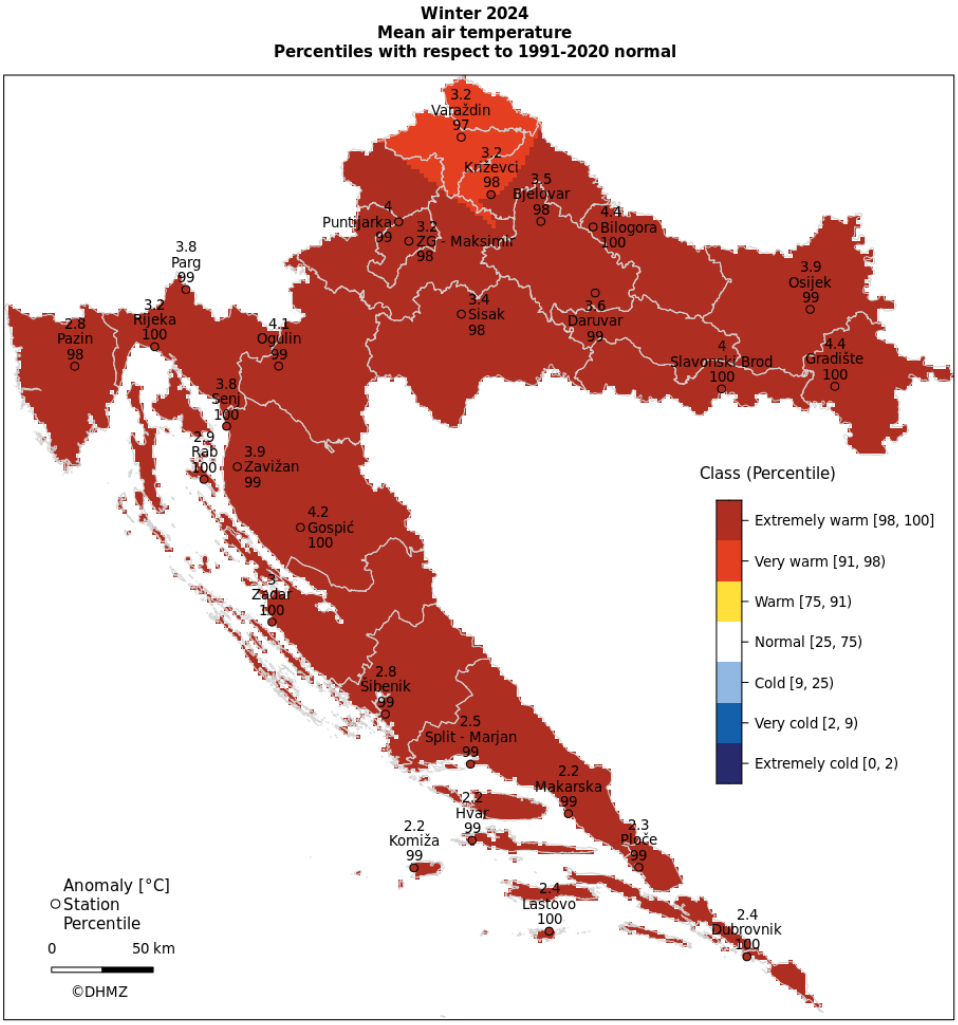
Climate Report for Croatia for Winter 2023/2024

Air temperature anomalies for Croatia in Winter 2023/2024

The average winter air temperature (December 2023, January 2024, February 2024) throughout Croatia was above the multi-annual average (1991 - 2020). Corresponding air temperature anomalies for winter 2023/2024 were within the range from 2,2 °C (Hvar, Komiža, Makarska) to 4,4 °C (Bilogora, Gradište).

According to percentile ranks and classification ratings, thermal conditions in almost whole Croatia for winter 2023/2024 have been described by the categorie **extremely warm**. Only wider area of town Varaždin was **very warm**.

