STUDY ON METEOROLOGICAL PARAMETERS (TEMPERATURE AND PRECIPITATION) IN CLUJ NAPOCA IN THE INTERVAL 2015-2020

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Abstract Climate refers to the average weather of an area including the general patterns of atmospheric conditions, seasonal variation and weather extremes averaged over a long period (Vinay, 2009). The aim of this study is determination the temperature and precipitation on seasons. For this study vere calculated the temperature and precipitation on seasons: Winter, Spring, Summer and Autumn in interval 2015-2020. The biggest negative deviation from normal was in 2017 with -5.2% the season being characterized as excessive breezy. The highest amounts of precipitation were in 2015, 2017, 2019 with 61.8%, 77.7%, 61.5%, the seasons being characterized as excessive rainy. Temperature and precipitation in Cluj-Napoca show a clear warming trend over the last three decades.

Keywords: climatic parameters, temperature, precipitation, season

INTRODUCTION

Climate refers to the average weather of an area including the general patterns of atmospheric conditions, seasonal variation and weather extremes averaged over a long period (Vinay, 2009). Temperature and precipitation are two most important factors that determine the climate (Miller et al., 2018). Changes in temperature and rainfall patterns are observed along with increasing frequency and intensity of extreme weather events such as floods, droughts, heat waves, tornadoes (Kamlesh Pritwani, 2019). Intergovernmental Panel on Climate Change (IPCC, 2007) stated a 0.6°C (0.4 to 0.8°C) increase of global temperature during the period of 1901 to 2001, indicating warming of the earth in the last few decades. However, IPCC (2013) mentioned that the global surface temperature towards the end of the 21st century is likely to exceed 1.5°C relative to 1850 to 1900 for all RCP model scenarios except RCP2.6. Most scientists believe that the warming of the climate will lead to more extreme weather patterns (heat, waves, droughts, strong winds, and heavy rains) such as: more hurricanes and drought, longer spells of dry heat of intense rain (depending on where you are in the world). The vulnerability of human societies and natural systems to climate extremes is demonstrated by the damage, hardship and death caused by events such as droughts, floods, heat waves and windstorms. While there are uncertainties attached to estimates of such changes, some extreme events are projected to increase in frequency and/or severity during the 21st century due to changes in the mean and/or variability of climate, so it can be expected that the severity of their impacts will also increase in concert with global warming (McCarthy et al., 2001).

MATERIAL AND METHODS

The city of Cluj-Napoca is located in the central part of Transylvania (Figure 1). It covers an area of 179.5 km^2, at an average altitude of 335 m. The climate of Cluj-Napoca is moderately continental, characterized by cold winters, with temperatures often below freezing, and mild or pleasantly warm summers and the precipitation amounts to 595 millimetres. Some West-Atlantic influences are present during winter and autumn. Winter temperatures are often below 0°C (32°F), even though they rarely drop below −10°C (14°F). On average, snow covers the ground for 65 days each winter. In summer, the average temperature is approximately 18°C (64°F) (the average for July and August), despite the fact that temperatures sometimes reach 35°C (95°F) to 40°C (104°F) in mid-summer in the city centre. Although average precipitation and humidity during summer is low, there are infrequent yet heavy and often violent storms. During spring and autumn, temperatures vary between 13°C (55°F) to 18°C (64°F), and precipitation during this time tends to be higher than in summer, with more frequent yet milder periods of rain. Meteorological data were provided by the meteorological station ADSCON Telemetry of University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca. In this study were calculated temperature and precipitation on seasons: Winter, Spring, Summer and Autumn, and deviation from normal in the interval 2015-2020 and the temperature and precipitation were characterized from a climactic point of view according to Criveanu 2000.

Fig. 1. Cluj-Napoca City
Source: http://apmcj.anpm.ro-Cadrul%20natural.pdf

RESULTS AND DISCUSSION

TEMPERATURE. Figure 2a show the temperature in the winter season. The temperature is between -1.3% and -5.2%. The biggest negative deviation from normal was in 2017 with -5.2% the season being characterized as excessive breezy. Figure 2b shows the temperatures in the spring season. The highest recorded temperature was in 2018 with +3.4%. and the lowest recorded temperature was in 2020 with +1% the seasons being characterized as very warm and warm. Figure 2c shows the temperatures in the summer season. The highest temperatures recorded were in 2015, 2017, 2019

with temperatures of +2.7%, the season being characterized as very warm. In 2016 and 2018 the temperature was +1.6% and +2.1% the season being characterized as warm. Figure 2d show the temperatures in the autumn season as can be seen the highest temperature recorded was in 2019 with +3.3%, the season being characterized as very warm. And the lowest temperature in 2016 was +0.5%, the season being characterized as normal. Otherwise the temperature is in normal parameters.

