

USING GIS TO ESTIMATE THE INFLUENCE OF BLACK SEA AREA ON THE CLIMATE OF MOLDAVIAN REPUBLIC

Tatiana Constantinov*, **Maria Nedelcov***, **Valentin Răileanu***
Anatol Șevîrnogov**, **Alexei Cartușinschii****, **Galina Vîsoțkaia****

**Institute of Ecology and Geography, Moldovian Academy Science, Chișinău*

***Institute of Biophysics of the Russian Academy of Science, Siberian Section,
Krasnoïarsk*

Abstract: On the basis of the meteorological data collected between 1960 and 2007 from 17 measuring stations, was constructed a GIS database that allowed the determination of the temperature and rainfall patterns by using different interpolation methods. In the analysis of these patterns was also taken into account the configuration of the atmospheric pressure fields above Europe. Thus were discovered thermal and rainfall anomalies determined by the influence of the Black Sea.

Key words: *GIS, climate, Black Sea*

Introduction

The hydrotermic regime of the territory of Republic it is induced by the local physical-geographic parameters but also by the vicinity of the Oriental Carpathians in North and the Black Sea in the South. By analyzing the spatial distribution of some thermal values from South and South-East of the Republic, it demonstrate that sometimes the geographical repartition is not the same. For example the maximum and maximum average of spring and summer temperatures from the meteorological stations situated in the South of the Republic, are not very diferent comparing the ones from the central part of the Republic as a consequence of vicinity of Black Sea area which has influence upon the heating process of it's nearest territories. But in the South area we can estimate more days with „absolute” humidity (>80%), with strong winds (>15m/sec) etc. than the central area. There are well known situations when the South had climatological abnormalities as strong rains and winds.

Is very important, scientific and practical, to determinate the role of Black Sea upon such situations [1]. So that the following study is concentrated on comparative and extensive analyse of elements wich make connection between hydrotermic regime in the region and synoptical situations determined by the influence of Black Sea.

Teaching aid and methods of study

As an informal base i have used the dates of termical regime and rains between 1960-2007 from 17 meteorological stations of Hidrometeo Service from Moldavian Republic and synoptical maps which shows atmospherical pressure to the ground (mb) and geopotential at 700hPa, 850 hPa level on Europe (www.wetterzentrale.de). The algorithm of investigation has the following aspect (fig.1).

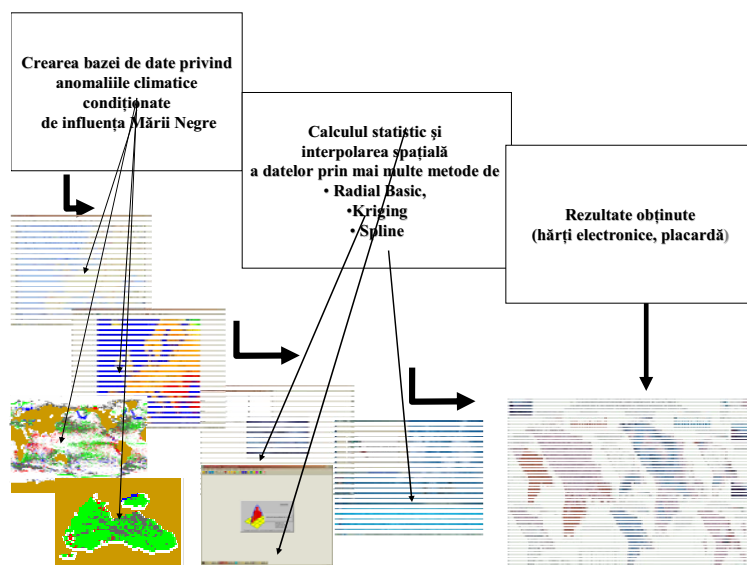


Figure 1. The algorithm of the study about the Black Sea area influence upon Moldavian's climate

The analysis of results

Statistical calculation, cartographical shaping and comparative analyses of hidrotermic values and synoptical situations from Black Sea area, has permitted the determination of type, frequency and intensity of climatological abnormalities and the role of Black Sea for their genesis. The instability of termical regime during the cold season, represents one of the specific nature of regional climate. Considering the monthly average of negative temperatures in the cold season, from certain years, the maximum can be more than $+16^{\circ}\text{C}$ [2] and they are very much influenced by the Black Sea. If we take in consideration the monthly average of temperatures during more years, for example in february is 0°C in South –and $2,9^{\circ}\text{C}$ in North (fig.2a), the maximum of this month was $+15^{\circ}\text{C} : +17^{\circ}\text{C}$ (fig.2b) in 2007, on 75% of the moldavian territory, influenced by the air masses from south and south-east (fig.2c).

