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Climate change influence on spring yields in neovolcanic rock structures of the Slovak Republic

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The climate change scenarios for Slovakia assume the most probable increase of mean annual air temperature by about 1-2 ^{0}C in 2025. Therefore it was necessary to assess the present state and the long-term trends in groundwater characteristics development to minimize the global warming negative impacts on groundwater resources recharge and management. The evaluation is very important especially in water deficit areas of Slovakia to which belong also areas built by neovolcanic rocks in central and eastern part of Slovakia.

The groundwater régime analysis was done for 12 representative springs flowing out from various types of neovolcanic rocks, located in eight neovolcanic mountains of the Slovak Republic. Hydrogeological structures dewatered by respective spring were characterized from the geological, structural, petrological, hydrogeological and hydrogeochemical point of view. Climatic conditions, mainly air temperatures and precipitation were assessed as well. Time series of monthly spring discharges involved 20 – 40 years of observation. Besides mean monthly and yearly discharges, minimal and maximal values were assessed.

Time series analysis was oriented on three main components – trend occurrence, seasonal variations and long – term periodical changes. Decreasing trend occurred in most of assessed time series. According to the seasonal variations type, evaluated springs could be divided into two groups – springs with distinct yearly course of discharges and springs without any distinct seasonal variation. The highest values of discharges are typical for April, the lowest for September – October. The most often proved long – term periods are, in addition to 12-month also 2, 5.5, 7.5 and 12.5-year periods.

The results proved decreasing tendency of discharges in the last years which are con-

sidered to be the part of the important warm period identified by climatologists in the Slovak territory. Double mass-curve method was used for testing of the time series in order to define starting points of changes in trend direction. It showed quite clear differences in the decreasing trends evolution after 1982. Cluster analysis was utilized for grouping springs with similar time behavior of discharges.

According to the results, springs were divided into three groups. For the first group of springs, the decreasing trend started in the 80-ies, it has continued in the 90-ies, or spring discharges got stabilized. The long – term constant development without any significant decrease in the 80-ies and 90-ies is typical for the second group of springs. For the third group of springs increasing trends in the 80-ies were proved. No territorial dependency was proved.

As a conclusion, we can say that the starting point of decreasing trends and also intensity of trend changes is not the same in all evaluated mountains and needs further studies.