

# Assessment of the seasonal forecast for the summer season 2011 in Bulgaria

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8 November 2011, Sofia

## 1. Introduction

### 1.1 Regular seasonal forecast

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.

### 1.2 Explanations

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. The name of a season is constructed by the first letters of the names of the months in the three-month period. For example JJA=June-July-August.

The regular seasonal forecast is available to the public on the website of the institute (<http://info.meteo.bg/>) though only in Bulgarian language.

## **2. Verification of the most recent summer forecast**

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 30 meteorological stations distributed evenly in the country. The data from each of those 30 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  $\pm 0.5$  we consider that the forecast is excellent (4), within  $\pm 1.0$  – very good (3), within  $\pm 1.5$  – good (2), and beyond 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.

In Table 1 and 2 we give our regular seasonal forecast for the summer season JJA 2011 issued in March (Month-3), April (Month-2), and May (Month-1) 2011 and for the individual months of the summer season issued up to three months in advance of 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 the summer season 2011 in Bulgaria. The reference period for the index is 1980-2009.

Temperature	Forecast			Category	Score		
	Month-1	Month-2	Month-3		Month-1	Month-2	Month-3
June	1	1	1	0.18	3	3	3
July	1	1	0	1.20	4	4	2
August	1	0	0	0.62	4	3	3
Summer	1	1	1	0.91	4	4	4

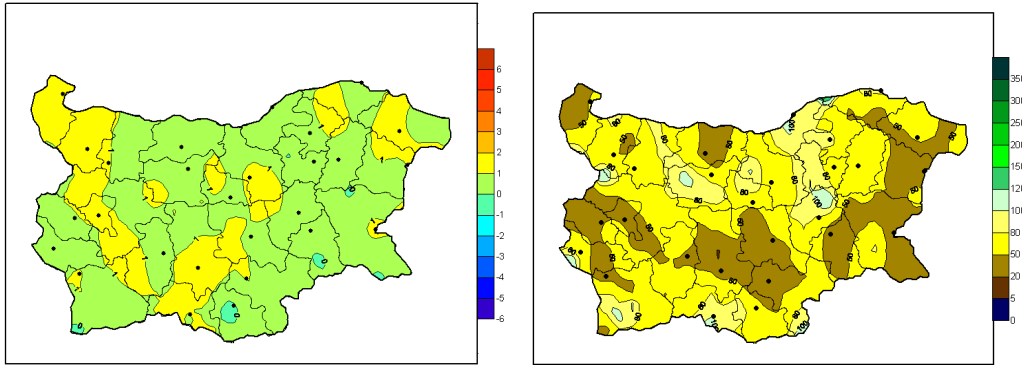
**Table 2:** Scores of the seasonal forecast of seasonal amount of precipitation for the summer season 2011 in Bulgaria. The reference period for the index is 1980-2009.

Precipitation	Forecast			Category	Score		
	Month-1	Month-2	Month-3		Month-1	Month-2	Month-3
June	-1	-1	0	-0.74	4	4	3
July	-1	0	0	0.72	0	3	3
August	-1	0	0	0.15	2	4	4
Summer	-1	-1	0	0.12	2	2	4

