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THE USE OF GIS IN EVALUATING PECULIARITIES OF REGIONAL CLIMATIC CHANGES

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Introduction

In world practice, the quantitative evaluation of natural and anthropic factors over climate change relies on research made by national experts, research that is later used to solve problems related to planning economic, scientific and technical development, etc.

The most convincing argument in favour of climatic changes is the increase of mean temperatures-the main factor of global warming. According to most recent publications in this field (Climate Change, 2007), mean temperatures have increased with cu $0,74^{o}C$ in the last century (1906-2005), $0,14^{o}C$ more than the values included in ($0,6^{o}C$) the evaluation report [1].

The first attempts to analyze climatic changes under the influence of anthropic factor in the Republic of Moldova consisted in liniar models [2], which reflects the dynamics of the regional climatic system within the context of global warming. At the same time, regional climate changes, that go hand in hand with global tendencies, are transformed to a great extent under the influence of local geographical factors. These tranformations are easily detected using GIS.

Materials and study methods

The initial information served the data base regarding weather observations taken by Weather Service over a period of time longer than a century (1887-2007). The statistic processing was accomplished through Statgraphics Plus programme while the cartographic modelling used the Surfer and Arc View programmes. The usage procedure for GIS can have the following schematic view (fig 1).

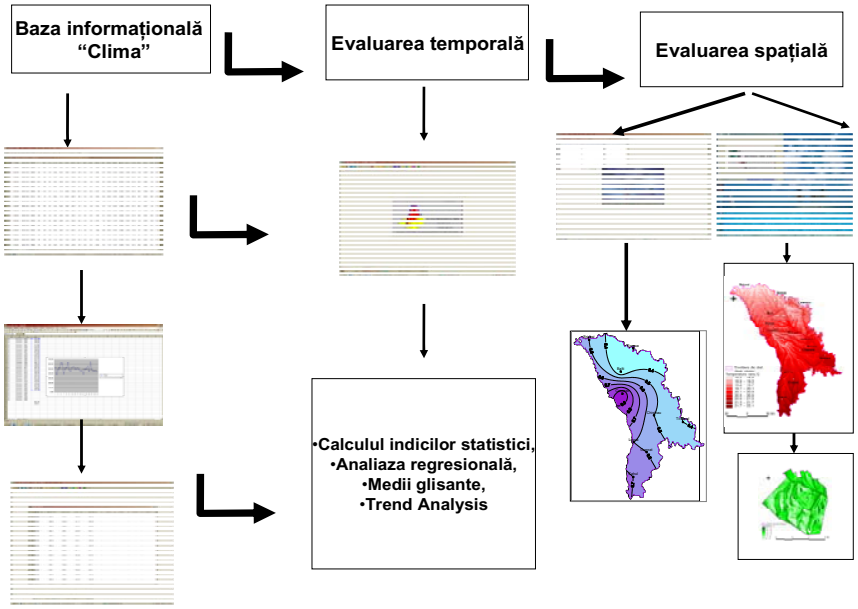

Figure 1. *GIS in evaluating climate change in Republic of Moldova*

Analysis of results obtained

A synthetic analysis of global climate changes included in the 4th evaluation report indicates that there is a slight increasing tendency of mean annual temperatures (+0,9^{0C}) in Europe [3] over the period 1901-2005, and this is also true for regional analysis (fig.2). The interannual study of the thermic regime shows that the warming takes place during the months of the cold season (fig.3). At the same time, the deviation from the climatic norm in certain years is well defined.

