WEATHER ANOMALIES AND INFLUENCE ON BULGARIEN SECTION OF DANUBE RIVER

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Abstract

The provision of information on recent, past and current meteorological conditions, together with data on the hydrological and tidal states, are essential components of an appraisal and forecasting procedures. Meteorological products and weather forecasts are effective applications to river management.
In this paper we analyzed the weather anomalies over Balkans and relation with the extremely water stages in Bulgarian section of Danube river during the period of 2005 – August 2007. Seasonal fluctuations in water levels as well as the flooding of riparian areas are natural features of running.
Two more flood waves occurred in Bulgaria in spring and in summer of 2005. During April-May of 2006 the river Danube in Bulgaria reached the highest levels since 1895. Flooded area of Bulgaria: 5,500 ha.
After for long drought the levels of Bulgarian section of Danube reached to standard water stages in the end of the spring of 2007.
The changes in the precipitation patterns over the year can lead to more flooding in some regions or seasons and more droughts in other, more frequent land slides and soil erosion. Annual precipitation trends in Europe are much more varied than temperature trends. Weather extremes are becoming more frequent in Europe: e.g. the summer of 2005, spring of 2006 and. The attention was paid to Danube water level in Bulgarian section during the above periods and the anomalies of synoptic situations. The results are shown on Figures. We analyzed (NAO) and relationship to regional temperature and precipitation over Bulgaria. The NAO is a phenomenon associated with winter fluctuations in temperatures, rainfall and storminess over much of Europe.

Keywords: *atmospheric circulation, low water stages, precipitation, flood, NAO.*

1 INFORMATION DATABASE

Utilized data: time-series (1961-2007) of the monthly mean temperatures, precipitation from some surface synoptic stations and climatic stations have been used as initial data.
The fields for seasonal air temperature and precipitation are studied for this period for all territory of the country. The behavior of the fields characterizing the change of the temperature and precipitation anomalies is analyzed by physical-statistical methods. The variations of the temperature and precipitation during

the winters and summers were estimated expressed in relation to the 1961-1990 periods. This period was accepted taking into account the recommendation of WMO for comparative estimates [9].

2 SIGNIFICANT CLIMATE ANOMALIES

Analysis of precipitation and air temperature at the territory of Europe and particularly for Bulgaria

Precipitation climatic variability estimates for the country is of great interest as temperature data [1], [2], [3].
On the fig 1 you can see significant climate anomalies and Events in 2005. In eastern Europe severe flooding (May-August).
The year 2005 to date has been very dry over most of western Europe, with less than 50 % of normal rainfall in many places for the 3-month period between January and March (see Fig 2). The same period has been unusually cold in south and east, with some exceptionally heavy snowfall. Over the Balkans was severe winter weather and much below average winter temperatures.
Cold weather during the second part of March cold was replaced by milder conditions. As a result, mean temperatures overall were above normal every where. By reason of this the thawing started. At the end of March (31-th) the water level of Danube river at the station Vidin was 800 sm.
A major storm system affected southeastern Europe between 12th and 14th March 2005 (fig.4).Strong winds cut power supplies across parts of Bulgaria, Romania, Grece and Turkey, while heavy rainfall flooded thousands of homes.
Early April in 2006, was above normal (fig.5) ever where and it was a warm month with (3,0 degree C warmer than average). There is extreme high water level during the April and May. The high stages were in station Ruse- 912 sm on 12th April.
An early season heat wave over parts of western Europe around mi-month of April 2007 saw temperatures rise close to 30 degree C in parts of Belgium, Germany and Netherlands. These records for April (fig.6 and 7) affected Europe with warm and less seasonal rain (fig 8).
The blocking processes [4] over West Europe and Atlantic Ocean interrupted zonal circulation over the Continent, which is significant importance for continuously dry period over West, Central and Southeast Europe.

