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Geochemical and Nd-Sr Isotopic Constraints on the Protoliths of the Gneisses from the 100∼2000 M Main Hole of the Chinese Continental Scientific Drilling Project

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Similar to the lithologic association outcroped in the Dabie-Sulu orogen, the gneisses are predominantly rock types in the main hole of the Chinese Continental Scientific Drilling Project(CCSD-MH), including granitic gneiss and plagiogneiss two types. The granitic gneisses in the CCSD-MH, being all of monzogranitic in composition, are characterized by strong fractionation between LREE and HREE, strong negative Eu and Sr anomalies, and distinct negative Nb, P, and Ti anomalies. MgO, CaO, FeO*, and TiO2 contents of the granitic gneisses are lower than the plagiogneisses in the CCSD-MH, while K2O/Na2O and Rb/Sr ratios are much higher. εNd(t) values(–8.2 to –13.0) and Nd model ages(∼2.3 Ga) of the granitic gneisses suggest that the original granitic rocks were probably formed by partial melting of Paleoproterozoic rocks in the Neoproterozoic. The plagiogneisses in the CCSD-MH have a wide range of major and trace element contents. Similar to the differentiation trends of magmatic rocks, the immobile elements or oxides of the plagiogneisses show a continuous bulk-rock chemical variation, which implying a pyroclastic against sedimentary protolith. The plagiogneisses can be subdivided into two types in geochemistry. One similar to the retrograded eclogite or amphibolite which are border upon the plagiogneisses in some geochemical features, they all have lower REE concentrations, weakly fractionation between LREE and HREE, strong positive Ba anomalies and obvious positive Eu anomalies, and near-chondritic εNd(t) values(+1.3 to –2.6), which indicating a genetic relationship between the plagiogneisses and the eclogites. Another characterized by high REE concentrations, medium negative Eu anomalies, significant positive Ba anomalies and negative Nb, Ta, and Sr anomalies, and these characters are similar to that of acidite end-member of the Neoproterozoic bio-model volcanic rocks outcropped along the northern margin of the Yangtze Craton. Their εNd(t) values are relatively low (–3.0 to –9.4), but their Nd model ages(TDM=2.1–2.4 Ga) are much older than the emplacement ages of their protoliths, which may indicating a partial melting of preexisting crust genesis of their protoliths. During UHP metamorphism, Mg, Fe, Ca, Si, Ti, Al, Cr, Ni, V, Co, Fe, Mn, Cu, Zn, Sc, Nb, Ta, HREE and Y are inactive elements. Whereas K, Pb, Rb, Ba, U, Th and LREE are active elements. Other elements(Na, Sr, Zr, Hf) are intervenient, belonging to sub-inactive elements.