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Chronology of Early Cretaceous tectonic evolution of the North Kitakami Belt, Northeast Japan

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Introduction We measured the U-Pb zircon age of Lower Cretaceous rocks (part of which is age unconstrained) in the Taro-Tanohata area of the North Kitakami Belt, Northeast Japan, to constrain the age of tectonic evolution. The rock units we studied are the Omoto (sandstone) and Harachiyama (sandstone and dacitic lapilli tuff) formations, the Taro pluton (diorite), and the Raga Formation of the Miyako Group (sandstone).

Geologic Setting Jurassic to earliest Cretaceous accretionary complex (AC) and Early Cretaceous plutonic and shallow-marine sedimentary rocks occur in the Taro-Tanohata area. The Omoto Formation consists of sandstone, mudstone, and minor felsic pyroclastic rocks. The formation was correlated with the Berriasian-Valanginian because of its stratigraphic position and the common occurrence of the Ryoseki-type flora with the Berriasian-Valanginian Ayukawa Formation of the South Kitakami Belt (Sugimoto, 1974). The overlying Harachiyama Formation consists mainly of andesitic to dacitic lava and pyroclastic rocks with the K-Ar hornblende age of 122 $\pm$ 5 Ma although the age has been interpreted to be of contact metamorphism by later granitic plutons. (Shibata et al., 1978). The Taro diorite cutting the two formations has K-Ar hornblende ages of 120-110 Ma (e.g., Kawano and Ueda, 1965). The Miyako Group, covering the Taro diorite, yields ammonoids such as *Hypacanthoplites subcornuerianus* and *Valdedorsella akuschaensis* and has been correlated with the Upper Aptian-Albian (Hanai et al., 1968). In summary, the magmatic or depositional age of the Early Cretaceous rocks except for that of the Miyako Group has not well been constrained.

Age determination The U-Pb age of igneous detrital zircons extracted from the studied rock units was measured with the LA-ICP-MS equipped in the Graduate School of Environmental Studies of Nagoya University. The results were as follows. The age of the youngest zircon from the sandstone sample of the Omoto and Harachiyama Formations was 132.3 $\pm$ 3.5 Ma and 119.0 $\pm$ 4.7 Ma, respectively. The zircon ages from the lapilli tuff sample of the Harachiyama Formation clustered around 126 Ma and 133 Ma, with the concordia age of the former cluster (5 grains) of 126.3 $\pm$ 2.0 Ma. The zircon ages from the Taro diorite clustered around 120 Ma and 128 Ma, with the concordia age of the former cluster (5 grains) of 121.0 $\pm$ 2.2 Ma. The age of the youngest zircon from the sandstone sample of the Raga Formation of the Miyako Group was 117.5 $\pm$ 3.1 Ma.

Discussion Previous studies have proposed that the Omoto and Harachiyama formations, together with the underlying AC, were involved in NS-trending folding and sinistral strike-slip shearing. Granitic plutons cut these geologic units and structures coevally with NS-trending dip-slip shearing (e.g., Minoura and Tsushima, 1984). Our new U-Pb data constrain the age of tectonic evolution as follows. The Omoto Formation was deposited at 136 Ma (Valanginian) or later and was covered with the Harachiyama Formation with the dacitic lapilli tuff of 128.2-124.2 Ma (Barremian-Early Aptian) and sandstone of 123.7 Ma (Early Aptian) or younger. NS-trending folding and sinistral shearing followed and were cut by Taro diorite at 121.2 $\pm$ 2.2 Ma (Aptian) coevally with NS-trending dip-slip shearing. Finally the Miyako Group covered all of the above elements at 120.6 Ma (Late Aptian) or later.

Keywords: U-Pb age, zircon, LA-ICP-MS, Northeast Japan, North Kitakami Belt