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CLIMATIC CHANGES IDENTIFIED IN THE WESTERN PART OF ROMANIA. TREND OF THE MAIN METEOROLOGICAL PARAMETERS OVER A LONG PERIOD OF TIME (1961-2020)

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Abstract: Climate change generates not only concern about the climate future of the planet but also great material damages, in the most diverse areas of social life, causing phenomena that seem to irreversibly change the face of the world and implicitly the general conditions of life. The series of meteorological data (air temperature and atmospheric precipitation), from the Lugoj meteorological station were used to identify and highlight the conditions of occurrence and manifestation of climate changes that took place in the western part of Romania and in the last 60 years, from 1961 until 2020. Climatic elements and phenomena are interconnected to such a great extent that on a global scale, it is necessary to recognize a "climate system", governed by its own laws, which determine both its configuration at a given moment and its evolution over time. As a consequence of the global climate changes we are witnessing, it can be observed, analyzing the variability and evolution trend of the thermal regime of the air over the last 60 years, that the evolution trend of the multi-annual average temperature at the Lugoj meteorological station is increasing with a value of about 1.7° C. In the context of global climate changes, the distribution of precipitation by seasons in this part of the country where the Lugoj meteorological station is situated follows quite different trends over the last 60 years, namely: a constant trend is recorded in summer, a trend decreasing in spring and winter is recorded decrease and in the fall there is a more pronounced upward trend, which in total cancels the decreases during the spring and winter.

• Introduction

According to the World Health Organization (WHO), "climate change and global warming" are the greatest challenges of humanity in the twenty-first century. They threaten all aspects of our lives (Organization WH 2018).

The expression "global warming" usually refers to the observed rise in average global temperature in the last decades in terms of frequency and intensity and the term "climate change" refers to observed measurable changes in the climate over a long period of time. Climatic elements and phenomena are interconnected to such a great extent that on a global scale, it is necessary to recognize a "climate system", governed by its own laws, which determine both its configuration at a given moment and its evolution over time.

• Material and method

Air temperature is one of the most important climatic parameters, which shows spatial-temporal variations related to the factors that influence it, namely: latitude, altitude, dynamics of air masses, physical-geographical conditions, etc. (Sandu et al., 2008). Within Banat, the air temperature regime presents a series of features and an uneven distribution, as a result of the interaction of dynamic processes with the great diversity of the mentioned physical-geographical conditions (Dunca, 2018). Compared to the multi-annual average value of the temperature, throughout the analyzed period (1961-2020), the average annual air temperature showed quite large non-periodic variations, depending on the frequency and intensity of the advection of different air masses (fig. 1).



Figure 1. Average annual temperature variation at Lugoj meteorological station (1961-2020)

As a consequence of the global climate changes we are witnessing, it can be observed, analyzing the variability and evolution trend of the thermal regime of the air over the last 60 years, that the evolution trend of the multi-annual average temperature at the Lugoj meteorological station is increasing with a value of about 1.7° C.

Dividing the analyzed period into equal 10 years intervals (1961-1970, 1971-1980, 1981-1990, 1991-2000, 2001-2010 and 2011-2020), it can be seen that this growth starts to be visible with the transition from the interval 1981-1990, to the interval 1991-2000, when the multi-annual mean temperature increases by 0.3° C.

Further in the analyzed period, the transition to the next interval is achieved with an increase of 0.6° C in the multi-annual average temperature, and the transition to the last interval is made with the highest increase in the multi-annual average temperature of 0.7° C.

The multi-annual average temperature of the cold season (October-March), calculated for this station has a rather high value of 4.3° C and the multi-annual average temperature of the warm season (April-September) has a value of 17.6° C. And in the case of the seasonal average temperature was found an increase value of temperature, more pronounced and more obvious in the cold season (1.8° C) and less pronounced in the warm season (1.0° C). The atmospheric precipitation regime during a calendar year results from the interaction of genetic factors (at the continental level) with local factors.

• Results and discussions

Due to the geographical position of the Lugoj meteorological station in the western part of the country and at a low altitude, the annual amount of precipitation is lower, but thanks to both the oceanic air masses coming from the west and the humid Mediterranean air masses coming from the south-west, the annual amount of precipitation is higher compared to other parts of the country, as the Romania Plain, located in the southern part of Romania. The varied natural conditions from this region determine the great differences in their vertical distribution, depending on the altitude, the exposure of the slopes, and the constitution of the relief forms. The multi-annual average amount of precipitation increases as the relief steps increase in altitude, so with a gradual increase in relief altitude, from the western part to the eastern part of Banat region, an increase in the amount of precipitation is observed. In the analyzed period (1961-2020) the average annual amplitude at this station has a value of 50.0 mm, and the precipitation regime has an irregular character, because the values of the annual amounts of precipitation showed quite large non-periodic variations, depending on the frequency and intensity of advection different air masses during a calendar year (fig. 2).

