HELLENIC NATIONAL METEOROLOGICAL SERVICE
ΕΘΝΙΚΗ ΜΕΤΕΩΡΟΛΟΓΙΚΗ ΥΠΗΡΕΣΙΑ

VERIFICATION of the SEECOF-20 WINTER 2018/2019 CLIMATE OUTLOOK FOR GREECE

DIVISION of CLIMATOLOGY – APPLICATIONS

HELLENIC NATIONAL METEOROLOGICAL SERVICE

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Introduction

This report consists of two parts. In part A, an analysis of the observed mean temperature for Winter 2018/19 as well as an assessment - verification of SEECOF-20 temperature outlook for Winter 2018/19 were performed, first on monthly basis and then for the whole Winter 2018/19 season. The reference period for comparison/ verification was the base period of 1971-2000.

In part B, an analysis of the observed precipitation for Winter 2018/19 as well as an assessment - verification of SEECOF-20 precipitation outlook for Winter 2018/19 were performed, first on monthly basis and then for the whole Winter 2018/19 season. The reference period for comparison/verification was the base period of 1971-2000.

Part A

1. Temperature

1.1. Seasonal analysis of the Winter 2018/19 air temperatures anomalies in Greece

The analysis of seasonal mean air temperatures in Greece is based on data from 31 meteorological stations distributed evenly in the country. The seasonal air temperature in winter ranged from 0 ^{o}C to +14 ^{o}C (Figure 1).

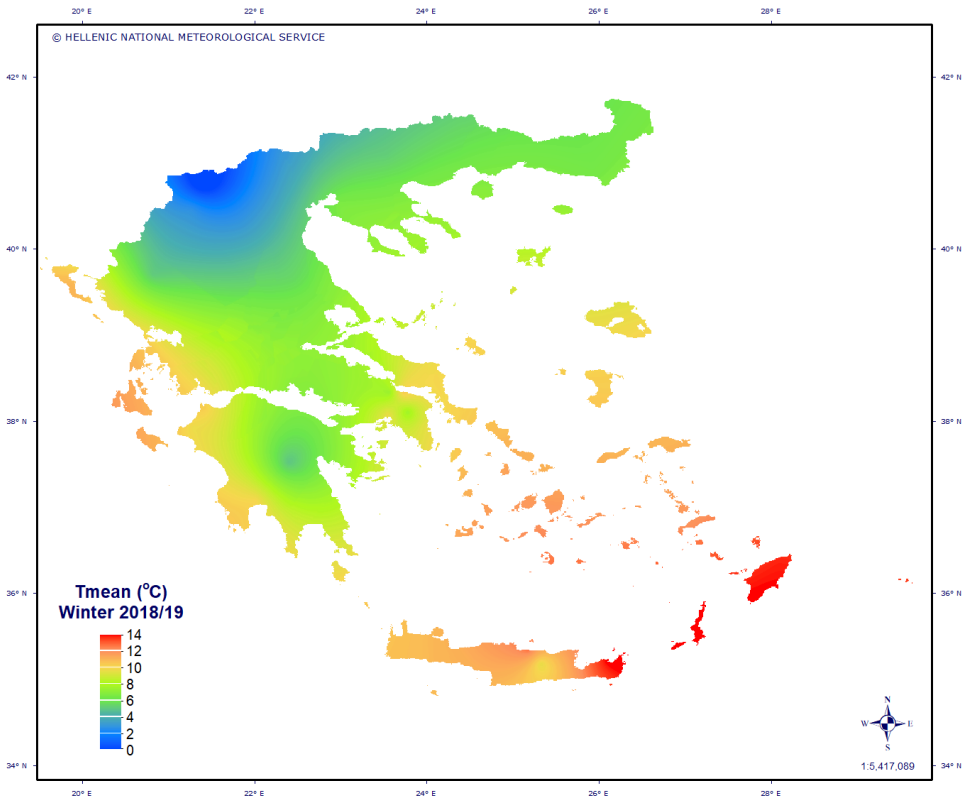


Figure 1. Mean temperature (°C) in Winter 2018/19.

The greatest mean temperature values were recorded over southeast areas (east Crete, Karpathos and Rhodes islands) and the lowest ones over northwest mainland (Figure 1).

The winter 2018/19 in most areas of Greece was near to normal values compared to the 1971-2000 climatology. The departure of mean air temperature from the normal values (1971-2000), in winter ranged from -2.0 ^{o}C to +1.3 ^{o}C with positive values mainly in the eastern parts of the country. (Figure 2).