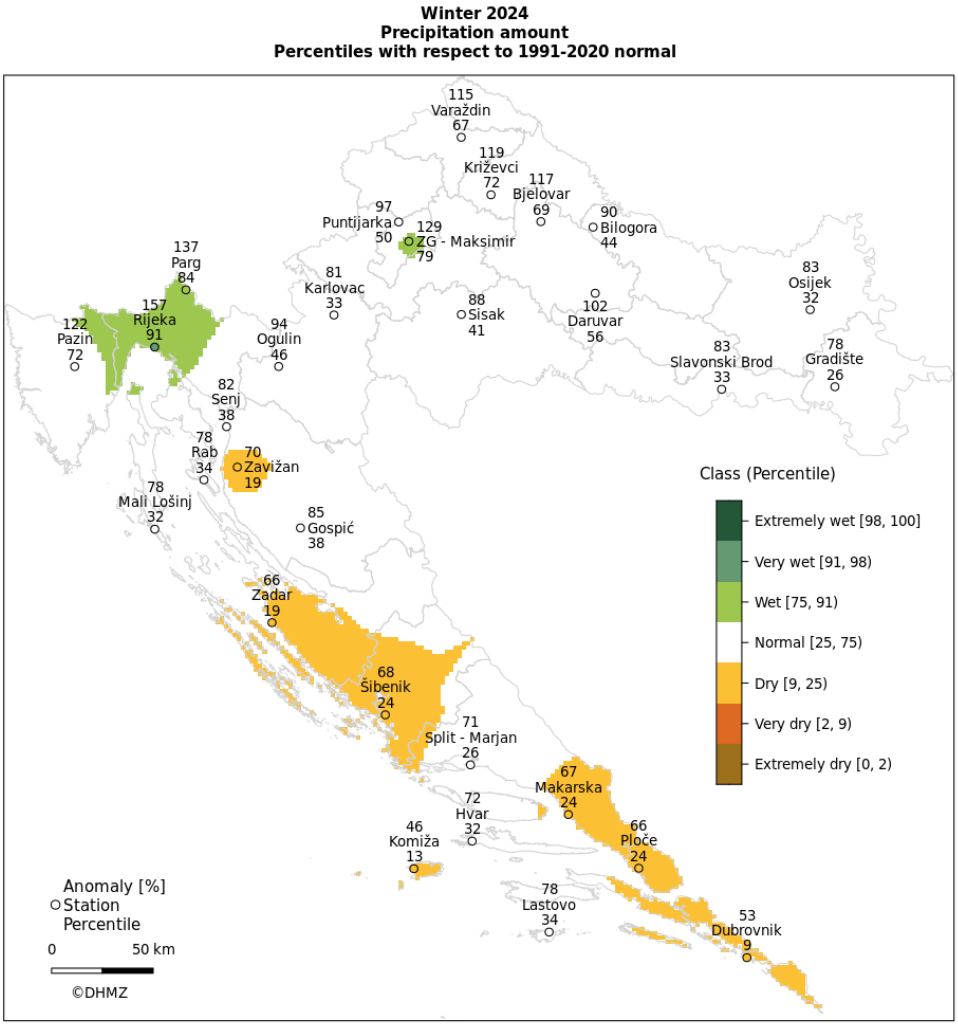
At all stations, Winter 2023/2024 was the first or second warmest since the beginning of measurements.



Precipitation anomalies for Croatia in Winter 2023/2024

An analysis of the precipitation amounts for winter 2023/2024 expressed as percentages (%) of 1991 - 2020 average, shows that precipitation amounts were mostly around the average. Corresponding precipitation amounts for winter 2023/2024 were within the range of 46 % (Komiža – 120,1 mm) to 157 % (Rijeka – 657,0 mm) of the multi-annual average for this season.

According to percentile ranks and classification ratings, the precipitation amounts for winter 2023/2024 have been described by the following categories: **normal** (in most of Croatia), **wet** (wider area of town Zagreb and Rijeka, and north part of Gorski kotar (Parg)) and **dry** (part of Dalmatia – Zadar, Šibenik, Komiža, Makarska, Ploče and Dubrovnik and the highest mountain - Zavižan).



