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# Hydrothermal system with highly radiogenic Sr isotope in the NE Tibetan Plateau

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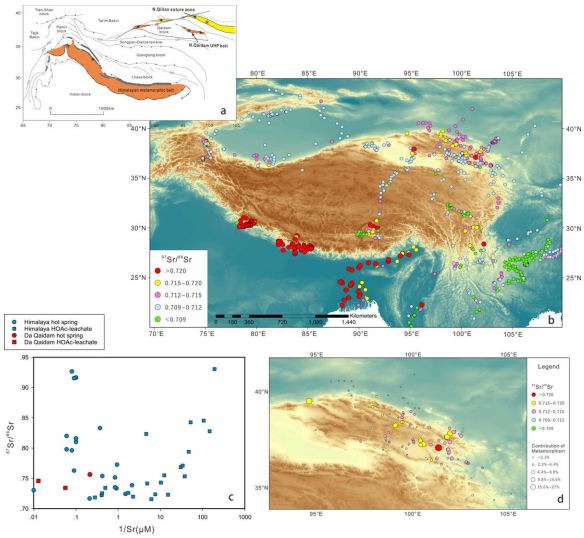


Hydrothermal systems are a common feature of orogenic evolution. These systems can profoundly affect the Sr fluxes and Sr isotopic composition of riverine waters through the direct input of Sr from hot springs and groundwater and the chemical weathering of hydrothermal calcite. The hot springs and hydrothermal calcite in the Himalayas with highly radiogenic Sr due to high-pressure metamorphism contribute significant amounts of radiogenic Sr to Himalaya rivers, which affects the global seawater 87Sr/86Sr evolution during Cenozoic. Here, we reported $^{87}Sr/^{86}Sr$ ratios of the hydrothermal system in the early Paleozoic North Qaidam ultrahigh-pressure metamorphic belts, NE Tibet. $^{87}Sr/^{86}Sr$ ratios of hot spring water and acetic acid-leachates of the surrounding rocks (schist and gneiss) found in the northern margin of the ultrahigh-pressure metamorphic belts range from 0.757~0.734. The $^{87}Sr/^{86}Sr$ ratios of acetic acid leachates of two marbles are ~ 0.713, and those ratios of trace vein carbonate-bearing rocks found in the ultrahigh-pressure metamorphic belts vary from 0.713-0.737. All the above observations suggest the hydrothermal systems around the Qilian-north Qaidam region is similar to the Himalayas. The compilated $^{87}Sr/^{86}Sr$ ratio distributions around the Tibetan Plateau show that the Qilian region displays a higher $^{87}Sr/^{86}Sr$ ratio than other regions except for the Himalayas. These hydrothermal systems in the Qilian-north Qaidam region may deliver highly radiogenic Sr to rivers and lakes through hot springs, groundwater and the weathering of hydrothermal calcite, resulting in the higher $^{87}Sr/^{86}Sr$ ratio around the Qilian Shan region than the surrounding areas. The limited exposure of the early Paleozoic ultrahigh-pressure metamorphic rock in the NE Tibetan Plateau has exerted a significant impact on regional water $^{87}Sr/^{86}Sr$ ratio at present, suggesting a pivotal role of ultrahigh-pressure metamorphic process in regulating past seawater $^{87}Sr/^{86}Sr$ evolution.