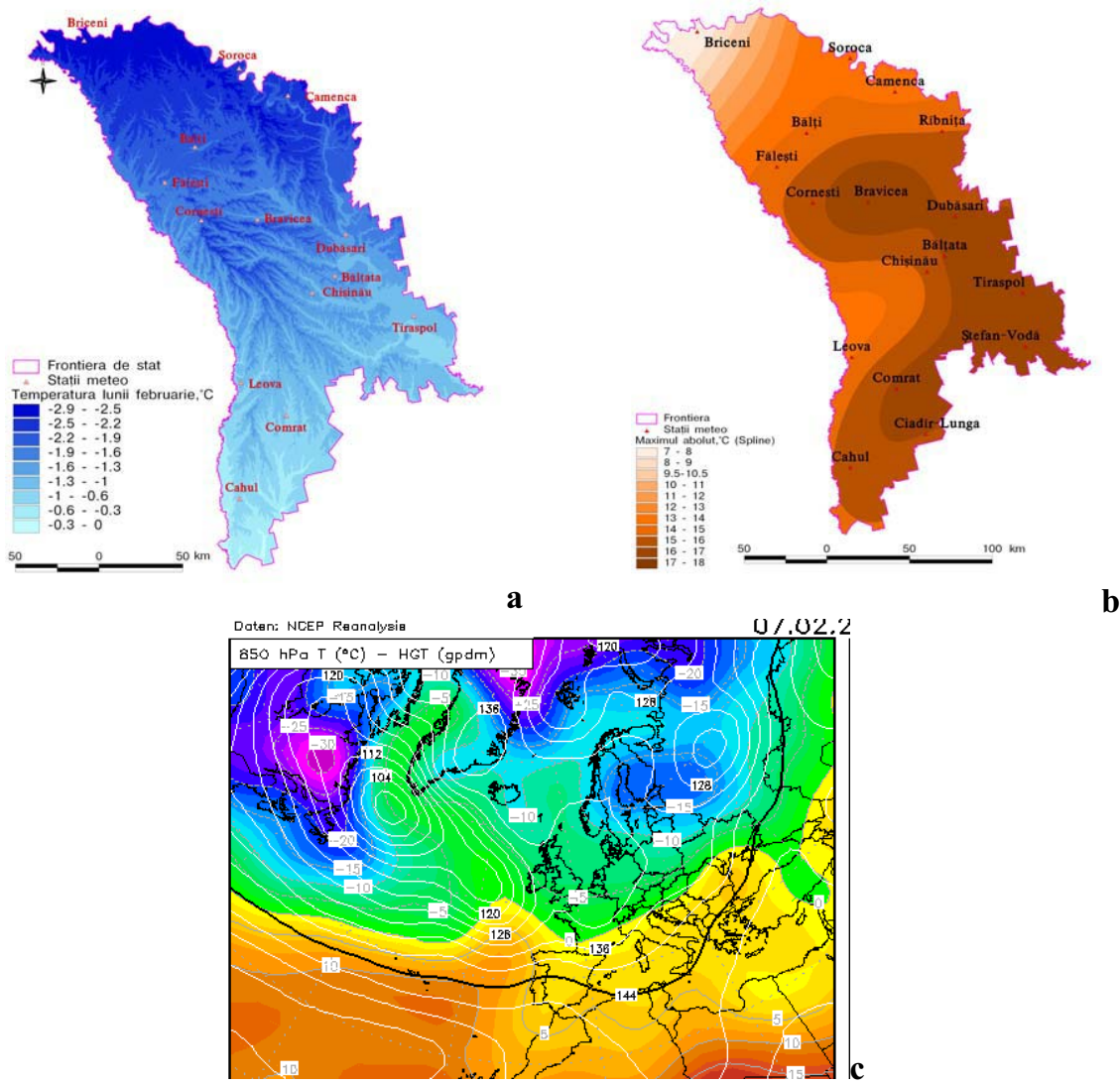


Figure 2. Spatial repartition of monthly average temperatures in February (a), and maximum in 2007 (b) influenced by hidrodynamic regime of Black Sea (c). Sursa: www.wetterzentrale.de

