

**VERIFICATION of the SEECOF-28 WINTER 2022/2023**  
**CLIMATE OUTLOOK FOR GREECE**

DIVISION of CLIMATOLOGY – APPLICATIONS  
HELLENIC NATIONAL METEOROLOGICAL SERVICE (HNMS)

A. Mamara, E. Chatziapostolou and N. Karatarakis

## Introduction

This report consists of two parts. In part A, an analysis of the observed mean temperature for Winter 2022/23 as well as an assessment - verification of SEECOF-28 temperature outlook for Winter 2022/23 were performed, first on monthly basis and then for the whole Winter 2022/23 season. The reference period for comparison/verification was the base period of 1981-2010.

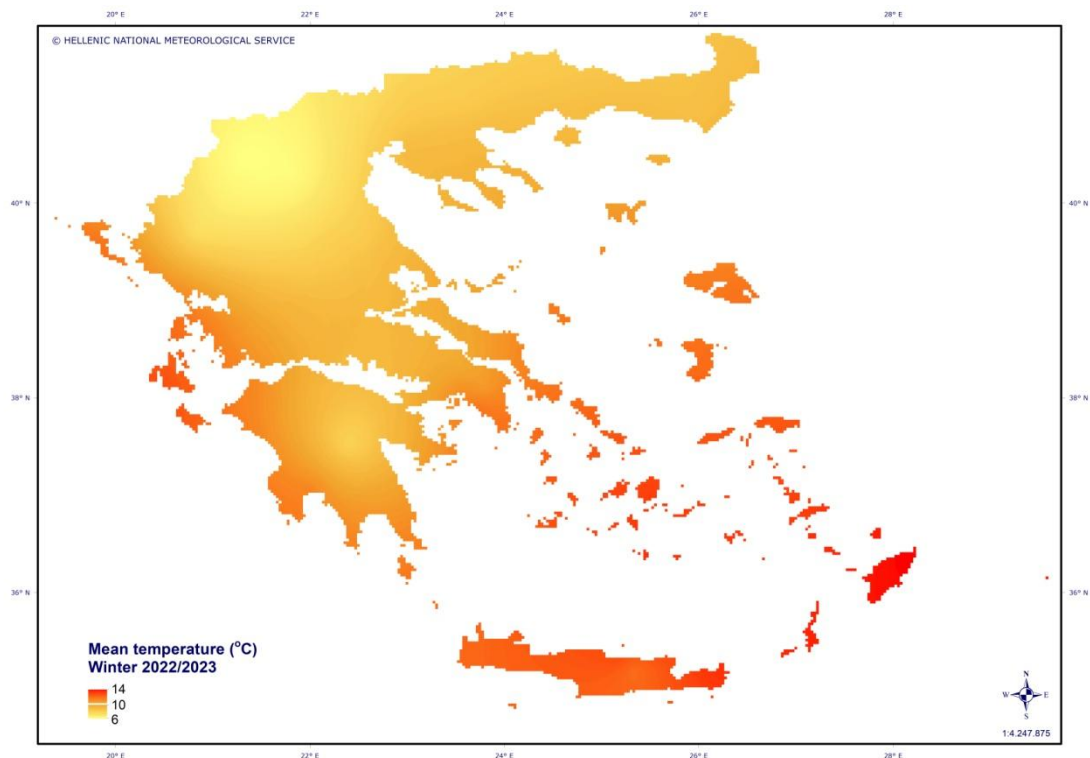
In part B, an analysis of the observed precipitation for Winter 2022/23 as well as an assessment - verification of SEECOF-28 precipitation outlook for Winter 2022/23 were performed, first on monthly basis and then for the whole Winter 2022/23 season. The reference period for comparison/verification was the base period of 1981-2010.

## Part A

### 1. Temperature

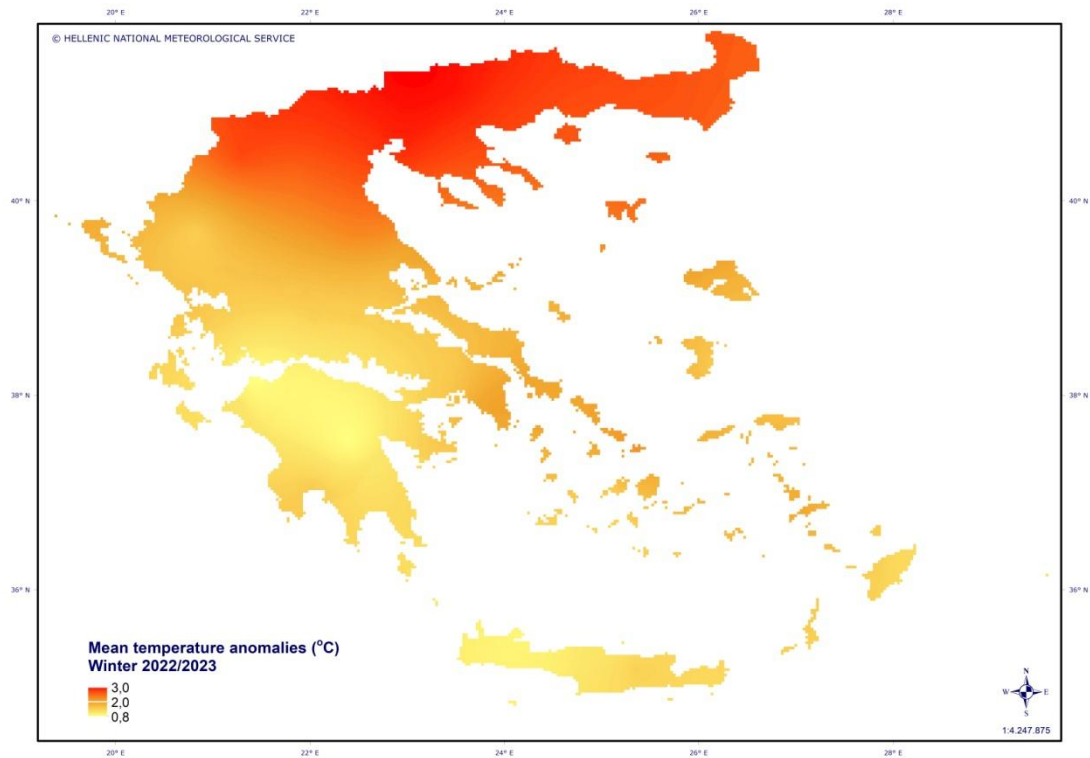
#### 1.1. Seasonal analysis of the Winter 2022/23 air temperatures anomalies in Greece

