The seasonal forecast for winter 2019/20 in Bulgaria

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1. Verification of the seasonal forecast for winter 2019/20

Tables 1 and 2 show the regular Bulgarian seasonal forecast for the winter season DJF 2019/20 issued in September (Month-3), October (Month-2), and November (Month-1) 2019 and for the individual months of the winter season issued back up to 3 months prior to the forecast one. The column "Category" 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 winter 2019/20.

Temperature	Forecast			Category	Score		
	Month-1	Month-2	Month-3		Month-1	Month-2	Month-3
December	1	1	1	1.84	3	3	3
January	1	2	1	1.51	3	4	3
February	1	1	1	2.00	3	3	3
Winter	2	1	1	1.98	4	3	3

Table 2: Scores of the seasonal forecast of seasonal amount of precipitation for winter 2019/20.

Precipitation	Forecast			Category	Score		
	Month-1	Month-2	Month-3		Month-1	Month-2	Month-3
December	0	-1	-1	-1.26	2	4	4
January	-1	-1	-1	-1.68	3	3	3
February	-1	-1	0	1.04	0	0	2
Winter	-1	-1	-1	-1.06	4	4	4

In average the forecast for temperature scores 3.2 which is very good. In average the seasonal precipitation amount forecast scores 2.8 which is also very good. The seasonal outlook for temperature is either very good or excellent and the seasonal outlook for precipitation is excellent. The only misleading part of the forecast is the precipitation outlook for February where the return to wetter weather was not captured.

The national seasonal forecast followed roughly the SEECOF and the MedCOF guidelines for temperature and precipitation. For temperature the SEECOF-MedCOF

forecast was giving warm or normal for the region of Bulgaria and for precipitation – near or below normal.

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 winter it was said that the season should be similar to winter 2018/19 in both temperature and precipitation. The winter of 2018/19 was warm or normal (1.02) with precipitation near or below normal (-0.74). Winter 2019/20 therefore is indeed similar to winter 2018/19 in terms of precipitation (-1.06) but warmer (1.98).

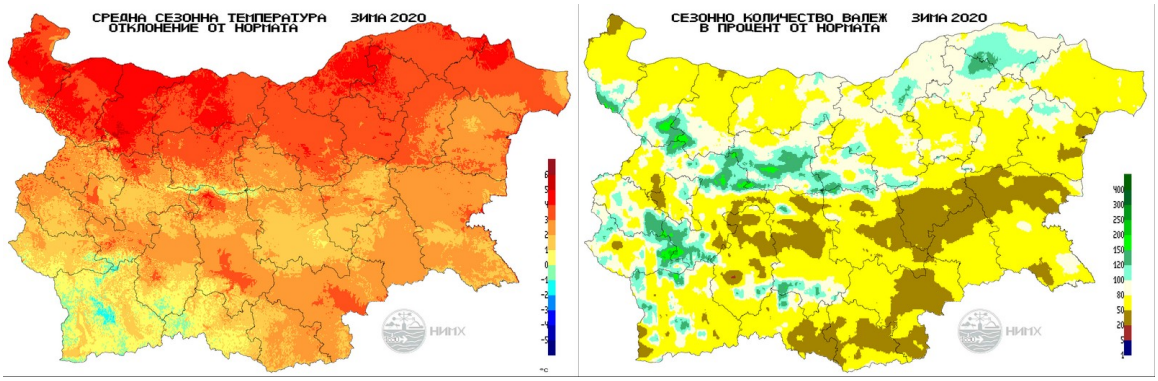

Figure 1: Departure of the seasonal mean temperature from normal (1961-1990) (left) and seasonal amount of precipitation in percent of normal (1961-1990) (right) for winter (December-January-February) 2019/20.

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 winter season as a whole (Fig. 1) and the individual months of December 2019 (Fig.2), January 2020 (Fig.3), and February 2020 (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.