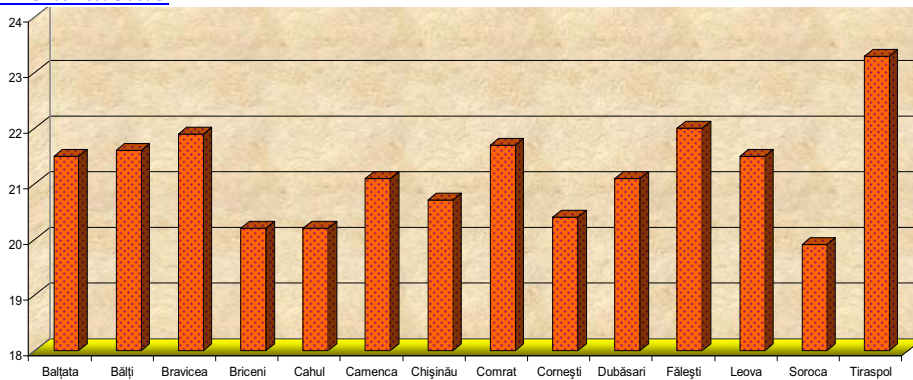


Figure 3. Absolute maximum temperature (february, 1960-2007)

By analysing the february's maximum (fig.3) for 1960-2007, we can observ how special values are noticed not just in the Low Nistru's Plane and South of Moldavia (Tiraspol, Comrat, Leova), but also in Codrilor Plateau and Baltilor Plane (Balțata, Bravicea, Bălți), all of them periodical influenced by the Black Sea.

