Zircon U-Pb ages and O-Nd isotopic composition of the Qinling Group in North Qinling, central China

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The Qinling Group exposed in the North Qinling orogenic belt, central China, has been interpreted as the oldest basement rocks of Precambrian in age and it records crustal formation and evolution of the North Qinling orogenic belt. However, previous studies have demonstrated different formation ages such as Paleoproterozoic, Mesoproterozoic, and Neoproterozoic for the Qinling Group. In this study, we present U-Pb ages and O isotopic data of zircons obtained on the same analytical spot by the SIMS technique and Nd isotopic composition of whole-rocks from two different types of metamorphic rocks collected from the Qinling Group in the eastern part of the North Qinling orogenic belt. They are felsic gneiss and amphibolite in composition and both are major components of the Qinling Group.

Zircons of a biotite plagioclase gneiss show clear oscillatory zoning of magmatic origin but with complex core-rim structures shown in cathodoluminescence (CL) images. The cores of zircons mostly yield U-Pb ages of ca. 930 Ma, suggesting a Neoproterozoic formation age of the Qinling Group. The rims give U-Pb ages of about 500 Ma, recording an Early Paleozoic metamorphic event. Zircon grains have $\delta^{18}O$ values of 6.5 to 9.3‰ and whole-rocks yield low initial ε_{Nd} values of about -20, suggesting an origin of crustal material for magma(s) of the precursors. Zircons of amphibolite samples do not have clear oscillatory zoning and the residual cores are irregular shown in CL images. The SIMS dating yields U-Pb ages clustering in two peaks of 850 Ma and 510 Ma, also recording the Neoproterozoic formation age and the Early Paleozoic metamorphism. Zircons $\delta^{18}O$ values cluster around the mantle value with an average of 5.3 ±0.1‰, implying that the parental magma was derived from a mantle source. Initial ε_{Nd} values of whole-rocks range from -13.9 to -10.0, showing significant contribution of crustal material.

In combination with previous geochronological data and the results reported here, it is proposed that the Qinling Group formed in early Neoproterozoic. This rock group is obviously composed of variable rocks of different formation ages. The North Qinling block underwent metamorphism in Early Paleozoic related to the North Qingling orogenic event along the southern margin the North China Craton. This study is supported by the Ministry of Science and Technology of China (grant No. 2012CB416606).

Sr isotope study of Marinoan Cap carbonates from southwestern Mongolia

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The basal Ediacaran (Marinoan) Ol cap carbonate rests above the second of two glacigenic horizons in the Tsagaan Oloom Formation of southerwestern Mongolia [1]. This cap-carbonates is composed of a basal buff-colored micro-peloidal dolostone with tubestone cements, and an upper lime-mudstone with peudomorphosed aragonite crystal fans in between. In this work, we studied the Sr isotope compositions of the cap-carbonate to understand the origin of Sr isotope variability in basal Ediacaran cap carbonates globally.

Forty cap carbonate samples from Ol member, Tsagaan Oloom formation in Mongolia, were analyzed for $^{87}Sr/^{86}Sr$. An incremental leaching technique using 1N ammonium acetate and various concerntrations of acetic acid and hydrocloric acid was applied to extract Sr from different phases in the cap-carbonates (including surface adsorbed Sr, calcite, dolomite and clay minerals). The leacheates were then passed through chromatographic columns and pure Sr was analyzed using MC-ICP-MS (Neptune) at Yale university.

Our results show that the lowest $^{87}Sr/^{86}Sr$ values among all leacheates from each sample span 0.7089-0.7092, which is higher than both the overlying carbonate crystal fans and limestones (0.7082-0.7087), the least-altered samples from the Tayshir member below Khongoryn diamictite [1,2], and the lowest $^{87}Sr/^{86}Sr$ values previously reported in global basal Ediacaran carbonates (~0.7075) [3]. Very small $^{87}Sr/^{86}Sr$ variation has been observed throughout the 6-meter cap-dolomite section and leachates from the carbonate portion of each sample, suggesting these dolostones are quite uniform in chemical compositions, consistant with sub-per mil variation in $\delta^{18}O$ (-7.2 ± 0.8 ‰) and $\delta^{13}C$ (-1.2± 0.7‰) of these samples. The relatively high, but uniform $^{87}Sr/^{86}Sr$ ratios in the Ol cap dolostones could be explained by high-degree alteration or dolomitization process involving local waterbody with more radiogenic $^{87}Sr/^{86}Sr$, implying Sr isotope compositions in these dolostones might not be suitable for chemostratigraphic correlation.

[1] Macdonald et al., (2009) *Geology* **37**, 123-126.
[2] Brasier et al., (1996), *Geological Magazine*, **133**, 445-485.
[3] Halverson et al., (2007) *PAELEO* **256**, 103-129.