Geophysical Research Abstracts
Vol. 14, EGU2012-12115, 2012
EGU General Assembly 2012
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The Neoproterozoic Granitoids from the Qilian Block, NW China

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Field occurrence, petrography, geochemistry, Nd isotopes, and geochronology of the Neoproterozoic granitoids exposed at Tuole, Huangyuan, Duohai, Haiyan, Riyueshan, and Maxianshan in the Qilian block were studied. The Neoproterozoic granitoids are quartz diorite, granodiorite, granite, and leucogranite. They have intruded the schists of the Huangyuan Group, the basement sequence of the Qilian block, and are medium- to coarse-grained. Gneissosities are well developed and are concordant with the schistosities of the country rocks.

The Neoproterozoic granitoids plot in the field of diorite, granodiorite, and granite in (K_2O+Na_2O) vs. SiO_2 diagram and are medium- to high-K calc-alkaline. Their REE patterns all show enrichment in LREE's and, with exception of the quartz diorite at Maxianshan, negative Eu anomalies. Their spiderdiagrams also exhibit enrichment in large ion lithophile elements, Rb, Th, U, and K and negative anomalies in Nb, Ta, Sr, P, Ti, and, with exception of the quartz diorite at Maxianshan, Ba.

The ages of the Neoproterozoic granitoids are divided into two groups: ca. 800 Ma and ca. 900 Ma. The ε_{Nd}(1 Ga) and T_{DM} are -6.7$\sim$-12.7 and 2.2$\sim$3.0 Ga for the ca. 800 Ma granitoids and are -4.3$\sim$-5.3 and 2.0$\sim$2.3 Ga for the ca. 900 Ma granitoids.

The granitoids of both age groups were all formed in arc tectonomagmatic environment on active continental margin. The Huangyuan granodiorite, Duohai leucogranite, Haiyan granodiorite, and Maxianshan granite are peraluminous and S-type, and were most probably derived from melting of clay-poor, mature psammitic sources. The Riyueshan granodiorite is metaluminous and I-type, and could have formed by solidification of partial melts of metabasalt or eclogite at pressures of 1-4 GPa. The partial melts may have assimilated MgO-rich crustal rocks before solidification. The Tuole leucogranite and Maxianshan quartz diorite are also I-type, but are weakly peraluminous. They could also have formed from partial melting of metabasalt or eclogite at pressures of 1-4 GPa. The Neoproterozoic granitoids in the Qilian block may be correlated with those in the Yangtze block, suggesting a strong affinity toward each other for the two blocks. Thus, a unified Qilian-Yangtze continent in the Neoproterozoic era is implied.