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Serpentine diapir intrusion in the Cretaceous forearc basin in northern Japan

KOHKI YOSHIDA[1] and YASUHIRO IBA[2]

[1]*Department of Geology, Faculty of Science, Shinshu University, Japan*
[2]*Department of Earth and Planetary Science, The University of Tokyo, Japan*

Several conglomeratic beds containing serpentinite clasts and shallow marine fauna reveal intrusion and subsequent exposure of the serpentinite in the Cretaceous forearc basin of northern Japan. The serpentine-bearing conglomerate is discovered from the Lower Yezo Group of the lower part of the Cretaceous Yezo Supergroup, which is considered to be a forearc basin fill sediment.

The Lower Yezo Group mainly comprises an alternation of sandstone and mudstone with pebbly mudstone and thick-bedded sandstone; all of these were formed as sediment-gravity-flow deposits in deep basin. The conglomerate is associated with calcareous fragments of shallow marine fauna and Early-Middle Albian ammonoid. Isolated oolitic grains, including chromian spinels as nuclei, are frequently observed in the matrix of the conglomerate. Rare detrital blue amphibole grains originating from high P/T type metamorphic rocks are detected.

The serpentine clasts and detrital blue amphiboles reveal that the serpentine mass was extruded from a deeper region of the subduction zone, where high P/T type metamorphism occurred. The bioclasts of sallow marine fauna and oolitic grains, including detrital chromian spinels, also imply that the serpentinite body gets exposed to a warm shallow marine environment. Thus, the body is considered to have been the serpentine diapir intrusion in the Cretaceous forearc basin.

Meanwhile, the evidences of serpentine extrusion and exhumation of the high P/T metamorphic rocks are detected in the form of occurrence of serpentine clasts, detrital chromian spinels, and blue amphiboles in the Albian - Cenomanian sediments. Therefore, the occurrence of the serpentine clasts indicates that the wide area of the forearc was controlled by the distribution of the deep-penetrated-faults as a conduit of serpentine diapir from the supra-subduction zone. Researchers have suggested that large quantities of oceanic-island type greenstone were subducted in northeastern Eurasia margin during the early Cretaceous. Thus, the destructive modification of the forearc region, which was induced by the subducted seamount, may have occurred as a trigger of the serpentine intrusion in the forearc of northern Japan.

Keywords: serpentine diapir, Cretaceous, Albian, forearc basin, chromian spinel, blue amphibole.