# TRACE ELEMENTS INCL. REY AND ISOTOPES IN FORMATION WATERS: GEOCHEMICAL TOOLS FOR THE EXPLORATION OF DEEPLY-BURIED HYDROTHERMAL MINERALIZATION

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Exploration for ore deposits is becoming increasingly challenging, as many of the surficial (<1km) ore deposits have already been discovered. Hence, the mining industry has to target mineralization at ever greater depths, also in greenfield exploration, in order to detect unknown ore deposits that are buried deeply in the underground. Tools and geochemical pathfinders for easy and especially cost-effective probing for covered mineralization are in high demand and will probably gain even more importance in years to come. Here, we report on formation waters from oil and gas production sites in the North German Basin and discuss their potential relation to mineral deposit formation. The North German Basin (NGB) features numerous o&g deposits which are currently exploited by a number of companies. Exploration and production drilling exposed hydrothermal mineralization in numerous areas all over the NGB. The formation waters that are coproduced during o&g production are highly saline brines which represent deep groundwaters and as such are mixtures of connate brines, meteoric brines and other fluids. Previous research indicates that formation waters from the North German Basin, especially from Rotliegend strata, may represent, at least in certain regions, original connate waters, i.e. basinal brines. There are indications that these waters did not mix with descending meteoric waters due to the sealing of the formations by overlying Zechstein evaporite units. Hence, these waters and their geochemical signatures are potential archives for very long-term (>>1Ma) water rock interaction, and their chemical signature might be used as a geochemical tool for exploration of mineral deposits under deep cover.

We present trace element (including REY) as well as $^{87}Sr/^{86}Sr$, $^{143}Nd/^{144}Nd$, $\delta D$ and $\delta^{18}O$ isotope data for formation waters from North German o&g reservoirs and compare our results to data from fluid inclusions hosted in base metal and fluorite-barite mineralization found in adjacent drill cores.