

# Groundwater monitoring during hydraulic fracturing: what can stable isotopes do?

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Hydraulic fracturing can potentially lead to contamination of groundwater resources by fluids, salts or organics. Hence, each hydraulic fracturing operation must be accompanied by a comprehensive risk analysis including a monitoring of the presence, transport, and (bio)degradation of hydraulic fracturing-associated compounds. This is a highly challenging task due to the multitude of chemicals applied or mobilised in conventional hydraulic fracturing operations.

Here, we will present and discuss analytical methods by which prevalent compounds potentially related to fracking can be sensitively detected in groundwater samples. Emphasis will be placed on methods based on the analyses of stable isotopes of certain elements (e.g.,  $^{13}\text{C}/^{12}\text{C}$ ,  $\text{D}/\text{H}$ ,  $^{34}\text{S}/^{32}\text{S}$ ,  $^{15}\text{N}/^{14}\text{N}$ , noble gases) as such stable isotope signatures contain information usable for source identification and/or (bio)degradation of specific compounds.