

Verification of the seasonal forecast for summer 2025 in Bulgaria

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1. Verification of the seasonal forecast for summer 2025

Tables 1 and 2 show the regular Bulgarian seasonal forecast for the summer season JJA 2025 issued in March (Month-3), April (Month-2), and May (Month-1) 2025 and for the individual months of the summer season issued back down to 3 months prior to the forecast month. The column “Index” gives the assessment of the month or the season based on real data.

Table 1: Scores of the seasonal forecast of mean seasonal temperature for summer 2025.

2025	Month Season	Forecast			Index	Score		
		-1	-2	-3		-1	-2	-3
Tempera- ture	June	1	1	1	1.98	3	3	3
	July	1	1	1	1.98	3	3	3
	August	1	1	1	1.51	3	3	3
	Summer	2	1	1	2.00	4	3	3

Table 2: Scores of the seasonal forecast of seasonal amount of precipitation for summer 2025.

2025	Month Season	Forecast			Index	Score		
		-1	-2	-3		-1	-2	-3
Precipita- tion	June	-1	-1	-1	-1.85	3	3	3
	July	-1	-1	-1	-1.38	4	4	4
	August	-2	-1	-1	-0.54	3	4	4
	Summer	-2	-1	-1	-1.80	4	3	3

In average the forecast for temperature scores 3.1 which is very good. In average the seasonal precipitation amount forecast scores 3.5 which is excellent. The national forecast was inline with the MedCOF/SEECOF forecast which was favoring hot (70% chance) and dry summer (50% chance). The national forecast for Bulgaria was produced as usual, based on subjective evaluation of the online map products of leading global centers such as the ECMWF and the multi-model ensemble of the C3S service.

In the evaluated summer forecast for the summer of 2025 it was said that it could have been expected to have a summer season 2025 similar to the summer of 2024. The summer of 2024 was with temperatures above normal (2.00) and with precipitation near

or below normal (-1.23). Summer 2025 therefore was as warm (2.0) and even drier (-1.80) than the summer of 2024.

Figure 1, 2, 3, and 4 show maps of the departure from normal (1991-2020) of the seasonal/monthly mean temperature (left) and the seasonal/monthly amount of precipitation in percent of normal (1991-2020) (right) for the summer season as a whole (Fig. 1) and the individual months of June 2025 (Fig.2), July 2025 (Fig.3), and August 2025 (Fig.4). The maps are regular operational products of the Bulgarian weather service and from this year are given with reference to normal based on the period 1991-2020.

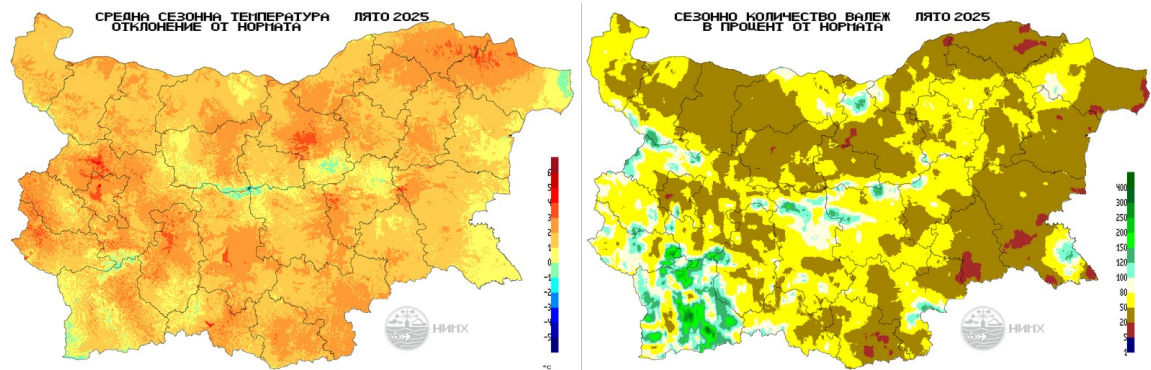


Figure 1: Departure of the seasonal mean temperature from normal (1991-2020) (left) and seasonal amount of precipitation in percent of normal (1991-2020) (right) for summer (June-July-August) 2025.

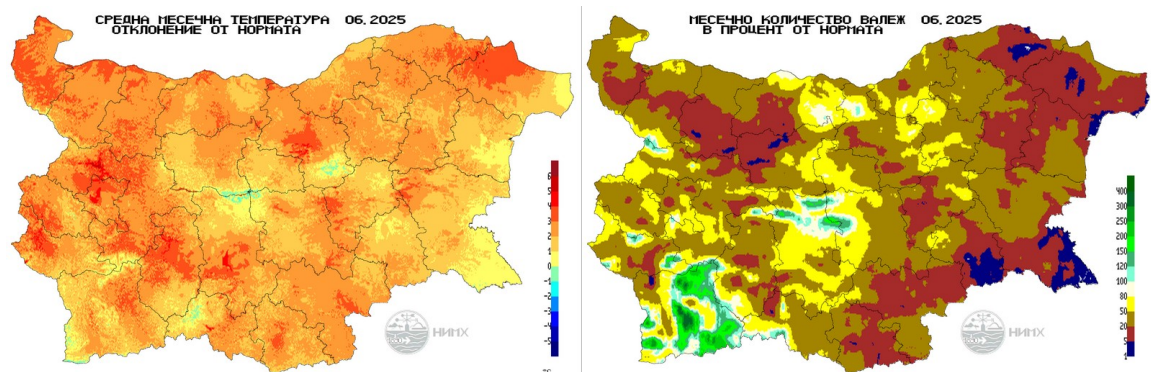


Figure 2: Departure of the monthly mean temperature from normal (1991-2020) (left) and monthly amount of precipitation in percent of normal (1991-2020) (right) for June 2025.

