

Monitoring of mining impact on natural waters using isotopic tracers (S, U, and Sr) – a pilot study from Talvivaara, northeastern Finland

I. MÄNTTÄRI^{1*}, Y. LAHAYE¹, R. KIETÄVÄINEN¹, A. PASANEN², A. ESKELINEN²,
M-L. RÄISÄNEN² AND P. FORSMAN²

¹*Geological Survey of Finland, P.O.Box 96, FI-02151 Espoo, FINLAND (*correspondence: irmeli.manttari@gtk.fi)*

²*Geological Survey of Finland, P.O.Box 1237, FI-70211 Kuopio, FINLAND*

This study aimed to identify the possible effects of the acidic, metal-bearing waste water leakage from the gypsum pond on natural waters at the Talvivaara mining area, northeastern Finland by using and testing the applicability of isotopic tracers. As a pilot study, only a few mining related water samples and samples from nearby surface- and groundwaters were selected for S, U, and Sr isotope analyses.

For S and U isotope analysis, S was eluted using cation exchange resin and U using TRU-Spec resin. Sr was eluted using Dionex ICS-3000 ion chromatography system. The isotope ratios were measured using MC-ICPMS at the Geological Survey of Finland, Espoo.

From the available restricted isotope data, we can conclude that especially in case of S and U isotopes, it was not always clear whether the mining waste waters were leaked into the surrounding lakes or, whether the isotope signatures were (partially) controlled by natural redox processes. In this case, Sr isotopes showed clearly the influence of the mining processes (chemicals and their effects) to nearby lakes and one shallow groundwater sample. For identifying bedrock ground water flow paths, the sample set was insufficient.

Since individual isotopic systems may solve different type of questions, it is essential to familiarize well to surrounding geology and all the mining processes before making the sampling plan and selecting the used isotope systems. It would also be essential to select enough mining process related samples and background samples to solve possible natural trends and finally discriminate them from the mining waste water pollutions.