

Historical transition in chemistry of detrital chromian spinels in the Cretaceous Yezo and Kuji Groups, northern Japan

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Tectonic histories of sedimentary basins in the Cretaceous Japan arc have been assessed to understand the response of the Asian continental margin to the oblique subduction of the Paleo-Pacific (i.e. Kula or Izanagi) Plate beneath the Asian continent during the Early Cretaceous and that subducted orthogonally in the Late Cretaceous. In the Cretaceous Yezo Group in Hokkaido, northern Japan and the Kuji Group in the Kitakami Massif in northeastern Honshu, sandstone petrography and chemistry of detrital chromian spinel grains were performed to assess the tectonic environmental change during the Cretaceous period on the basis of provenance analysis.

Results of sandstone petrography suggest that the material of clastic rocks was derived from areas of a Cretaceous volcanic belt (Rebun?Kabato Belt) and from a Jurassic accretionary complex (Oshima - North Kitakami Terrane), which was intruded by Cretaceous granite, adjacent to the depositional basin. The compositions of detrital chromian spinels in these sediments are very diverse and mainly derived from tholeiitic and intra-plate basalts showing high-TiO₂ (>about 1.0 wt%) and island arc basalts with moderately low-TiO₂ (1.0 > TiO₂ > 0.5 wt%) and high -Cr#. Latter chromian spinels can be considered as a record of island arc activity including high Mg-andesite. Because adequate source rocks of the spinels are elusive near the basin, these rocks are believed to have been disturbed by Cenozoic tectonics and eroded and covered by newly formed volcanic and sedimentary rocks.

Comparison of chemical composition of the chromian spinels among studied areas of the Yezo and Kuji Groups indicates that chromian spinels with very low-TiO₂ (<0.5 wt%) prevail in the Lower Cretaceous (Aptian-Albian). In contrast, chromian spinels showing moderately low TiO₂ predominated in the late Cretaceous (Cenomanian-Santonian). This clear difference suggests the change of oceanic plate motion around Japan arc promoted the change of source rock assemblage and the arc volcanic activity in late Cretaceous time. Thus the chemical characteristics of detrital chromian spinels of the Yezo and Kuji Groups give the key to clarify the interaction between the swaying of young and hot plate and development of the Cretaceous island arc in eastern Asian margin.

Keywords: Yezo Group, Kuji Group, Cretaceous, heavy mineral