

Detrital clinopyroxene and zircon in the Tokoro Belt, Hokkaido: Insight to Cretaceous magmatic arc in the Sea of Okhotsk

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Basement of the Sea of Okhotsk consist of ~20 km thick continent-like crust. Jurassic and younger granites and volcanic rocks have been dredged from its sea floor. It is thus regarded as a continental block (Okhotsk Sea Block: OSB). However, rocks suggestive of Precambrian basement and Paleozoic strata common in continental blocks in NE Asia derived from the super-continent have not been found from the sea. Therefore, the origin of OSB is left unknown and could be different from the common continental blocks. It is however difficult to directly explore the OSB basement in detail because it is mostly submerged in the sea. Cretaceous and Paleogene in the Nemuro and Tokoro belts of eastern Hokkaido belong to the paleo-Kuril arc of the OSB margin. They are characterized by volcanogenic sandstones, whose clastic sources are assumed to be a volcanic arc in OSB. They can thus be a key to understand age and composition of OSB. This paper tests chemical composition of clinopyroxene and ages of zircons in sandstones of the Tokoro Belt. Detrital clinopyroxenes are common in sandstones of the Nikoro Group (middle? Cretaceous accretionary complex), Saroma Group (Late Cretaceous forearc basin), and the Yubetsu Group (early Paleogene accretionary complex). All of analyzed clinopyroxene grains are poor in titanium and resemble to those of island arc volcanics. The Nikoro and Saroma sandstones contain scarce and tiny zircon crystals. Among them, grains with enough sizes for LA-ICPMS measurement yielded approx. 90-100 Ma. On the contrary, the Yubetsu sandstone yielded abundant zircon grains, whose U-Pb ages cluster in the Late Cretaceous (65-80 Ma), Jurassic, Permian, and Paleoproterozoic to Neoproterozoic. A large age gap exists between 430 and 1600 Ma in the sample. Occurrences of detrital zircons suggest that a distinct change in clastic supply occurred in the end of Cretaceous. Detrital zircons in the Yubetsu sandstone share the common age distribution with those in the NE Japan arc, whereas the Yubetsu Group still has characteristics of paleo-Kuril arc with abundant intermediate to mafic volcanic clasts and clinopyroxene composition common with the Nikoro and Saroma groups. Such coexistence of both NE Japan (Eurasia) and Kuril (Okhotsk) natures in the Yubetsu Group is consistent with the dual provenance model by Nanayama (1992), in which the group deposited at the junction between the two arc-trench systems. It is reasonable to consider that the two arcs joined in late Late Cretaceous, so far as no sign of clastic supply from the Eurasia is found in the Saroma and Nikoro groups. These groups formed before the coupling might be more important to examine the origin of OSB using clastic composition.

Keywords: Tokoro Belt, Okhotsk Sea, Paleo-Kuril arc