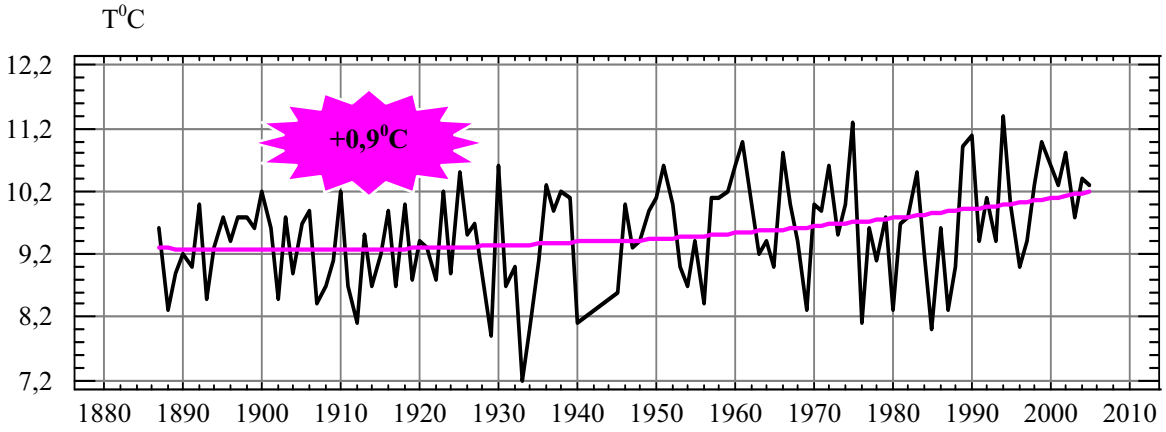

Figure 2 *Dynamics of the mean annual temperatures in Republic of Moldova (1887-2006)*

In the co-raport of thermic anomalies, the pozitive ones prevail after the 1960s, when the influence of the anthropic factor over climate change increases in the Republic of Moldova. Also in this period, there have been recorded major changes in the evolution of the absolute minimum: for a period of over a century the absolute minimum temperature increased with 7^0C (fig.4), radically changing the winter conditions for multiannual crops.

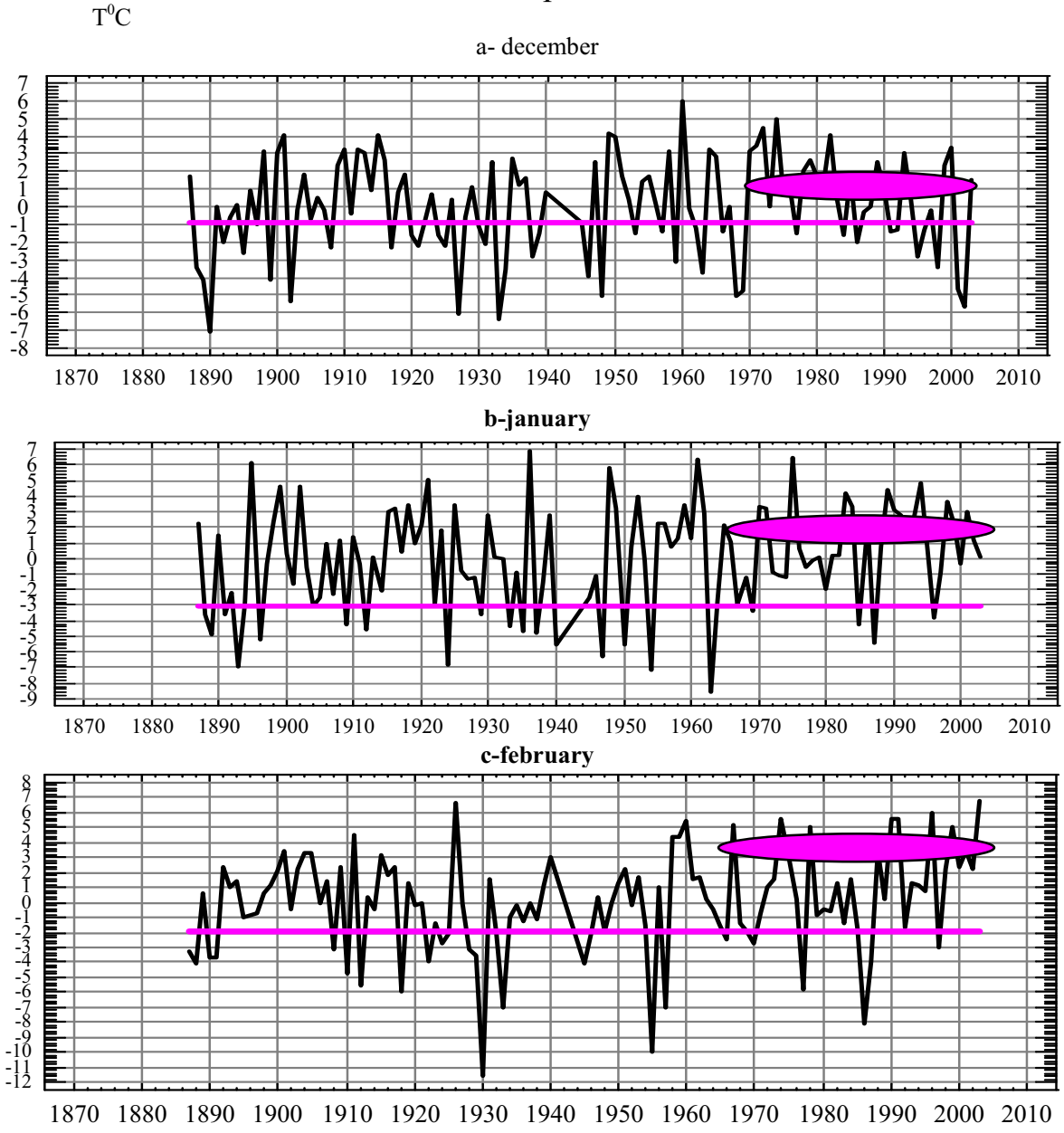

Figure 3 *Distribution of monthly thermic anomalies (1887-2003) in the cold period in Republic of Moldova*

