

Isotopic investigation on the origin of the mineral waters from Someșeni, România

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The isotopic study (¹⁸O, D) of mineral waters from Someșeni Spa is important in the tentative to rehabilitate them as natural curative waters. The studied area, Someșeni Spa, is located in the eastern part of Cluj-Napoca, Romania. From a geological point of view, the mineral aquifer is located on the western border of the Neogene Transylvanian Basin. The therapeutical qualities of this waters were known since the early 1920's and the spa was established in 1927. The first scientific studies on the mineral waters from Someșeni were completed in the early 1920's with some researches on their chemical composition and medical properties. The detailed physical and chemical analyses were performed by the Institute of Balneology and Physioterapy (Institute of Balneology and Physioterapy, 1965).

From the hydrological point of view, our researches by deuterium analyses have presumed that these waters are related to a unique aquifer, and the differences in the physical and chemical properties of the sources are related to the different ways in which these waters are followed in the vicinity of the salt body (Baciu et al., 2001).

The water samples were collected monthly for five investigated springs: No. 1, No. 2, No. 3, No. 8, No. 15, and also for Becaș Brook and Someșul Mic River.

The deuterium analyses of water are carried out on the hydrogen gas obtained by on line quantitative reduction of water sample (about 1 μl) with the home-made mass spectrometer SMAD-1. The deuterium content is expressed as δD values, $\delta D = (R/R_S - 1) \cdot 1000$, where R is the deuterium ratio of sample, and R_S is the ratio of international V-SMOW standard (Vienna Standard Mean Ocean Water). The precision of δD values was ± 2‰.

The $\delta^{18}\text{O}$ values were measured by an isotope ratio mass spectrometer type ATLAS 86 designed by Varian. The precision of the $\delta^{18}\text{O}$ measurements was $\pm 0.3\text{‰}$. The results of the measurements are presented in Fig. 1.

These measurements confirm previous studies (Cuna, Berdea, Baciu, 2001) showing that all the springs are related to a unique aquifer. The waters following different ways to reach the surface in the salt breccia zone reach the surface with different chemical compositions.

The δD vs. $\delta^{18}\text{O}$ values of these five springs confirm the meteoric provenience, having the deuterium content of meteoric water, but shifted to higher ^{18}O content. This $\delta^{18}\text{O}$ shift is the result of isotopic exchange of the oxygen from water with salted layers in the water trajectory to the discharge.

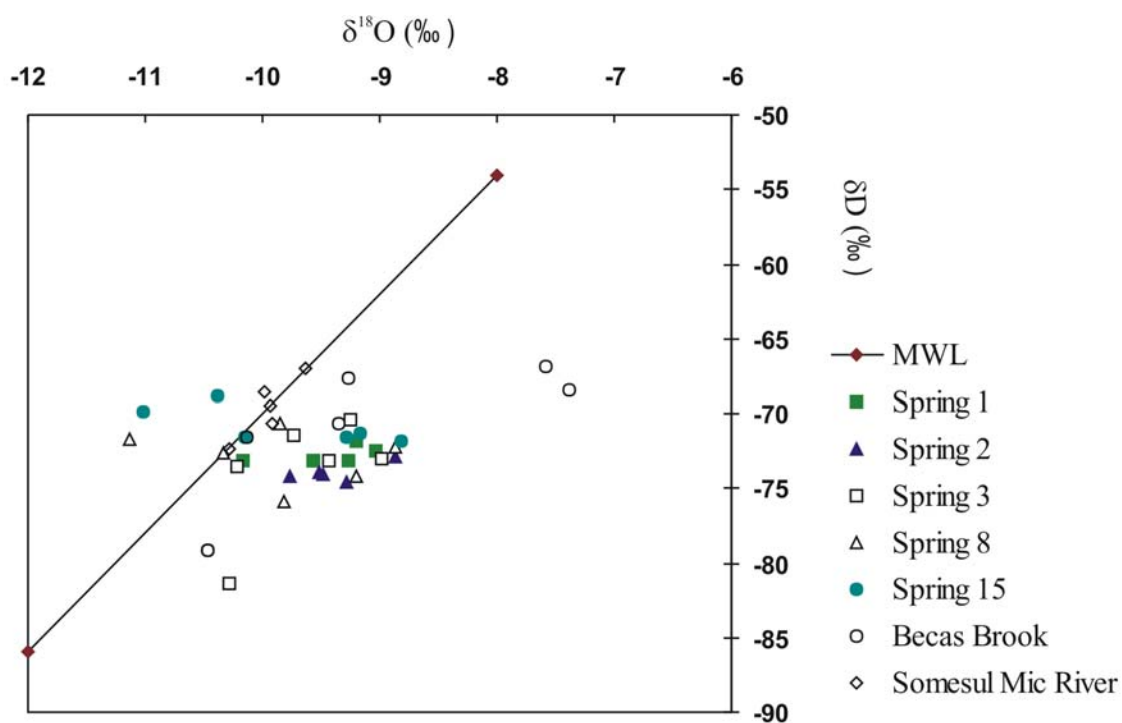


Fig. 1. δD vs. $\delta^{18}\text{O}$ in waters from Someșeni Spa area

An unexpected ^{18}O enrichment in Becaș Brook water, probably having the cause in the micro-organisms activity in polluted warm water, was also observed. There are others three unexpected values for the springs No. 8 and No. 15. We have supposed that these

values present the water isotopic content of mixed water with shallower meteoric water having heavier isotopic (D, ^{18}O) content. The water from spring No. 3 and from the Becaş Brook show one values with water depleted in D and ^{18}O isotopes. This values is related to the spring time isotopic pulses. That means the spring No. 3 is mixed with Becaş Brook, so this spring is improper for human use.

In conclusion, the isotopic δD and $\delta^{18}\text{O}$ investigations of the five springs from Someşeni Spa confirme the meteoric provenience having the deuterium content of meteoric water. The values of ^{18}O shifted to higher ^{18}O content confirm the deeper circulation. The waters from springs No.1, 2, can be used as mineral waters. The spring No. 3, 8, 15 are improper for medical use being mixed with shallower waters.

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