Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

SGL43-P01 Room:Poster Time:May 1 18:15-19:30

K-Ar whole rock dating of the metamorphic rocks in the Yorii-Ogawa area of the north-eastern part of the Kanto Mountains

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[1]none

Atokura Nappe is widely exposed in the Yorii-Ogawa area. It is mainly composed of Permian granitic rocks, Cretaceous Atokura Formation, Cretaceous pyroclastic rocks, Paleogene Yorii Formation and Paleogene Kiroko greenstone melange (Figure 1). Mid-Cretaceous metamorphic and granitic rocks are also distributed as small tectonic blocks. Kiroko greenstone melange mainly consists of high-pressure-type metamorphic rocks (Kiroko metamorphic rocks), meta-gabbro, meta-tonalite, serpentinite, epidote amphibolite and amphibolite. The Atokura Nappe tectonically overlies on the Mikabu greenstones and Chichibu Complex.

K-Ar whole rock ages of the Kiroko metamorphic rocks were determined on three slates and one mafic rock. The results for the slates are 127Ma, 117Ma and 115Ma. Whereas the K-Ar whole rock age of the mafic rock is 57.4Ma. The older ages of the slates are due to the presence of detrital white mica [1]. Based on the results of the K-Ar ages, the Kiroko metamorphic rocks are regarded as members of Sanbagawa metamorphic rocks. This conclusion reveals that nappe tectonics took place even in the region where Sanbagawa metamorphic rocks were exhumed.

The nappe tectonics occurred at many times in Cretaceous and Paleogene forearcs of Southwest Japan. In the northeastern part of the Kanto Mountains weakly metamorphosed Chichibu complex lie on the Mikabu greenstones by thrust faults [2, 3]. The existence of unconsolidated fault gouges suggests the formation of the thrust faults in a surface part of the crust. The thrust faults were formed by Cretaceous nappe tectonics before the formation of the Atokura Nappe.

Radiometric dating of the metamorphic rocks of the Chichibu and Mikabu belts is lack in the surveyed area. Hence, K-Ar whole rock dating was performed on a muscovite-chlorite schist from the Mikabu belt and a slate from the Chichibu belt. The results are presented on the left side of Figure 1. Locations of the samples are described below and are shown by star signs in the geological map.

The sample Yorii-Mikabu is a pelitic schist of the Mikabu belt exposed near the River Arakawa, Yorii town. The sample Sekisonzan is a weakly metamorphosed slate of the Chichibu belt which was exposed near Mt. Sekisonzan, Ogawa town. The sample Suguro-P2 is a black slate rich in carbonaceous materials and fine white mica. The location of the slate is loc. d of Ref. [1]. It is a member of the Kiroko metamorphic rocks.

Particle sizes of white micas vary considerably for each slate specimen studied. This is an evidence for insufficient recrystallization of white mica during regional metamorphism. Therefore, K-Ar whole rock ages of all the studied slates are older than the assumed metamorphic ages.

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[2] K.Sudo and K.Matsumaru, 1973, Bull. Chichibu Mus. Nat. History, 17, p.13-24.
[3] T. Kimura, 1977, Abs. Geol. Soc. Japan Meeting, p.104.

Keywords: Kanto Mountains, Yorii-Ogawa area, Mikabu greenstones, Chichibu Cmplex, K-Ar dating, Nappe

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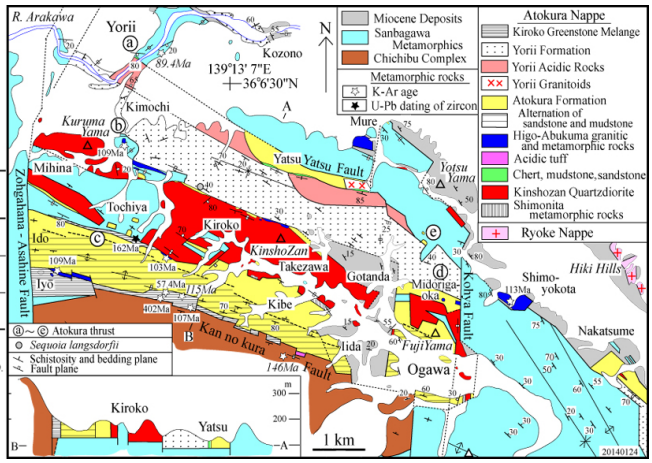
New K-Ar whole rock ages of metamorphic rocks from the Yorii-Ogawa area

Sample	Age (Ma)	^{40}Ar rad (scc/g x10^{-5})	^{40}Ar rad (%)	K (%)
Yorii-Mikabu	89.4 ± 2.2	1.34	95.9	3.76
		1.34	95.1	3.76
Sekisonzan	146 ± 4.0	1.60	95.2	2.75
		1.66	95.4	2.76
Suguro-P2	115 ± 3.0	1.86	97.4	4.01
		1.84	97.9	4.01

λ_β =4.962×10^{-10}/yr , λ_ε=0.581×10^{-10}/yr
^{40}K/K=0.01167 atom%
Geospace Science CO.,LTD.