T^0C

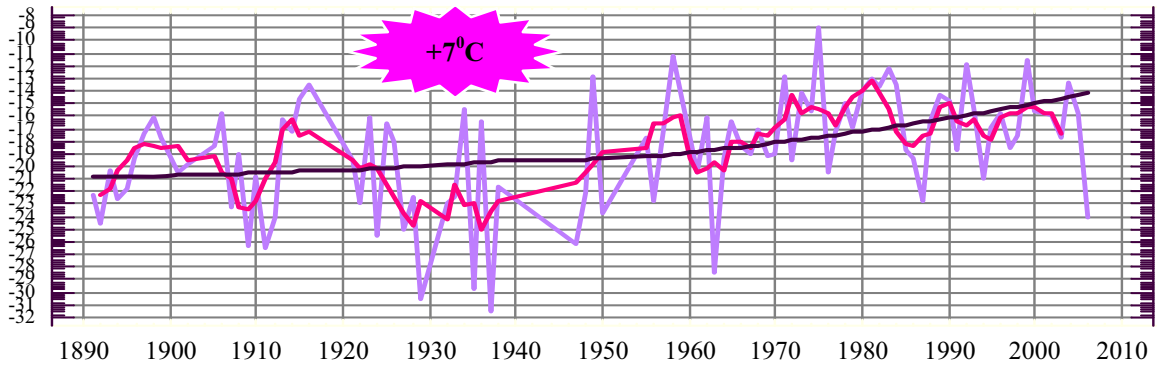

Figure 4. *Dynamics of absolute minimum in Republic of Moldova (1891-2006)*

For the distribution of the regional rainfall, there is a characteristic increase trend (fig.5). During the period 1887-2007, the annual sum of rainfall increased with 100 mm. Nonetheless, their temporal distribution changed: for the last decades there can be observed a thick alternation of wet-dry anomalies that contribute to the appearance of cliamtic risc phenomena- floods, droughts.

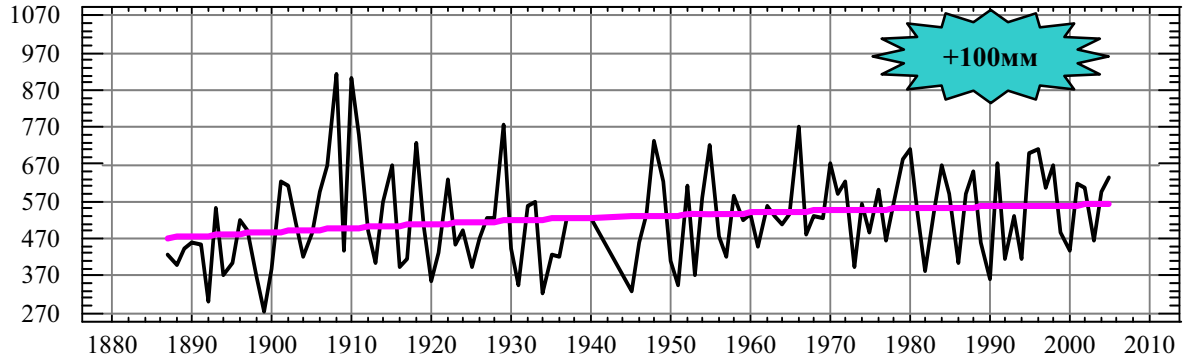

Figure 5. *Dynamics of annual sum of rainfall in Republic of Moldova (1887-2006)*

The Martonne index is one of the various indices that characterize the degree of drought. According to [4] CRU mean annual temperature data and GPCC VASClimO data about annual sum of rainfall (for the period 1951-2000), a world map of the spatial distribution of this index was put together (fig.6). This map allows us to see that the Republic of Moldova has climatic conditions that are characteristic to steppe and silvo-steppe. This is confirmed by the data obtained as a result of cartographic modelling at regional level (fig.7a).

