

U-Pb geochronology of detrital zircons from the Magisawa and Omoto formations in the North Kitakami Belt (NKB), NE Japan

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INTRODUCTION U-Pb analyses of detrital zircons from sandstone samples of the Magisawa and Omoto formations in the eastern part of the NKB, NE Japan, were carried out to constrain the age of sedimentation and provenance. Moreover the degree of possible dispersion of some statistical values was estimated from the analyses of four sandstone samples of the Magisawa Formation.

GEOLOGIC SETTING The study area lies in the eastern marginal part of the Akka-Tanohata Subbelt in the NKB, and comprises, in younging order, (1) the Magisawa Formation, consisting of Triassic to Late Jurassic chert-clastics sequences, (2) the Omoto Formation, consisting of sandstone, mudstone, and pyroclastic rocks, (3) the Harachiyama Formation, consisting of andesitic to rhyolitic pyroclastic rocks, (4) Early Cretaceous granite cutting these geologic units, and (5) the Late Aptian-Albian Miyako Group, consisting of clastic rocks. Minoura and Tsushima (1984) further divided the Magisawa Formation into nappes I, II, and III, in ascending order, among which we collected 4 sandstone samples from the upper part of Nappe II. The Omoto Formation is assumed to be of earliest Cretaceous (Berriasian-Valanginian) age, from plant and molluscan fossils (Sugimoto, 1969). K-Ar ages of 114-121 Ma have been reported from the andesitic volcanic rocks in the NKB and SKB, correlative with the Harachiyama Formation (Shibata et al., 1978; Mikoshiba, 2002).

RESULTS The U-Pb dating of the zircons was carried out with the LA-ICP-MS equipped in the Graduate School of Environmental Studies of Nagoya University. The results are summarized as follows. (1) **Magisawa Formation:** Four data sets from the sandstone samples of the formation all clustered at 300-160 Ma and 2100-1700 Ma, with the youngest concordant age of 160.3 +/- 3.1 Ma. The proportion of Precambrian zircons in each sample (%Pc) ranges from 60% to 90%, with the average of 71.3% and standard deviation of 12.7% (17.8% of the average). The correlation coefficients of two of the four data sets range from 0.71 to 0.98. (2) **Omoto Formation:** The zircon ages also clustered at 300-160 Ma and 2100-1700 Ma, with the youngest concordant age of 132.3 +/- 3.5 Ma. %Pc of the Omoto zircons, 40%, was significantly lower than that of the Magisawa zircons.

DISCUSSION (1) **Age of sedimentation:** The age of Nappe II of the Magisawa Formation is assumed to be Oxfordian to Kimmeridgian, because (i) the siliceous mudstone Nappe III, overlying Nappe II, yields Late Jurassic (Oxfordian) radiolarians (Matsuoka and Oji, 1990), and (ii) the chert-clastics sequence in the accretionary prisms in Japan usually has downward-younging age polarity. The youngest zircon age from the Magisawa sandstone (160.3 +/- 3.1 Ma; Oxfordian), which marks the upper limit of the age of sedimentation, is concordant with the assumption. The youngest zircon age from the Omoto sandstone (132.3 +/- 3.5 Ma; Valanginian-Hauterivian), on the other hand, is most likely the age of sedimentation, because the volcanic activity that formed the pyroclastic rocks of the formation may have supplied coeval zircons in the sandstone. The age gap of 28 m.y. between the Magisawa and Omoto formations, together with the slight structural obliquity between the two formations (Minoura and Tsushima, 1984), suggests an unconformable relationship. (2) **Provenance:** The two sandstones presumably had the same continental provenance with abundant Paleoproterozoic rocks, because they have common zircon age clusters at 160-300 Ma and 1700-2100 Ma. The lower %Pc of the Omoto sandstone can be explained by the "dilution" of Paleoproterozoic zircons with coeval igneous zircons. (3) **Statistical dispersion:** The four data sets from the Magisawa Formation all show common major age-clusters, and encourage us that we can grasp major age clusters of a geologic unit with a single sample. However the %Pc values from the data sets warn us that %Pc can disperse some 18% of the average even in a single geologic unit.

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