

## Stable hydrogen isotope in mineral water and implications for chemical weathering intensity

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Chemical weathering plays a key role in the long-term climate change and global biogeochemical cycles. The prerequisite of chemical weathering study is to establish suitable proxies for the intensity and rate of chemical weathering over the geologic past. Over the last decade, the indications and their applicability of the widely-documented chemical weathering indices have been revisited by some studies. However, to our knowledge, the essential of chemical weathering is the interaction between water and rock and their weathering residues under the surface environment. Water as the most important agent for promoting chemical weathering was poorly considered in previous studies.

In order to reveal the implications of mineral-water hydrogen isotope for chemical weathering intensity, a 5.1 m-long basalt-developed weathering profile from Hunan Province, China was selected for the analyses of major elements, grain size, pH, total organic carbon, thermogravimetric (TG) and differential thermogravimetric properties (DTG), and stable isotopes ( $\delta D$  and  $\delta^{18}O$ ) in mineral waters. Based on the TG and DTG results, different types of mineral water were extracted by a sequential heating extraction technique (0–120°C, 120–300°C, 300–600°C and 600–900°C). The mineral water lost below 120°C is absorbed water, a mixture of interlayer and crystal waters occurs at 120–300°C, and >300°C is mostly constitution water. The absorbed water has been exchanged and reached isotopic equilibrium with soil water, while crystal water and interlayer water cannot be discriminated by heating method in this study. Hydrogen isotope of constitution water can indicate chemical weathering, which shows a positive relationship with chemical weathering intensity due to the isotopic fractionation during hydrolysis between secondary clays and surface water. Although we need more studies on the direct indication of hydrogen isotope of constitution water for paleo-atmospheric precipitation, this study sheds new light on the proxy of chemical weathering and water cycle in earth surface process.

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