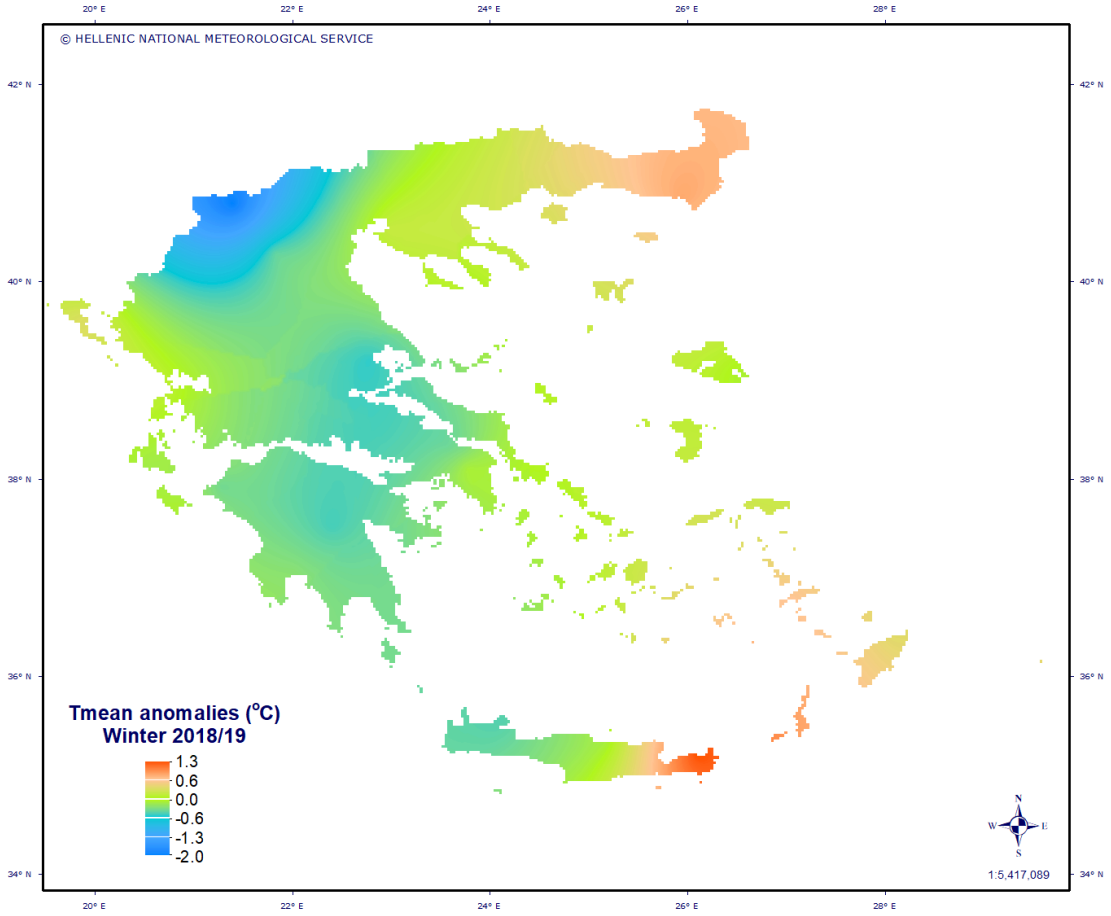


Figure 2. Mean temperature anomalies (°C) for Winter 2018/19 in Greece according to the 1971-2000 climatology.

In order to quantify the observed seasonal temperatures in winter 2018/2019 in terms of cold, warm and normal, the percentile method was used. The percentiles were calculated for each station and are based on homogenized mean temperature series for the period 1960-2004.

According to percentile ranks (Figure 3) **normal** conditions prevailed in most parts of Greece (77 % of the examined stations) during winter 2018/19. Cold conditions were present in the areas of Peloponnese and western Crete, very cold conditions in Florina station located over northwest Macedonia, while warm or very warm conditions prevailed only in three stations (Siteia and Karpathos stations located in Crete and

southeast Aegean respectively and Alexandroupoli station located in the region of Eastern Macedonia and Thrace).

