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SGL44-01 Room:101B Time:May 23 15:30-15:45

Accretionary age of Pale-Tethys subduction in northern Thailand: Constraints from U-Pb age of detrital zircon

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These Paleo-Tethyan rocks in Thailand characterized by Ocean Plate Stratigraphy were subducted beneath the Indochina Block during the Permian to Triassic (Wakita and Metcalfe, 2005). In the Inthanon Zone of northern Thailand, melanges occur in association with oceanic rocks of Paleo-Tethys origin (Hara et al., 2009). Accretionary age related to the Paleo-Tethys subduction has not been clarified in northern Thailand because of absence of fossils from clastic rocks. For understanding accretionary age, we examined U-Pb ages of detrital zircon of sandstone collected from the Inthanon Zone, by using LA-ICPMS.

Keywords: Paleo-Tethys, melange, zircon, U-Pb age, Thailand

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Publication of Geology of Nago and Yambaru district, northan and central Okinawa main-island

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This abstract is in Geology of Nago and Yambaru district. The geological map occupies the northern and central Okinawa main-island. The district is basemental geologically divided into the Ie, Nakijin, Motobu, and Nago, and Kayo zones. The latter Nago and Kayo zone corresponds to the Crataceous Shimanto zone of Southwest Japan, but the former early Cretaceous Ie and Motobu zone corresponds to e. g., the Jurassic northern Kitakami and related zones of Northeast Japan, not with the Chichibu zone of Southwest Japan. In this district, the Ie zone, and then the Triassic Nakijin zone occupies the highest structural position by the Hedo reverse fault, but it followed lateral tectonic translation from tropical zone. It is a primary characteristic that the hanging wall Anne Unit of the Motobu Complex separated from the footwall of more metamorphosed Nago Complex, by the Kijoka detachment fault. The Motobu complex is devided into the two units by the additional major detachment fault. Exhumation of the metamorphic rocks, consisting mostly of the Nago Complex, especially the Miyagi Unit, exhumed by this later D2 brittle event, which includes also major reverse faulting, assymetric folding, and reversing of strata. Early D1 event is a ductile non-coaxial deformation less than outcrop-scale, but associated with prograde metamorphism. Overthrust nappe of the Nakijin Complex is included in later D2 phase. Also the juxtaposion of the Nago and Kayo complexes is by the Futami reverse fault included in D2, but the Kayo complex is characterized by D1 coaxial deformation including major assymetric folding.

The Valanginian to Hauterivian Ie complex consists of sandstone and mudstone, and includes exotic blocks of red chert, limestone, and basalt. The Carnian Nakijin conplex consists of marl and basalt, but includes exotic blocks of Permian calcareous schist at Hedo-misaki. The Valanginian to Hauterivian Motobu Complex includes the Anne and Yanaza Units, bounded by the Yaedake detachment fault. The hangingwall Yaedake Unit is distributed in the Motobu Peninsula, and consists of sandstone and mudstone as a matrix, and includes exotic blocks of Tyriassic chert, Permian limestone, and basalt. The Anne Unit consists of an alternated psammitic and pelitic schist, but includes exotoc blocks of mafic, calcarenous, and siliceous schists. The Albian Nago Complex includes the Miyagi, Inogama, and Oku Units, but only contains trace fossils. The Miyagi Unit occupies the western flank of backbone range, the Inogama Unit lies on the range, also within fenster, and along eastern coast, and the Oku unit occupies the eastern flank, in general. The Miyagi Unit consists of mafic schist below and pelitic schist and then thin alternated psammitic and pelitic schist above. The Inogama Unit consists of thick alternated psammitic and pelitic schist, and conformably overlies the Oku Unit. The Oku Unit consisits of pelitic schist, siliceous schist (silicic tuff), and thin alternated psammitic and pelitic schist. The Eocene Kayo complex consists of alternated sandstone and mudstone, but contains hemipelagic mudstone at Henoko misaki.

The cover sediments are the Upper Miocene and Pliocene Shimajiri Group, and the Pleistocene Ryukyu Group, consisting of the Kunigami, Guga, Nakoshi, and Naha Formations. The Kunigami Formation is a constituent of the higher terrace, the Guga Formation represents a coastal river valley and fan truncates the higher terrace, but partly deposited in a half graven bounded by the Nago fault, the Nakoshi Formation is a marine sediments covered the Guga Formation, and the Naha Formation, deposited on the Nakaoshi Formation, is a reefal but detrital limestone, which formed a kind of two terraces. The Pleistocene is strongly affected by NW-SE trending normal faulting, other than NE-SW trending Nago fault. These active faults are responsible for the opening of the Okinawa trough. The present morphology and sedimentation reflects the active faulting.

