

ANALYSES OF TEMPERATURE CHANGES IN DANUBIAN LOWLAND

Čimo J., Malenčíková T., Szomorová L.

Slovak Agriculture University in Nitra, Horticulture and Landscape Engineering Faculty,
Department of Biometeorology and Hydrology, Hospodárska 7, 949 76 Nitra, Slovakia

Abstract

The aim of this paper was to review the temperature changes in Danubian lowland in Nitra locality in years from 1961 to 2010. Average temperatures were evaluated for decades with using mathematical statistical methods. In conclusion can be stated that it was recorded the increasing of average temperatures after decades for years 1960-2010, especially in vegetation period (April - September). The highest increase of average temperatures evaluated over decades was recorded in months May (1, 6°C), July (2, 1°C) and August (1, 6°C).

Key words: climate change, agriculture, temperature change, decade

1. INTRODUCTION

Mark Twain said „The weather is always doing something there“ and this is probably the reason why do we care about weather so much. Weather moods and humours do not even fascinate us but also terrify and endanger us. Weather effects our physical and mental health and influence living conditions, livelihood and lifestyle of peoples all around the world perpetually. Consciousness about dramatic global changes and climatic conditions among a scientists and general public increased during the last decade. Forecast of relevance range of these changes do differ and a lot of often contradictory theories, which explains the reasons, do exist. Among scientific community predominate opinion that this progress is influenced by human activity in a certain measure and only urgent and timeous human intervention can precede possible catastrophic incident in worl-wide criteria.. Purpose of this report is to poin the real problem of climate change by the means of available information and review temperature change in Nitra locality in years 1961-2010.

2. MATERIALS AND METHODS

According to climate change , within which there is a consistent change of energetic balance globally, but particularly locally, has temperatures regime evaluation foundation. We have used climatic data from agrometeorological station ($\gamma = 48^{\circ} 19'$, $\lambda = 18^{\circ} 07'$, 172,6 m.a.s.l.) of Biometeorology and hydrology department, Horticulture and landscape engineering faculty of SPU in Nitra, which were published in yearbooks (Šiška and coll., 2001, Repa and coll., 2000) and in purpose publications (Špánik and coll., 2002). Average monthly and yearly values of air temperatures were analysed after decades, for period of 1961-2000, through the use of mathematical statistical methods. Processed problematic is valid mostly for south part of Slovakia, which belongs to the most productive part of Slovakia, because the localization of agrometeorological station is geografically in north part of Danubian lowland.

3. RESULTS

On figures from nr.1 to nr. 8, 11 and 12 is visible increase of average air temperature in months (from January till August, November and December) on observed areas for years 1961-2010 after decades. Line of trends has increasing tendency. Figure nr. 9 and 10 describes the continuance of average air temperatures for observed months (September and October) for years 1961-2010, where line of trend has a little decreasing tendency, but very low demonstrativeness. We can observe at the sight of

analysed 50-years time line (figure 13) that average yearly air temperature, evaluated after decades, has increasing character what also shows increasing trend line and determination index $R^2=0,7451$. The biggest average air temperatures grow, evaluated after decades, was in month May (1,6 °C), July (2,1 °C), August (1,6 °C). On figures 5, 7 and 8 is also visible that determination index values are moving around value $R^2= 0,9$ what means that it is strong linear functionality.

