



## **The study of mineral water resources from Oriental Carpathian area using stable isotopes**

Stela Cuna, Cornel Cuna, Petre Berdea, Gabriela Balas, Edina Szilagyi, Alina Magdas

National Institute for Research and Development of Isotopic and Molecular Technologies, Cluj-Napoca, Romania (cuna@itim-cj.ro / Phone: +40 264 584037)

The isotopic ( $^{18}\text{O}$ , D) study of mineral waters from Carpathian area, Romania, was realised to investigate the origin of these waters. We have used the environmental isotopes for the origin elucidation and the age of the underground water determination, as well as for the investigation of the aquifer supply processes, mixing of different waters, geochemical reactions, chemical kinetics, water–rock–atmosphere interaction and polluting processes.

Water samples were collected monthly from sources together with the precipitation from 2005 till 2007. The  $^{18}\text{O}$  content was measured by off-line  $\text{CO}_2$ -  $\text{H}_2\text{O}$  equilibration method using a Delta V Advantage mass spectrometer. The deuterium analyses of water were carried out with the home-made mass spectrometer SMAD-1 on the hydrogen gas obtained by on line quantitative reduction of water sample (about 1  $\mu\text{l}$ ). The precision of  $\delta^{18}\text{O}$  measurements was  $\pm 0.003\%$ , expressed as  $1\sigma$  ( $n=10$ ). The precision of  $\delta\text{D}$  values was  $\pm 2\%$ .

We have found that the studied sources of mineral waters are of meteoric origin having the average deuterium content of local meteoric water. The deep circulation of these waters was proved by  $^{18}\text{O}$  shift to higher values. This  $^{18}\text{O}$  shift is the result of isotopic exchange of the water oxygen with the oxygen from rocks, or the exchange of water oxygen with  $\text{CO}_2$  oxygen in his trajectory to the discharge. The  $^{18}\text{O}$  content shows that the source water varies from deep meteoric water to Geothermal Water Line. Also, the  $\delta^{18}\text{O}$  and  $\delta\text{D}$  values for few sources shown that the waters could be the result of the

mixing process of deep water with shallower water. These waters show winter isotopic shift with depleted isotopic contents.

#### References

Baciu C., Cosma C.& Berdea P., An approach to the dynamics of mineral waters from Someeni Spa in: Approaches Characterising Groundwater Flow, Seiler & Wohnlich (eds.), Munchen, pp. 893-896, 2001

Berdea P., Cuna Stela, Balas Gabriela, Hauer Elza, Origin of mineral waters from Someeni, Transylvanian Basin, Romania, Geological Quarterly 49 (2), pp. 145-150, 2005.

Gonfiantini R, Frohlich K, Araguas-Araguas L, & Rozanski K, Isotopes in ground-water hydrology, in: Isotope Tracers in Catchment Hydrology, Kendall C & McDonnell (Eds), Elsevier Science B.V., Amsterdam, 1998