



Ministry of ecology and natural
resources of The Republic Of
Kazakhstan Republican State
Enterprise «Kazhydromet»

SEASONAL BULLETIN ANOMALIES OF AVERAGE AIR TEMPERATURE AND PRECIPITATION IN KAZAKHSTAN FOR THE WINTER OF 2024–2025

INTRODUCTION

The study of regional climate and continuous monitoring of its change is one of the priority tasks of the national hydrometeorological service of Kazakhstan RSE «Kazhydromet».

For the preparation of the bulletin, observation data from the RSE «Kazhydromet» meteorological monitoring network were used: series of average seasonal air temperatures and seasonal precipitation totals since 1941.

Anomalies of mean seasonal surface air temperatures and seasonal precipitation totals are determined relative to the norms, i.e. mean multiyear values calculated for the period 1991-2020, recommended by the World Meteorological Organization as a baseline for monitoring the degree of anomaly of the current climate. Air temperature anomalies are calculated as deviations of the observed value from the norm. Precipitation anomalies are presented in percent of the norm, that is as a percentage ratio of the amount of precipitation to the corresponding value of the norm.

To characterize climatic extremes, maps are given, where for each station the range of empirical probability of non-exceedance of the current value in the time series of the variable under consideration for the period from 1941 to the current year is given (empirical probability of non-exceedance is the fraction of time series values less than or equal to the current value). If the probability of non-exceedance of the current value of the variable falls into the extreme ranges (0-5 % or 95-100 %), it means that this value occurred in no more than 5 % of cases in the period from 1941. If we look at the amount of precipitation, the former indicates extremely low precipitation, the latter extremely high precipitation.

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ANOMALIES OF THE AVERAGE AIR TEMPERATURE PER SEASON

In the winter period of 2024–2025, positive air temperature anomalies were observed throughout the territory of Kazakhstan, except for the foothill areas in the south and southeast of the country (Fig. 1). The average negative anomalies during the winter were not lower than -1 °C. The exception was the weather station Zhalanashkol (26.5 km from Dzungarian Gate), where the anomaly was -1.2 °C. The average air temperature anomaly for the winter period in Kazakhstan amounted to +2.7 °C. Thermal anomalies increased from about +1 °C in the south to more than +5 °C in the northern half of Kostanay region, North Kazakhstan, and the northern part of Pavlodar region.

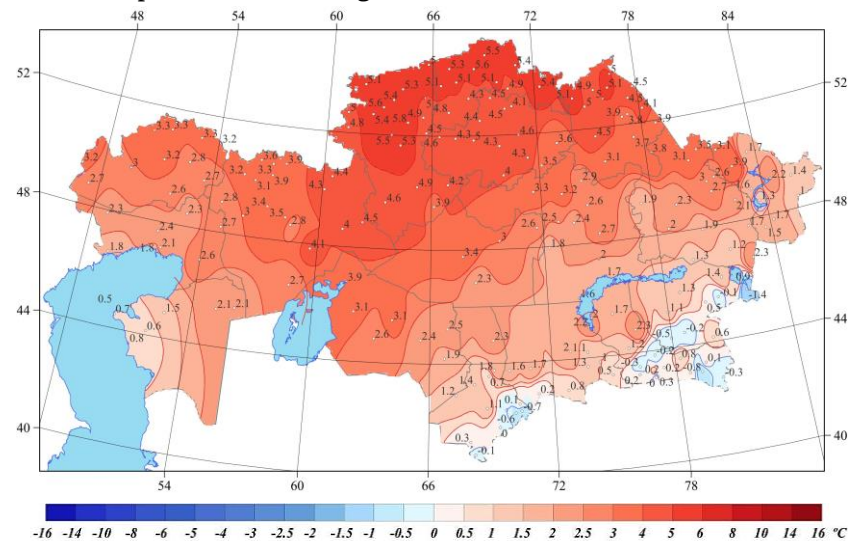


Figure 1 – Spatial distribution of anomalies of the average winter air temperature (°C) in 2024–2025, calculated relative to the norms for the period 1991–2020

For the period of winter 2024–2025. 127 meteorological stations located in the western, central, eastern and northern parts of the southern

regions of the country entered the gradation “warm” with a probability of non-exceedance of 75–95 % (Fig. 2). In Kostanay, North-Kazakhstan region and the northern part of Akmola region temperature anomalies were recorded in the category “extremely warm” with a probability of non-exceedance of 95–100 %. At MS Rudny in Kostanay region, the records of seasonal air temperatures for the winter period were updated (Table 1).