The seasonal air temperature in winter ranged from +6 °C to +14 °C. The greatest mean temperature values were recorded over southern areas (Crete, south Aegean islands) and the lowest ones over northwest mainland (Figure 1).



**Figure 1.** Mean temperature (°C) in Winter 2022/23

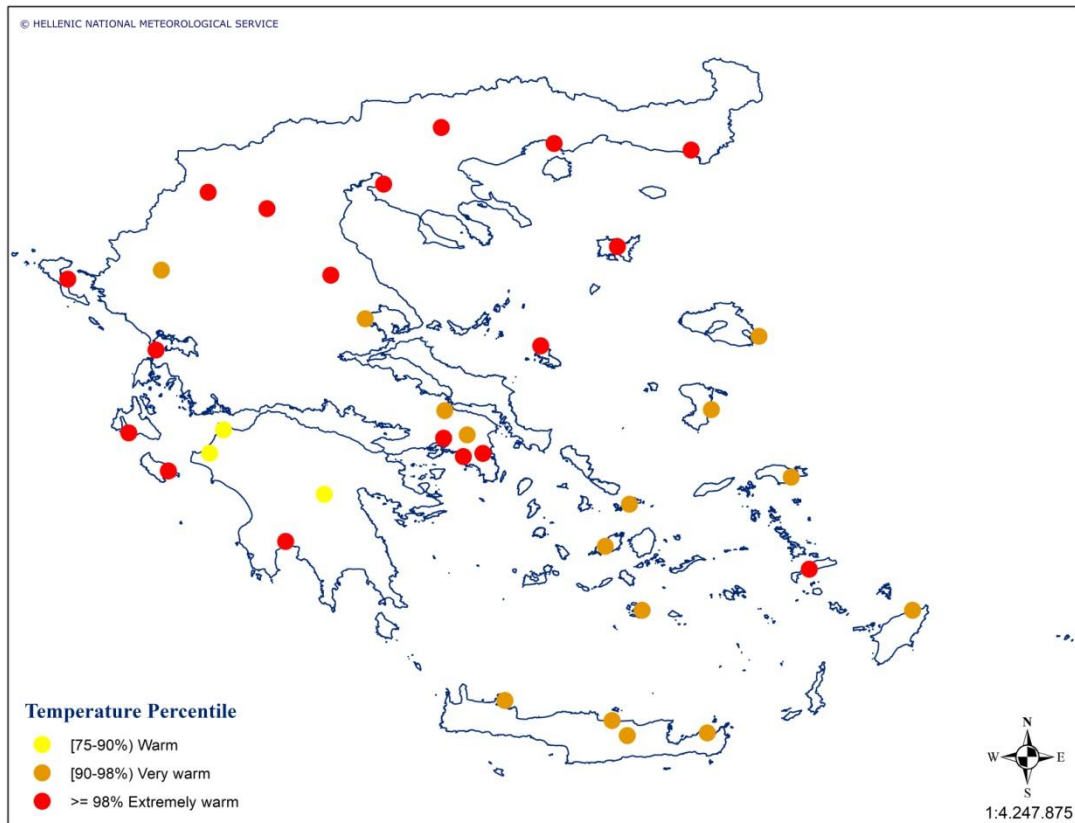
Winter 2022/23 was among the five warmest winters when temperatures over north Greece were 3 °C above 1981-2010 normal values (Figure 2).



**Figure 2.** Mean temperature anomalies (°C) for Winter 2022/23 in Greece according to the 1981-2010 climatology.

In order to quantify the observed seasonal temperatures in winter 2022/23 in terms of cold, warm and normal, the percentile method was applied. The percentiles were calculated for each station and are based on homogenized mean temperature series for the period 1960-2010.