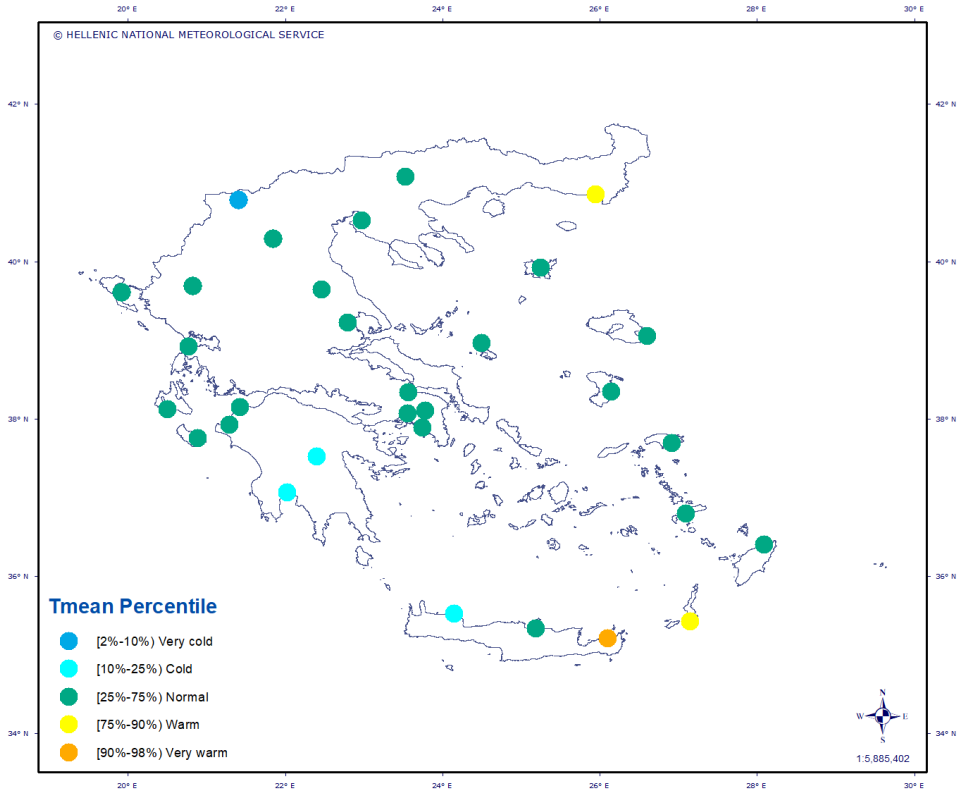


Figure 3. Mean temperature percentiles for winter 2018/2019.

1.2. Monthly analysis of the air temperatures anomalies in Greece

Mean temperatures in **December 2018** ranged near to normal values for the greatest part of the country. The departures of mean monthly air temperature from the normal values 1971-2000 ranged from nearly -1.1 °C to nearly 0.4 °C.

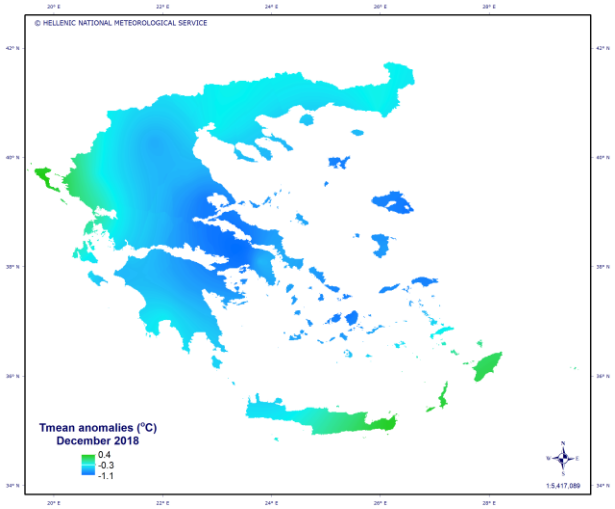


Figure 4. Mean temperature anomalies (°C) in December 2018 according to the 1971-2000 climatology.

January 2019 was a cooler than average month for the greatest part of Greece. Also during January the northwest mainland experienced many frost days and nights e.g.

- The HNMS Florina station (WMO-ID: 16613) experienced fifteen consecutive days and nights with total frost (days with Tmax and Tmin ≤ 0 ^{o}C). Also on January 8, 2019 the minimum temperature at the meteorological station of Florina was -23 ^{o}C that is the second lowest recorded value.

- The HNMS Karya station (WMO-ID: 16636) experienced seven consecutive days and nights with total frost (days with Tmax and Tmin ≤ 0 ^{o}C).

In January 2019, negative departures of mean monthly air temperature from the normal values 1971-2000 were found in the greatest part of mainland, in Ionian islands and in west Crete, while positive ones were found in eastern parts (Figure 5).

February 2019 was a warmer than average month mainly for the northern areas of Greece and slightly negative for the southern ones. Positive departures from the normal values 1971-2000 prevailed in mainland as well as in the Ionian and in most of the Aegean islands, while slightly negative anomalies were found only in west Crete (Figure 5). The greatest positive departures from normal, ranging from 1.0 °C to 1.7 °C, were noted at north mainland and Corfu (north Ionian island).

