

## New zircon U-Pb age data from “Nagasaki Metamorphic Rocks” (*sensu lato*) in the Nomo Peninsula, Southwest Japan

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### Introduction

Nagasaki Metamorphic Rocks (NMR) are distributed in the Nishisonogi and Nomo peninsulas of Nagasaki Prefecture and the Amakusa Shimoshima Island of Kumamoto Prefecture, SW Japan. Miyazaki and Nishiyama (1989), Nishimura et al. (2004), Takeda et al. (2002), and other researchers proposed that NMR in the Nomo Peninsula consist of Sanwa Formation (=Late Cretaceous Sambagawa Metamorphic Rocks), Joyama Mylonite (=Early Cretaceous Higo Metamorphic (Plutonic) Rocks), Nomozaki Formation (=Triassic (to Jurassic?) Suo Metamorphic Rocks and Late Cambrian Nomo Metagabbro Complex). Miyazaki et al. (2016) proposed to exclude Nomozaki Formation from NMR. In this study, we measured the zircon U-Pb ages of NMR (including the Nomozaki Formation) and organized geochronological data (see attached table).

### Geologic Setting

NMR consist of Sanwa Formation, Joyama Mylonite, and Nomozaki Formation, in apparent ascending order. Sanwa Formation is composed mainly of pelitic schist in the garnet to biotite zone and mafic schist that contain albite spot. K-Ar phengite ages of the pelitic schist are 86-68 Ma (Ueda and Onuki, 1968). Joyama Mylonite is composed pelitic-psammitic gneiss and granitic mylonite, and contains hornblende metagabbro and amphibolite. K-Ar phengite ages of the pelitic-psammitic gneiss are 92 Ma and 84 Ma (Takeda et al., 2002). Nomozaki Formation is composed mainly of interlayered mafic, psammitic and pelitic phyllites in the chlorite zone, accompanied by limestone lenses. K-Ar phengite ages of the pelitic phyllite are 254-153 Ma (e.g. Nishimura, 1998). In addition, above the phyllites, there is Nomo Metagabbro Complex, which consists mainly of metagabbro and amphibolite (Igi et al., 1979), accompanied by calcareous, mafic and pelitic phyllite blocks. Cretaceous granite and aplite have baked Nomozaki Formation (e.g. Nishimura, 1998 ; Oshima, 1968).

### Samples and method

We separate zircons from the pelitic schist in the garnet zone (Sanwa Formation), the hornblende metagabbro and granitic mylonite (Joyama Mylonite), and the pelitic phyllite block (Nomo Metagabbro Complex). The U-Pb isotopic analysis was conducted with the LA-ICPMS equipped in the Graduate School of Environmental Studies, Nagoya University.

### Age dating results

**Pelitic schist:** The age composition of zircons (%) was as follows: Late Cretaceous (6.7), Early Cretaceous (4.4), Jurassic (48.9), Triassic (8.9), Permian (8.9), and Paleoproterozoic-Archean (22.2). The  $^{206}\text{Pb}/^{238}\text{U}$  age of the youngest zircon (YZ) was 90.3 +/- 3.5 Ma, and the weighted average of the  $^{206}\text{Pb}/^{238}\text{U}$  ages of the zircons in the youngest cluster (YC) was 92.1 +/- 1.8 Ma.

**Hornblende metagabbro:** U-Pb data from 16 spots out of 33 gave the concordia age of 113.5 +/- 1.3 Ma.

**Granitic mylonite:** Details are shown in the poster presentation.

**Pelitic phyllite block:** The age composition of zircons was as follows: Ordovician (83.4) and Neoproterozoic-Mesoproterozoic (16.6). The YZ was 444.3 +/- 9.9 Ma and the YC was 457.8 +/- 6.2 Ma.

## Discussion

**Pelitic schist (Sanwa Formation)** : The YZ and YC corresponded to the Turonian (ICS, 2016), suggesting that the depositional age of Sanwa Formation is the Turonian or later. The metamorphic ages of Sanwa Formation (86-68 Ma: Coniasian to Maastrichtian) are concordant with this depositional age.

**Hornblende metagabbro (Joyama Mylonite)** : It was formed at ca. 113 Ma. This age is similar to that of Karasaki Mylonite and Oshima Metamorphic rocks in western Shikoku, Higo Plutonic Rocks in western Kyushu, and Upper Unit of NMR in Amakusa Shimoshima Island (Sakashima et al., 1998 ; Sakashima et al., 2000 ; Sakashima et al., 2003 ; Miyazaki et al., 2013).

**Pelitic phyllite block (Nomo metagabbro complex)** : The YZ and YC were Ordovician (ICS, 2016), indicating that its depositional age is the Ordovician or later. The age is younger than the age of crystallization of the metagabbro in Nomo Metagabbro Complex (ca.526-474 Ma). The zircon age spectrum of the pelitic phyllite is similar to that of the psammitic schist in Renge Metamorphic Rocks (Kouchi et al., 2013) .

Keywords: Zircon, Nagasaki metamorphic rocks, Cretaceous, LA-ICPMS, SW Japan

Unit name	Lithology	Previous study		This study
		K-Ar age	Zircon U-Pb age	Zircon U-Pb (formation) age
Nomo metagabbro complex	metagabbro and amphibolite (phyllite blocks)	592–457 Ma	<b>526–474 Ma</b>	<b>458 Ma or later</b>
Nomozaki Formation	phyllite (chlorite zone)	252–153 Ma	238 Ma	
Joyama Mylonite	Hbl metagabbro–amphibolite granite mylonite high-T metamorphic rocks	92 Ma, 84 Ma		<b>113.5 Ma</b> <b>120–100 Ma</b>
Sanwa Formation	schist (garnet zone–biotite zone) serpentinite	86–68 Ma (91 Ma)	(108–105 Ma)	<b>92 Ma or later</b>