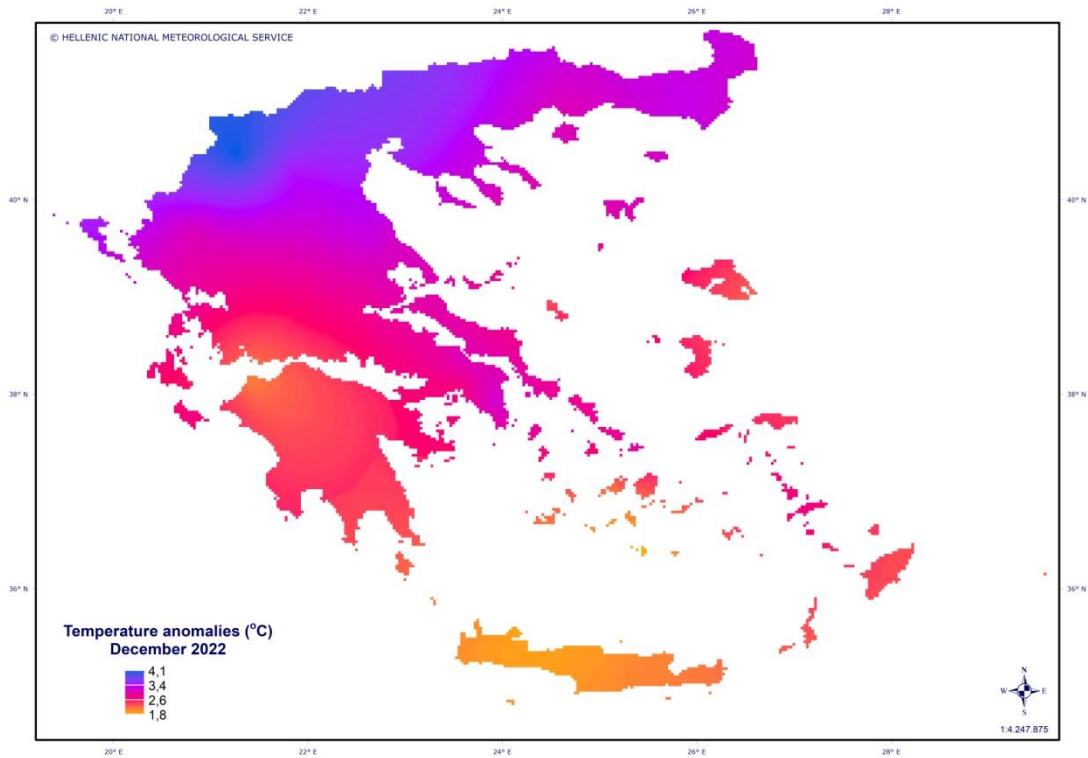
According to percentile ranks (Figure 3), the majority of stations (92% of the examined stations) experienced very warm or extremely warm conditions.