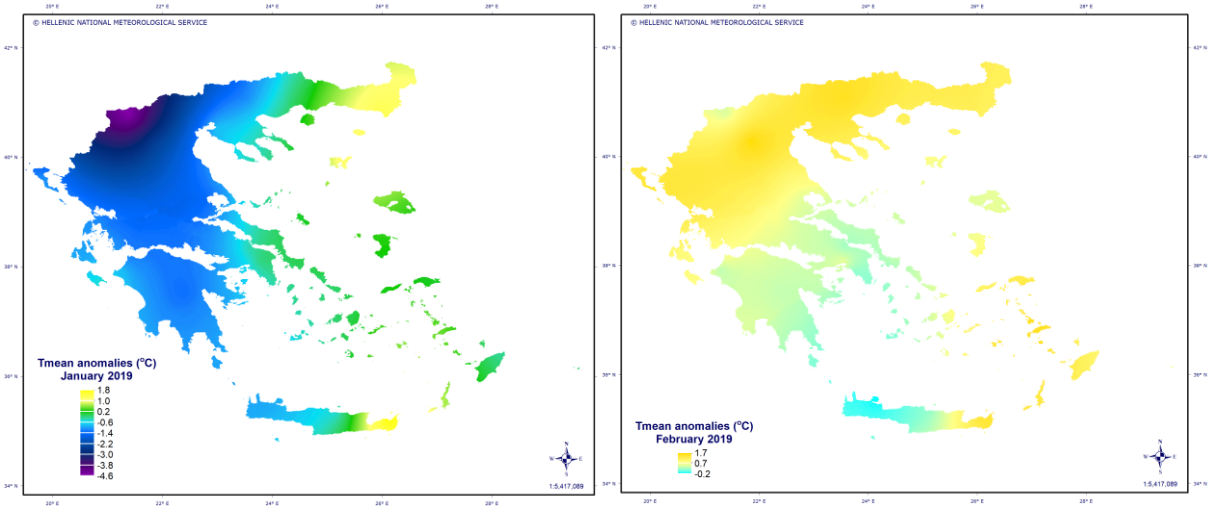


Figure 5. Mean temperature anomalies (°C) in January (left) and February 2019 (right) according to the 1971-2000 climatology.

1.3. Verification of the SEECOF-20 Winter 2018/19 temperature outlook for Greece

The consensus statement of SEECOF-20 Winter 2018/2019 temperature outlook mentioned that above normal or around normal thermal anomalies were likely to dominate the whole SEECOF region in the winter 2018/19. The probabilities for above-normal temperature in Greece was 40% above normal, 40% around normal and 20% below normal (zone 2) (Figure 6).

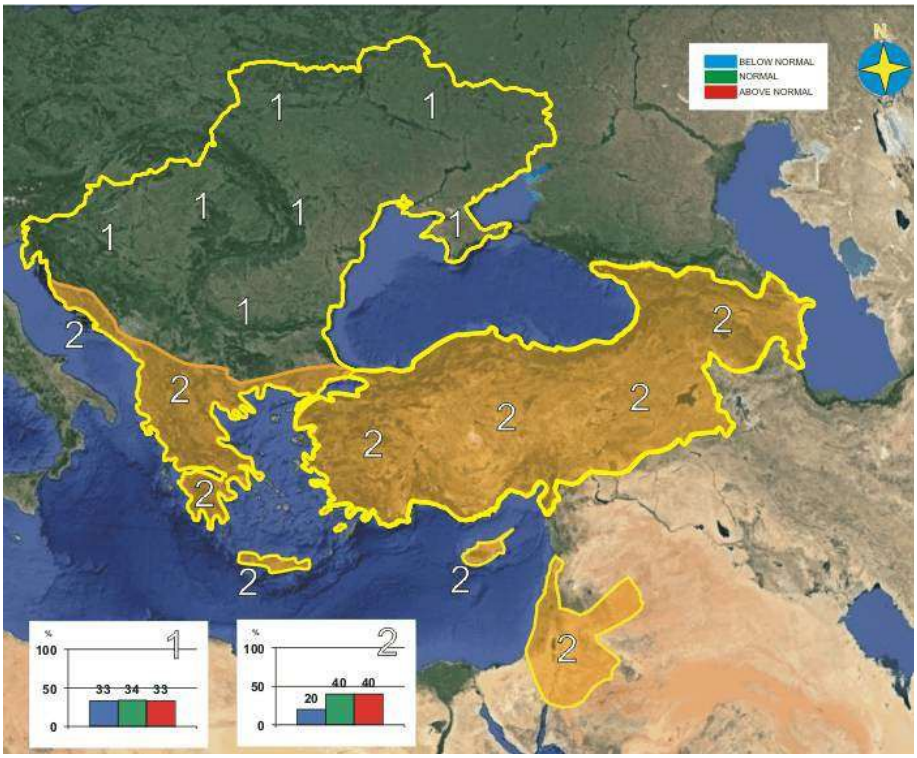


Figure 6. Graphical presentation of the 2018/19 winter temperature outlook.

Verifying the SEECOF's temperature outlook (although this is relative to the 1981-2010 normal values): the SEECOF's prediction can be considered as successful since temperatures were around normal in most parts of Greece.

Part B

2. Precipitation

2.1. Seasonal analysis of the Winter 2018/19 precipitation anomalies in Greece

The analysis of seasonal precipitation amounts throughout Greece is based on data from 31 meteorological stations distributed evenly in the country. Winter precipitation totals were above the average (relative to the normal base period 1971-2000) for the whole area of Greece, ranging from 70.0 mm up to nearly 760.0 mm. The lower values appeared in north and central mainland, while the higher ones in the southern regions and west Crete (Figure 7).