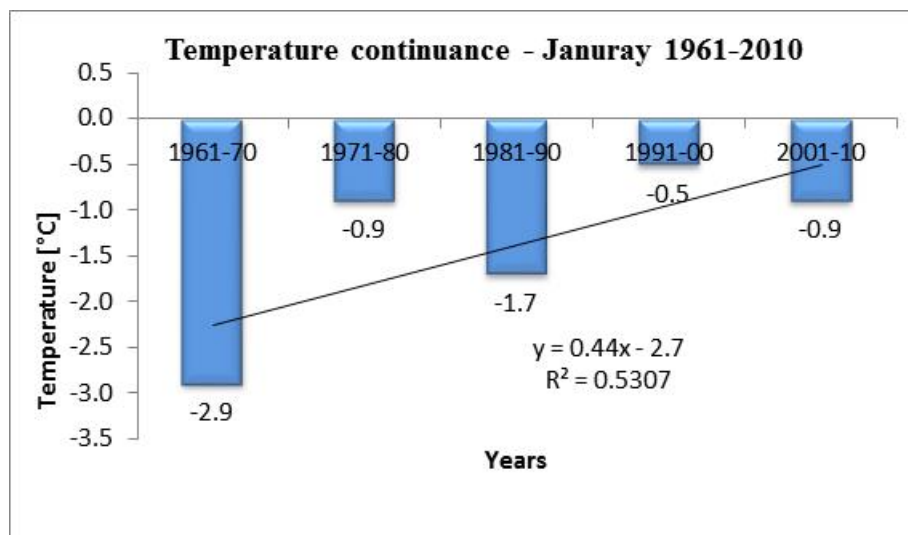


Figure 1: Continuous of average temperatures for month January after decades for years 1961-2010

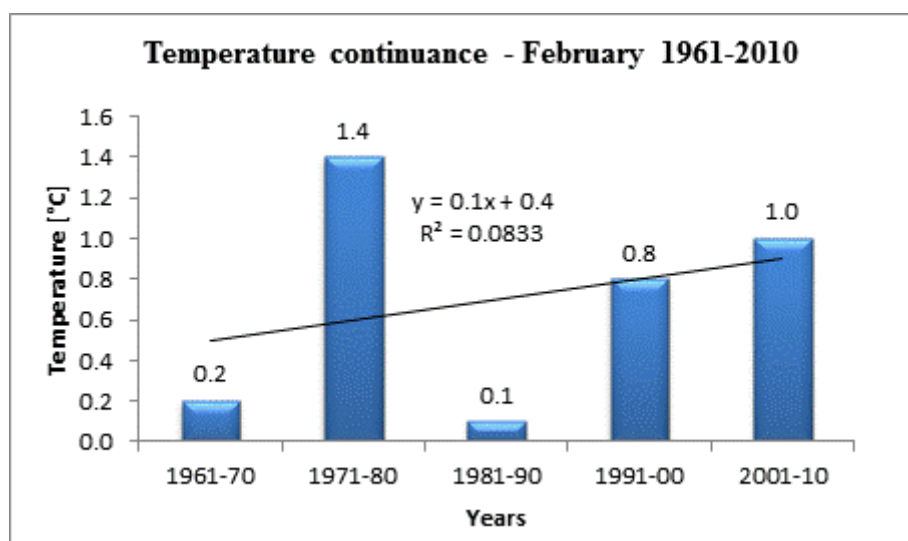


Figure 2: Continuous of average temperatures for month February after decades for years 1961-2010

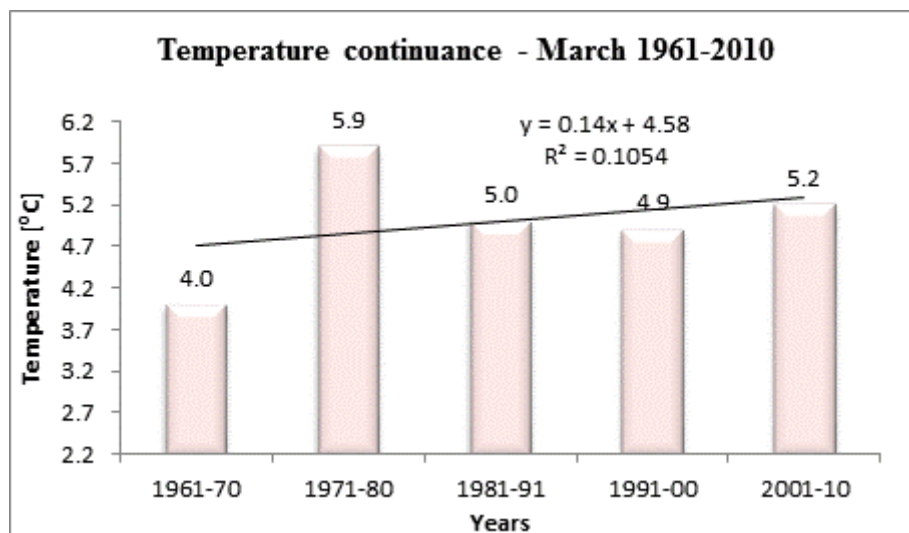


Figure 3: Continuous of average temperatures for month March after decades for years 1961-2010

