

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 serpentitized, 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