Extreme low water stages

Extreme low water stages were in the end of August 2005(see fig. 3) after the floods during the first half of month.
As a upper limit of low water level can use positions below which must limit the load up of vessel and thus appears the erosion of the river thresholds, by investigation of Nikolov P. [8] this limit of low water level of the river Danube is the next: Vidin with water position 250 cm, Lom – 260 cm, Svishtov – 200 cm, Ruse – 200 cm about elevation 0 (zero) of the depth gauges.

The duration of low water positions varies in the wide limits but the case of extreme low water stages is observed in Ruse in the end of August it falls below elevation (zero). This was a period of extreme low water positions at this part of the Danube River in Bulgaria.

Analyse of NAO

The standardized seasonal mean NAO index during cold season (blue line) is constructed by averaging the daily NAO index for January, February and March for each year(fig.9) The black line denotes the standardized five-year running mean of the index. Both curves are standardized using 1950-2000 base period statistics.
For the last years 2005- 2007 the mean of the index NAO was closed to the average. But the temperatures during winter 2005/2006 were below norm about 3 degree C. For north-west region of Bulgaria the temperature was below normal, and for the other parts about norm.

3 LIST OF FIGURES

Figure 1. Significant climate anomalies and Events in 2005

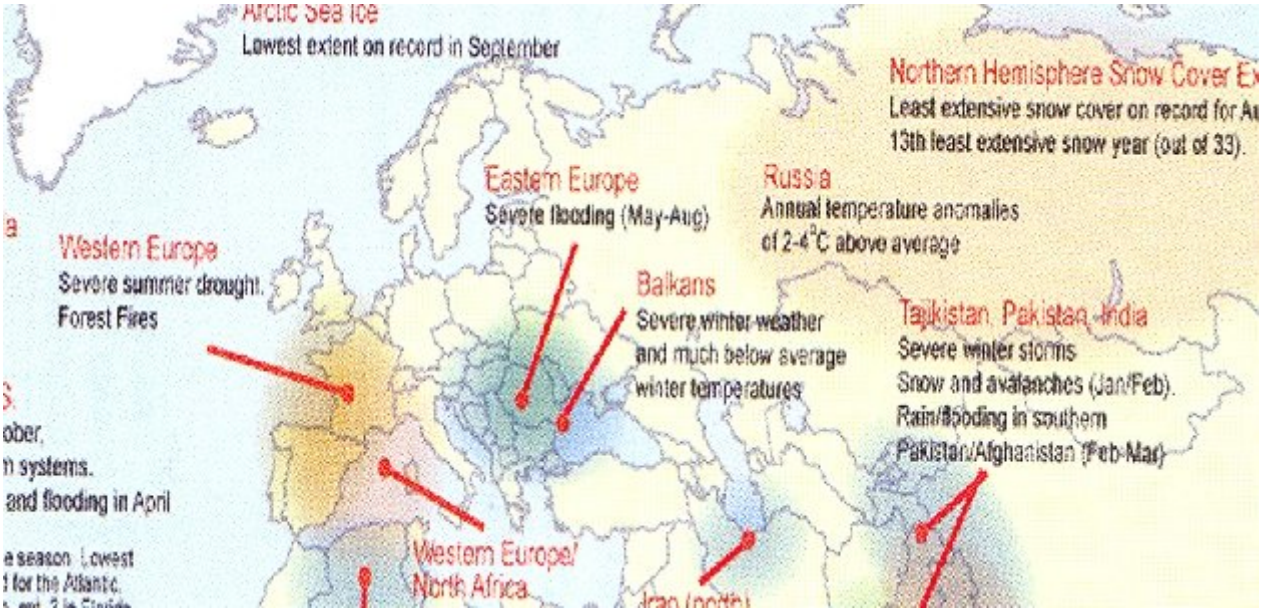


Figure 2. January –March 2005 Rainfall (Percentage of 1961-1990 normal)