**Figure 3.** Mean temperature percentiles for Winter 2022/23 .

### 1.2. Monthly analysis of the air temperatures anomalies in Greece

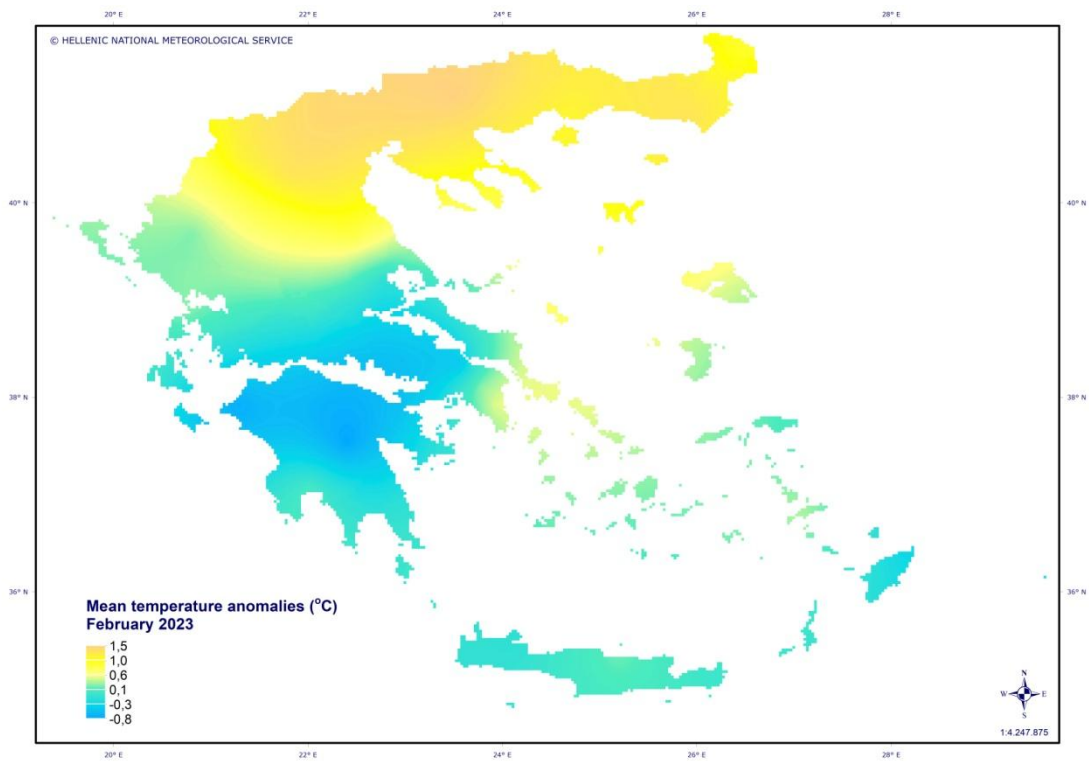
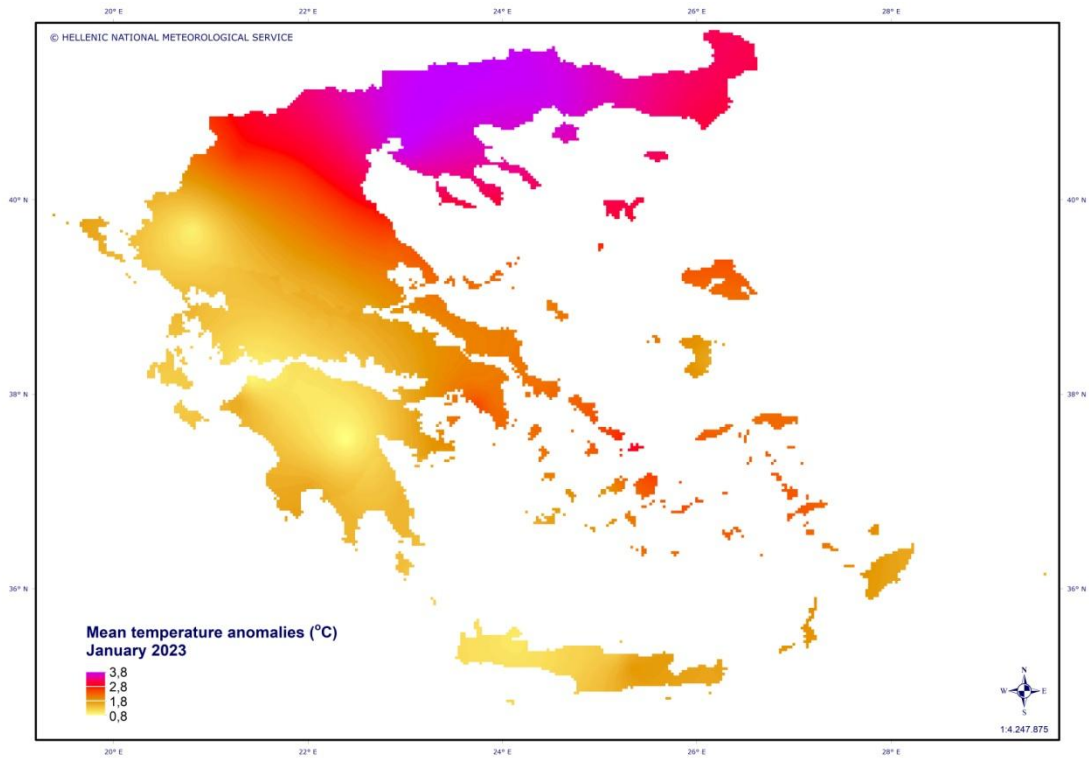
**December 2022** was the warmest December on record since 1961. Mean monthly temperature was 12.7 °C on average, about 2.6 °C above 1981-2010 normal value. The greatest positive mean temperature anomalies of even 4 °C above average occurred across northwest Greece. It is noted that Florina met. station in west Macedonia experienced maximum temperature greater than 10 °C for 20 days, while its 1981-2010 normal value is about 5.9 °C. In addition, Kerkyra met. station in north Ionian recorded maximum temperature greater than 17 °C for 26 days i.e at least 2°C above 1981-2010 average. Moreover, on December 16 and 17<sup>th</sup> most of the meteorological stations recorded maximum temperature above 20 °C, Florina met. station recorded 21.6 °C and 21.9 °C respectively i.e about 16 °C above 1981-2010 normal value and Heraklio met. station in Crete recorded 25°C and 25.4 °C respectively i.e 8 degrees above normal values. (Figure 4).



**Figure 4.** Mean temperature anomalies (°C) in December 2021 according to the 1981-2010 climatology.

**January 2023** mean temperatures were about 2.0 °C warmer than the 1981-2010 January average. The greatest temperature anomalies, of above 3.0 °C, occurred in north Greece (Figure 5).

Temperatures in **February 2023** were near to or slightly below 1981-2010 normal values in south Greece and across the Ionian and Aegean islands and above normal values in north Greece (Figure 5).

