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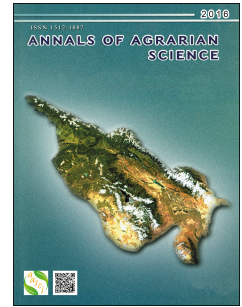
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Climate Change: a trend of increasingly frequent droughts in Kakheti Region (East Georgia)

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ABSTRACT

Following the global warming, in Kakheti Region, in East Georgia (by municipalities), the trends of changes (increase or decrease) in agro-climatic characteristics for the development of agricultural crops were identified. Such changes result in the prolonged vegetation period, increased sum of temperatures and mostly, decreased sum of precipitations. Based on the latter indicators, a trend of a decreasing index of the hydrothermal coefficient is observed evidencing more frequent droughts with low or moderate intensity. The data of the 60-year-long period of meteorological observations (1949-2008) were divided into two 30-year-long periods in order to compare them. It was found that in the second period (1979-2008), the indices of a hydrothermal coefficient in all municipalities (except Kvareli) are decreased in the active vegetation period (VI-VIII). The dynamics of the course of a hydrothermal coefficient is shown with trends. Based on the many-year meteorological observation data (1949-2008) in different municipalities, the sums of active annual temperatures ($>10^{\circ}\text{C}$) and atmospheric precipitations were calculated. On the background of global warming, the repeated nature of droughts of different types was identified. The nomograms of the frequency of the droughts of the type typical to the study object and moisture evaporation have been drafted. Based on the sums of the annual active temperatures ($>10^{\circ}\text{C}$) and atmospheric precipitations, an equation to calculate the hydrothermal coefficient was given. A correlation between the date of the temperature rising over 10°C and the sum of temperatures was identified ($r=0.80$) and a regression equation to forecast different types of droughts was designed. Against frequent droughts following the global warming, it is recommended to take relevant adaptation measures to avoid negative events.

Keywords: Climate change, Active temperature, Atmospheric precipitation, Hydrothermal coefficients, Droughts, Earth climate.

1. Introduction

The Earth climate has been changing for the last half billion years with the alternating warm and cold periods. The reason for such changes has been an abnormal action of volcanoes, the change of the rotation axis in relation to the Sun, change in the configuration of the continents and other phenomena. The second part of the past century was characterized by the onset of the Global Warming, also confirmed by the studies of the World Meteorological Organization (WMO) at the beginning of the XXI century. The global climate change means increase of average long-term air temperature on the Earth. In modern times, the climate change is mainly the result of the anthropogenic impact [1], which is seen as wrong industrial activity of a human and intense use of natural resources causing so called „greenhouse effect” in the atmosphere. It is hard to predict the future, but based on the experts opinion (in 1988, with this aim, the UNEP (the UN

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