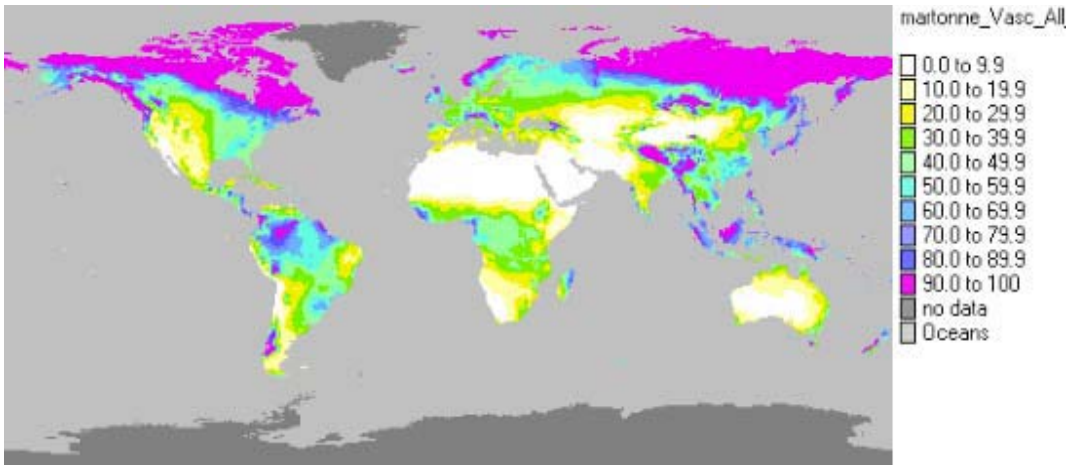

Figure 6 *Map of world distribution of Martonne index (1951-2000) .Annual.*

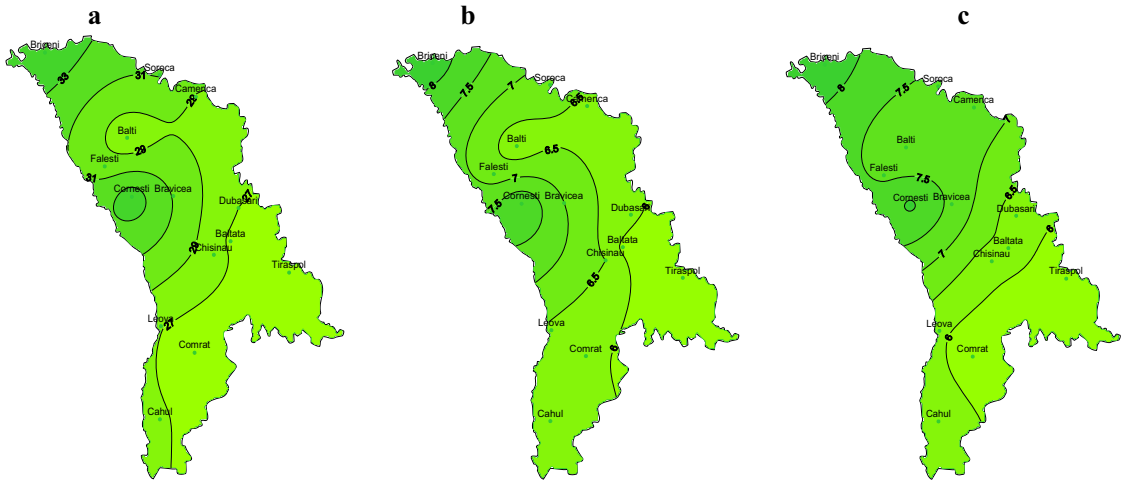

Figure 7. *Map of regional distribution of Martonne index (1960-2005) annual (a) and seasonal (b,c)*

The estimation of this index in seasonal aspect (fig.7b,c) shows that in the warm period of the year (spring-summer) there are similar conditions to those in the desert and semi-desert in the Republic.

To conclude, among the negative consequences of climate change we can see the increase in frequency of droughts and in aridity degree of the teritory. Among the pozitive aspects we can include the improvement of winter conditions of fruit growing.

References

Climate Change 2001. The Scientific Basis, Third Assessment Report. Cambridge University Press, Cambridge U. K., 881 pp

Коробов Р.М., Николенко А.В., Тодираш В.А. Регионализация глобальных моделей изменения климата. // Сб. Глобальные и региональные изменения климата и их природные и социально-экономические последствия. - Москва, Геос. – 2000.- С.157-173

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Jürgen Grieser, René Gommes, Stephen Cofield and Michele Bernardi *Data sources for FAO worldmaps of Koeppen climatologies and climatic net primary production* The Agromet Group, SDRN FAO of the UN, Viale delle Terme di Caracalla, 00100 Rome, Italy August 2006 uergen.grieser@fao.org