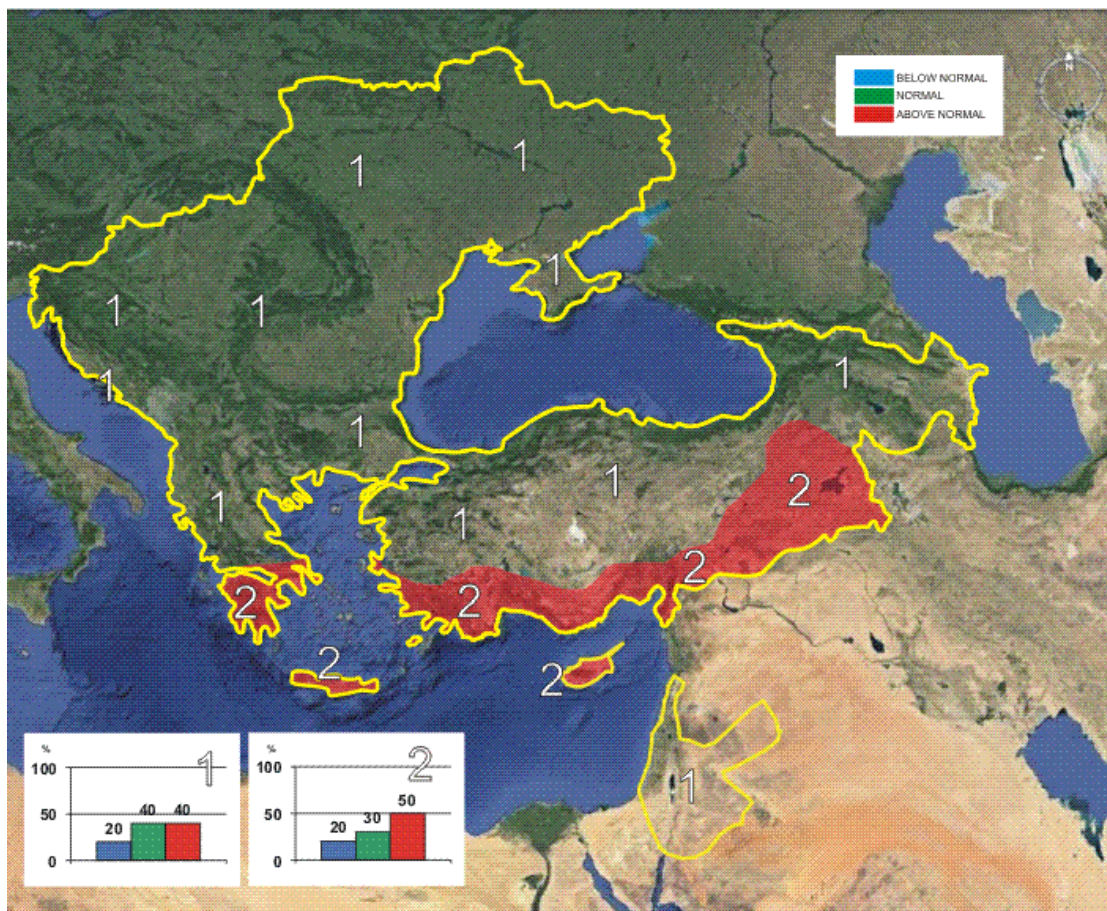


**Figure 5.** Mean temperature anomalies (°C) in January (above) and February 2022 (bottom) according to the 1981-2010 climatology.



### 1.3. Verification of the SEECOF-28 Winter 2022/23 temperature outlook for Greece

The consensus statement of SEECOF-28 Winter 2022/23 temperature outlook mentioned that winter temperature was likely to be near or above-normal in most of the SEECOF region (zone 1 in Figure 6) and above normal in Jordan, Israel, southern parts of Greece and Turkey (zone 2 in Figure 6). The distribution probabilities for temperature in north and central Greece were 20% below normal, 40% around normal and 40% above normal (zone 1), while in south Greece, were 20% below normal, 30% around normal and 50% above normal (zone 2) (Figure 6).



**Figure 6.** Graphical presentation of the 2022/23 winter temperature outlook.

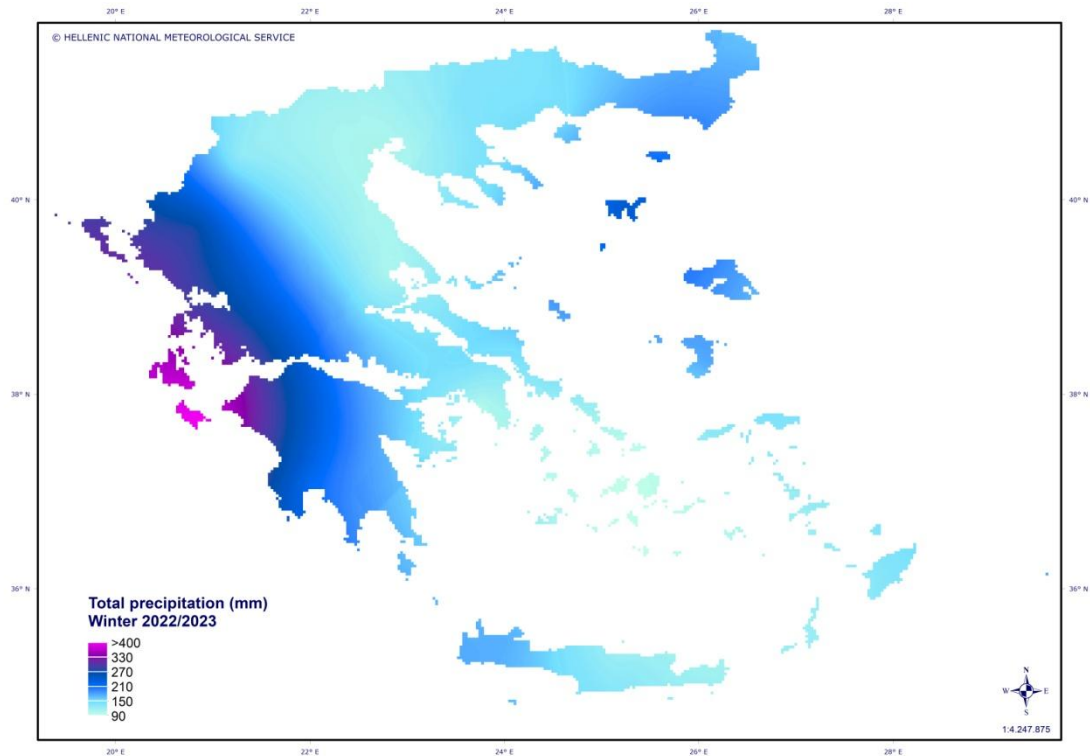
Verifying the SEECOF's temperature outlook: the SEECOF's prediction is partially successful since winter temperatures in the whole Greek territory were above normal values and the greatest temperature anomalies occurred in the north Greece.

