Neoproterozoic mafic intrusions in the Panzhihua district, SW China: implications for interaction between subducted slab and mantle wedge

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In the western margin of the Yangtze Block, South China, widespread Neoproterozoic mafic intrusions are closely associated with granitic plutons and metamorphic complexes. The mafic rocks have been interpreted as the products of either subduction-related arc magmatism [1-2] or mantle plume activity [3]. Among the Neoproterozoic mafic intrusions are two spatially associated bodies in the Panzhihua district, Sichuan province. Our study of these two intrusions supports a Neoproterozoic arc-accretion scenario in the western margin of the Yangtze Block.

Two Neoproterozoic mafic intrusions, one olivine gabbro and one hornblende gabbro, have identical SHRIMP zircon ages of 746 ± 10 Ma and 738 ± 23 Ma. The hornblende gabbros have K_2O concentrations ranging from 0.70 to 1.69 wt % and show enrichment of Rb, Ba, U, Th and Pb and depletion of Nb,Ta and Ti. They have variable $^{87}Sr/^{86}Sr$ ratios (0.7045-0.7070) with constant εNd (t) values (-0.12 to -0.93). The olivine gabbros have relatively low K_2O (0.19-0.43 wt %), are depleted in Rb and Th relative to Ba and U, and have obvious negative Nb-Ta and Zr-Hf anomalies on primitive mantle-normalized trace element diagrams. Their εNd (t) values range from -0.64 to -1.73 and initial $^{87}Sr/^{86}Sr$ ratios from 0.7070 to 0.7075. The olivine gabbros were not experienced any crustal contamination, whereas the hornblende gabbros involved minor crust contamination. The parental magmas of the olivine and hornblende gabbros were formed by partial melting of garnet-spinel lherzolite and spinel lherzolite, respectively. Trace elemental ratios reveal that the hornblende gabbros were probably derived from a source strongly modified by subducted slab fluids, whereas the olivine gabbros came from a mantle source modified by subducted slab melts. The close association of the olivine gabbros and hornblende gabbros suggests that a steep subduction zone existed along the western margin of the Yangtze Block during Neoproterozoic time. Thus, the giant Neoproterozoic magmatic event in South China was subduction-related.

References

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