HYDROGEOCHEMICAL AND STABLE ISOTOPE MONITORING AND NUMERICAL MODELLING OF GROUNDWATER RESOURCE IN EASTERN GEORGIA TO SECURE STABILITY AND QUALITY OF WATER SUPPLY

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ABSTRACT

The problem of water resources and water quality is of major importance for many countries including Georgia due to negative impact of global warming and increasing pollution. The new geochemical and especially stable isotope application play very important role in solving mentioned water problems. In the present paper is considered the situation in the East Georgia, which suffers from shortage of drinking water. In order to investigate underground water systems in Alazani-Iori catchment for the first time studies based on the hydrogeochemical and environmental isotope methods were conducted: GNIP and GNIR stations were organized and monitoring of air temperature, humidity and precipitation in the recharge and discharge areas of aquifer was carried out. Monitoring of water level and discharge on Alazani and Iori rivers as well as monitoring of underground water level at two stations (Lagodekhi and Dedoplitskaro) have been organized. More than hundred groundwater, streamwater and lake water samples were analysed to study composition of major ions and isotopes ^{18}O, ^{2}H and ^{3}H in the Alazani-Iori area. Three groups of groundwaters were identified, revealing the dominant evolution of mineralization from Northwest to Southeast, with major increase in the Shiraki syncline area. The geochemical patterns among these groups evolve from $Ca(Mg)/HCO_3$ type in the Kvareli aquifer to $Na/SO_4(Cl)$ type in the Shiraki syncline. Almost all aquifers in the study area contain admixture of older waters with no Tritium and low $\delta^{18}O$ values. Although most of the artesian boreholes are up to 500 m deep, their groundwater belong to different hydrochemical and isotopic groups and must be considered with respect to local stratigraphy. Whereas the ground waters in the Alazani valley artesian aquifers are concluded to be of a good quality they are recommended for drinking. In order to assess quantity of existing water resource, a numerical model of groundwater was elaborated for Shiraki area. The model was calibrated in the transient transport mode to validate tritium concentration measured in boreholes and springs located in Shiraki area. The model estimated discharge and recharge zones, groundwater flow directions and velocities as well as groundwater age for the test area. As a result of carried work it is recommended to enhance the use of waters from the karstic formations as an alternative source for the Dedoplitskaro settlement in order to achieve sustainable exploitation of drinking water resources.

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