## Part B

### 2. Precipitation

#### 2.1. Seasonal analysis of the Winter 2022/23 precipitation anomalies in Greece

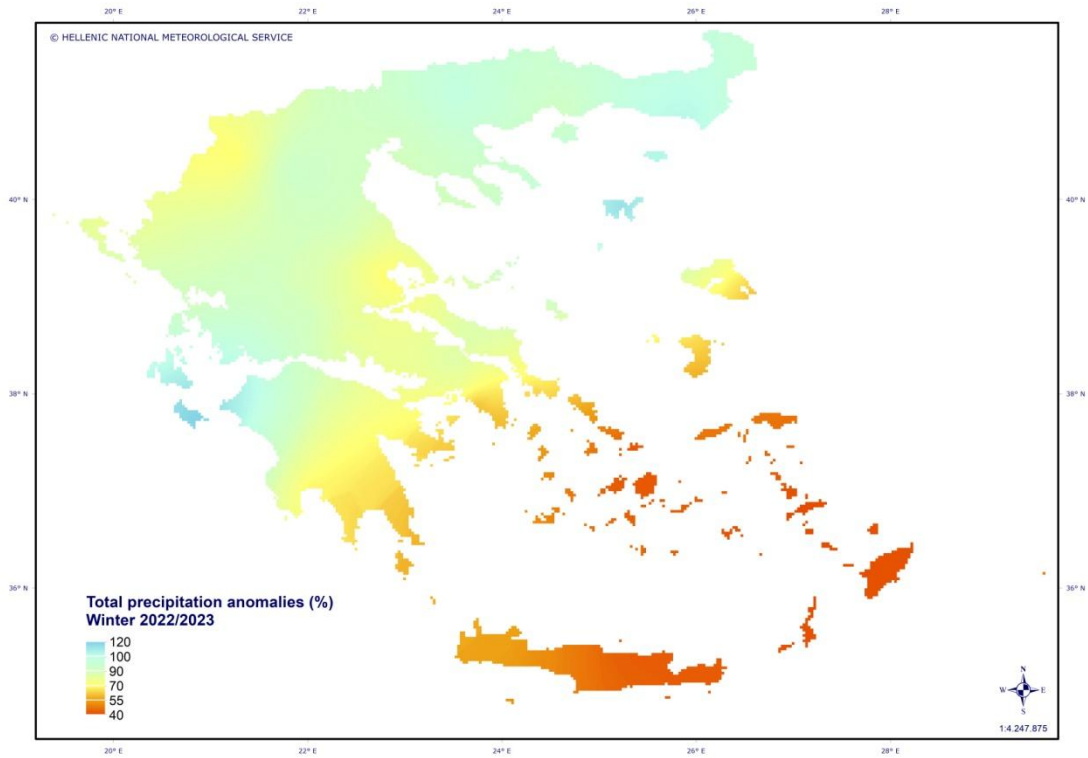
Winter precipitation totals ranged from 90 mm up to above 400 mm. The lower rainfall heights were recorded in north-central mainland and Cyclades islands, while the higher ones in the north Ionian islands (Figure 7).



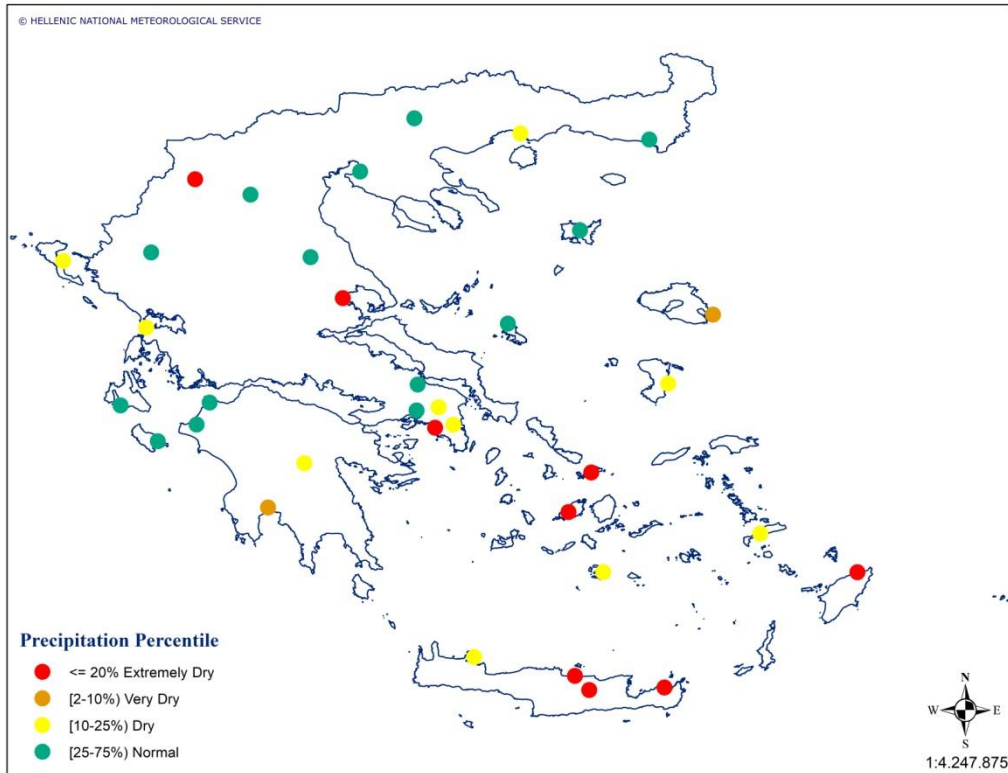
**Figure 7.** Spatial distribution of Winter 2022/23 precipitation totals expressed in mm.