Keywords: Okinawa main island, colored geologic map, full colored text book 209p., Geology of Nago and Yambaru district, Nago Museum

SGL44-03 Room:101B Time:May 23 16:00-16:15

U-Pb ages of detrital zircons from the Ashidani Formation in the Kuzuryu area, the Hida Gaien Belt

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The Hida Gaien Belt lies between the Hida Belt and the Mino Belt, and is sporadically traced from the Oumi area, through the Renge, Hapoone, Asahi-Shiroumadake, Fukuji, Takayama, and Naradani, to the Kuzuryu area. The Hida Gaien Belt in the Kuzuryu region, the sedimentological and chronological study of the Motodo Formation, radiolarian fossil study of Silurian-Devonian, and stratigraphic and chronological study of the Tomedoro and Konogidani formations, the results of recent years are remarkable geological. For these studies, the Ashidani Formation in the Kuzuryu area since 1967, has not been studied at all. In addition, in the Kuzuryu area, the Ashidani Formation is a stratum has been left as the only age-unknown formation because it does not produce fossil. Based on the above situation, the present study, re-examine the Stratigraphy of the Ashidani Formation, and was carried out U-Pb dating of detrital zircons in order to estimate the geological age.

The Ashidani Formation is distributed almost in east-west direction on the north of the Lake Kuzuryu-ko. The formation strikes N50W to E-W, and dips steeply to the south, with some exceptions of north-dipping sites. The Ashidani Formation is subdivided into three parts: the Lower, Middle, and Upper members.

The Lower Member consists mostly of black shale alternating with thin sandstone layers. The Middle Member is a sandstone-rich member and varies in thickness from 100 m to 250 m. Fine- to coarse-grained and grey to green schistose sandstone is characteristic in the Middle Member. The granite gravels are included in the Middle Member. The Upper Member consists mostly of shale rarely intercalating sandstone layers. The upper limit of the member is cut by a fault, and the thickness of the member is 170 m or more. The shale of the Upper Member is generally phyllitic black shale.

Separating the detrital zircons from two samples (A-1, A-2) of green schistose sandstone of the Middle Member, and was carried out SHRIMP U-Pb dating. A-1 sample is sandstone with a weakly schistose structure. A-2 sample is strongly schistose structure, which is sandy schist. The measurement results of detrital zircon ages are 280-220 Ma with both samples, they is largely concentrated in the 280-250 Ma. The Ashidani Formation is limited to the Triassic to Paleogene, because it is intruded into the Neogene andesite.

According to the existing data, has been reported the Yakuno Group of the Maizuru Belt is that there is a peak of detrital zircon ages to 280-210 Ma. The Ashidani Formation is likely correlated with the Yakuno Group, because of detrital zircon ages the Ashidani Formation obtained in this study are included in the range of 280-210 Ma. However, because the sandstone of the Yakuno Group is fine-grained and dark gray to blue-gray sandstone in general, can't correlate the Ashidani Formation and Yakuno Group promptly. On the other hand, the Ashidani Formation may be able to correlate with the Triassic of the Ultra-Tamba Belt, because the Triassic of the Ultra-Tamba Belt contain the green sandstone. In any case, it is considered the Ashidani Formation is the Triassic, but a detailed determination of the geological age is an issue in the future.

Keywords: Ashidani Formation, detrital zircon, Hida Gaien Belt, Kuzuryu area, U-Pb age

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SGL44-04 Room:101B Time:May 23 16:15-16:30

Serpentinite-bearing conglomerate from the Ultra-Tamba Terrane in Kawanishi City: Oeyama ophiolite in Permian forearc?

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The Ultra-Tamba and Akiyoshi Terranes in Southwest Japan are interpreted as a Permian subduction-related accretionary complex. These terranes tectonically underlie the Yakuno ophiolite (Maizuru Terrane) and Oeyama ophiolite, respectively. The Yakuno ophiolite represents Permian crust and mantle of an island arc-marginal basin system along the Eastern margin of East Asia (Ichiyama and Ishiwatari, 2004), and the Oeyama ophiolite does the Early Paleozoic fore-arc lithosphere (Machi and Ishiwatari, 2010). Interpretation was that the Ultra-Tamba and Akiyoshi terranes formed at separate subduction trenches in front of the Maizuru and Oeyama Terranes, respectively.