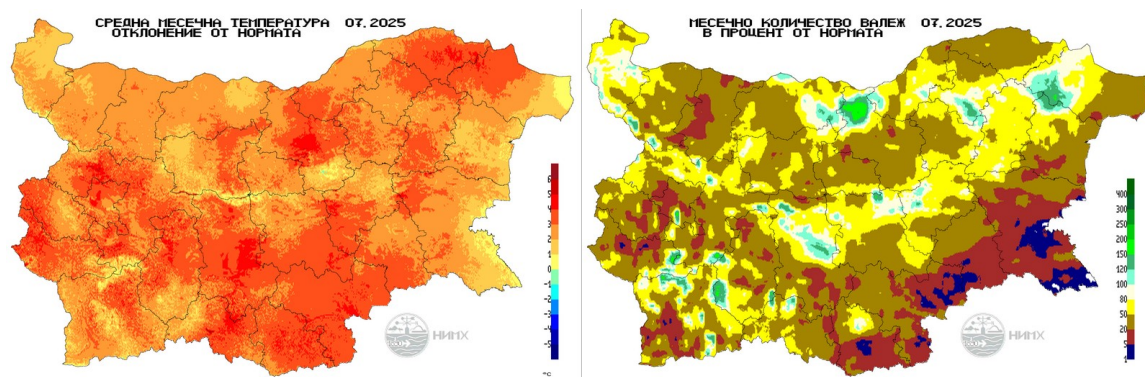


Figure 3: Departure of the monthly mean temperature from normal (1991-2020) (left) and monthly amount of precipitation in percent of normal (1991-2020) (right) for July 2025.

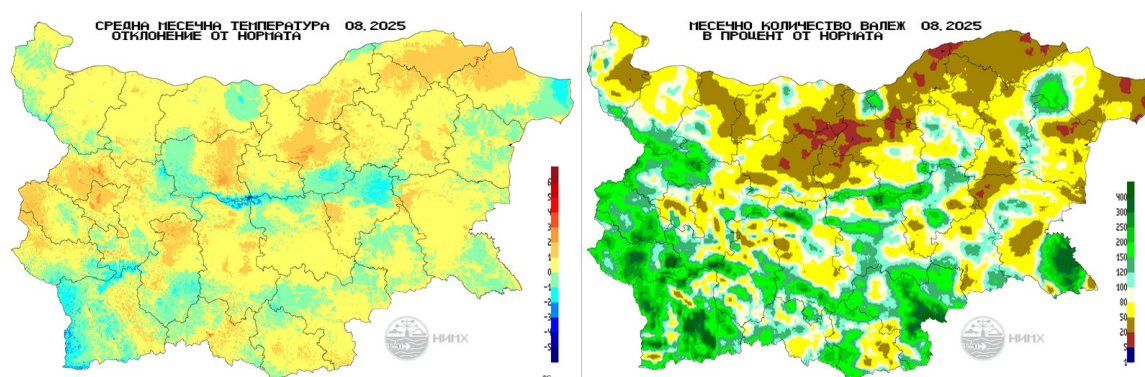


Figure 4: Departure of the monthly mean temperature from normal (1991-2020) (left) and monthly amount of precipitation in percent of normal (1991-2020) (right) for August 2025.

2. Extreme events

The summer of 2025 is one of the driest summers in Bulgaria since 1950, similar to the summers of 2000 and 2012. Seasonal precipitation amounts are below the climatic norm – between 7 and 74% of it. June 2025 is the driest June since 1950.

During the periods from June 30 to July 9 and from July 19 to 29, the entire country was engulfed in a heat wave. High temperatures, a prolonged period of no rain, and human negligence caused dozens of fires to rage in various parts of the country. With the passage of atmospheric disturbances on 7 and 28 July thunderstorms, intense rainfall of rain and hail, and strong winds were registered. In towns streets were flooded, roofs and fences were damaged, power poles were broken and trees were uprooted, and sections of the road network were temporarily blocked.

The country experienced another heat wave from August 3 to 17. In the first half of the month, large fires engulfed forest and field areas in the municipalities of in the east part of the country. On August 22, intense rainfall accompanied by strong winds caused

local flooding, felled trees, and damaged the power grid and infrastructure in the northern parts of the country.

