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The chemical composition of the detrital heavy minerals in the Upper Cretaceous Kuji Group, northeast Japan

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The Kuji Group distributed in the northern part of the Kitakami Mountains is regarded as a Cretaceous deposit on forearc area. The sediments in the Kuji Group have remarkable characters with a large amount of lithic fragments, which reflects the derivation from various rock types. The provenance of the Kuji Group offers the information of the significant aspect of the Cretaceous arc system. Thus the provenance analysis of sandstones from the Kuji Group was carried out to clarify the detail of the hinterland on the basis of the chemical composition of detrital heavy minerals using by EDS. The detrital heavy minerals for analysis were prepared by heavy liquid separation. The number of grains analyzed is 36 grains of the garnet, 108 grains of the chromian spinel, and 127 grains of the tourmaline. Chemical analysis of detrital garnets reveals that the source area of the Kuji Group was composed of regional metamorphic rocks reaching greenschist to granulite facies condition and contact metamorphic rocks. The chemical composition of detrital tourmalines suggests the derivation from metasediment. Detrital chromian spinels is characterized by high TiO₂ (> 0.5wt.%) implying the supply from island-arc basalts and intra-plate basalts. Small amount of chromian spinels with low TiO₂ (<0.5 wt%) are derived from ultramafic rocks. These chemical compositions of detrital heavy minerals suggest that the provenance of the Kuji Group was composed mainly of thermal metamorphic rocks, basic volcanic rocks and ultramafic rocks. The source rocks are found mainly in the North Kitakami Terrane and its contact metamorphic zone by Cretaceous granite, close to the Kuji Group. In respect to chromian spinels with low TiO₂ wt%, the source rocks are limited in ultramafic rocks of the Hayachine Terrane. During the late Cretaceous time, northeast Japan arc was situated along the eastern margin of the Asian continent where was suffered by active lateral fault (Xu et al., 1989). Thereby, it is likely that the wide variety of rocks were distributed with various erosional levels in the hinterland affected by such enhanced tectonism.

Keywords: detrital garnet, detrital chromian spinel, detrital tourmaline, provenance, Late Cretaceous, chemical composition