The Inagawa Complex (Sugamori, 2009) mainly consists of alternating sandstone and mudstone beds and their broken fragments with minor amount of felsic tuff, siliceous mudstone and conglomerate. The felsic tuff and mudstone bear Middle and Late Permian radiolarians, and the complex is interpreted as a Permian subduction-related accretionary complex. The conglomerate of ca. 2 m thick containing serpentinite granules crops out on the floor of the Hitokura Oroji River in Kawanishi City, and is conformably intercalated in mudstone of the Inagawa Complex. The conglomerate contains 5 mm sized granules of felsic tuff, serpentinite and quartzite or mylonite with minor basalt, felsic volcanic rocks, granite, mudstone, sandstone and chert. The chert and mudstone granules contain radiolarian and foraminiferan shells, respectively. The composition of granules suggests that clastics in the conglomerate were derived from Paleozoic sedimentary rocks, ultramafic rocks, metamorphic rocks, granites and arc volcanic rocks.

The serpentinite granules are severely serpentinized, but spinel crystals are well preserved at least in their cores, and exhibit very irregular shapes resembling the so-called ”dancing spinel” that are characteristic to the mantle peridotites of the Oeyama ophiolite. EPMA analyses of spinel cores are done for 5 or 6 points in one serpentinite granule in each of 3 thin sections (TH). Resulted Cr# (=100Cr/(Al+Cr)) data are as follows: TH-1: 50.87+/-0.51, TH-2: 50.33+/-0.22, TH-3: 41.95+/-0.28. The Cr#50-51 spinels are quite common among the western mantle peridotite bodies of the Oeyama ophiolite (Arai, 1980), and the Cr#42 spinels are close to those from the eastern Oeyama body (Cr#35; Kurokawa, 1985). The extremely irregular habit of spinel crystals and their mineral chemistry indicate that they originated in the mantle peridotite of the Oeyama ophiolite.

The clastic grains in the Ultra-Tamba Terrane generally contain abundant felsic tuff. Hayasaka et al. (2010; JGS Meeting abst.) reported that the U-Pb age population of zircon grains from the Ultra-Tamba and Akiyoshi Terranes commonly shows a peak at 270 Ma, corresponding to that of the Yakuno ophiolite rocks (280 Ma) in the Maizuru terrane, and interpreted that the Ultra-Tamba and Akiyoshi Terranes formed by subduction-accretion in front of the Maizuru magmatic arc. However, the conglomerate also includes serpentinites from the Oeyama ophiolite and crystalline schists probably derived from the Sangun-Renge metamorphic belt. These facts remind us of the geological setting such as observed in the NE Japan, Cascades (W USA), and Izu-Bonin-Mariana, where volcanic arcs are accompanied with forearc ophiolite exposures (e.g. Ishiwatari et al. 2006).

The serpentinite granules of the Oeyama ophiolite origin discovered from the Permian accretionary complex of the Ultra-Tamba Terrane indicate that the Oeyama ophiolite was exposed with various Paleozoic sediments, metamorphic rocks and granites in the vicinity of the Maizuru arc, possibly in its forearc area. The island arc-marginal basin system of the Maizuru Terrane may have formed by rifting and spreading of the pre-existing active continental margin as in the case of the Green Tuff volcanism and Japan Sea opening event in Miocene.

Keywords: dancing spinel, island arc-marginal basin system, Sangun-Renge metamorphic belt, Permian accretionary complex, Maizuru (Yakuno) volcanic arc, SE Hyogo Pref. SW Japan

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Tectonostratigraphy of the Omama Complex of the Ashio Belt in the Umeda area, Kiryu City, Gunma Prefecture

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The Jurassic accretionary complex widely distributed in the north of the Kanto Plain is called the Ashio Belt, regarded as the northeastern extension of the Tamba-Mino Belt. Since the mid-1990s, tectonostratigraphic studies have been conducted in the Kuzu area located in the southeastern part of the Ashio Belt (e.g., Kamata, 1996, 1997, 2000); however, the tectonostratigraphic architecture of accretionary complexes in other areas has been unclear. In the Umeda area, Kiryu City, Gunma Prefecture, a Jurassic accretionary complex comprises the Omama and Kurohone-Kiryu complexes (Kamata, 1996). We here describe lithology and geologic structure of the Omama Complex.

In the present study, the Omama Complex is subdivided into two tectonostratigraphic units, Unit A and Unit B. Unit A consists of sheared alternating sandstone and shale and a melange that includes slabs and clasts of chert and a minor amount of limestone and basalt with a muddy matrix. Shale contains probably Middle Jurassic radiolarians. Unit B is a melange containing large blocks of Permian chert and basaltic rocks.