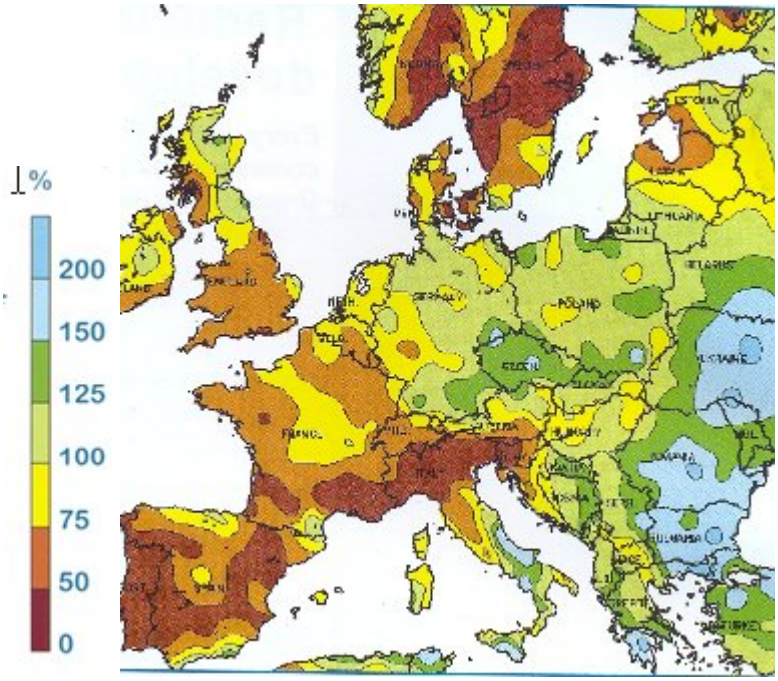


Figure 3. August 2005 Rainfall (Percentage of 1961-1990 normal)

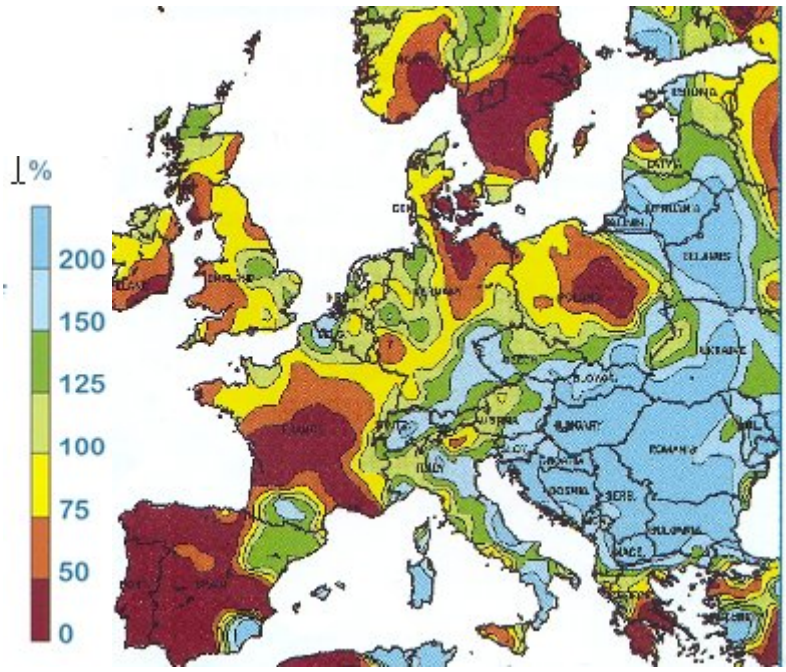


Figure 4. January –March 2006 Rainfall (Percentage of 1961-1990 normal)