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Detrital zircon geochronology of the Tetori Group in the Arimine and Itoshiro areas, central Japan

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Introduction Provenance of the Tetori Group in the Arimine (Toyama-Gifu prefs.) and Itoshiro (Fukui Pref.) areas was analyzed using detrital zircon age distribution. In the course of the study, zircon ages of the Hida gneiss and granitoid were also determined.

Geologic Setting The Tetori Group consists of Middle Jurassic to Early Cretaceous shallow marine to terrestrial deposits. The group is divided, in ascending order, into the Kuzuryu, Itoshiro, and Akaiwa subgroups in the Itoshiro area (Maeda, 1961), and into the Higashisakamori, Nagatogawa, and Atotsugawa formations in the Arimine area (Kawai & Nozawa, 1958); the lower, middle, and upper units of the two areas have been correlated with each other. The lower members of the Nagatogawa-Atotsugawa formations consist of gravelly deposits of eastward running braided rivers, whereas the upper members consist of sandstone and mudstone of southward running meandering rivers. The U-Pb age of a tuff bed in the upper member of the Atotsugawa Formation is 120.0 +/- 1.2 Ma.

Zircon ages from surrounding areas The Hida Gneiss to the west of the Arimine area contains abundant 250-220-Ma zircons (Sano et al., 2000). The Korean Peninsula is mainly occupied by Archean-Paleoproterozoic basements of the Nangnim and Yeongnam massifs, covered with Cambrian-Jurassic deposits and cut by 250-160-Ma granitic rocks (e.g. Zhao et al., 2005). On the other hand, Northeast China between the Jiamusi Massif and the Songliao Basin, famous for " Phanerozoic crustal growth " (Wu et al., 2000), is composed primarily of 250-160-Ma granitic rocks and virtually no Precambrian rocks.

Samples and method of study U-Pb ages of zircons from (1) sandstone and sandy siltstone samples from six formations (members) of the Tetori Group from each area, (2) the Shimonomoto, Funatsu and Utsubo bodies of the Hida granite around the Arimine area, and (3) the Hida meta-granite on the north of the Arimine area were determined with laser ablation inductively coupled mass spectrometers (LA-ICP-MS) equipped in the Earthquake Research Institute of the University of Tokyo and Graduate School of Environmental Studies, Nagoya University.

Results There was marked difference in the percentage of Precambrian zircons (%Pc) between the Itoshiro-Akaiwa subgroups and the Nagatogawa-Atotsugawa formations: i.e. the %Pc of the former is 80 or more whereas that of the latter is less than 10. The samples of the Itoshiro-Akaiwa subgroups contained abundant 2500-1500-Ma zircons and a couple of Archean zircons. Age peaks of 190-170-Ma and 250-220-Ma were commonly seen for all samples of the Tetori Group. Among them, the peak of 250-220-Ma was higher in the braided river deposits and that of 190-170-Ma was higher in the meandering river deposits in the Arimine area. The Shimonomoto, Funatsu, Utsubo, and meta-granite bodies mainly contained 200-180-Ma, 250-190-Ma, 205-185-Ma, and 280-220-Ma zircons, respectively, and 180-170-Ma zircons were rare in the Hida Belt.

Discussion The meandering-river deposits in the Arimine area contain abundant 180-170-Ma zircons, which are virtually absent in the Hida Belt, and very few Precambrian zircons (%Pc $<$10). The catchment of the meandering rivers must have been occupied by Triassic-Jurassic igneous rocks with narrow exposures of Precambrian rocks. Considering the geology of eastern margin of Asia, the meandering rivers most likely passed through Northeast China (Jiamusi-Songliao). On the other hand, the braided river deposits of the area contain many 250-220 Ma zircons, suggesting that they were likely supplied at the time of uplifting of the Hida gneiss to the west. On the other hand, the Itoshiro-Akaiwa subgroups have abundant Precambrian zircons (%Pc $>$80). Possible candidates of the Precambrian exposure that could supply the sediments of these subgroups are the Yeongnam-Nangnim massifs. Hence the sediments of the Itoshiro-Akaiwa subgroups were likely carried by rivers that passed through the massifs.

Keywords: U-Pb age, detrital zircon, LA-ICP-MS, Tetori Group, Northeast China, East Asia

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Quaternary Tectonic Environments in North-Central Japan

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The present-day central Japan is located at the convergent junction area among four tectonic plates, Amur, Okhotsk, Philippine Sea and Pacific plates. The Toyama Trough - Fossa Magna region is a major tectonic depression bounding the contrasting, tectonic provinces, i.e. the Northeast Japan (NEJ) arc on the Okhotsk plate and the Southwest Japan (SWJ) arc on the Amur plate. The north-central Japan on the Japan Sea side of Honshu Island is characterized by the latest Cenozoic thrust/fold belts, which are considered as the results of a series of inversion/conversion tectonics in relation to the Quaternary changes in relative motion between Eurasia/Amur and Philippine Sea plates.

