

Late Cretaceous detrital zircon from the Eclogite unit of the Sanbagawa belt: implications for exhumation tectonics

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Eclogite facies rocks in the Sanbagawa belt can be classified into two types: 1) coarse-grained mafic-ultramafic complex such as the Iratsu body, and 2) surrounding fine-grained mafic, pelitic and siliceous schists. The former type has poly-phase metamorphic history with an early metamorphic stage in Early Cretaceous (c. 116 Ma), whereas the latter type has short-term history of a Late Cretaceous (c. 90 Ma) subduction-exhumation cycle (Wallis et al. 2009 JMG; Endo et al. 2012 Lithos; Aoya et al. 2013 Geology). However, there is another proposal that entire the high-grade Sanbagawa belt underwent peak metamorphism at Early Cretaceous (120-110 Ma) followed by pervasive retrograde recrystallization during Late Cretaceous (90-80 Ma)(Okamoto et al. 2004 Terra Nova; Aoki et al. 2009 Lithos; Itaya et al. 2011 JAES). To solve the controversial views in geochronology of the high-grade Sanbagawa belt, this study use detrital zircon geochronology to place constraints on the depositional ages of eclogitic pelitic schists at the trench. Zircon grains were separated from two pelitic schist samples from the oligoclase-biotite and albite-biotite zones in the Besshi area of central Shikoku. The sample localities belong to the Eclogite unit (Mouri & Enami 2008 Geology; Kouketsu & Enami 2010 IAR). Separated zircon grains exhibit oscillatory-zoned detrital cores and very thin metamorphic rims on CL images. LA-ICP-MS U-Pb dating of detrital zircon from the oligoclase-biotite and albite-biotite zone samples yields weighted mean ages of the youngest group as 101.7 ± 1.6 Ma (n=12, youngest grain: 94.4 ± 4.8 Ma) and 94.2 ± 2.5 Ma (n=9, youngest grain: 87.6 ± 4.6 Ma), respectively. Zircon rims from the two samples yield metamorphic ages of 90.0 ± 4.1 Ma (n=4) and 86.9 ± 5.7 Ma (n=1), respectively. These results reconfirm Late Cretaceous accretionary complex origin of the eclogite-facies region except for the coarse-grained mafic-ultramafic bodies. Late Cretaceous (c. 90 Ma) subduction of voluminous metasedimentary rocks to great depth (~70 km) resulted in formation and subsequent buoyancy-driven rapid exhumation of the Eclogite unit (consisting of the coarse- and fine-grained types) in the Sanbagawa belt.

Keywords: Sanbagawa belt, eclogite, pelitic schist, zircon, U-Pb age