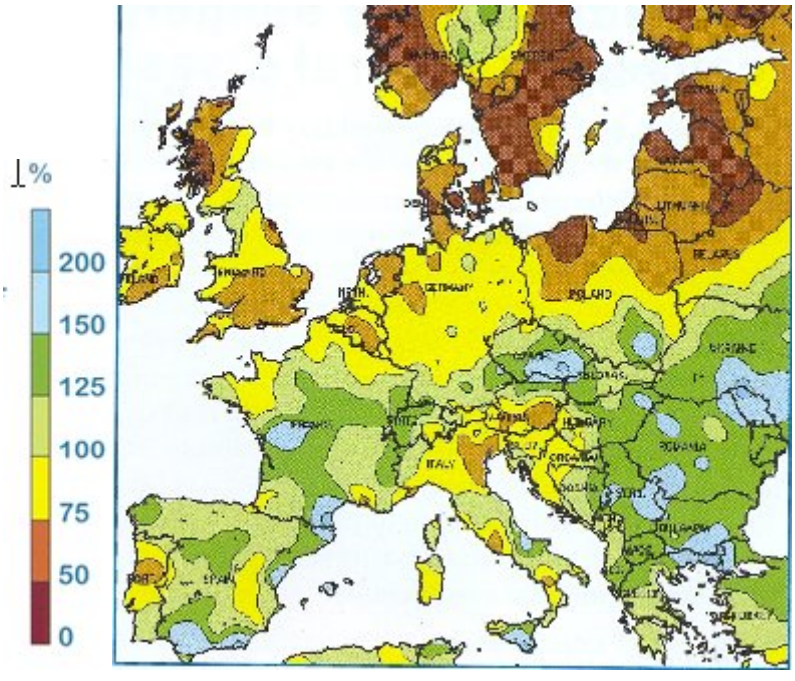


Figure 5. April 2006 Rainfall (Percentage of 1961-1990 normal)

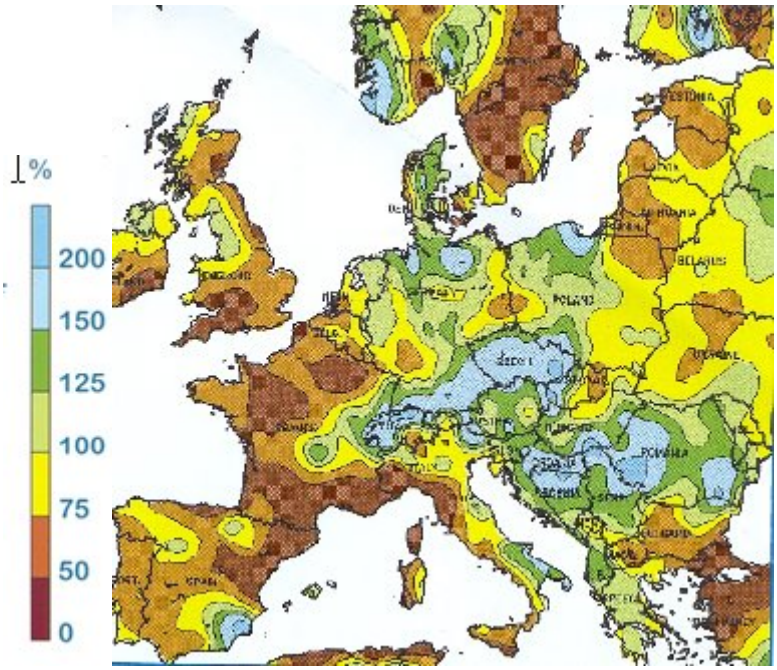


Figure 6. April 2007 Rainfall (Percentage of 1961-1990 normal)