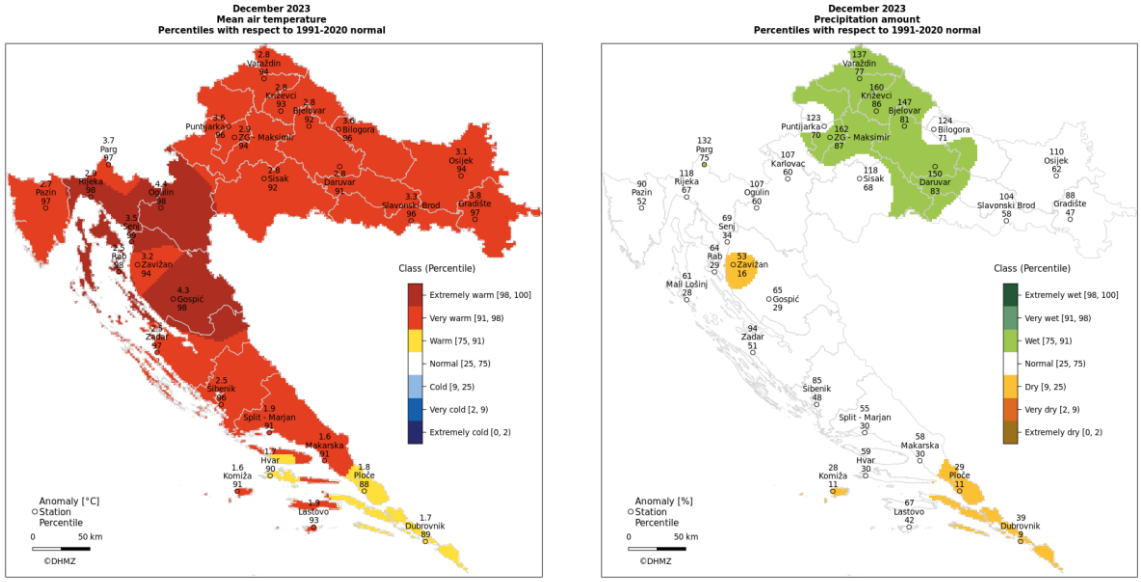
Air temperature anomalies for Croatia in December 2023

The anomalies of the mean air temperature in December 2023 with respect to the normal 1991 - 2020 were within the range from 1,6 °C (Komiža, Makarska) to 4,4 °C (Ogulin). At all stations air temperature were higher than the respective multi-annual average. Absolute maximum temperature for December was recorded at several stations (Senj, Slavonski Brod, Split-Marjan, Mali Lošinj, Zadar - Table 1).

According to the percentile ranks and classification ratings, thermal conditions in Croatia for December 2023 are described in the following categories: **warm** (southern part of Dalmatia), **very warm** (the eastern and central part of Croatia, Istra, the rest of Dalmatia and the highest part of mountainous Croatia) and **extremely warm** (Kvarner – the northern Adriatic and greater part of mountainous Croatia).

Table 1 - Absolute maximum temperature in December 2023 (in red – the highest temperature since there are measurements) and comparison with available series of measurement (these stations are included in the analysis of climate anomalies in Croatia)

