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Geogenic sources of local arsenic enrichment in groundwater from northwestern Thuringia, Germany

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Aqueous fluids migrating in the Earth's crust interact with the host rocks and partially take up their geochemical signatures. Mineralization and sometimes geogenic contamination of the groundwater may be the consequence: The aquifer systems of the Lower Triassic Buntsandstein Formation, an important source of drinking water in north-western Thuringia, and the Rotliegend Formation are locally affected by elevated arsenic concentrations. Data from water wells locally show arsenic concentrations above the limit value for drinking water (10 μg/L). The regional distribution as well as lack of secondary vein mineralizations or anthropogenic sources within this area point to a geogenic stratibound source of arsenic.
The average concentration of the toxic, carcinogenic trace element arsenic in rocks of Phanerozoic rocks in Germany range from 5 to 12 μg/g for different lithologies, being generally higher in Variscan rocks. However, it can be several times enriched in certain sedimentary lithologies such as pelites and even more so in coal beds.
In our present study we investigate all sequences of the Buntsandstein and Rotliegend Formation with their different lithologies in order to identify the relevant carriers of arsenic. Geochemical analyses on samples from selected drill cores and outcrops show arsenic of >50 μg/g especially in carbonaceous sediment sections as well as in primarily gray-green lacustrine clay stones. Elevated arsenic concentrations seem to be related to lithofacies of lacustrine origin in the Buntsandstein and carbonaceous sediment sections in the Rotliegend.
Aim of the current study is now to identify the appropriate synsedimentary mineral phases that incorporate arsenic and to identify the processes and conditions under which arsenic is mobilized from these phases and transferred into the groundwater.