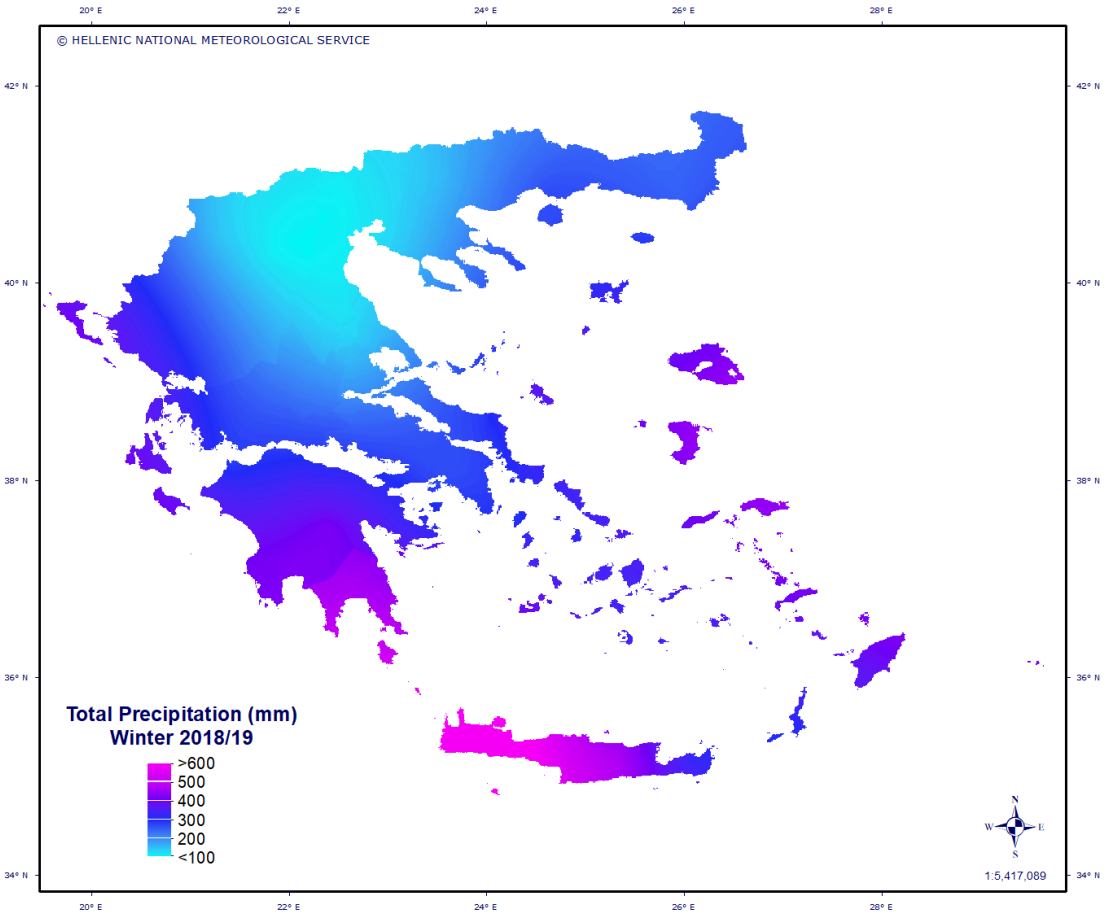


Figure 7. Spatial distribution of Winter 2018/2019 precipitation totals expressed in mm.

The winter 2018/2019 precipitation ratios to the normal values (1971-2000) (the normal values are based on homogenized data series) were computed and are given in percentages in Figure 8. The analysis showed that the winter of 2018/19 was wetter for the southern Greece. The winter 2018/2019 precipitation anomalies ranged from

70 % to 310 %. Total winter precipitation accounted for more than 120 % of normal values (1971-2000) over southern Greece, while locally over west Crete and east Peloponnese, accounted for more than 200 % of normal values. On the other hand, total winter precipitation accounted for less than 90 % of normal values (1971-2000) over the central and northwest mainland (Figure 8).