Naziv meteorološke postaje	Godina od kada su raspoloživi podaci	Vrijednost najviše izmjerene temperature (°C) u prosincu (do 2022.) u razdoblju od kada su raspoloživi podaci	Datum kada je postignuta najviša vrijednost (* označava nepotpuni niz)	Vrijednost najviše izmjerene temperature zraka (°C) u prosincu 2023.	Datum kada je postignuta vrijednost najviše izmjerene temperature zraka u prosincu 2023.
Dubrovnik	1961.	20.4	17. 12. 2022.*	18.4	1. 12.
Senj	1948.	20.9	13. 12. 1957.*	21.5	1. 12.
Šibenik	1949.	20.3	18. 12. 1989.	19.5	1. 12.
Slavonski Brod	1963.	23.0	19. 12. 1989.	23.5	2. 12.
Rijeka	1948.	20.4	4. 12. 1979.	17.9	2. 12.
Karlovac	1949.	23.4	18. 12. 1989.	15.6	30. i 31. 12.
Osijek	1899.	21.3	25. 12. 2009.*	18.9	25. 12.
Hvar	1858.	20.6	7. 12. 1967.*	19.5	2. 12.
Pazin	1961.	21.6	4. 12. 1979.	18.4	19. 12.
Split – Marjan	1948.	18.6	1. 12. 2014.	18.7	2. 12.
Ogulin	1949.	20.9	17. 12. 1989.	20.3	1. 12.
Komiža	1981.	21.6	9. 12. 2010.	21.4	1. 12.
Sisak	1949.	23.7	18. 12. 1989.	17.1	25. 12.
Daruvar	1978.	23.5	17. 12. 1989.	17.6	25. 12.
Mali Lošinj	1961.	18.9	25. 12. 2009.	19.1	1. 12.
Poreč	1981.	19.4	21. 12. 1989.*	19.3	1. 12.
Zagreb - Maksimir	1949.	22.5	17. 12. 1989.	16.1	26. 12.
Bjelovar	1949.	22.5	17. 12. 1989.	15.8	25. 12.
Varaždin	1949.	21.4	17. 12. 1989.	16.2	26. 12.
Gospić	1872.	16.9	18. 12. 1989.*	16.5	1. 12.
Lastovo	1948.	18.8	1. 12. 2010.*	18.4	2. 12.
Zadar	1961.	18.7	1. 12. 2014.	18.9	2. 12.
Parg	1950.	17.1	5. 12. 1979.*	16.7	19. 12.
Puntijarka	1981.	16.1	9. 12. 2016.	15.2	18. 12.
Zavižan	1953.	14.6	13. 12. 1994.*	12.2	19. 12.



Mean air temperature (left) and precipitation amount (right) - December 2023 - percentiles with respect to 1991-2020 normal

Precipitation anomalies for Croatia in December 2023

Precipitation anomalies expressed as a percentage (%) of the multi-annual average (1991-2020) were in December 2023 within the range from 28 % in Komiža (95,9 mm) to 162 % in Zagreb (100,2 mm). Analysis of precipitation anomalies in December 2023, expressed as a percentage (%) of the multi-annual average shows that precipitation amounts at half of the stations were below the multi-annual average, and at other stations above.

Precipitation conditions in December 2023 are described in more details in the following categories: **dry** (wider area of Zavižan (the highest mountain), south Dalmatia and island Vis), **wet** (part of central Croatia) and **normal** (the rest of Croatia).

Air temperature anomalies for Croatia in January 2024

The anomalies of the mean air temperature in January 2024 with respect to the normal 1991 - 2020 were within the range from 0,6 °C (Križevci, Zagreb-Maksimir) to 2,2 °C (Zavižan). At all stations air temperature were higher than the respective multi-annual average. Absolute maximum temperature for January was recorded at Slavonski Brod (Table 2).

According to the percentile ranks and classification ratings, thermal conditions in Croatia for January 2024 are described in the following categories: **normal** (part of Istra and most of Central Croatia), **warm** (most of East Croatia, Kvarner, mountainous Croatia and North and Central Dalmatia) and **very warm** (South Dalmatia and island Rab).

