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GEOSTATISTICAL CHARACTERISTICS OF SPACE-TIME VARIATION IN QUALITY PARAMETERS IN KLODZKO WATER SUPPLY SYSTEM(SW PART OF POLAND)

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Abstract
Selected results of research connected with the development of a (3D) geostatistical hydrogeochemical model of the Klodzko city area, dedicated to the spatial and time variation in the quality parameters in the Klodzko water supply system (SW part of Poland) will be presented. The research covers the period 2007 ÷ 2011. Spatial analyses of the variation in three different quality parameters, i.e. Fe iron [g/m3] content, Mn manganese [g/m3] content and NH4+ ammonium ion
[g/m3] content, were carried out. Spatial and time variation in the parameters was analyzed on the basis of the data (2007 ÷ 2011). Thematic databases, containing original data on coordinates X, Y (latitude and longitude) and Z (time – years) and on regionalized variables, i.e. the water quality parameters in the Klodzko water supply system, were created. The input for the studies were the chemical determinations of the quality parameters of water samples taken in the Klodzko water supply system area in different periods of time. These data were subjected to spatial analyses using geostatistical methods. The geostatistical parameters of the assumed theoretical models of directional semivariograms functions of the studied water quality parameters, calculated for the time (years) interval, were used in the ordinary (block) kriging estimation.
Generally, the behaviour of the quality parameters in the Klodzko water supply system has been found to vary in space and time. Thanks to the multidirectional spatial analyses some regularities in the variation in the water supply system in the Klodzko city area have been identified.
In the considered time interval, the shapes of the directional Fe iron content semivariogram show a tendency to vary periodically. The courses of the directional semivariograms of Mn manganese content and NH4+ ammonium ion content show some tendencies towards directional variation over the passing years: distinctly expressed trends of variability for Mn content and stronger for NH4+ ion content.
The kriging estimation results were used to determine the levels of elevated values Z* of the water quality parameters in the years 2007 ÷ 2011 and to forecast these values for the years 2012 ÷ 2014. The maximum values Z* of the quality parameters were stated for the years: 2007, 2008 ÷ 2009 and 2012 (the decreasing trend in Fe iron content averages Z* variation towards the year 2012, the increasing trend in Mn content averages Z* variation towards the year 2012 and the increasing trend in NH4+ ion content averages Z* variation towards the years 2008÷2009 and then the decreasing trend towards the year 2012).
Thanks to the (3D) geostatistical model of quality variability parameters, precise characteristics of the studied parameters throughout the Klodzko city water supply system for the years 2007 ÷ 2011 have been obtained.