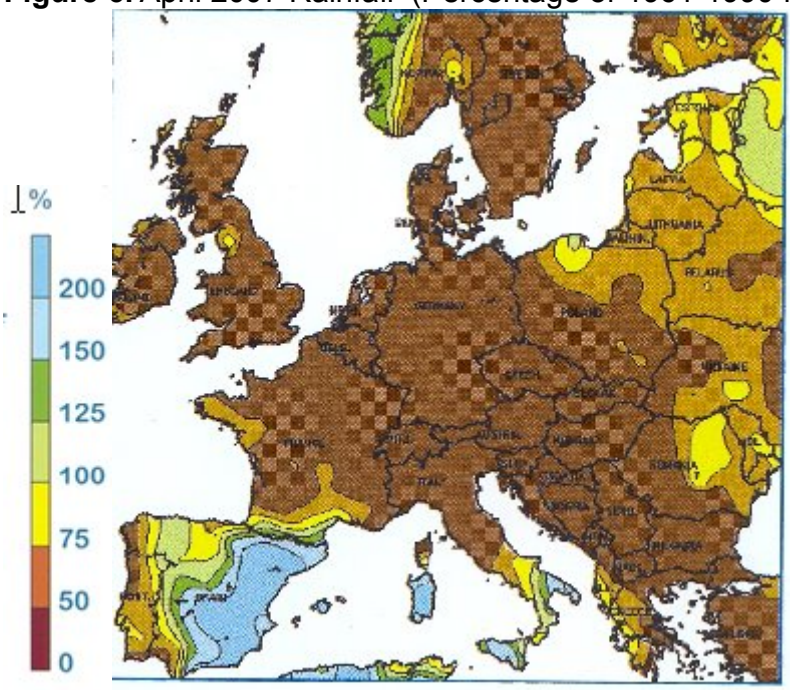


Figure 7. April 2007 Mean Temperature (Difference from 1961-1990 normal)

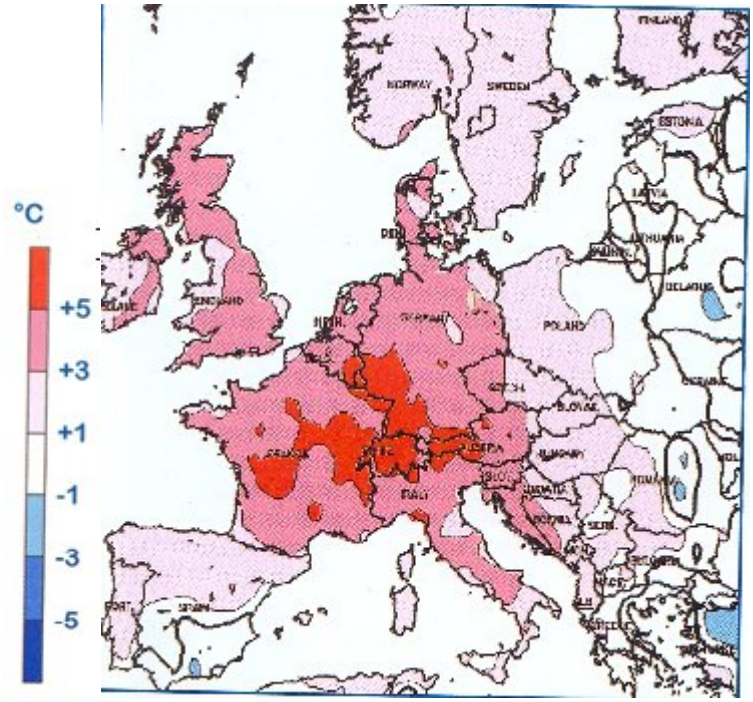


Figure 8. May 2007 Rainfall (Percentage of 1961-1990 normal)

