

The art of collecting groundwater samples in crystalline bedrock

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Sampling of groundwaters at depth in crystalline bedrock requires access to boreholes and, therefore, involves special difficulties. The natural groundwater conditions are easily disturbed especially by the drilling, but also by almost every subsequent activity performed in the borehole. The challenge of obtaining high quality hydrochemical data that accurately represent *in situ* conditions has been tackled in the framework of the programme for the deep geological disposal of spent nuclear fuel performed in Sweden by SKB (Swedish Nuclear Fuel and Waste Management Co.). The objective has been to describe the chemistry and distribution of groundwaters as well as their origin and the hydrogeochemical processes involved in their evolution. Finally, based on that, one of the main purposes is to predict the future evolution of the groundwater chemistry and also to support the hydrogeological models. Points and measures of importance in order to obtain the best possible sample quality and to resolve this issue are:

Hydrochemical demands have to be considered at an early stage when planning for the drilling (i.e. the choice of drilling technique, drilling fluid and tracer).

Flow logging and borehole imaging logging as well as a close cooperation with the hydrogeologists should precede the choice of borehole sections and sampling procedure.

On-line *in situ* measurements of Eh and pH are most important to avoid problems due to pressure changes and effects on the carbonate and on the redox systems and it is the only way to obtain values suitable for geochemical modelling, and redox modelling, in particular.

Crucial, in order to ensure hydrochemical stability, is the collection of time series of samples.

Evaluation of the quality of samples considering representativity and analytical performance is needed to produce a dataset suitable for the hydrochemical site description.

However, no single method or procedure is universally applicable to all types of groundwater sampling programs; therefore, the selection of appropriate sampling mechanisms and materials is vital to the success of any ground-water investigation.