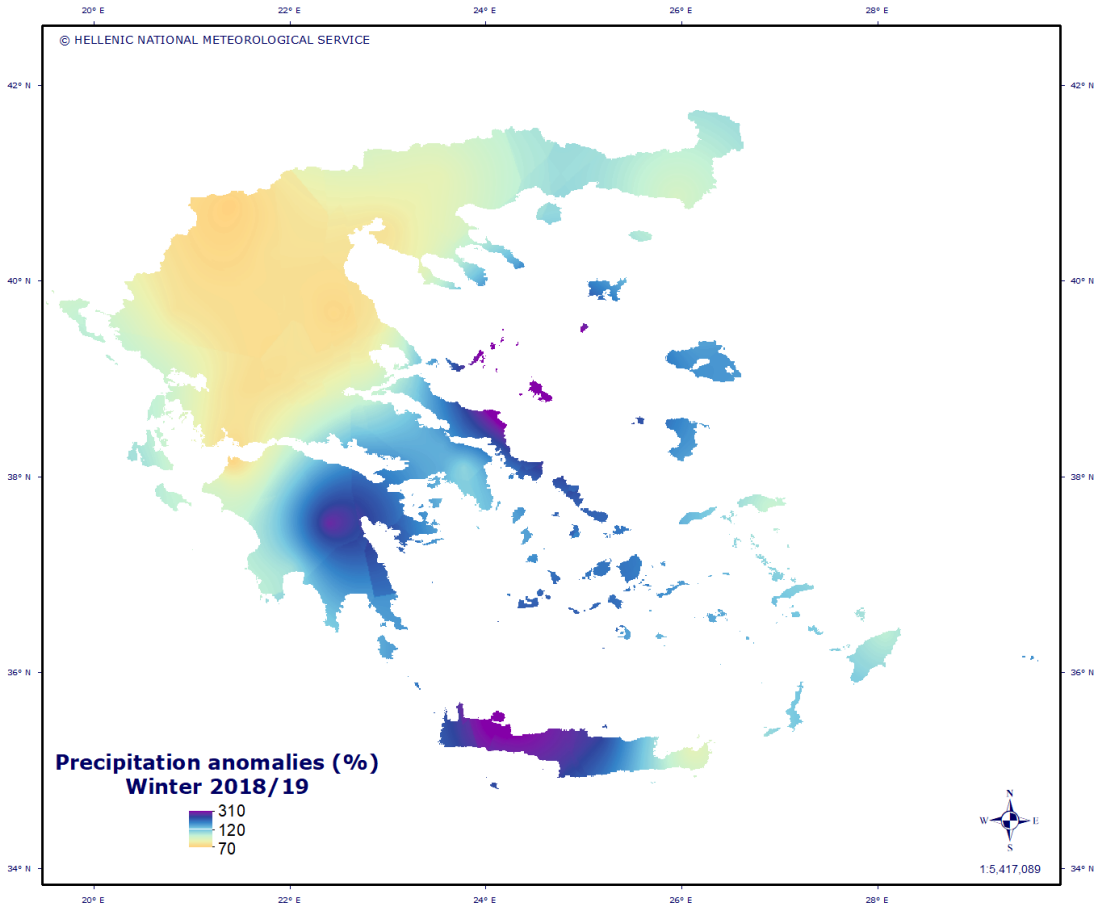


Figure 8. Winter 2018/19 precipitation anomalies (compared to 1971-2000 climatology) given in percentages.

In order to quantify the observed precipitation height in terms of wet, dry and normal the percentile method was used. The percentiles were calculated for each station and are based on homogenized precipitation series for the period 1970-2004. According to percentile ranks (Figure 9) accumulated precipitation for winter 2018/19 has been described by the following categories in the whole country:

- dry conditions were found in only 2 stations located in west and northwest parts (6 % of the examined stations).

- normal conditions were found in 13 stations located in the central and north continental Greece and in the southeastern Aegean islands and eastern Crete (42 % of the examined stations).

- wet to extremely wet conditions were found in 16 stations distributed in western and eastern Greece (52% of the examined stations).

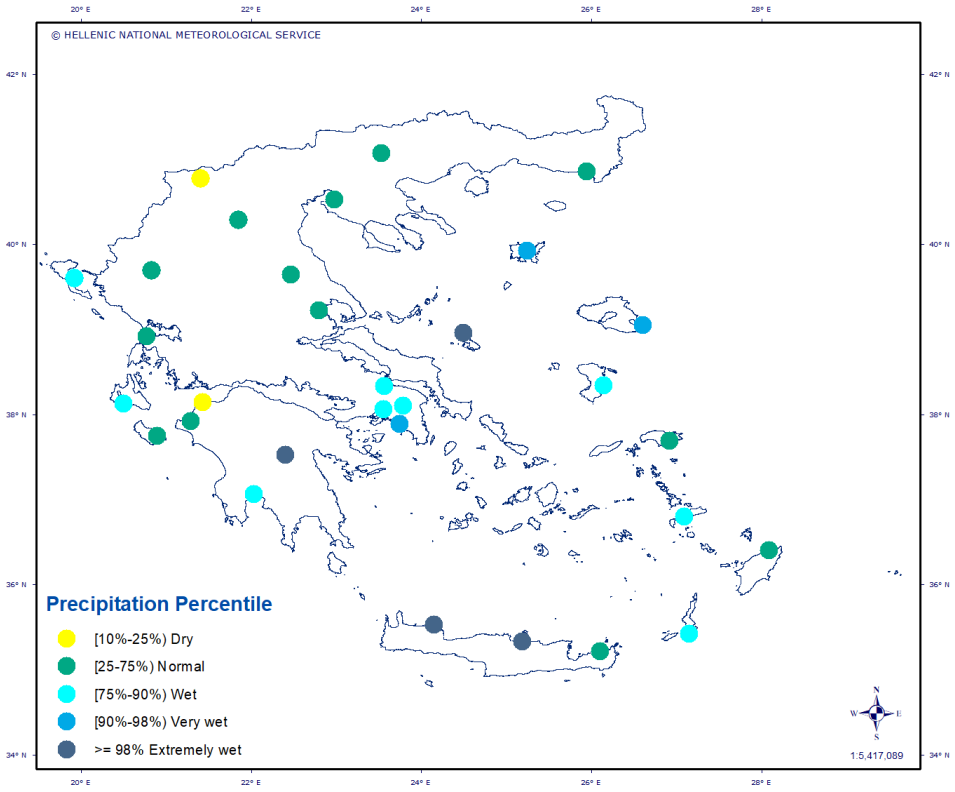
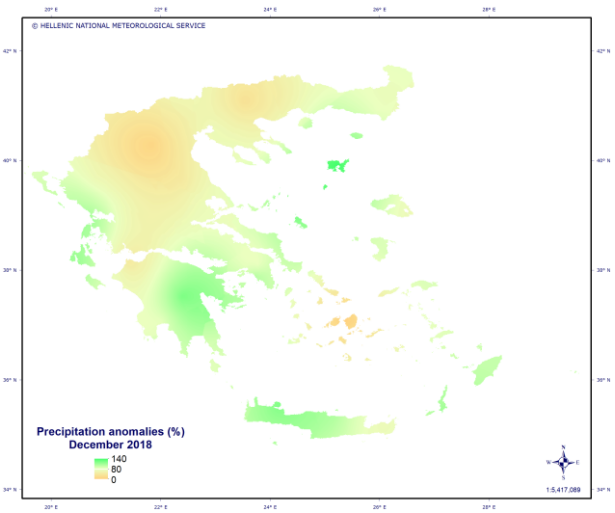