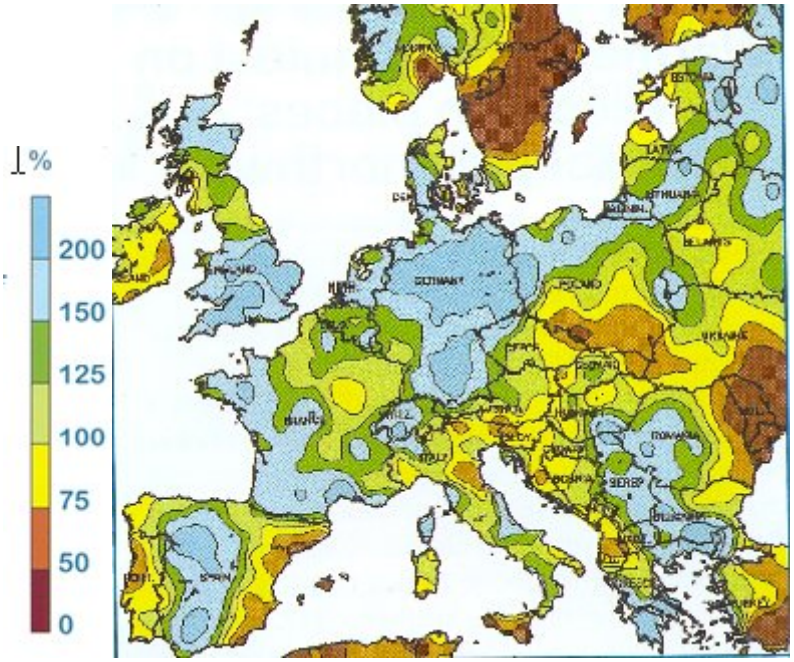
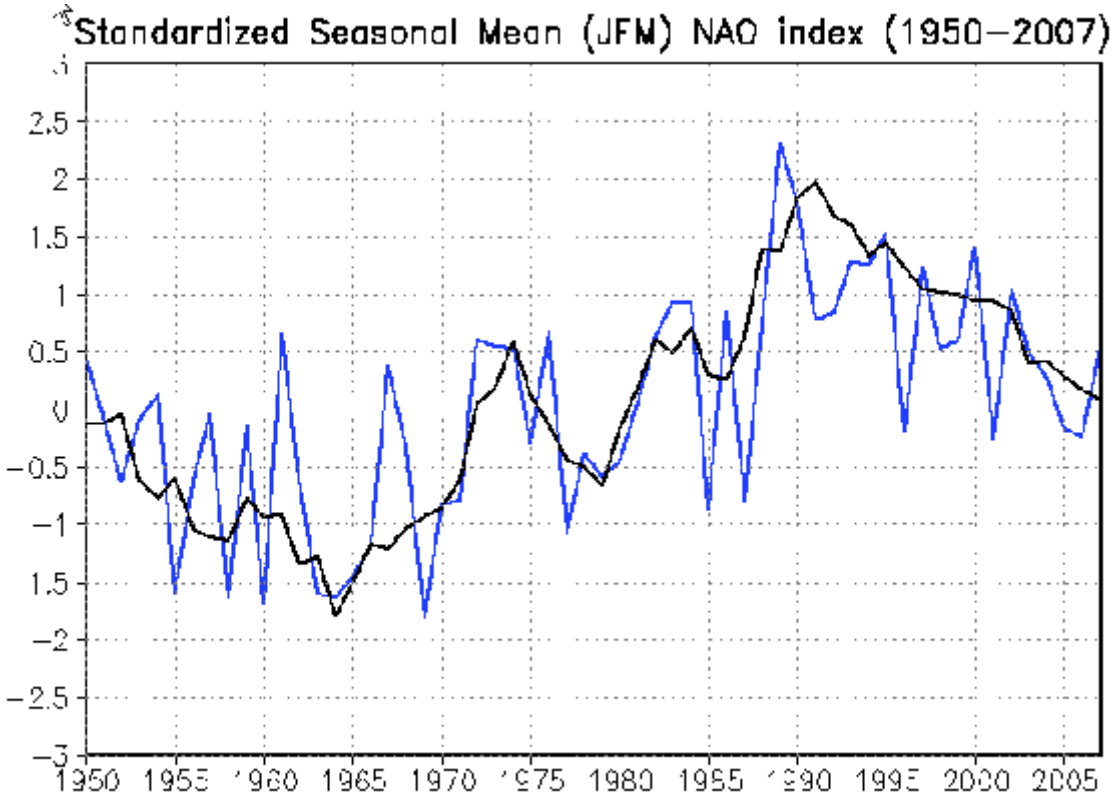


Figure 9. Seasonal mean NAO index for period 1950-2007



4 BASIC RESULTS

There is the tendency for decreasing of precipitation during the 1961 - 2003 period in Bulgaria.
There is exceptionally dry period for all territory of the country for the summer of 2007.
The reduction in summer precipitation during the drought period in Bulgaria had strong negative influence on water level of the rivers in Bulgaria.
The blocking processes over West Europe and Atlantic Ocean interrupted zonal circulation over the Continent, which is significant importance for continuously dry period over West, Central and Southeast Europe.
The climate variability during the drought period influenced considerably on the water regime in Bulgaria.

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