

The seasonal forecast for summer 2014 in Bulgaria

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1. Verification of the seasonal forecast for summer 2014

Tables 1 and 2 show the regular Bulgarian seasonal forecast for the summer season JJA 2014 issued in March (Month-3), April (Month-2), and May (Month-1) 2014 and for the individual months of the summer season issued back up to 3 months prior to the forecast one. 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 2014.

Temperature	Forecast			Index	Score		
	Month-1	Month-2	Month-3		Month-1	Month-2	Month-3
June	0		0	-0.76	3	1	3
July	-1	0		0.02	2	4	1
August	0	0	0	0.93	3	3	3
Summer	0		1	0.18	4	1	3

Table 2: Scores of the seasonal forecast of seasonal amount of precipitation for summer 2014.

Precipitation	Forecast			Index	Score		
	Month-1	Month-2	Month-3		Month-1	Month-2	Month-3
June	1		1	1.48	4	1	4
July	1	1		1.16	4	4	1
August	0	0	1	0.47	4	4	3
Summer	1		0	1.6	3	1	0

In average the forecast for temperature scores 2.58 which is very good and there are no bad hits but only 3 where climate was given as best guess. In average the seasonal precipitation amount forecast scores 2.75 which is very good. There is only one bad hit and 3 other with no specific forecast.

The national seasonal forecast followed roughly the SEECOF-11 and the MedCOF-2 guidelines and the discussions above apply for the assessment of the regional forecast as far as it concerns Bulgaria. The MedCOF-2 and SEECOF-11 forecast for summer 2014 for the region of Bulgaria was for near or above normal for both mean seasonal temperature and seasonal amount of precipitation.

Since 2012 the Bulgarian seasonal forecast contains an additional sentence that presents an attempt to predict how the upcoming season or month is expected to compare to the same one from the previous year. For this summer it was said that the season

should be similar to summer 2013 or less warm and with more precipitation. The summer of 2013 was warm or normal (1.22) and with precipitation near normal (0.3). Summer 2014 therefore was indeed less warm (0.3) and with more precipitation (1.6) than summer 2013.

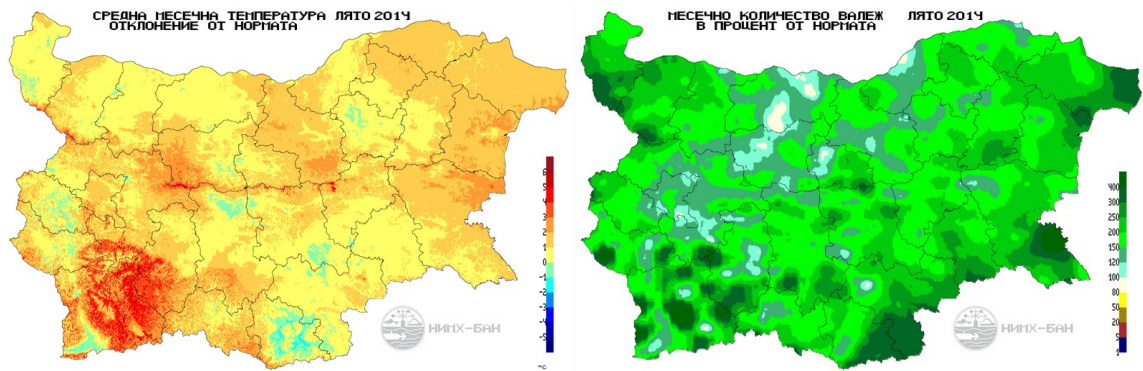


Figure 1: Departure of the seasonal mean temperature from normal (1961-1990) (left) and seasonal amount of precipitation in percent of normal (1961-1990) (right) for summer (June-July-August) 2014.

Figure 1, 2, 3, and 4 show maps of the departure from normal (1961-1990) of the seasonal/monthly mean temperature (left) and the seasonal/monthly amount of precipitation in percent of normal (1961-1990) (right) for the summer season as a whole (Fig. 1) and the individual months of June 2014 (Fig.2), July 2014 (Fig.3), and August 2014 (Fig.4). The maps are regular operational products of the Bulgarian weather service and are therefore given with reference to normal based on the period 1961-1990 as with the WMO recommendations.