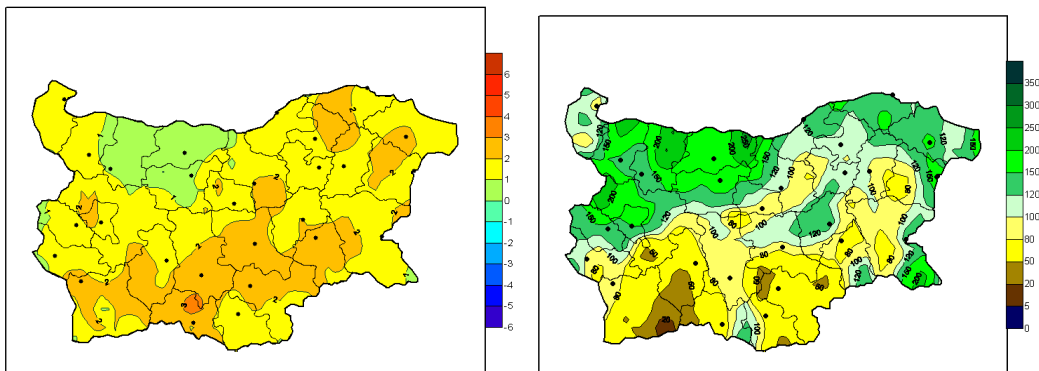
We started in March with predicting a warm to normal summer with precipitation near normal and ended in May with predicting a warm to normal and dry to normal summer (See Table 1 and 2, line “Summer”). The summer season 2011 actually turned to be rather normal in terms of precipitation and in average for the country. It was also warm to normal in terms of temperature. The seasonal forecast of mean seasonal temperature is excellent. The seasonal forecast of seasonal amount of precipitation is very good. The picture for precipitation is more heterogeneous than the one for temperature. There are large relatively dry and wet parts of the country but not to exceptional level. The temperature and precipitation forecast for the individual summer months is very good in average. The month of June is relatively dry in most of the country (See Fig.1 right). In July and August we have large relatively dry and wet parts of the country but not to exceptional levels (See Fig.2 and 3 right).

Figure 1, 2, and 3 show maps of the departure of the monthly mean temperature from the norm (1961-1990) (left) and monthly amount of precipitation in percent of normal (1961-1990) (right) for the summer months June 2011 (Fig.1), July 2011 (Fig.2), and August 2011 (Fig.3). The maps are regular operational products of the Bulgarian weather service and are therefore given with reference to norms based on the period 1961-1990 as with the WMO recommendations.

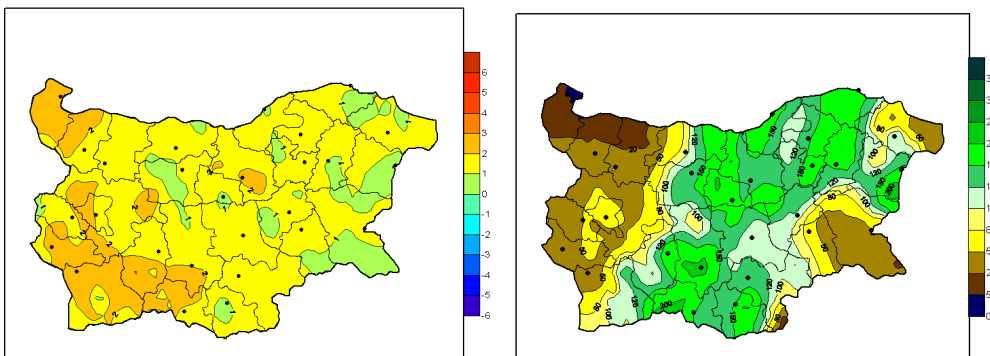
**Figure 1:** Departure of the monthly mean temperature from the norm (1961-1990) (left) and monthly amount of precipitation in percent of normal (1961-1990) (right) for June 2011.



**Figure 2:** Departure of the monthly mean temperature from the norm (1961-1990) (left) and monthly amount of precipitation in percent of normal (1961-1990) (right) for July 2011.



**Figure 3:** Departure of the monthly mean temperature from the norm (1961-1990) (left) and monthly amount of precipitation in percent of normal (1961-1990) (right) for August 2011.



### **3. Extreme events**

There was a strong precipitation event around 10-11 August 2011 mostly in the north-central part of the country and the Rhodope Mountains in the south. The registered precipitation amounts were as big as 30-90 mm which is harmful but not exceptional. This precipitation amounts though exceed the monthly norm and turn those parts of the country relatively wet on the monthly scale (See Fig.3). Thunderstorms episodes in mid July (24-25 July 2011) caused damage mostly in the Danube plane towns. The precipitation amounts were as big as 20-50 mm and exceed the monthly norm. That is why the north-central part of the country is wet in July on monthly basis (See Fig.2).

#### **References:**

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