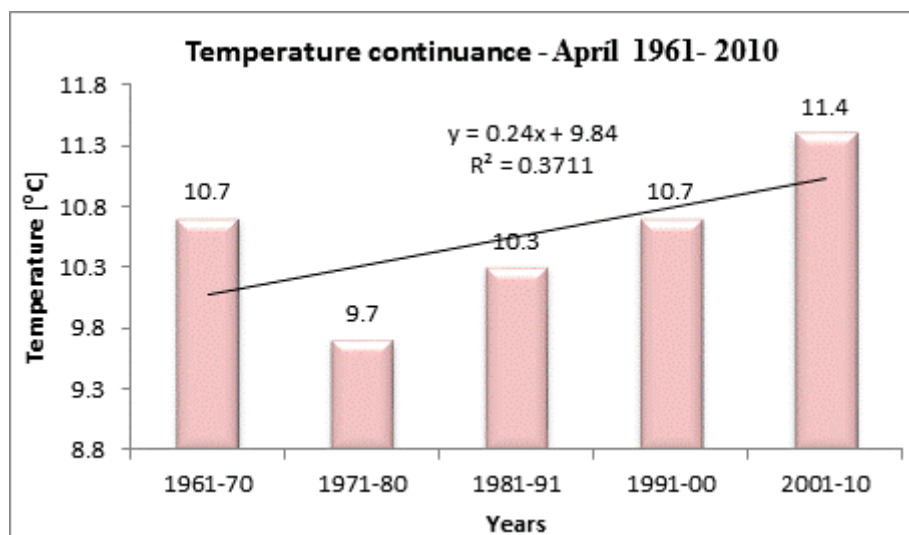


Figure 4: Continuous of average temperatures for month April after decades for years 1961-2010

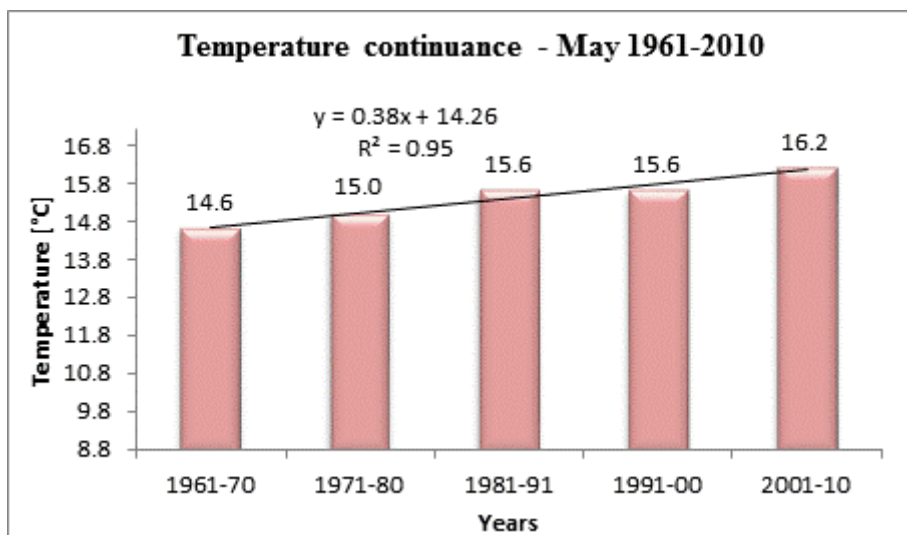


Figure 5: Continuous of average temperatures for month May after decades for years 1961-2010