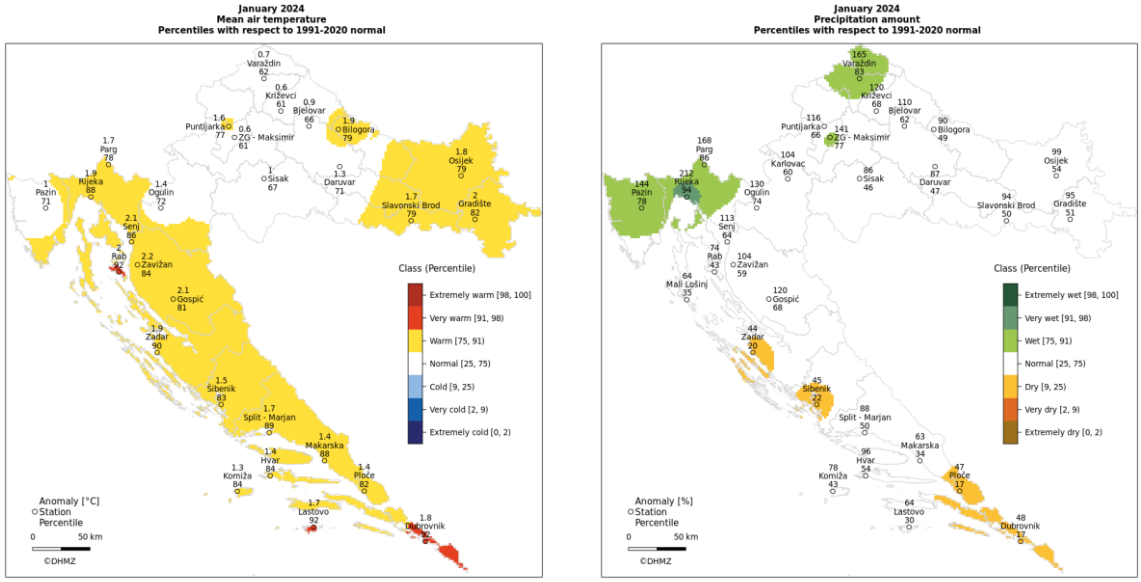
Table 2 - Absolute maximum temperature in January 2024 (in red – the highest temperature since there are measurements) and comparison with available series of measurement

Naziv meteorološke postaje	Godina od kada su raspoloživi podaci	Vrijednost najviše izmjerene temperature (°C) u siječnju (do 2023.) u razdoblju od kada su raspoloživi podaci	Datum kada je postignuta najviša vrijednost (* označava nepotpuni niz)	Vrijednost najviše izmjerene temperature zraka (°C) u siječnju 2024.	Datum kada je postignuta vrijednost najviše izmjerene temperature u siječnju 2024.
Dubrovnik	1961.	19,2	2. 1. 2022.*	18,5	4. 1.
Senj	1948.	20,3	20. 1. 1974.*	18,4	18. 1.
Šibenik	1949.	21,4	31. 1. 1989.	17,6	26. 1.
Slavonski Brod	1963.	19,5	5. 1. 2022.	20,5	18. 1.
Rijeka	1948.	20,0	20. 1. 1974.	15,8	25. 1.
Karlovac	1949.	19,3	7. 1. 2001.	18,2	4. 1.
Osijek	1899.	19,0	11. 1. 1903.*	18,4	18. 1.
Hvar	1858.	19,6	30. 1. 1949.*	18,9	18. 1.
Pazin	1961.	21,4	31. 1. 1989.	15,5	25. 1.
Split - Marjan	1948.	17,4	20. 1. 1974.	16,5	6. 1.
Ogulin	1949.	19,8	17. 1. 2011.	15,6	5. 1.
Komiža	1981.	20,2	10. 1. 2016.	19,9	18. 1.
Sisak	1949.	21,4	7. 1. 2001.	18,1	18. 1.
Daruvar	1978.	18,8	23. 1. 1985., 5. 1. 2022.	18,5	18. 1.
Mali Lošinj	1961.	17,4	20. 1. 2007.	15,4	18. 1.
Poreč	1981.	16,6	19. 1. 2014.*	14,8	5. 1.
Zagreb - Maksimir	1949.	19,4	7. 1. 2001.	15,7	4. 1.
Bjelovar	1949.	18,0	1. 1. 2023.	15,6	4. i 18. 1.
Varaždin	1949.	19,1	29. 1. 2002.	15,1	3. 1.
Gospić	1872.	16,0	19. 1. 2007.*	14,3	18. 1.
Lastovo	1948.	19,3	15. 1. 1993.*	18,4	18. 1.
Zadar	1961.	17,4	10. 1. 2016.	17,1	3. 1.
Parg	1950.	17,8	29. 1. 2002.*	11,0	4. 1.
Puntijarka	1981.	14,1	29. 1. 2002.	9,4	31. 1.
Zavižan	1953.	13,0	1. 1. 2022.*	9,4	31. 1.

Precipitation anomalies for Croatia in January 2024

Precipitation anomalies expressed as a percentage (%) of the multi-annual (1991. - 2020.) average were in January 2024 within the range from 44 % in Zadar (33,7 mm) to 212 % in Rijeka (266,3 mm).