Winter 2022/23 precipitation ratios to the normal values (1981-2010) (the normal values are based on homogenized data series) were computed and are given in percentages in Figure 8. The analysis showed that winter 2022/23 was drier than normal over most of Greece, mainly in southern parts, while near-to-normal conditions dominated only in a few regions (southwest and northeast areas).





**Figure 8.** Winter 2022/23 precipitation anomalies (compared to 1981-2010 climatology) given in percentages.

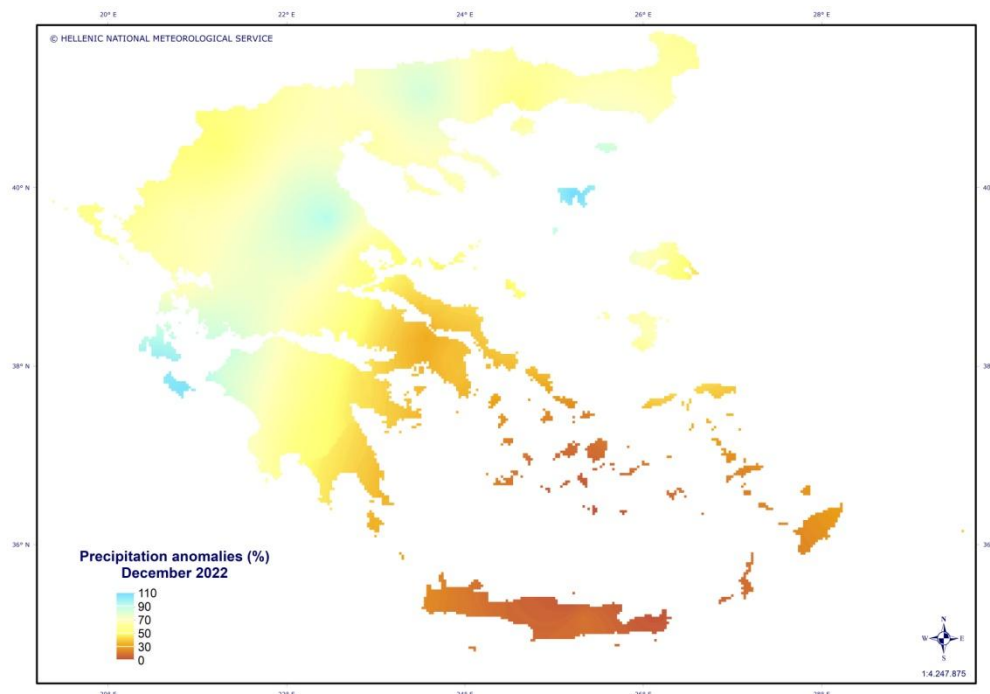


**Figure 9.** Precipitation percentiles for Winter 2022/23.

In order to quantify the observed precipitation height in terms of wet, dry and normal the percentile method was applied. The percentiles were calculated for each station and are based on homogenized precipitation series for the period 1960-2010. According to percentile ranks 60 % of the examined stations (most of them located in south Greece) experienced dry to extremely dry conditions and 40 % had normal conditions (Figure 9).

## 2.2. Monthly analysis of precipitation anomalies in Greece

**December 2022** in terms of precipitation, was much drier than normal mainly for southern Greece where total precipitation accounted for less than 50 % of 1981-2010 normal value.