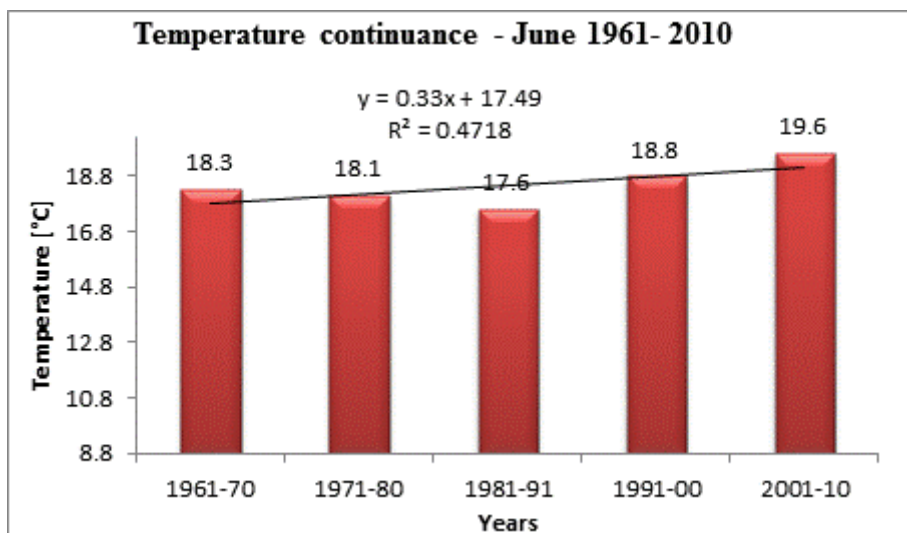


Figure 6: Continuous of average temperatures for month June after decades for years 1961-2010

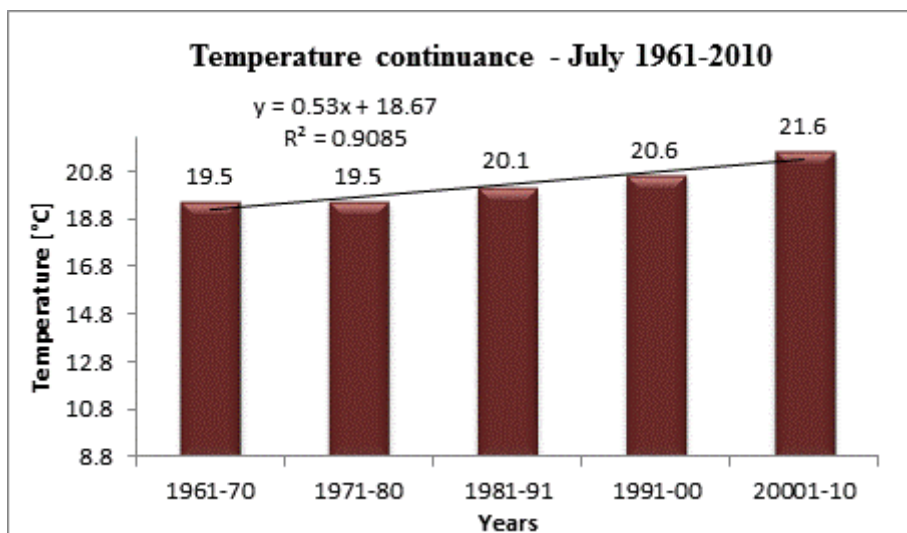


Figure 7: Continuous of average temperatures for month July after decades for years 1961-2010

