Zircon U-Pb ages and felsic volcanic clasts in the Lower Cretaceous Rebun Group, Hokkaido

*Nozomu Suzuki[1], yusuke Sugiyama, Hayato Ueda[1]

1. Niigata University

The Rebun - Kabato Belt, is characterized by Early Cretaceous arc volcanic and volcaniclastic rocks. The belt extends to the Harachiyama Formation of NE Honshu (Kitakami Mountains) in the south and Moneron Island offshore Sakhalin in the north. The Rebun –Kabato belt has been assumed to be a clastic source for the Sorachi Group, which comprise an accreted or trapped ocean basin in central Hokkaido. Thus, history and composition of volcanic activity in the Rebun-Kabato Belt is important to reconstruct oceanic plate configuration offshore Japan in the Early Cretaceous. This study examines stratigraphy, age, and clastic composition of the Rebun Group in Rebun Island and discusses on the cryptic basement on which the arc volcanic activity occurred.

We divided the Rebun Group into seven stratigraphic units (J, US1, and UN1 to UN5). The lowermost unit J is composed of thin-bedded volcaniclastic turbidites and massive volcaniclastic conglomerates, The overlying units are composed of volcaniclastic sandstone and conglomerate, and partly with tuff breccia and lapilli tuff. US1 unit consists both of conglomerate and sandstone. UN1, UN3 and UN5 unit are gravelly, and the UN2 and UN4 units are dominated by sandstone.

Bulk-rock silica contents of 26 volcanic clasts were diverse ranging from basaltic andesite to rhyolite, in spite that no felsic rocks have been known to occur in the Rebun Group. All the volcanic clats are subalkaline and tholeiitic. They can be subdivided into high-Ti and low-Ti groups. The high-Ti group show a typical tholeiite trend with evidently increasing TiO2 and FeO along with differentiation. The low-Ti group show increasing SiO2 and decreasing TiO2 and FeO somewhat similar to calc-alkaline rocks. The felsic clasts are metaluminous.

We obtained zircon U-Pb ages from a tuff bed in unit J. Concordant ages ranging from 110-142 Ma shows a skewed peak of probability density suggesting a mixture of two age groups averaging 123 Ma and 136 Ma. The younger and more dominant 123 Ma group is considered to represent the sedimentary age. The older group zircons probably originated either from xenocrysts inherited in the magma chamber or accidental grains involved during eruption and/or transportation. In both cases, the older zircons suggest an age of the host crustal rocks in which the felsic magma developed and erupted.

Occurrences of felsic rock clasts from the lowermost unit of Rebun Group imply that the underlying crust had already been more or less mature until 123 Ma. The crust was probably dominated by juvenile igneous rocks because of metaluminous composition of rhyolites and the absence of old inherited zircons in the tuff. The underlying crust could be oceanic because the belt neighbors the Sorachi-Yezo Belt in the east, where oceanic basalts are also overlain by arc-derived detritus. On the other hand, felsic magma in the Harachiyama Formation as a southern extension of the Rebun –Kabato Belt is considered to have developed within the underlying Jurassic accretionary complex of Eurasian margin, because some rhyolites are peraluminous and contain inherited zircons of Precambrian ages presumably originated from the host sandstone. These contrasting occurrences suggest that the Rebun-Kabato-Harachiyama arc was formed crosscutting previous plate boundary between Eurasia and the Sorachi ocean basin.

