lines.

Three people lost their lives in the areas of Evia, Fthiotitha and Korinthia.

Dry October

Precipitation in October 2018 was extremely low mainly over eastern Greece, where locally total monthly precipitation was registered lower than 30 mm (Figure 10). Moreover almost all Greece except Ionian islands received total monthly precipitation less than 50 % of normal values (1971-2000) (Figure 11).

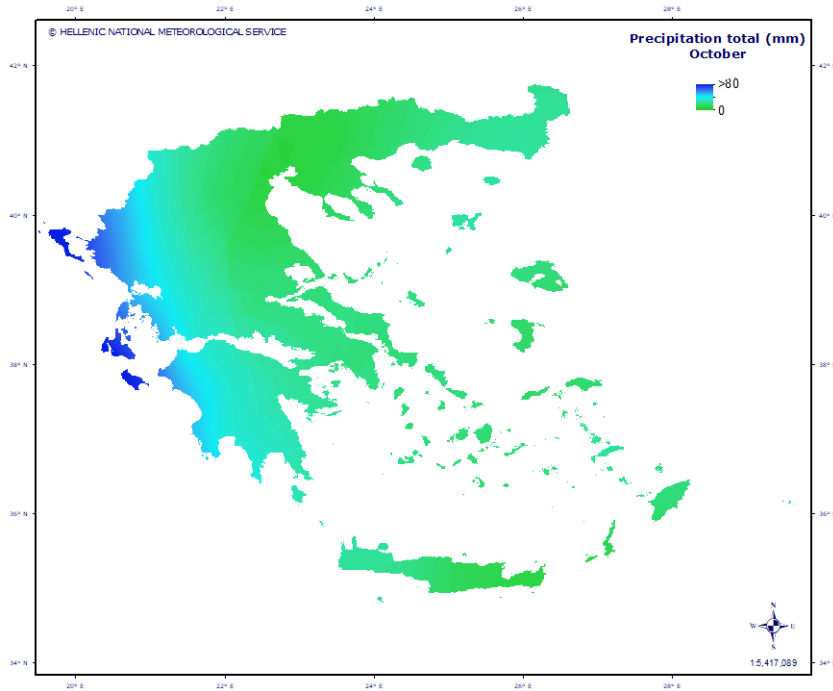


Figure 10: Monthly precipitation sums (mm) in October 2018

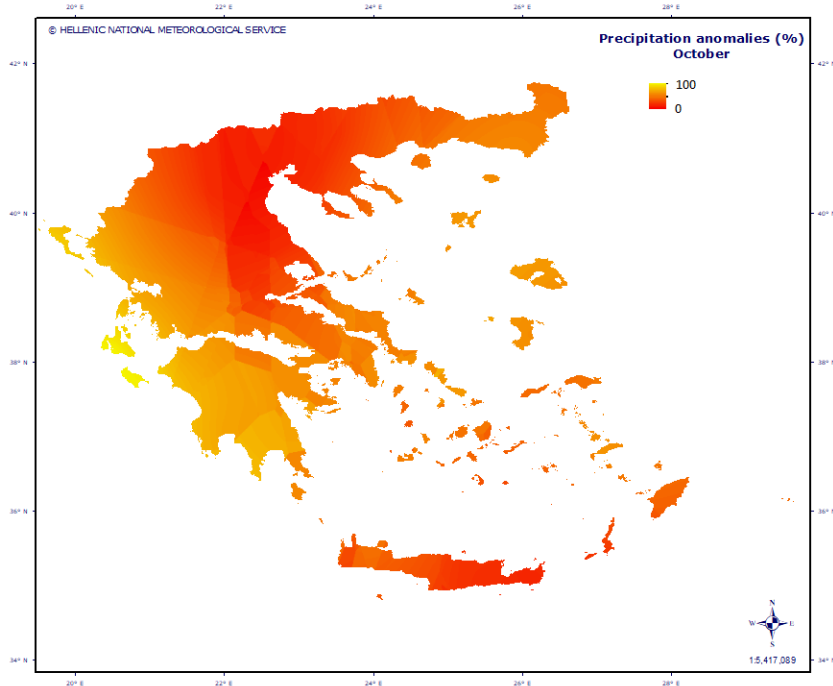


Figure 11. October 2018 precipitation anomalies given in percentages according to the 1971-2000 climatology