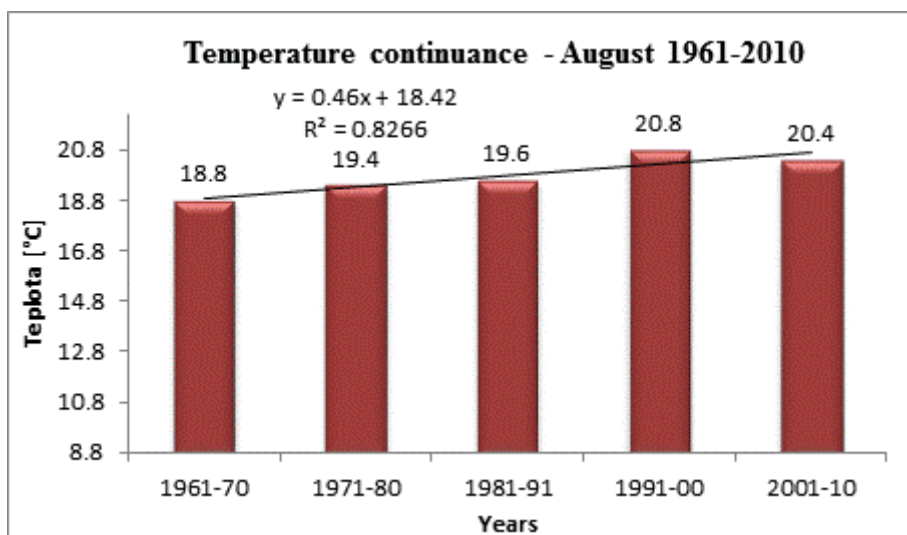


Figure 8: Continuous of average temperatures for month August after decades for years 1961-2010

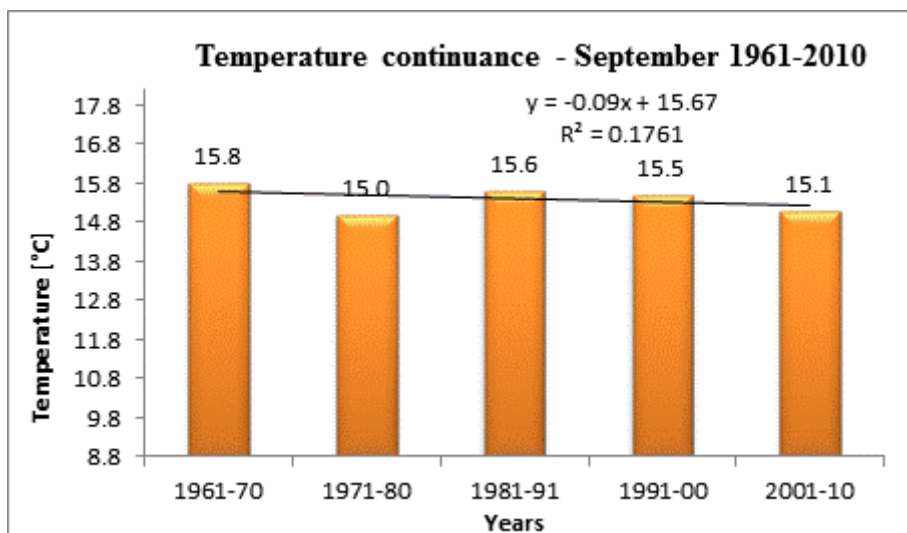


Figure 9: Continuous of average temperatures for month September after decades for years 1961-2010

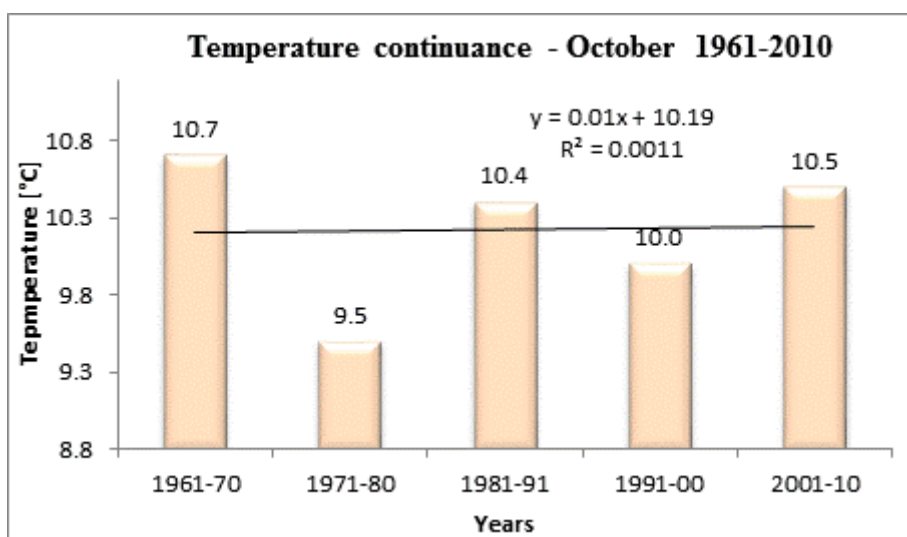


Figure 10: Continuous of average temperatures for month October after decades for years 1961-2010