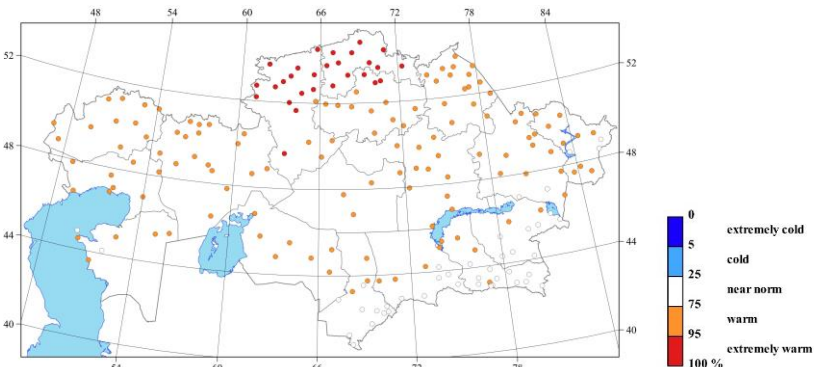


Figure 2 – Spatial distribution of probabilities of non-exceeding the average winter air temperature (°C) in 2024–2025, calculated relative to the norms for the period 1941–2025

Table 1. Maximum record air temperatures for the winter of 2024–2025

№	Meteorological station	Region	A new seasonal record for air temperature, °C	Previous record seasonal air temperature, °C
1	Rudny	Kostanay	-8,6	-8,8 (2020)

A comparative analysis of air temperature changes showed that the winter period of 2024–2025 was 1.4 °C warmer than the winter period of 2023–2024 and 2.7 °C higher relative to the base period (Fig. 3).

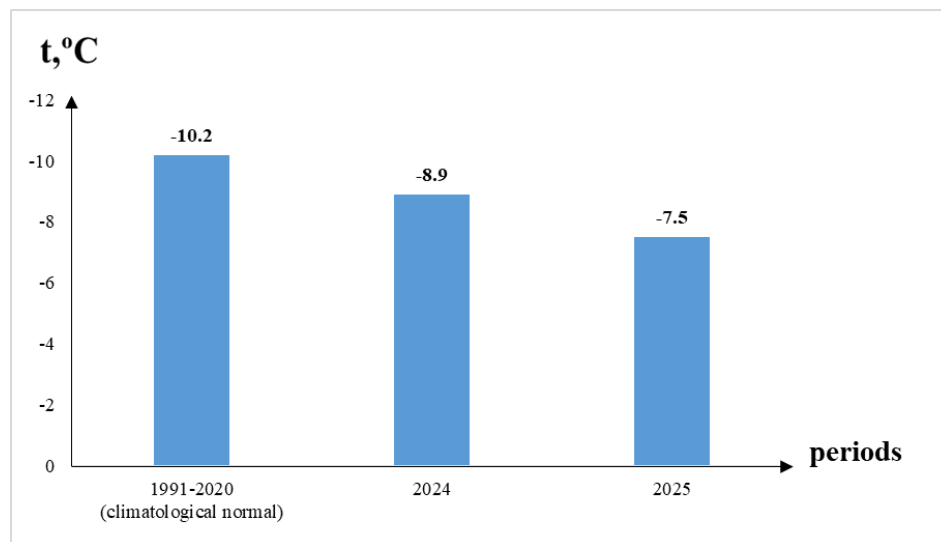


Figure 3 – Average winter air temperature (°C) relative to the norm for the long-term period 1991–2020, for the winters of 2023–2024 and 2024–2025

SEASONAL PRECIPITATION

In the winter of 2024–2025, precipitation in the country was unevenly distributed (Fig. 4). Excess precipitation (more than 120 % of the norm) was observed in the west (Atyrau, Mangystau and Aktoobe regions) in the north (North Kazakhstan and Akmola regions) and in the east (Abai, East Kazakhstan and the eastern part of Karaganda regions). The largest amount of precipitation fell on Aksuat MS in the Abai region – 51.2 mm, which was 166.9 % of the norm. Precipitation was about normal (80–120 %) in Kostanay, Aktoobe, Karaganda, Pavlodar regions and in Ulytau and Zhetysu regions. However, even in these regions, there were isolated pockets of both deficit and excess precipitation. Precipitation deficit was mainly recorded in West Kazakhstan and Kostanay regions, as well as in the central and southern regions of the country.

