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Zircon U-Pb geochronology and Hf isotopes from the Sanbagawa Metamorphic Belt, Western Shikoku, Japan: evidence for the prevalence for the Late Cretaceous protoliths

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Sanbagawa Metamorphic Belt lies to the south of Median Tectonic Line and is exposed on Kyushu, Shikoku and Honshu Islands in Japan. This belt has been the focus of many studies in recent years since the discovery of young detrital zircon grains (80 - 95 Ma). Samples for this study come from a 2000 m bore hole from north-western Shikoku drilled in an area considered to be part of the Jurassic to Early Cretaceous part of the Sanbagawa Belt. Dating of single zircon grains using the LA–ICP–MS U–Pb dating method shows that all but one sample contain zircons younger than 100 Ma and thus the protoliths are younger than the previously accepted age of metamorphism of the Sanbagawa Belt at ca. 110 Ma. The single sample that contains only zircons dated at 136 $\pm$ 3 Ma, apparently is of volcanic origin and could be a clast representing the source of 130–140 Ma zircons of the sample taken about 120m above this sample. In addition, three surface samples were analyzed. Two of these also contain zircons younger than 100 Ma, whereas the third sample contains only zircons older than 159 Ma.
Hf-isotope values for the younger age group 82-116 Ma, εHf(T) range from -2.4 to +9.6. Zircon grains of 127–146 Ma ages have more positive εHf(T) values of +11.5 to +19.0 indicating depleted mantle source. We envisage these zircons to have been derived from the ocean side of a magmatic arc. All grains in the range 215-250 Ma are characterized by negative εHf(T) ranging from -2.3 to -15.2, suggesting re-melting of already existent crust.
Within the detrital zircon populations contained in the Sanbagawa meta-sediments age groups are recognized that are also known from SE China. However, compared to those from mainland China, zircons from the Sanbagawa meta-sediments are usually characterized by higher εHf(T) values suggesting higher input of material derived from the depleted mantle.