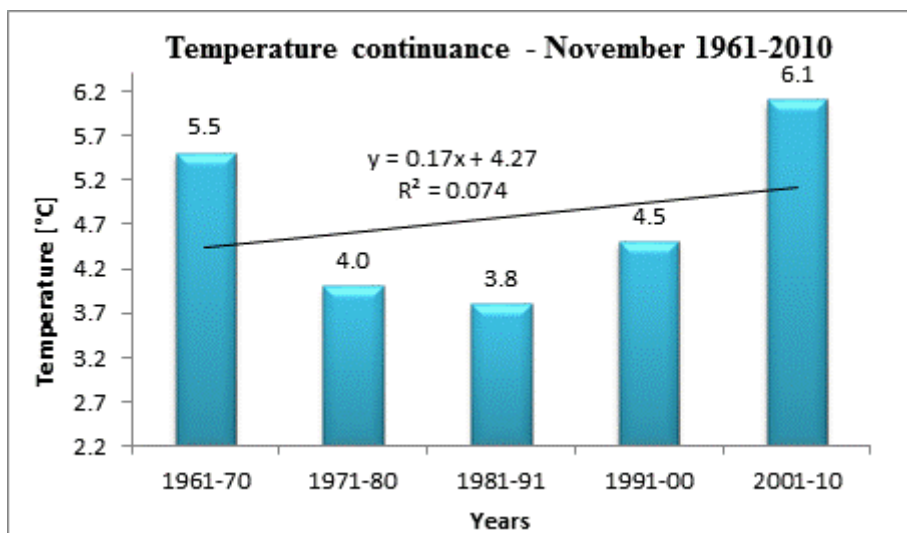


Figure 11: Continuous of average temperatures for month November after decades for years 1961-2010

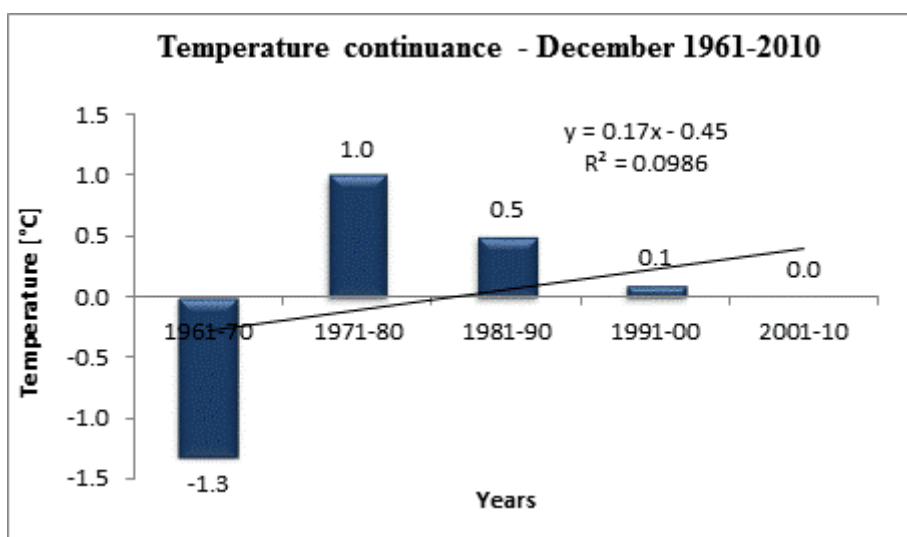


Figure 12: Continuous of average temperatures for month December after decades for years 1961-2010