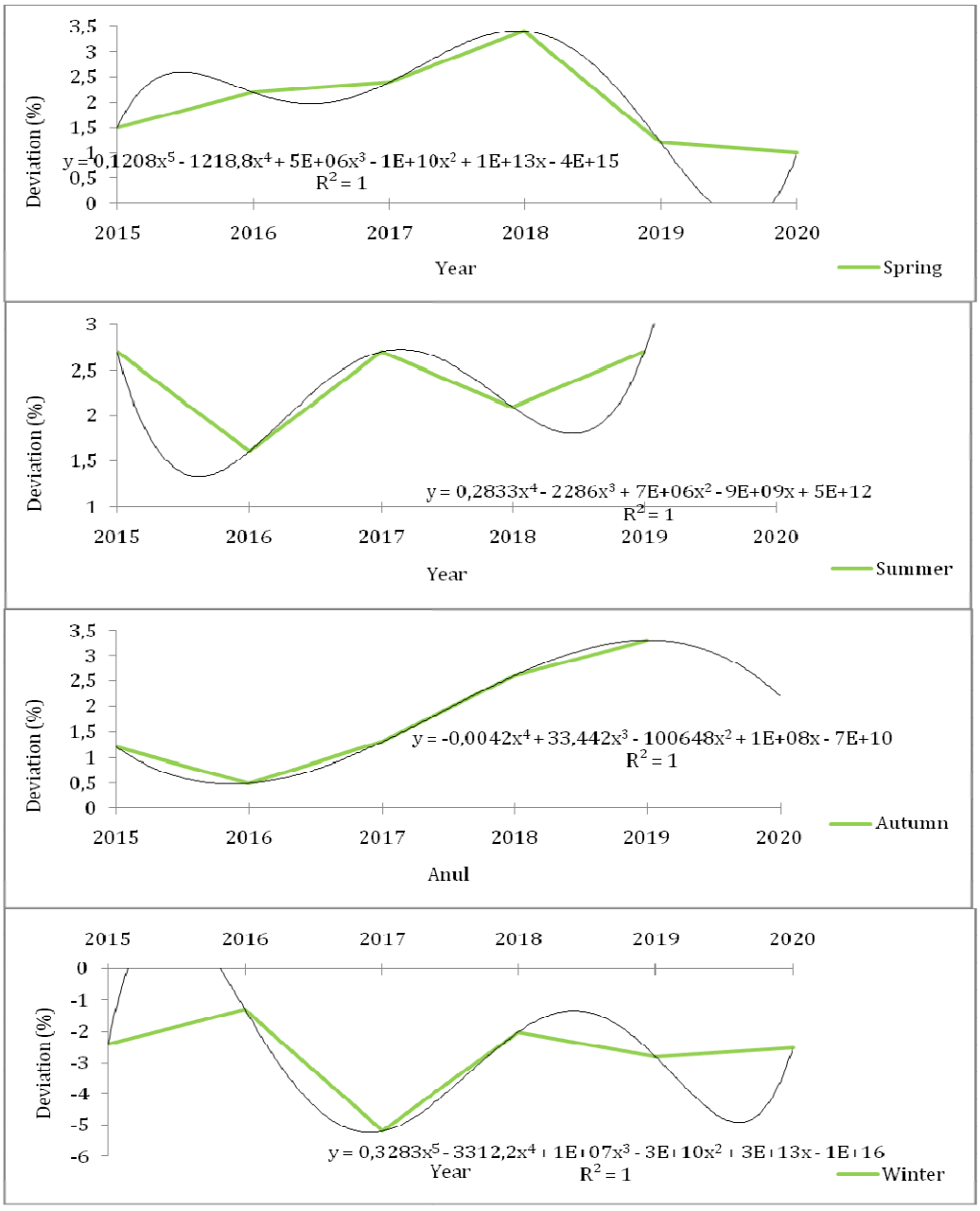

Fig. 2. Evolution of temperature by seasons in Cluj- Napoca in the interval 2015-2020