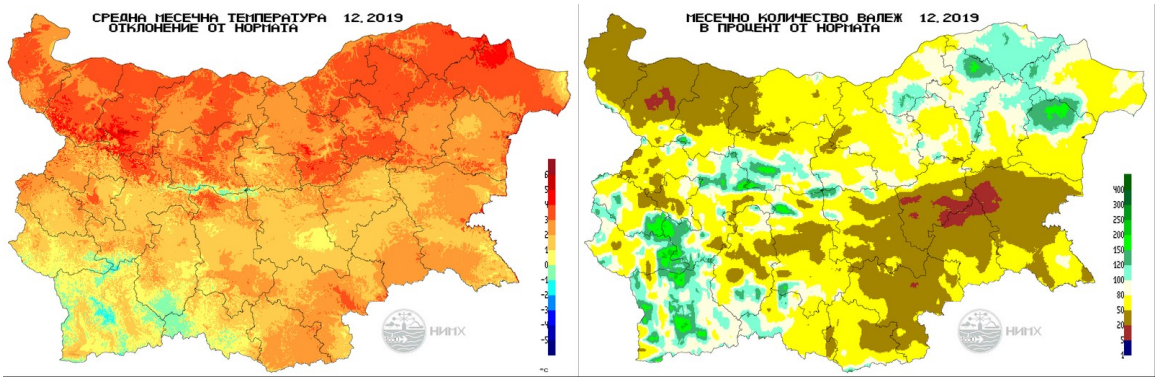

Figure 2: Departure of the monthly mean temperature from normal (1961-1990) (left) and monthly amount of precipitation in percent of normal (1961-1990) (right) for December 2019.

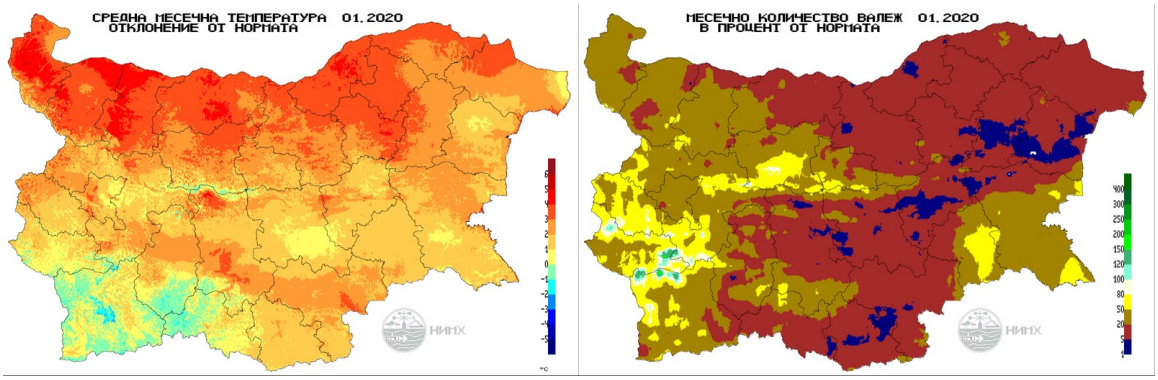

Figure 3: Departure of the monthly mean temperature from normal (1961-1990) (left) and monthly amount of precipitation in percent of normal (1961-1990) (right) for January 2020.

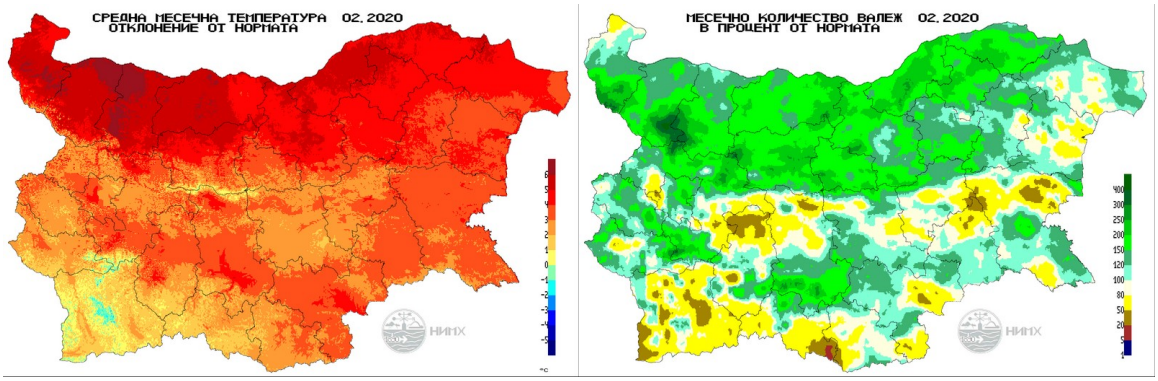

Figure 4: Departure of the monthly mean temperature from normal (1961-1990) (left) and monthly amount of precipitation in percent of normal (1961-1990) (right) for February 2020.

2. Extreme events

Drought conditions dominated the weather in Bulgaria since the middle of the summer of 2019. They continued in autumn and winter. It was only in February where the weather pattern returned to wetter type. The drought brought water reservoirs in Western Bulgaria to critically low levels and special measures had to be taken to tackle the water shortage in cities.

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, NMME, MetOffice, Meteo-France, NCEP

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/meteo7/sites/storm.cfd.meteo.bg.meteo7/files/Bulletin.pdf) and older issues available on demand.

Seasonal forecast for Bulgaria. Latest issue available online (http://www.meteo.bg/en/forecasts/seasonal).