The hot and dry weather called into question the survival of some spring crops grown under non-irrigated conditions. As a result of below-normal rainfall towards the end of the month, productive soil moisture reserves were completely depleted in many of the country's agricultural regions. With the deepening moisture deficit, a large part of the sunflower grown under non-irrigated conditions has a severely impaired turgor, with small, poorly decorated cotyledons. In corn crops, yellowing and drying of the leaves on the lower floors of the plants is observed. As a result of unfavorable agrometeorological conditions, damage to agricultural crops is increasing - leaf scorch on corn and sunflower, sterility in late-production vegetable crops, premature leaf fall in some perennial crops.

In the first half of August, the deepening summer drought and extremely high temperatures compromised the corn and sunflower harvest in many places in the country. Sunflower yields are unusually low, in places - below 100 kg/hectare, and a significant part of the corn crops grown under non-irrigated conditions will not be harvested.

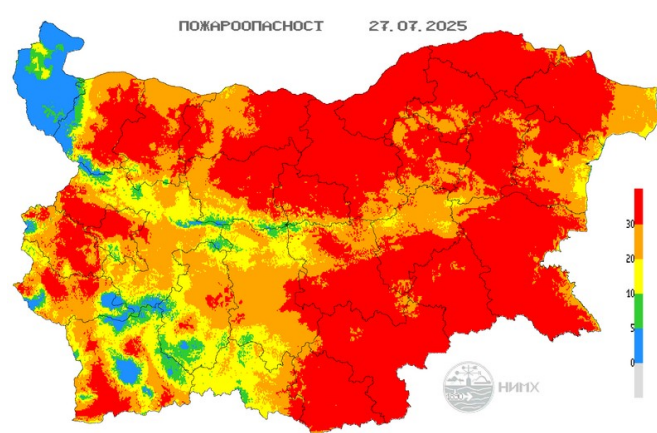


Figure 5: Fire weather index on 27 July 2025.

3. Explanations

3.1 Regular seasonal forecasting in Bulgaria

The National institute of meteorology and hydrology (NIMH) is the national weather service of Bulgaria. We have been producing regular seasonal forecast for our country since 2005. It is updated once a month at the end of the month as soon as all forecast materials become available. It is based on subjective analysis of the map products from the numerical climate prediction models of the following centers or multi-model systems:

ECMWF, C3S

3.2 Notation rules

The categories “above normal”, “around normal”, and “below normal” by definition have an equal probability of occurrence of 33.3%. The aim of the seasonal forecast is to favor one or two of the three categories based on the analysis of all available forecast materials and assessment of the evolution of large climate structures for the upcoming months. We consider Bulgaria as a region that is relatively small compared to the spatial uncertainties of the modern seasonal forecasting materials. That is why we give a unique forecast valid for the entire country without detailing for different regions except occasionally and only for the first month based on analysis of the medium range weather forecast. The forecast is summarized in tables with the favored categories in color as follows:

	warm		wet
	warm to normal		wet to normal
	normal		normal
	cold to normal		dry to normal
	cold		dry
	not available		not available
	all categories are likely		all categories are likely

We call “season” any three-month period which corresponds to the way the numerical seasonal forecast products are provided by the centers. However since 2011 the seasonal forecast is published only for the calendar season winter, spring, summer, and autumn.

The regular seasonal forecast is available to the public on the website of the institute though only in Bulgarian language.

3.3 Verification rules

In order to quantify the seasonal forecast in terms of categories below, around, and above normal we do the following. Since we give a unique forecast for the expected category for the entire country we need to have a unique assessment of the category of a given month or season. The assessment of the category is based on data from 20 meteorological stations distributed evenly in the country. The data from each of those 20 stations are analyzed. These are records of mean monthly temperature and monthly amount of precipitation from 1950 to present. The percentiles for below, around, and above normal are found for each station based on the latest possible 30-year period 1980-2009. This period is chosen in order to match the base periods of some if not all of the climate centers producing probability map. This reference period is also more suitable to give monthly or seasonal category that would correspond better to the perception of the public. This should be especially true for the thermal category because of the recent overall warming trend. The months and seasons therefore can be attributed a certain category numbered from -2 (below normal) to +2 (above normal). These numbers for all 20 stations and for each individual month or season are then averaged in order to produce a unique category number for the entire country. The forecast itself is also attributed a

number that reflects the forecast category. The numbers are -2 (below normal), -1 (below or around normal), 0 (around normal), +1 (above or around normal), and +2 (above normal). In order to assess the skill of our forecast we find the difference between the forecast and the real category. If it is within ± 0.5 we consider that the forecast is excellent (4), within ± 1.0 – very good (3), within ± 1.5 – good (2), and above it is considered to be poor (0). If there is no given preference to any of the three categories we attribute score (1) reasonable, because at least the forecast is not misleading.

References:

Monthly and yearly hydrometeorological bulletins of the National institute of meteorology and hydrology, Sofia, Bulgaria - <https://bulletins.cfd.meteo.bg/>

Seasonal forecast for Bulgaria. Latest issue available online (<http://www.meteo.bg/en/forecasts/seasonal> , <https://weather.bg/index.php?koiFail=bg2&lng=0>).