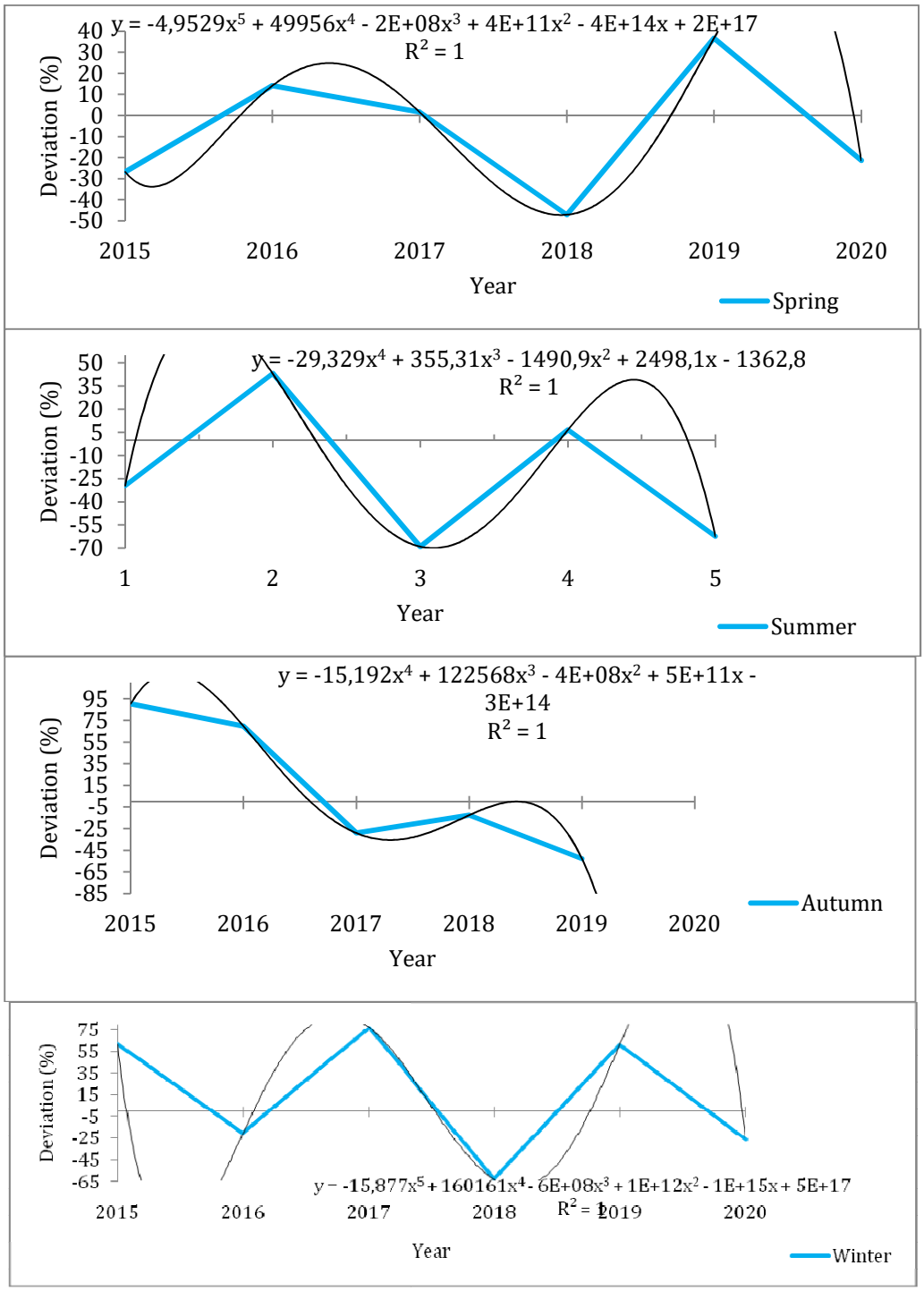

Fig. 3. Evolution of precipitation values by seasons in Cluj-Napoca in the interval 2015-2020

PRECIPITATION. Figure 3a shows the amount of precipitation recorded in the winter season. The highest amounts of precipitation were in 2015, 2017, 2019 with 61.8%, 77.7%, 61.5%, the seasons being characterized as excessive rainy. And the lowest amounts of precipitation were in 2018 and 2018 with -63% and -24.43% the season being characterized as excessive dry. Figure 3b shows the amount of precipitation recorded in the spring season. The highest amount of precipitation was in 2019 with 36.7%, the season being characterized as excessive rainy. And the lowest amounts of precipitation were in 2015, 2018 with -26.8%, -47.1%, the season being characterized as excessive dry. Figure 3c shows the amount of precipitation recorded in the summer season. The highest amounts of precipitation were in 2016 with 43.%, the season being characterized as excessive rainy. And the smallest amounts of precipitation were registered in 2015, 2017, 2019 between -29.6% and -62.3%, the season being characterized as excessive dry. Figure 3d shows the value of precipitation in the autumn season. The highest amounts of precipitation were in 2015 and 2016 with 90.4% and 69.6%, the seasons being characterized as excessive rainy. And the lowest amounts of precipitation were recorded in 2017 and 2019 with -29.5% and -52.7%, the season being characterized as excessive dry.

CONCLUSIONS

Temperature and precipitation in Cluj-Napoca show a clear warming trend over the last three decades. The highest temperature recorded in the winter season was in 2016 with -1.3%, and the lowest temperature in 2017 was -5.2%. In spring the highest recorded temperature was +3.4% in 2018, and the lowest recorded temperature was in 2020. In summer the highest recorded temperatures were in 2015, 2017, 2019 with +2.7%, and the lowest temperature registered in 2016 by +1.6%. In autumn the highest recorded temperature was in 2018 with +2.6% and the lowest recorded temperature was in 2016 with +0.5%.

The highest amount of precipitation in the winter season was in 2017 with 77.7%, and the lowest amount of precipitation was in 2018 with -62%. In spring, the most recorded precipitation was in 2019 with 36.7%, and the driest year was 2018 with -47.1%. In summer, the highest amount of precipitation was registered in 2016 with 43.0%, and the lowest amount of precipitation was in 2017 with -69%. In autumn, the highest amounts of precipitates recorded were in 2015 with 90.4% and the lowest amounts of precipitations were in 2019 with -52.7%.

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