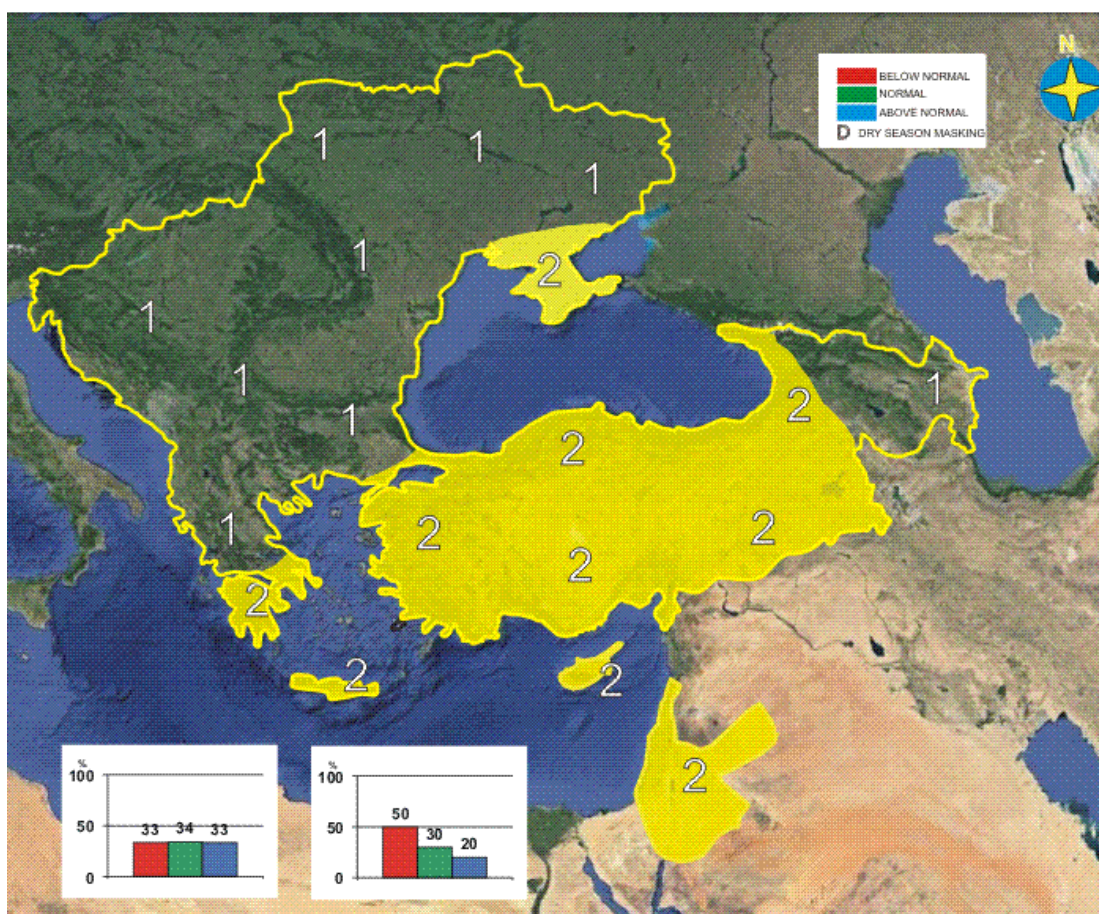
**Figure 10.** Precipitation anomalies (%) in December 2020 according to the 1981-2010 climatology.

In **January 2023** wetter than normal conditions dominated in west, north and central Greece, while south Aegean islands experienced drier than normal conditions.

In **February 2023** much drier than normal conditions dominated in most parts of Greece. Total precipitation in west, north and central parts as well as in Dodecanese islands accounted less than 40% of 1981-2010 normal value.

### 2.3. Verification of the SEECOF-28 Winter 2022/23 precipitation outlook for Greece

The consensus statement of SEECOF-28 Winter 2021/2022 precipitation outlook mentioned that winter precipitation totals are likely to be below-normal the south of Greece, Turkey, Israel, Jordan, along the coasts of Ionian, southern coasts of the Aegean, southern and eastern coasts of the Black Sea (zone 2 in Figure 11), while in rest of the SEECOF region (zone 1 in Figure 11) the uncertainty is high: probabilities for below, near- or above-average conditions are approximately equal.



**Figure 11.** Graphical presentation of the 2022/23 winter precipitation outlook.

Verifying the SEECOF-28 Winter 2022/2023 precipitation outlook: the SEECOF's prediction can be considered successful since south Greece experienced drier than normal conditions.

**Table 1. Seasonal mean temperature and precipitation sums – Ranks**

Winter 2022/23		Seasonal mean temperature (°C)					Seasonal precipitation sums (mm)			
Station	Rank*	33%	50%	66%	Observed value	Rank**	33%	50%	66%	Observed value
Thessaloniki	1	6.1	6.5	7.0	9.5	17	95	128	142	99
Helliniko	2	10.3	10.9	11.1	12.6	30	124	158	186	46
Souda	4	11.4	11.7	11.9	12.5	26	291	339	371	191
Zakynthos	2	10.9	11.3	11.6	12.2	7	349	374	437	452

\*Rank – 1981-2010 period (warmest season)

\*\*Rank – 1981-2010 period (highest seasonal precipitation)

**Table 2. Brief assessment of SEECOF-28 climate outlook**

Seasonal temperature		Seasonal precipitation		High Impact Events*
Observed	SEECOF-28 climate outlook for temperature	Observed	SEECOF-28 climate outlook for precipitation	
Above normal mainly in the north of Greece	Above normal in the south of Greece and near or above normal elsewhere	Below normal mainly in the south of Greece	Below normal in the south of Greece	

**Contact details**

HELLENIC NATIONAL METEOROLOGICAL SERVICE (HNMS)

Division of Climate, Environment and Meteorological Observations

Department of Climatology

14 E. Venizelou Str.,

GR - 16777 Hellinikon, Greece

Phone: +302109699030, fax: +302109628952

<http://www.hnms.gr>,

e-mails: 1. [anna.mamara@hnms.gr](mailto:anna.mamara@hnms.gr)

2. [eleni.chatziapostolou@hnms.gr](mailto:eleni.chatziapostolou@hnms.gr)

3. [karatarakis@hnms.gr](mailto:karatarakis@hnms.gr)