Precipitation conditions in January 2024 are described in more detail in the following categories: **dry** (part of Dalmatia), **normal** (most of Croatia), **wet** (part of Istra, part of Gorski kotar, wider area of town Varaždin and Zagreb) and **very wet** (wider area of town Rijeka).



Mean air temperature (left) and precipitation amount (right) - January 2024 - percentiles with respect to 1991-2020 normal

Air temperature anomalies for Croatia in February 2024

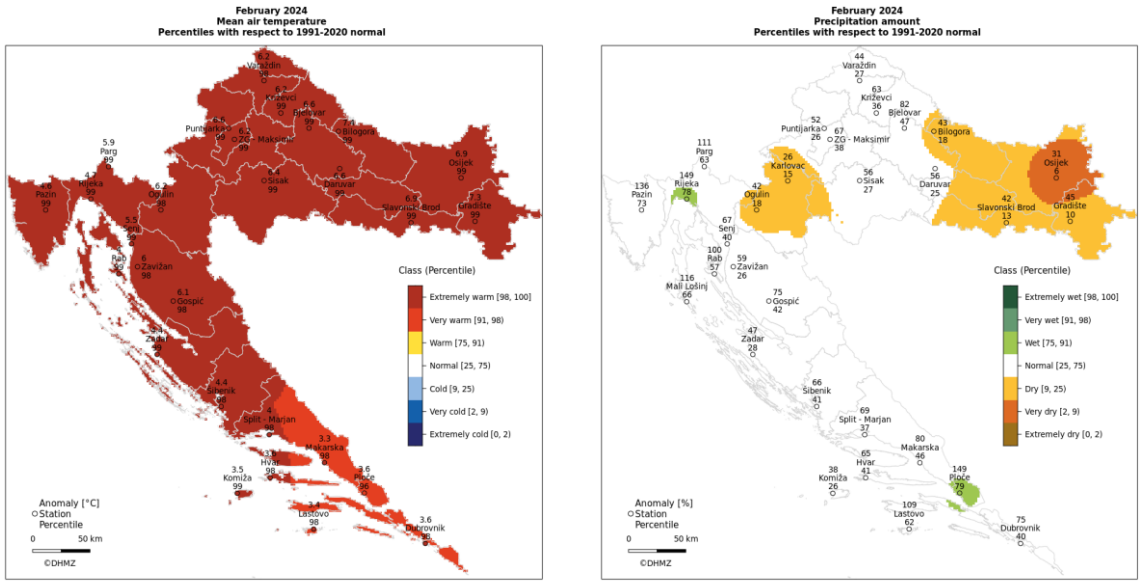
The anomalies of the mean air temperature in February 2024 with respect to the normal 1991 - 2020 were within the range from 3,3 °C (Makarska) to 7,4 °C (Bilogora). At all stations air temperature were higher than the respective multi-annual average.

According to the percentile ranks and classification ratings, thermal conditions in Croatia for February 2024 are described in more detail in the following categories: **very warm** (South Dalmatia) and **extremely warm** (the rest of Croatia).

Precipitation anomalies for Croatia in February 2024

Precipitation anomalies expressed as a percentage (%) of the multi-annual (1991-2020) average were in February 2024 within the range from 25,6 % in Karlovac (18,7 mm) to 149,1 % in Rijeka (193,4 mm). Analysis of precipitation anomalies in February 2024, expressed as a percentage (%) of the multi-annual average shows that precipitation amounts were mainly below the multi-annual average.

Precipitation conditions in February 2024 are described in more detail in the following categories: **very dry** (wider area of town Osijek), **dry** (most of East Croatia and part of Central Croatia), **normal** (most of Croatia) and **wet** (wider area of town Rijeka and Ploče).