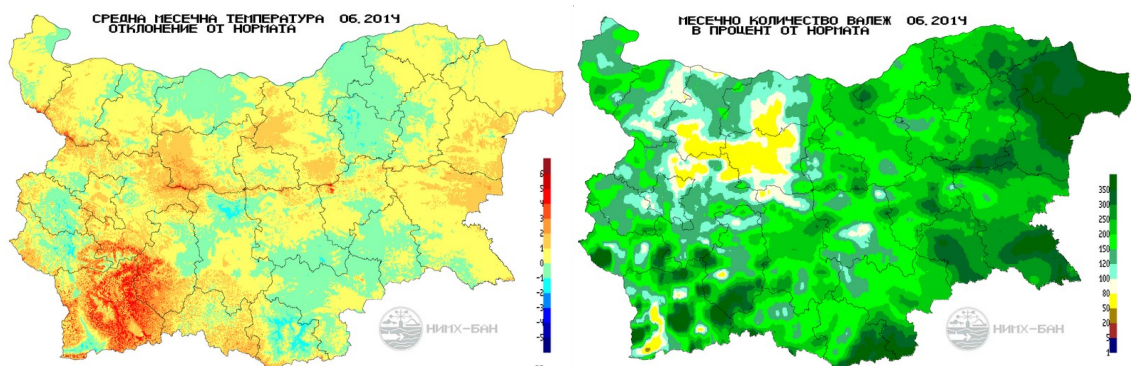


Figure 2: Departure of the monthly mean temperature from normal (1961-1990) (left) and monthly amount of precipitation in percent of normal (1961-1990) (right) for June 2014.

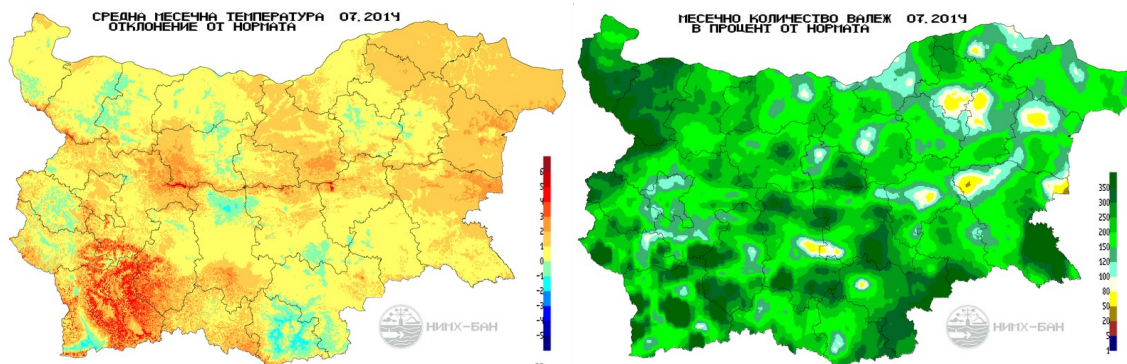


Figure 3: Departure of the monthly mean temperature from normal (1961-1990) (left) and monthly amount of precipitation in percent of normal (1961-1990) (right) for July 2014.