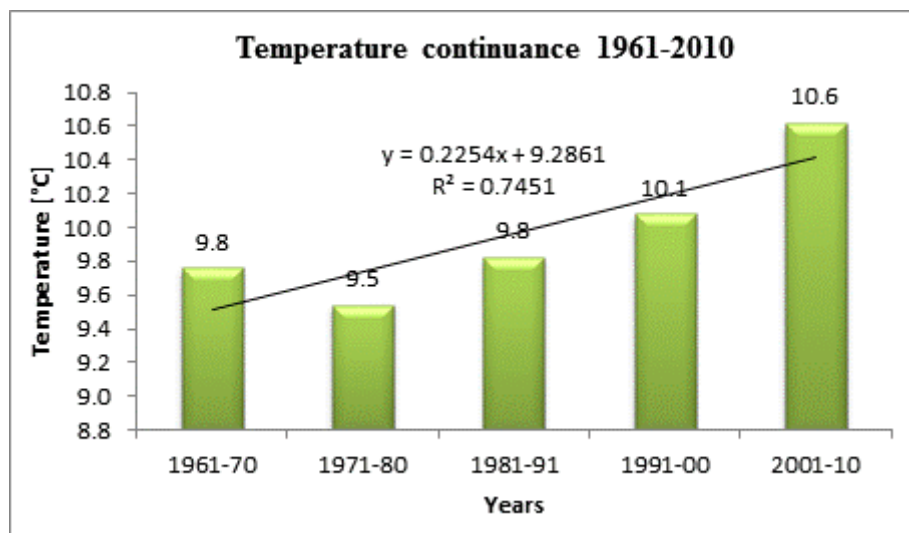


Figure 13: Continuous of average temperatures after decades for years 1961-2010

4. CONCLUSION

At the close we can point out increase of average air temperatures, evaluated after decades for years 1961-2010, especially in vegetation period (April- September). The biggest increase of average air temperatures, evaluated after decades, was in month May (1, 6 °C), July (2, 1 °C), August (1, 6 °C). Increase of monthly air temperatures sum, primarily in vegetation period, rainfall totals changes but also changes of other environment factors do change chronological continuance of vegetations life performance as initial phenophase, by means of that also length of phenophase intervals and whole vegetation periods for several plants. For vegetation periods, delimited by physiologic eminent air temperature for last 50 years, holds sooner start and behind finish of phenophases. On the base of that, we can suppose increase of biomass productive potential in Slovakia. Assumed warming can markedly influence current agricultural production regionalization and zonality placement of field and horticultural crops. This will enable movement of temperature more demanding crops plant from lower areas to higher areas of Slovakia. Agroclimatical analyses demonstrated sooner start of plus temperatures in spring for last 50 years, what cause more intense melting of snow and increasing trend of floods, mostly in spring period.

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REFERENCES

- ANTAL, Jaroslav - MADERKOVÁ, Lucia, 2010, Measures for decreasing of water resource pollution in Slovak Republic. In *45th Croatian & 5th International Symposium on Agriculture: proceedings*, 15. do 19. veljače 2010, Opatija Hrvatska. Osijek, Hrvatska: University Josip Juraj Strossmayer, ISBN 978-953-6331-79-6., pp. 42-45.
- BÁREK, Viliam - HALAJ, Peter - FUSKA, Jakub - POKRÝVKOVÁ, Jozefína - HALAJOVÁ, Denisa, 2010, Thermal regime changes of special crops by sprinkle cooling irrigation. In *Növénytermelés*. ISSN 0546-8191. ISSN 2060-8543, vol. 61, suppl., pp. 305-308.
- BUČKINA, N.P. - BALÁŠOV, Vladimír Jevgenievič - RIŽIJA, J.J. - PAVLIK, Sergey - HORÁK, Ján - IGAZ, Dušan, 2014 Vlivy bioglogie na svojstva půdy i emise parníkových plynů. In *Materialy*

naučnej sessii po itogam 2013 goda Agrofizičeskogo instituta. 1 izd. 172 s. ISBN 978-5-905200-18-2. . Petrohrad : Agrofizičeskij naučno-isledovatel'skij institut, pp. 165-170.

FUSKA, Jakub - BÁREK, Viliam - HALAJ, Peter - POKRÝVKOVÁ, Jozefína - BÁREKOVÁ, Anna, 2014, Evaluation of the non-contact measuring of water reservoir bottom topography. In *Materials, methods & technologies* online. ISSN 1313-2539, pp. 473-481, online.

