TIME SERIES ANALYSIS IN THE ASSESSMENT OF CURATIVE CHARACTER OF WATER

Katarzyna WĄTOR[1] and Joanna KARŁOWSKA-PIK[2]

[1]*AGH University of Science and Technology, Faculty of Geology, Geophysics and Environmental Protection, al. Mickiewicza 30, 30-059 Krakow, Poland; e-mail: katarzyna.wator@agh.edu.pl*
[2]*Nicolaus Copernicus University in Toruń, Faculty of Mathematics and Computer Science, ul. Chopina 12/18, 87-100 Toruń, Poland*

Introduction

Curative waters are subject to the Geological and Mining Law (GML, 2016) and Regulation of the Minister of Health (RMH, 2006). Curative waters are defined as groundwaters which are chemically and microbiologically uncontaminated. These waters should exhibit a natural variability of physicochemical parameters and contain at least one of the specific components determining their medicinal properties. In hydrogeology, the evaluation of the curative nature of waters is carried out in accordance with the methodology proposed by Ciężkowski ed. (2007), covering 5 stages of research. After the analysis of the shape of the distribution, data verification and control charts analysis, a trend assessment should be carried out. Only on the basis of all collected information, the final assessment of the curative character of the water can be made. The trend analysis could be conducted in three ways: i) by the examination of the value and significance of Spearman's correlation coefficient, ii) by the test sequence for randomness, iii) by the fitness of the linear model and check if the linear trend is present.

Samples and methods

Trend analysis of the sulphur (II) compounds concentrations was carried out for waters from the B-13 Anna intake located in the town of Busko-Zdrój. This intake was made in 1927. The waters are captured from a depth of 55 m from Santonian marls. According to the Szczukariew-Prikłoński classification, these are chloride-sodium, sulphide and iodide waters. The results of the 53 analyses of sulphur (II) compounds concentrations, which were performed by two different laboratories, were used for the research.

Results

In the first stage, Spearman's correlation coefficients were determined to identify whether there is a relationship between sulphur (II) compounds concentrations and the date of sampling. A test sequence for randomness was also made. Finally, the fitness of the linear model to the collected data was checked. The analysis showed that the linear model is poorly suited to the data and explains the variables in 13%.

Conclusions

No statistically significant linear trend was identified for the analysed dataset. This means that the concentration of sulphur (II) compounds in the waters from the B-13 Anna intake is stable over time.

References

Ciężkowski W (ed.) (2007) Dopuszczalne wahania eksploatacyjnych i fizyczno–chemicznych parametrów wód leczniczych (Permissible variation of the operational and physico-chemical parameters of medicinal waters). Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław (in Polish).

Regulation of the Minister of Health (Journal of Laws [Dz. U.] No. 80/2006 item 565)) on the scope of the studies required to determine the medicinal properties of natural medicinal resources and medicinal properties of climate, the criteria for their evaluation and a specimen certificate confirming these properties / Rozporządzenie Ministra Zdrowia z dnia 13 kwietnia 2006 r. w sprawie zakresu badań niezbędnych do ustalenia właściwości leczniczych naturalnych surowców leczniczych i właściwości leczniczych klimatu, kryteriów ich oceny oraz wzoru świadectwa potwierdzającego te właściwości (in Polish).

Geological and mining law of the 1st July 2016 (Journal of Laws [Dz. U.] item 1131) / Ustawa z dnia 9 czerwca 2011 r. Prawo geologiczne i górnicze – tekst jednolity (in Polish).