Fluid inclusion and stable isotopic study of a salinity crisis: Middle Miocene evaporites from Transylvanian Basin (Europe)

O. GELENCSÉR[1], L. PALCSU[2], I. FUTÓ[2], L. E. ARADI[1], M. BERKESI[1], CS. SZABÓ[12]

[1]Lithosphere Fluid Research Lab, Eötvös University Budapest, Hungary (*correspondence: gecso@caesar.elte.hu)

[2] Laboratory of Climatology and Environmental Physics, Institute for Nuclear Research, Hungarian Academy of Sciences, Debrecen, Hungary

Complex geochemical study is carried out on the Middle Miocene marine evaporite in the Transylvanian Basin (TB, Romania) to better understand the formation environment of the salt rock, which was formed during the Badenian salinty crisis. For this study, representative samples were collected from the Praid diapir body (eastern TB).

Petrography of the Praid salt rock shows that beside halite, the rock consists of anhydritie, dolomite, detrital clay minerals, quartz and garnet. Primary fluid inclusions hosted in halite are expected to record compositions and isotopic ratio of paleo seawater during the Badenian salinty crisis of the Paratethys.

Microthermometry of primary fluid inclusions in halite shows low homogenization temperature (10-24 °C) typical for marine environment. Microthermometry coupled with Raman spectroscopy revealed very low eutectic temperature, ranging from -56 to -41 °C and Na^{+}–Ca^{2+}-Mg^{2+}-SO_4^{2-}-Cl^{-}-H_2O composition of the paleo brine. Furthermore secondary (S-type) fluid inclusions was studied to determine post salt fluid migration events: secondary gas-rich fluid inclusions suggest two, a) a N_2-rich and b) CH_4-rich fluid migration event after the deposition of the rock salt. Beside mineral compounds, β-carotene was also identified from the insoluble residue, which suggests the presence of halobacteria in the brine.

Sulfate isotope values measured in anhydrite are ranging $\delta^{34}S$ 20.4 – 22.4 ‰ and $\delta^{18}O$ 12.9 – 14.5‰ that points to evaporated seawater origin and highly comparable to Polish salt deposits from the same age.

The geochemical signatures (Fe-zonation) and isotopic characters ($\delta^{18}O$ -7.07- -4.55 ‰ and $\delta^{13}C$ -9.03 - -8.31 ‰) of the rombohedral translucent dolomite suggest formation origin where meteoric water played a significant role.