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Geochronology of the Sanbagawa belt, Southwest Japan

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The high-pressure metamorphic rocks of the Sanbagawa belt, originated from deeply underplated accretionary complexes, show long and narrow distribution from the Kanto Mountains to east Kyushu. The metamorphic rocks are overlain on the south by non- to weakly-metamorphosed accretionary complexes of the Chichibu composite belt, which are, in turn, underlain by Cretaceous accretionary complexes of the Shimanto belt further on the south. The Cretaceous Shimanto belt consists, in apparently descending order, of Late Albian-Turonian (characteristically contains Triassic limestone blocks), Coniacian-Campanian, Campanian-Maastrichtian, and Maastrichtian-Paleogene units. The metamorphic or metamorphic cooling ages from the Sanbagawa belt revealed by the $^{40}Ar/^{39}Ar$ and K-Ar methods are approximately 95-60 Ma, although the peak metamorphic age and the protolith age of the eclogite unit are believed to be 120-110 Ma and Jurassic-Early Cretaceous, respectively.

In spite of the protolith age assumption of the eclogite unit, recent studies have started to show that substantial amounts of the Sanbagawa metamorphic rocks, psammitic schists in particular, have been originated from Late Cretaceous protoliths. The results of recent preliminary studies mentioned above strongly encourage the author to revise the structural division and tectonic history of the Sanbagawa belt. Hence this study aims to carry out the U-Pb age dating of detrital igneous zircons in the Sanbagawa psammitic schists.

The author measured the age of detrital igneous zircons from 18 psammitic schist samples from the Sanbagawa belt in the Kii Peninsula, central Shikoku, and eastern Kyushu. Detrital zircons that show oscillatory zoning structure under cathodoluminescence, a typical feature of igneous zircons, were separated from these samples, and the U-Pb age of each zircon was measured with LA-ICP-MS.

The results of the analysis clearly show that the 18 psammitic schist samples in the Sanbagawa belt were deposited in Late Cretaceous time or a little later. From the regional geologic structure mentioned above, the author proposes that the metamorphic rocks of the Sanbagawa belt, except for the eclogite unit and surrounding rocks occupying 10 % or less of the belt, have presumably been originated from the accretionary complex of the Cretaceous Shimanto belt. In other words, most of the protoliths of the Sanbagawa metamorphic belt had not been accreted to a continental or island-arc margin by the end of Early Cretaceous time, but were accreted from Late Cretaceous to earliest Paleogene times. In the present study, the metamorphic rocks of the Sanbagawa belt originated from the rocks of the Cretaceous Shimanto belt are called the Shimanto metamorphic rocks. The Shimanto metamorphic rocks are subdivided into three units as Lower, Middle, and Upper, from the zircon ages obtained in the present study and lithofacies. The Lower unit was formed in 75-70 Ma (Late Campanian-Maastrichtian) and are almost lacking in the zircons of 150-110 Ma. The Lower unit can be correlated with the Campanian-Maastrichtian unit of the Cretaceous Shimanto belt. The Middle unit is formed about 90 Ma (Turonian) and, is correlated with the Coniacian-Campanian unit of the Cretaceous Shimanto belt. Although chronological data from the Upper unit are scanty, the metamorphic rocks along the southern margin of the Sanbagawa belt contain lenses of calcareous schist yielding Late Triassic conodonts. Judging from the tectonostratigraphical position and lithofacies, the author proposes that this part of the Sanbagawa belt is occupied by metamorphic rocks originated from the Late Albian-Turonian units of the Cretaceous Shimanto belt.