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²³⁶U in well water - a tool for uranium prospection?

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²³⁶U (half-life 23·Myr) is produced in uranium ore via thermal neutron capture on ²³⁵U. The neutrons originate mainly from (alpha;,n) reactions caused by alpha;-particles from the uranium decay series. The equilibrium ratio of ²³⁶U/U in natural ore is proportional to the thermal neutron flux, which is expected to be proportional to the uranium concentration in first approximation. Since this fingerprint of high grade ore should stay unaltered in withering and dissolution, it should still be detectable in well water which was in subsurface contact with the ore; thus, such wells should be useful as natural probes for uranium prospection. We expect this signature to be more unambiguous than the uranium concentration in water, recently investigated e.g. in ¹. However, measurement capabilities for ²³⁶U were developed recently only at very few AMS (Accelerator Mass Spectrometry) facilities, among these at VERA (Vienna Environmental Research Accelerator).
We will discuss the feasibility of uranium prospection by using natural ²³⁶U in well water, and summarize existing measurements. Uranium ores show up to ²³⁶U/U=10⁻¹⁰, but measurements of uranium from low-concentration rocks or deep well water are sparse or unavailable ². The connection between uranium concentration and the ²³⁶U/U ratio will be discussed, since trace isotopes (serving as (alpha;,n) targets and "neutron poisons") and water content of the rock can alter the ²³⁶U production significantly.
A known highest grade ore deposit was located in Jáchymov, Czech Republic. It is mainly depleted now, but is a perfect test case to investigate whether high grade ore is indicated by high ²³⁶U/U concentration in well water in the vicinity. Thus, the Jáchymov region could be a perfect test case to study ²³⁶U in well water as a tool for uranium prospection.

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