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Inter-comparison between ^{81}Kr - and ^{14}C -dating of groundwater

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^{81}Kr is a cosmogenic isotope with a half-life of 229 ka. Due to its chemical inertness, it has a uniform distribution in the atmosphere and a simple transport behavior in the environment, avoiding some complexities in ^{14}C dating. Therefore, ^{81}Kr is an ideal tracer in the earth sciences.

Limited by the precision of ^{81}Kr analysis, there is a dating gap between ^{14}C and ^{81}Kr . Recently, we have achieved high precision ^{81}Kr -dating method, reaching 1% analytical uncertainty of relative abundance for groundwater samples between 10 ka and 230 ka. This improvement now allows for direct comparison between ^{14}C and ^{81}Kr , enabling multi-tracer approaches in groundwater research.

We have applied our high precision ATTA method to groundwater samples from the North China Plain, and compared it with ^{14}C measurements (AMS). Our results not only verify the reliability of high precision ^{81}Kr -dating method, but also open the opportunity to go beyond piston flow model in groundwater research.

Student Submission

Yes

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