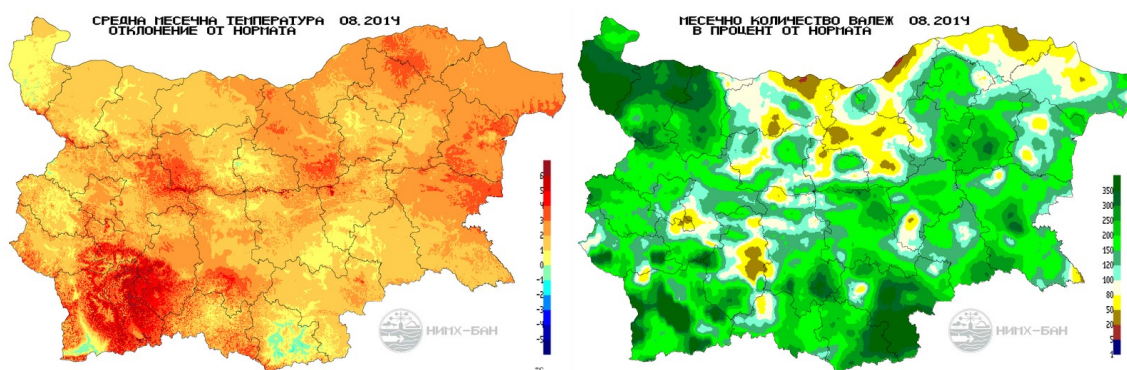


Figure 4: Departure of the monthly mean temperature from normal (1961-1990) (left) and monthly amount of precipitation in percent of normal (1961-1990) (right) for August 2014.

2. Extreme events

The summer of 2014 was marked by frequent heavy rain events. It is the wettest summer in Bulgaria since 2005. The spring of 2014 was also very wet (the wettest since 1978) which contributed to soil moisture conditions favoring floods and river overflows after big summer rain events. The summer season of 2014 also ranks among the strongest since 1950 in terms of thunderstorm and hailstorm activity. The most significant floods and hailstorms are listed below:

07-08.06: Wide-spread hailstorms hit mostly the northeastern part of the country where they cause significant damage on fruit trees.

19-20.06: Wide-spread hailstorms come again. The hail stones in Sofia, the capital city, were as big as hazelnuts. The northeast experienced the heaviest rains with 24-hour amounts reaching above 100 mm. Parts of Varna were flooded and there were a few deaths.

16.06: A water spurt was observed beneath a thunder cloud near Sozopol at the Black sea coast (Fig. 5).

08.07: Heavy thunderstorm with large hail struck Sofia, the capital city. Hail stones as big as tennis balls (Fig. 6) damaged cars and building walls and windows across the city.

11.07: Heavy rain and hailstorms hit the central part of the country. There was flood in a part of the town of Lovech.

15-16.07: Big thunderstorm and heavy rain (24-hour amounts above 200 mm) came onshore near the Black sea coastal resort town of Primorsko and flooded the region amid the highest vacation season.

19-20.07: Heavy rain with thunderstorms hit the Black sea coastal cities of Varna and Burgas. There were interruptions of rail transport services in both cities.

28-29.07: Heavy rain with thunderstorms and hailstorms hit again the central part of the country. In the region of Gabrovo and other towns there were partial floods and damaged house roofs.

31.07 The northwestern and central parts of the country experienced heavy rain with overflow of rivers in the region of Vratsa where the 24-hour amounts of precipitation exceeded the 100 mm mark.

01-03.08: The town of Mizia near the Danube was flooded by the overflowed river Skut after a series of big rain events in the previous couple of days in the river's watershed.

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:

European center for medium range weather forecast, Reading, UK;

MetOffice, Exeter, UK;

National center for environmental prediction, USA;

International research institute, Columbia University, USA;

Beijing climate center, China;

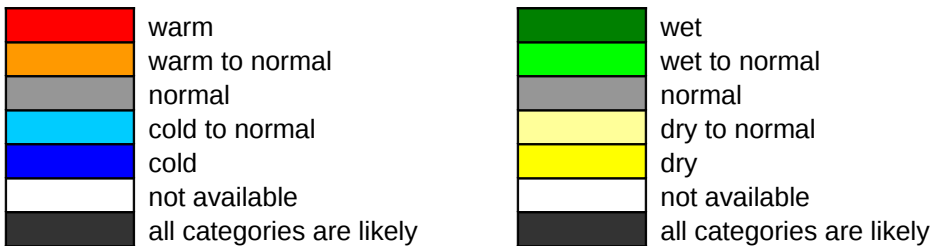
Tokyo climate center, Japan;

and the statistical prediction models of the Italian institute of biometeorology Ibimet and the Tokyo climate center. All these materials are available on the websites of the centers.

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:



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 bulletin of the National institute of meteorology and hydrology, Sofia, Bulgaria. Latest issue available online (<http://www.meteo.bg/sites/storm.cfd.meteo.bg.meteo/files/Bulletin.pdf>) and older issues available on demand.

Seasonal forecast for Bulgaria. Latest issue available online (<http://www.meteo.bg/en/node/58>).