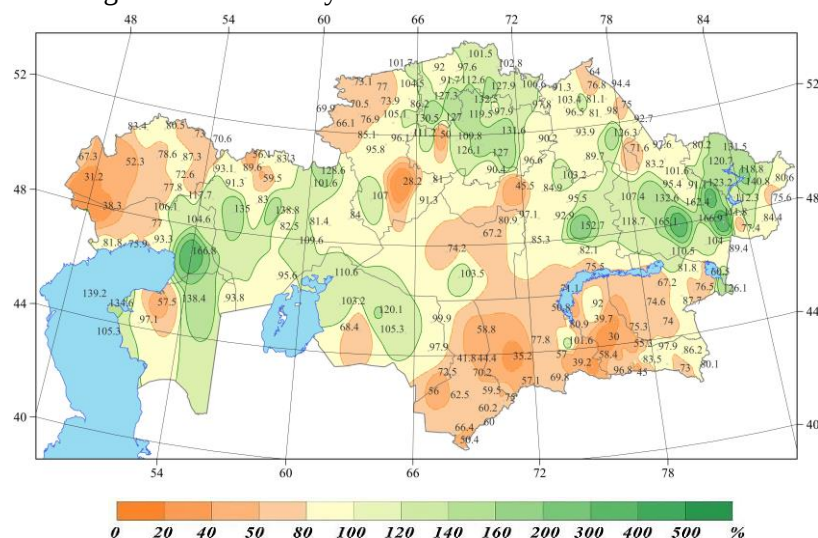


Figure 4 – Spatial distribution of the average amount of atmospheric precipitation over the winter period of 2024–2025 (in % of the norm calculated relative to the base period 1991–2020)

Small pockets of precipitation deficit were observed in Mangystau, Aktoobe, Kyzylorda, Akmola, Pavlodar and East Kazakhstan regions. According to data from 9 weather stations (Aidarly, Bakanas, Uyuk, Kordai, Urda, Ushtogan, Sholakkorgan, Amangeldy, Kertindy), 5%-level extremes were recorded, classifying them as “extremely dry” (Fig. 5). At Kulsary MS in Atyrau region, conditions were classified as “extremely wet”.

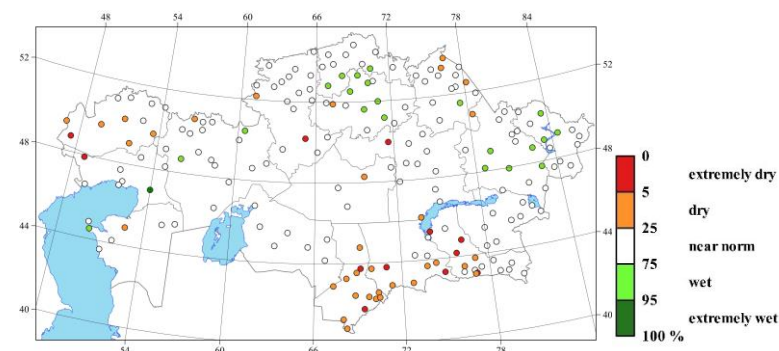


Figure 5 – Spatial distribution of the probability of not exceeding the average amount of precipitation over the winter period of 2024–2025. The probabilities are calculated based on data from the period 1941–2025

A comparative analysis of precipitation totals showed that in the winter period of 2024–2025, precipitation was 39.6 mm lower than in the winter of 2023–2024, and 9.8 mm below the long-term norm for 1991–2020 (Fig. 6).

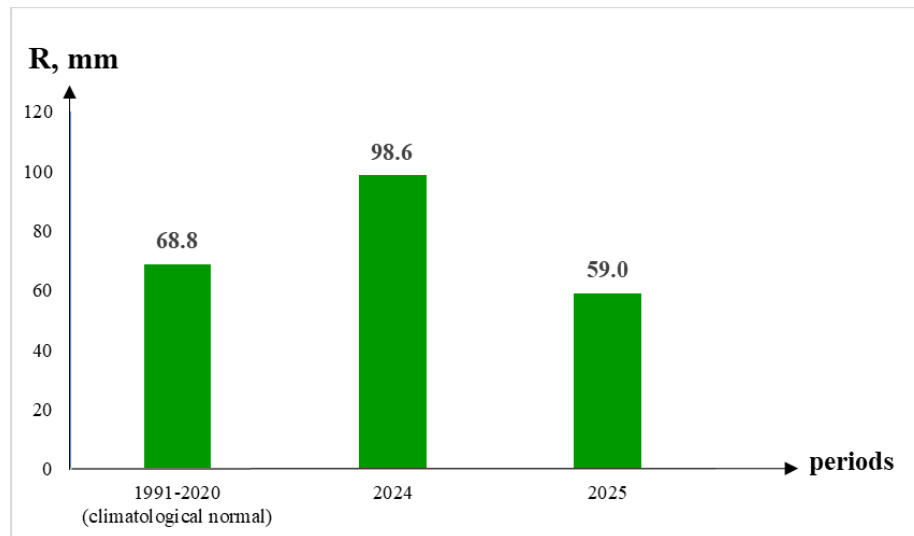


Figure 6 – Average amount of precipitation over the winter period (mm) relative to the norms for the long-term period 1991–2020, for the winters of 2023–2024 and 2024–2025