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Paleozoic Na-rich granites from the North Qinling (Central China): implication for crustal growth in post- collisional setting

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Granitoids that have juvenile isotopic compositions are considered to relate to crustal growth in accretionary orogenic belt. The Paleozoic granites in the North Qinling terrane provide an optimal place to address this issue. This study carried out detailed works on the Paleozoic granites alone the Shangdan Suture. Zircon U-Pb dating reveals Early Silurian (Tieyupu trondjemite, 437 $\pm$ 4Ma) and Early Devonian granitic magmatism (Yaogou monzogranite, 403 $\pm$ 4Ma; Liangchahe gneissic trondjemite, 406 $\pm$ 6Ma). The Tieyupu trondjemite display Na-rich adakite affinity, i.e. SiO_2 = 69.1% to 70.1%, Na2O/K2O = 1.9$\sim$2.26; high Sr/Y (137 to 160) and Y/Yb (9.89 to 10.25) ratios, suggest the garnet residue in their source. They have decoupled Sr-Nd and zircon Lu-Hf isotopic compositions, i.e. εNd(t) = -0.6 to -0.3, positive εHf(t) values of +4.29 to +12.04, these features indicate the Tieyupu trondjemite were formed by dehydration melting of the juvenile basaltic rocks, subsequent contamination by evolved crustal rocks may account for their evolved Sr-Nd isotopic compositions. The Yaogou monzogranite display higher K2O/Na2O ratios of 0.81 to 1.00, higher ΣREE (105 to 191ppm) contents, Eu*/Eu = 0.71$\sim$0.95. They have positive εNd(t) (+0.1) and zircon εHf(t) values (+6.79 to +12.22), suggest they were formed by dehydration melting of the juvenile basaltic rocks in high temperature condition. The Liangchahe gneissic trondjemite also display Na-rich adakite affinity: i.e. high SiO_2 (66.9% to 68.0%) contents and high Na2O/K2O (2.16 to 3.11) ratios, low ΣREE contents of 56.3 to 134 ppm, high Sr/Y ratios of 77 to 88. They have evolved Sr-Nd isotopic compositions (εNd(t)=-2), variable zircon Hf isotopic composition (εHf(t) = -14.97 to +9.80), suggest a heterogeneous source region. In combination with regional geology, we propose that these Paleozoic granites were contemporaneous with the exhumation of UHP metamorphic rocks in the North Qinling terrane. The exhumation of UHP metamorphic rocks in the Qinling Group caused compression and ductile strike-like faults along the Shangdan suture, which led to the melting of ophiolite complex and evolved crustal rocks along the Shangdan suture zone to produce the Paleozoic granites. These results imply that reworking of ophiolite complex in suture zone has great contribution to crustal growth in post-collisonal setting.