Mean air temperature (left) and precipitation amount (right) - February 2024 - percentiles with respect to 1991-2020 normal

SEECOF-30 CLIMATE OUTLOOK VALIDATION

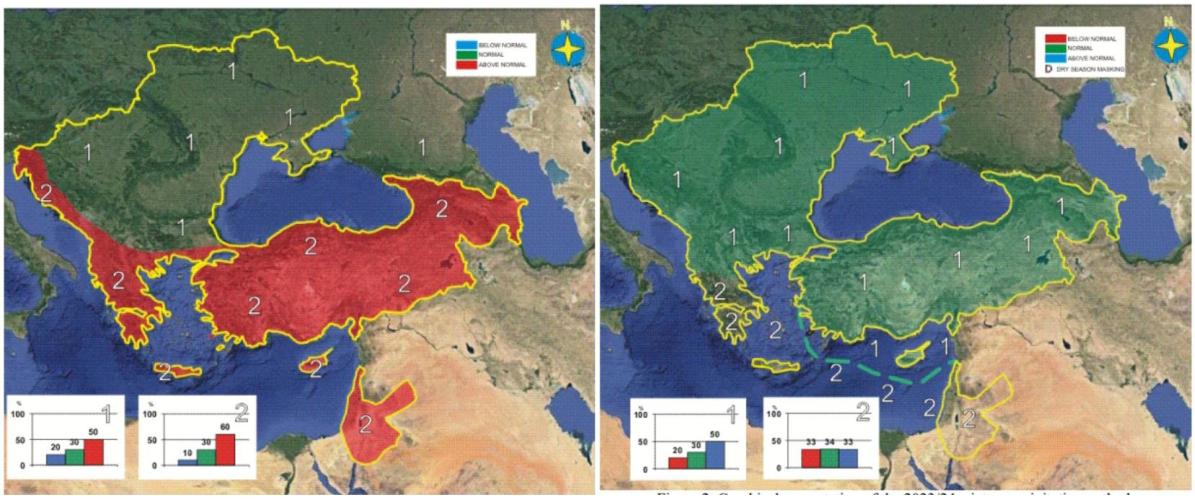


Figure 1: Graphical presentation of the climate outlook for the 2023-2024 winter season for the SEECOF region; Temperature outlook (left), Precipitation outlook (right)

Air temperature anomalies for Croatia in Winter 2023/2024

According to the SEECOF-30 climate outlook, for all Croatian teritory, winter temperature

was expected to be near or above-normal. Probability for exceeding the average winter season temperature was 50 %.

We can conclude that the outlook for the Winter 2023/2024 according the temperature was correct.

Precipitation amounts for Croatia in Winter 2023/2024

According to the SEECOF-30 climate outlook, winter precipitation sum in the whole Croatia was expected to be above normal with probability 50 %.

The actual precipitation amounts were mainly around the average. Only in small parts of Croatia the precipitation sum was above the average.

We can conclude that the outlook for the Winter 2023/2024 according the precipitation can be considered successful in small parts of Croatia.

Country	Seasonal temperature (DJF)		Seasonal precipitation (DJF)		High Impact Events
	Observed	SEECOF-30 climate outlook for **temperature**	Observed	SEECOF-30 climate outlook for **precipitation**	
Croatia	**Above normal** (in whole Croatia)	**Above normal** Along the coast (10,30,60) Inland (20,30,50)	**Below normal** (part of Dalmatia) **Normal** (most of Croatia) **Above normal** (small part of Croatia)	**Above normal** (20,30,50)	**Winter 2023/2024** **Wind** – a few episodes with gale and hurricane force gusts of bura wind (NE wind) was recorded along the Adriatic coast (December, January). Traffic between continental part and Adriatic coast were partly or complitely interrupted. Maritime traffic was also partially interrupted and there were disruptions in air traffic. There was damage on roads. (One girl was injured.) On 9th February very strong N wind

					with gale force gusts hit the continental part of Croatia. A construction scaffolding collapsed in Zagreb, luckily no one was injured. In February stormy jugo (SE wind) hit the Northern Adriatic - parts of the coast and beach were damaged. **Precipitation and floods** Episodes with heavy precipitation, thunderstorms and flash floods were rather frequent. In February heavy rain, thunderstorms, often with hail, hit south part of Croatia (Metković, Neretva river valley) coused floods and flash floods. Many houses, fields and roads were flooded. Great damage was caused to greenhouses and agricultural areas. During the winter there were several episodes with snow that caused traffic problems, mainly in mountainous Croatia.