FUSKA, Jakub - BÁREK, Viliam - POKRÝVKOVÁ, Jozefína - HALAJ, Peter, 2014, Comparison of actual and presumed water capacity of fish pond in Lukáčovce. In *Ecology & Safety*. ISSN 1313-2563, vol. 8, no. 1, pp. 409-414

HALAJ, Peter - BÁREK, Viliam - VELÍSKOVÁ, Yvetta - BÁREKOVÁ, Anna - PECHÁČOVÁ, Katarína - STREĎANSKÁ, Anna, 2013, Longitudinal dispersion coefficient impact assessment on HEC-RAS water quality model outputs. In *Water resources. Forest, marine and ocean ecosystems*. 1st ed. 889 s. ISBN 978-619-7105-02-5. International multidisciplinary scientific geoconference SGEM. Sofia : STEP92 Technology, pp. 213-220.

HALAJ, Peter - BÁREK, Viliam - HALAJOVÁ, Denisa - BÁREKOVÁ, Anna - STREĎANSKÝ, Jozef - ŠINKA, Zoltán, 2013, Effect of catchment land use on hydromorphological status of streams in agricultural land. In *Water resources. Forest, marine and ocean ecosystems*. 1st ed. 889 s. ISBN 978-619-7105-02-5. International multidisciplinary scientific geoconference SGEM. Sofia : STEP92 Technology, pp. 117-124.

HALAJ, Peter - VELÍSKOVÁ, Yvetta - SOKÁČ, Marek - BÁREK, Viliam - FUSKA, Jakub, 2014, Modelling of contaminant dispersion in streams - 1D versus 2D model use comparison: case study on the Ondava river. In *Ecology & Safety*. ISSN 1313-2563, vol. 8, no. 1, pp. 393-399.

HORÁK, Ján - IGAZ, Dušan - KONDRLOVÁ, Elena, 2014 Short-term soil carbon dioxide (CO₂) emission after application of conventional and reduced tillage for red clover in Western Slovakia. In *Eurasian journal of soil science*. ISSN 2147-4249, vol. 3, no. 3, s. 206-211.

KONDRLOVÁ, Elena - IGAZ, Dušan - HORÁK, Ján, 2013, Principles of soil particle size analysis by indirect optical method: advantages and disadvantages of laser diffraction analysis. In *Materials, methods & technologies* online. ISSN 1313-2539, vol. 7, no. 1, pp. 492-501.

MADERKOVÁ, Lucia - ANTAL, Jaroslav, 2012, *Charakteristiky erózne účinných dažďov na juhozápadnom Slovensku*. 1. vyd. Nitra : Slovenská poľnohospodárska univerzita, pp 107. ISBN 978-80-552-0739-1.

MADERKOVÁ, Lucia. Základné výpočty v krajinárstve a záhradníctve, 2013, 1. vyd. Nitra: Slovenská poľnohospodárska univerzita, pp 157 . ISBN 978-80-552-1103-9.

MADERKOVÁ, Lucia - ANTAL, Jaroslav, 2011, Výpočet charakteristík erózne účinného faktora pre vybrané stanice západného Slovenska. In *Študentská vedecká konferencia FZKI 2011*. Nitra : Slovenská poľnohospodárska univerzita, ISBN 978-80-552-0676-9..

HORÁK, Ján - IGAZ, Dušan - KONDRLOVÁ, Elena, 2014, Short-term soil carbon dioxide (CO₂) emission after application of conventional and reduced tillage for red clover in Western Slovakia. In *Eurasian journal of soil science*. ISSN 2147-4249, vol. 3, no. 3, pp. 206-211.

RODNÝ, Marek - IGAZ, Dušan - TÓTHOVÁ, Iveta - HORÁK, Ján - ŠURDA, Peter, 2010, Determination of the retention curve points using the artificial neural networks. In *Journal of International Scientific Publications: Ecology & Safety*. ISSN 1313-2563, vol. 4, no. 1, pp. 177-185.