This paper aims at describing these changes in crustal movements including active tectonics, and evaluates the existing hypotheses on the plate tectonic framework.

At the end of Pliocene in the NEJ arc, typical basin inversion has been occurred along the NE-SW trending, boundary faults of the Miocene sedimentary basins. While, on the side of SWJ arc, boundary faults of the Miocene basins were not reactivated, but other preexisting fractures have been reused to form the reverse fault and strike-slip fault provinces in response to N-S compression due to the Early Pleistocene northward subduction of the Philippine Sea plate, and to E-W compression due to the eastward motion of Amur plate, although the Present tectonic zone of strain concentration is probably related to the subduction of Pacific plate. In order to account for the Quaternary tectonic environment with a widespread stress field of strike-slip faulting in the basement as inferred from focal mechanism solutions, an accommodation mechanism is likely to have been worked in the asthenospheric mantle of the present arc-arc collision zone.

Considering the above neotectonic circumstances from the existence of the tectonic inversion of north-central Japan and stress field of the seismogenic layer, the hypotheses on eastward motion of Amur plate and on the nascent plate-boundary along the eastern margin of Japan Sea were positively evaluated.

Keywords: Amur Plate, Toyama Trough, Fossa Magna, Quaternary, neotectonics, north-central Japan

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Fracture system in the Sawara Granite at the area beside the Hinatatoge-Okasagitoge Fault, northern Kyushu

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The Hinatatoge-Okasagitoge Fault has been identified by recent research. This fault continues to the Maebaru and Itoshima-hanto-oki Faults Group, and forms a single fault zone (Shimoyama et al., 2013). Activity rank of this fault is estimated C class. We recorded fractures in the Sawara Granite at the area beside the Hinatatoge-Okasagitoge Fault, and examined formation history of fracture system.

The fractures in the surveyed area are classified by their orientations into three types: NNW-SSE to NW-SE-oriented high-angle fractures, ENE-WSW-oriented high-angle fractures, and low-angle fractures. The fractures are further divided into three groups: minor faults associated with cataclasite, minor faults associated with fault gouge, and joints.

Based on the crosscut relationships of these fractures and the mineralization along joints, the formation process of the fractures related to activity of the Hinatatoge-Okasagitoge Fault involves five stages.

The minor faults associated with cataclasite were formed at the first stage. The laumontite veins were precipitated in spaces formed by the opening of joints at next stage. At the third stage, the minor faults associated with fault gouge were formed. The stilbite veins were precipitated in spaces formed by the opening of joints at next stage. At the last stage, the minor faults associated with fault gouge were formed.

Keywords: Hinatatoge-Okasagitoge Fault, Sawara Granite, fracture system, hydrothermal activity

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Bouguer gravity anomaly related to Cretaceous volcanic rocks in the Yanahara area, Okayama prefecture, SW Japan

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Cretaceous volcanic rocks (volcanic, pyroclastic and lesser sedimentary rocks) unconformably overlying the basement rocks composed of the Maizuru Group and the Yakuno complex are widely distributed in the region from Okayama to Hyogo Prefectures, central Chugoku, SW Japan. Remarkable low gravity anomalous areas observed in the region of these volcanic rocks suggest some cauldrons. Total 610 observation points including 411 new points and 199 published points (GSJ, 2000; Shichi and Yamamoto, 2001) depict a detailed Bouguer gravity anomaly map of the Yanahara district through the band-pass filter between 1 to 30 km after the terrane and Bouguer corrections with a density of 2670kg/m3.

The Bouguer gravity anomaly map reveals low gravity anomalous areas corresponding with the Cretaceous volcanic rocks and the related granitic intrusive rocks; whereas high gravity anomalous areas corresponding with the Maizuru Group and the Yakuno complex.

The low gravity anomalous areas of the Yanahara district are observed in two parts: western and northeastern areas. The western low gravity anomalous area, measuring 20×7km in size, shows a flat-floor type anomaly surrounded with high gradient margins. The relative anomaly value is 8mgal less than that of the peripheral area. This suggests a flat-floor caldera (cauldron) filled up with thick rhyolitic volcanic rocks. This inferred caldera was possibly produced 80Ma, because quartz diorite intruded into this caldera has been dated as 79.8±1.8Ma by biotite K-Ar method.

Another area northeast of Yanahara shows an elongated funnel floor surrounded with high gradient margin. The anomaly value is 7mgal less than that of the peripheral area. This value is nearly equivalent to the gravity anomaly in the above mentioned western area. Accordingly, another lesser cauldron possibly lies in this area.