Figure 9. Precipitation percentiles for Winter 2018/2019.

2.2. Monthly analysis of precipitation anomalies in Greece



December 2018 was dry mainly in the northern parts of Greece. The precipitation anomalies were below or near normal values in most of the areas with exception few southern parts (e.g. east Peloponnese and west Crete).

Figure 10. Precipitation anomalies (%) in December 2018 according to the 1971-2000 climatology.

January of 2019 was a wet month for the entire Greece, since the accumulated monthly precipitation accounted for more than 130 % of normal values 1971-2000, while locally over the north Ionian islands, north Aegean islands, north Macedonia and Peloponnese accounted for more than 300 % of normal values (Figure 11).

- The Mytilini station (WMO-ID: 16667) located in north Aegean recorded total monthly precipitation 320 mm, which is three times the monthly average (based period 1971-2000).
- The Kalamata station (WMO-ID: 16726) located in Peloponnese recorded total monthly precipitation 300 mm, which is three times the monthly average (based period 1971-2000).

February of 2019 was a wetter month than average for the southern parts of Greece and especially for the west Crete, where the accumulated monthly precipitation was 3 or 4 times the average monthly precipitation (based period 1971-2000). On the other hand, the monthly precipitation anomalies over the western and northern Greece were below normal values 1971-2000 (Figure 11).

- The Souda station (WMO-ID: 16746) located in west Crete recorded 406 mm between 1 and 26 February, which is four times the monthly average and the second highest monthly total on record (the highest monthly precipitation total is 516 mm and recorded in January 1981).
- During the same period (1-26 February) the Heraklion station (WMO-ID: 16754) located in central Crete recorded 193 mm, which is 300 % of the average monthly rainfall (based period 1971-2000).

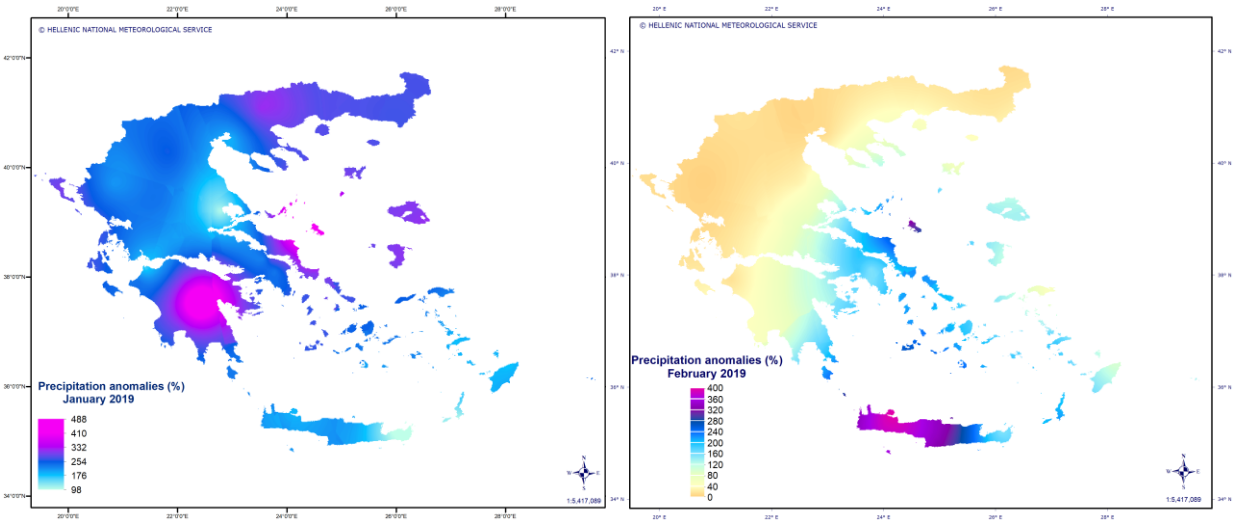


Figure 11. Precipitation anomalies (%) in January (left) and February 2019 (right) according to the 1971-2000 climatology.

2.3. Verification of the SEECOF-20 Winter 2018/19 precipitation outlook for Greece

According to SEECOF–20 Winter 2018/2019 precipitation outlook wetter-than-normal conditions prevail on Southernmost of the Balkan Peninsula, along the coasts of Adriatic Sea, Ionian and Aegean Sea and southeast Mediterranean (zone 2 in Figure 12).