According to Kamata (1997), the Kuzu Complex in the Kuzu area is subdivided into UNIT 1, 2, 3, in structural ascending order. UNIT 1 and 3 are characterized by the tectonic repetition of Triassic chert and Middle to early Late Jurassic clastic sequence, and UNIT 2 is composed of a melange with huge blocks of Permian limestone and basaltic rocks. Based on the lithological characteristics and geologic age, Unit A and B of the Omama Complex can be correlated with UNIT 1 and UNIT 2 of the Kuzu Complex, respectively. In addition, the Middle to early Late Jurassic Kuromatagawa Complex in Niigata Prefecture, composed mainly of coherent sequences of alternating sandstone and shale and slubs of basaltic rocks and chert (Hara and Kashiwagi, 2004), can be correlated with the Omama Complex. Considering the lithology, geologic structure, and age of accretion, Middle to early Late Jurassic accretionary complexes (Kuzu, Omama, Kuromatagawa complexes) occur several times throughout the Ashio Belt with large-scale synclines and anticlines.

Keywords: Ashio Belt, Omama Complex, Jurassic Accretionary Complex

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Upper Carboniferous adakitic granite from eastern margin of the Abukuma Mountain and its geological significance

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East block of the Hatagawa fault in the eastern part of the Abukuma Mountains are considered to the southern extension of the south Kitakami belt (Kubo and Yamamoto, 1990). Wariyama granitic body occurs along the east of the Futaba Fault, juxtaposed to the east of the Hatagawa fault, in eastern end of the Abukuma Mountains. The Wariyama granitic rocks are adakitic granites poor in K_2O and Rb, and similar granitic rocks occur as borehole samples from Matsukawaura (Abe and Ishihara, 1985; Kanaya, 1996) and Tomioka, these adakitic granites are considered to be the southern extension of the Lower Cretaceous adakitic granites in Kitakami (Tsuchiya et al., 2007). However, Ohtomo et al. (2008) described monazite, uraninite, and zircon U-Th-Pb age around 300Ma, and Tsutsumi et al. (2010)described zircon U-Pb SHRIMP age of 293.0 +/- 1.8Ma, 300.3 +/- 1.5Ma, and 304.3+/- 1.7Ma from the granitic rock in the borehole sample in Tomioka. From this, geological position of the Wariyama granitic body should be further studied in detail.

The Wariyama granitic body occurs along the east of the Futaba Fault, eastern end of the Abukuma Mountains, and exhibits an N–S-trending elongated shape about 0.5 to 1.5 x 15 km (Fujita et al., 1988). The Wariyama granitic rocks composed mainly of strongly foliated biotite-hornblende tonalite, which is characterized by poverty of K-feldsper. Kink and microcracking in plagioclase and subgrains in quartz are generaly shown. Nevertheless the degree of foliation shows remarkable local variation, modal compositions of constituent minerals are homogeneous. U-Pb dating of zircons were carried out using Agilent 7500cx quadrupole inductively coupled plasma mass spectrometer (ICP-MS) with a New Wave Research UP-213 Nd-YAG UV (213 nm) laser ablation system (LA) installed at the Kyushu University (Adachi et al., 2012). Zircon grains from biotite-hornblende tonalite (KAKUDA7) are 0.005–0.03 mm, elongated and euhedral with oscillatory zoning. All data concentrate around ca. 300 Ma, 8 analyses from 8 grains define a concordant age of 302.1 +/- 3.9 Ma (MSWD = 5.7, probability of concordance = 0.017). U-Pb zircon age obtained here is similar to those of the granitic rocks from the Tomioka borehole after Ohtomo et al. (2008) and Tsutsumi et al. (2010). Therefore, granitic rocks distributed to the east of the Futaba fault are considered to be adakitic granites of Upper Carboniferous age.

Kobayashi (2000) divided the Paleozoic granitic rocks in Japan into two groups; Ordovician to Lower Carboniferous granites (450-350Ma) and Permian granitic rocks (280-250Ma). In addition, Isozaki et al. (2011) shows five major granitic activity in the geotectonic history of the Japanese Island; Cambrian to Silurian (520-470Ma, 440-400Ma), Permian (280–250Ma), Triassic to Jurassic (240-210Ma, 190-150Ma), Early Cretaceous (110-90Ma), and Paleogene (60–30Ma). In these granitic rocks, Cambrian to Jurassic rocks are mostly digested by the past tectonic erosion processes in the fore-arc domains (Isozaki et al., 2011). Discovery of the 300Ma adakitic granite of this study indicates that the Permian granitic activity began from 300 Ma by the adakitic activity. The occurrence of the typical adakitic rocks indicates the possibility of ridge subduction and/or young plate subduction around 300Ma in the Japanese Island.

Keywords: zircon geochronology, adakite, Wariyama, Abukuma, Upper Carboniferous