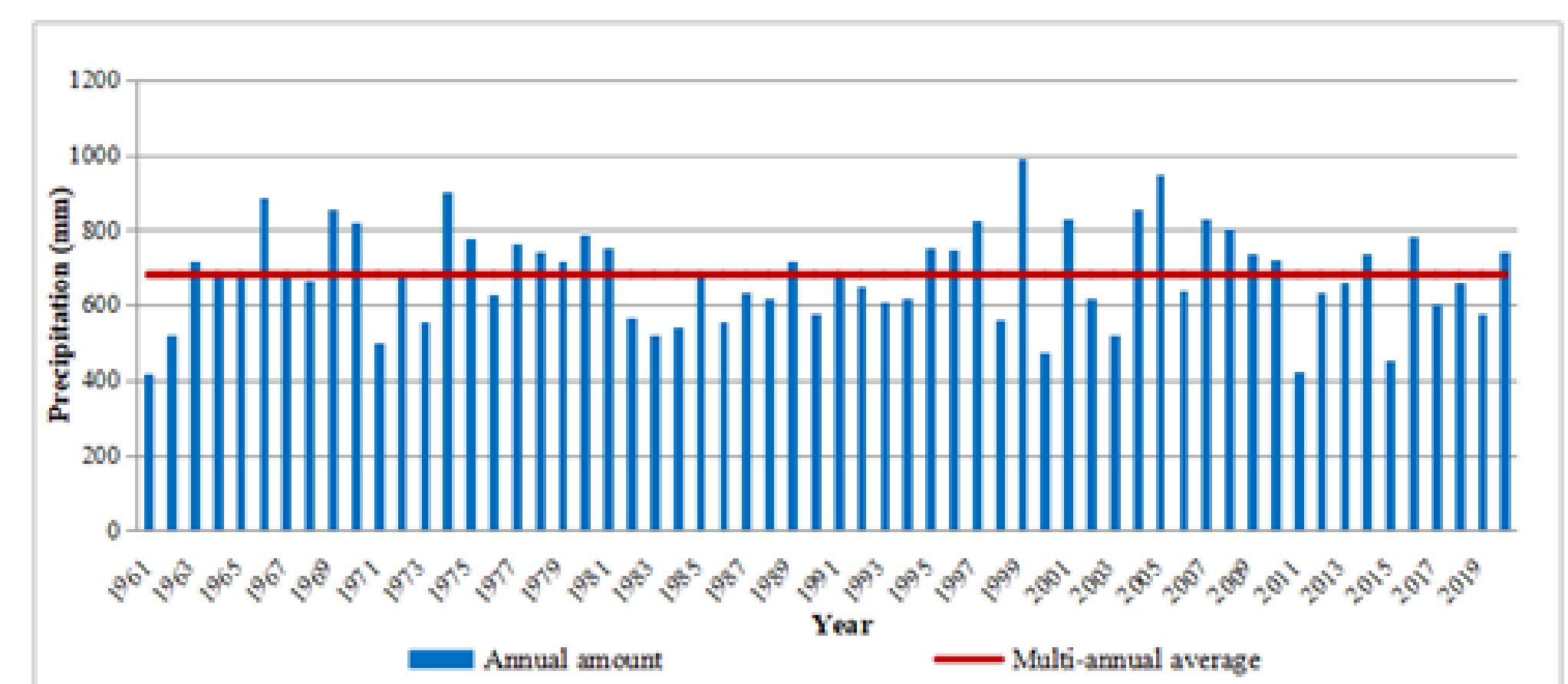


Figure 2. Variation of the annual amount of precipitation at the Lugoj meteorological station

The distribution of precipitation during the year is also different by season, with summer recording the highest amount of precipitation (213.5 mm), approximately 31.37% of the annual amount and winter the lowest (142.9 mm) with a weight of about 20.99% of the total amount. In the context of global climate changes, the distribution of precipitation by seasons in the part of the country where the Lugoj meteorological station is situated follows quite different trends over the last 60 years. These trends are: a constant trend in the summer, a decreasing trend in the spring and winter, and a sharper increasing trend during in the autumn, which in total cancels out the declines during in the spring and in the winter.

• Conclusions

In the context of global climate changes, the distribution of precipitation by seasons in this part of the country where the Lugoj meteorological station is situated follows quite different trends in the analyzed period (1961-2020), namely: a constant trend is recorded in summer, a trend decreasing in spring and winter is recorded decrease and in the fall there is a more pronounced upward trend, which in total cancels the decreases during the spring and winter. The growth trend of the precipitation amount is a consequence of the global climate changes we are witnessing, caused by human activity and the intense process of urbanization and industrialization, which determined, especially during the second half of the 20th century, an increase in the number of cloud condensation nuclei and an increase in the frequency of atmospheric precipitation. The range with the lowest multi-annual average rainfall is 1981-1990 (616.6 mm) and the one with the highest multi-annual average rainfall is 2001-2010 (750.6 mm).