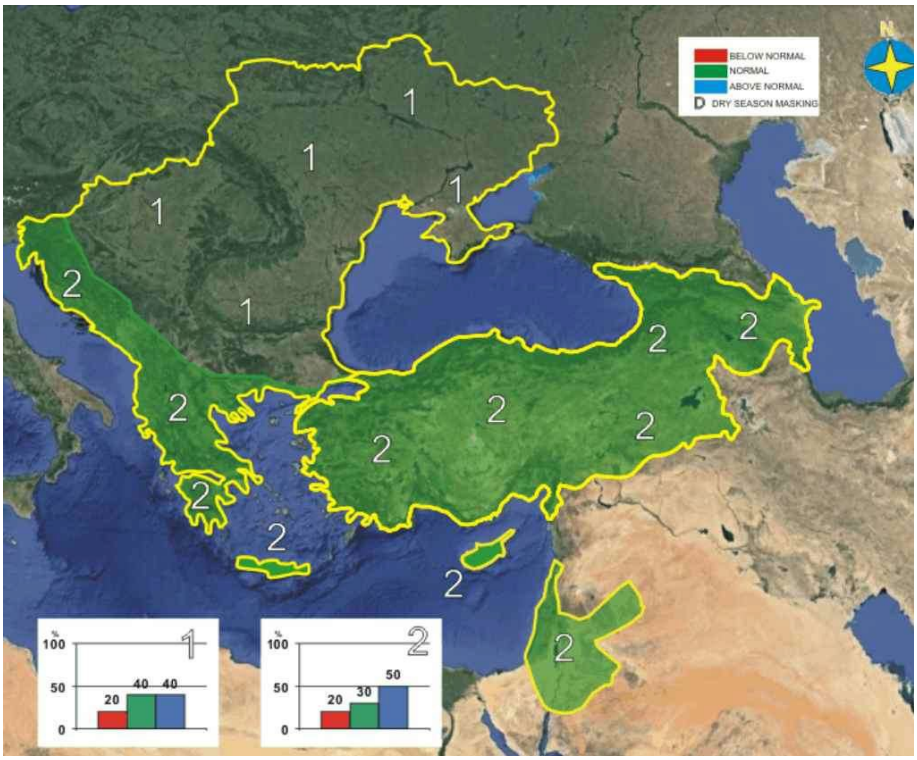


Figure 12. Graphical presentation of the 2018/19 winter precipitation outlook.

Verifying the SEECOF–20 Winter 2018/2019 precipitation outlook (although this is relative to the 1981-2010 normal values): the prediction was partially successful, since this outlook forecasted the wetter than climate averages season, but failed to specify the southern areas and especially west Crete where winter accumulated precipitation exceeded normal values.

Table 1. Seasonal air temperature and precipitation sums - Ranks

Winter 2018/19		Seasonal air temperature (°C)					Seasonal precipitation sums (mm)			
Station	Rank*	33	50	66	Observed value	Rank**	33	50	66	Observed Value
Thessaloniki	9	5.7	6.0	6.8	6.5	18	90.8	116.1	136.8	100.0
Helliniko	14	10.3	10.8	11.0	10.3	2	121.9	151.6	177.1	257.0
Souda	16	11.3	11.5	11.8	10.9	1	274.2	341.6	372.2	762.0
Zakynthos	10	10.9	11.2	11.5	10.9	8	323.1	378.5	406.1	448.0

*Rank – 1971-2000 period (warmest season)

**Rank – 1971-2000 period (highest seasonal precipitation)

Table 2. Verification of the SEECOF-20 Climate Outlook in Greece for Winter 2018/2019.

Country	Seasonal temperature		Seasonal precipitation		High Impact Events*
	Observed	SEECOF-20 climate outlook for temperature	Observed	SEECOF-20 climate outlook for precipitation	
Greece	Near normal in most of Greece	20% Below normal 40% Normal 40% Above normal	Above normal mainly in southern areas of Greece as well as in west Crete	20 % Below normal 30% Normal 50% Above normal	On January 8, 2019 the minimum temperature at the meteorological station of Florina was -23 ^{o}C that is the second lowest recorded value. Also during 3-17/1/2019 the same station experienced fifteen consecutive days and nights with total frost (Tmax and Tmin $\leq$ 0). Moreover, during the period 6-18/1/2019, the minimum temperature value recorded at the same station was lower than -15 ^{o}C (that is the limit for red alert in the North Greece at the meteoalarm system). On 9/1 the minimum temperature at the station of Tatoi, Attica was -8.9 ^{o}C that is the second lowest recorded at the specific station. 23-27/1/2019: Heavy rainfalls caused flooding occurred in the area of Peloponnese (Ilia, Messinia, Lakonia) where rivers overflowed, crop areas were destroyed and people were trapped in buildings and cars. During 12-17/2 and 23-26/2, heavy rainfalls caused extensive flooding and landslides at the area of Crete island. Infrastructures were destroyed, roads were closed, crops were damaged and people were trapped in their cars. Also the severe flood events caused 5 fatalities.

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