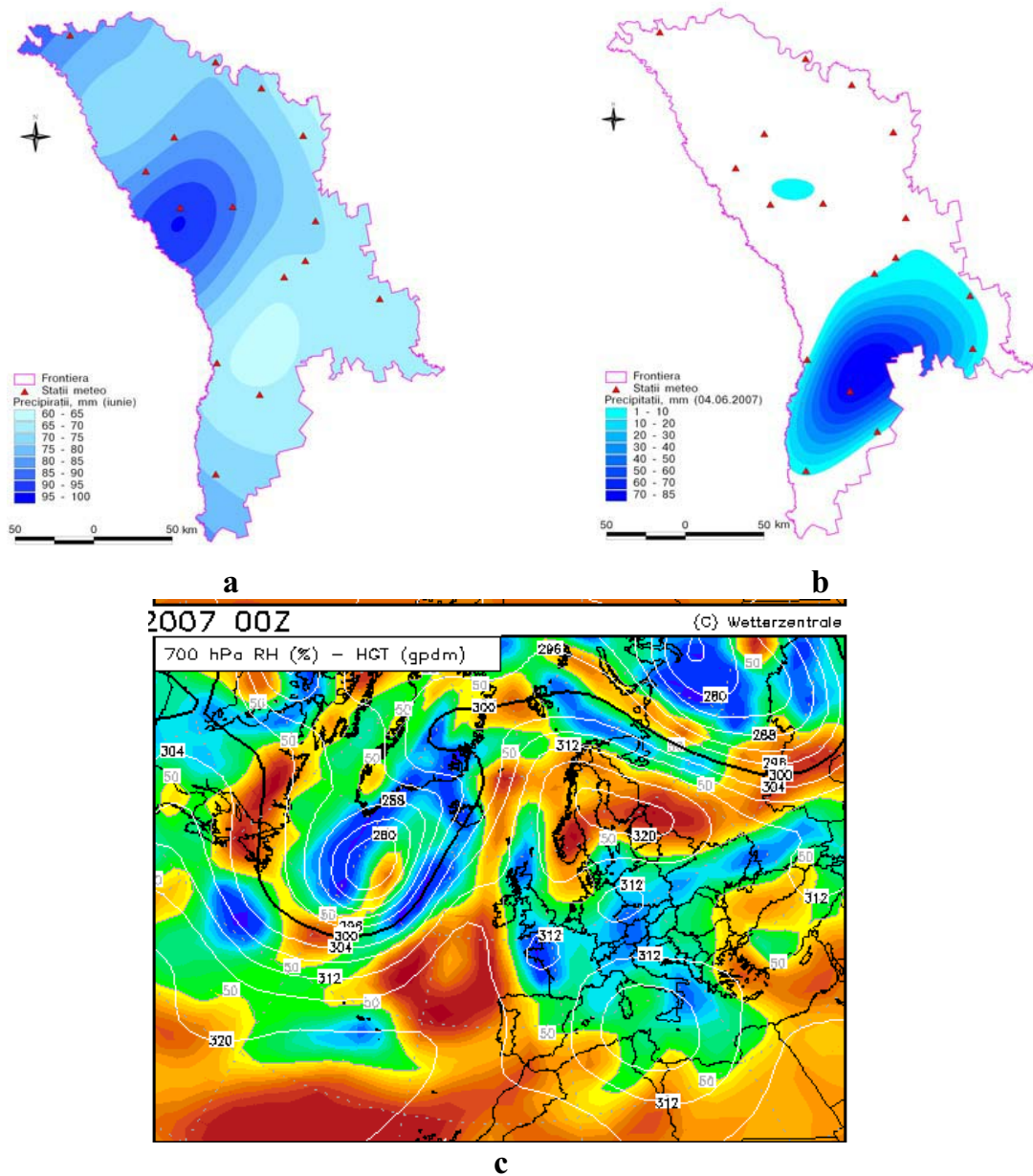


Figure 4. *Spatial repartition of average amounts of rains in June (a) and rains dropped on the 4th of June, 2007 (b) influenced by the hidrodynamic regime of the Black Sea (c).*
 Source: www.wetterzentrale.de

According with the precipitations regime from Republic's territory, their yearly and monthly amounts usually bent to decrease from north-west to south-east (fig.4a), with an exception in the accidental relief territories such as Codrilor Plateau and Tigheciului knoll.

During june (the most rainy month of the year), the territory of republic gets 90-95mm of rain in the north-west and central area and 60-65mm in the south and south-east. Because the summer of 2007 was a droughty one (esspecially in the south-east), after the circulation of cyclones came from south-east, the maximum precipitations amount from 4 of june was 78mm at Comrat, which is more beyond the monthly normal values of the region (60mm).

We have noticed that the daily values of precipitation were also bigger than usual in this place. During 1980-2006 they were only 48mm (fig.4).

By analysing the frequency of the winds from different directions in south-east area – usually more influenced by air masses from Black Sea, it shows us the preponderance of the winds from south and south-east (fig.5).

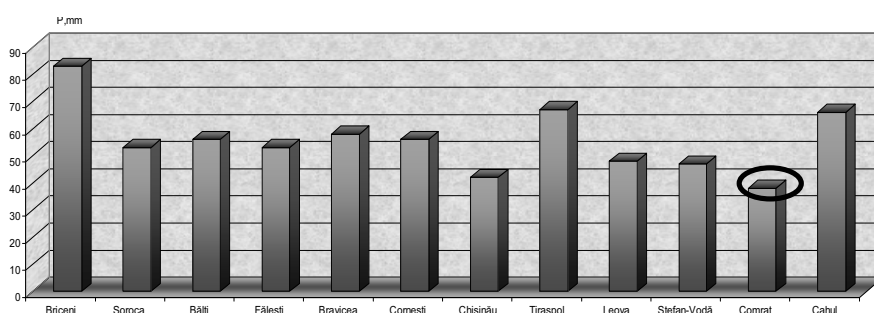


Figure 5. *Maximum daily of precipitation in Republic of Moldavia (1980-2006)*

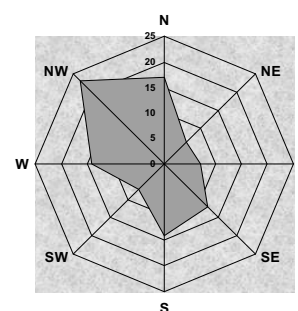


Figure 6. *The frequency of the winds in june (1980-2000) to Ciadir-Lunga station*

The results are very important to evaluate the climatical fluctuations in order to anticipate the meteorological situations influenced by the Black Sea : in the cold season it is possible to induce heating waves ; in the hot season – it can improve the humide values in the region.

References

Tatiana Constantinov, Maria Nedeačov, V. Răileanu, A. Șevîrnogov, A. Cartușinschii, Galina Vîsoțkaia (2007) *Setul de hărți în formă de placardă " Republica Moldova: Clima. Influența Mării Negre"* – Editura "Strih" , Chișinău

Научно-прикладной справочник по климату СССР. Серия 3. Многолетние данные.
Части 1-6. Выпуск 11, Молдавская ССР.