

Detrital zircons from a traverse along the Asemi River (Sanbagawa Metamorphic Belt, Shikoku, Japan): U-Pb geochronology and Hf isotopic composition

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Sanbagawa Belt is a classic high-P/low-T metamorphic belt that is exposed over a distance of about 1000 km on Kyushu, Shikoku and Honshu Islands in Japan. The age of this belt has been the focus of many studies in recent years since the discovery of young detrital zircon grains (80 - 95 Ma), younger than the presumed age of peak metamorphism.

Samples for this study come from a traverse along the Asemi River in central Shikoku. Dating of single zircon grains using the LA-ICP-MS U-Pb dating method shows that zircons from all sites investigated are younger than 90 Ma and thus the protoliths are younger than the previously accepted age of metamorphism for this part of the Sanbagawa Belt at ca. 116 Ma. Our sampling sites include the site sampled by Minamishin et al. (1979) which is the reference for metamorphism at ca. 116 Ma in this part of the belt. We therefore conclude that the linear arrays found by Minamishin et al. are mixing lines rather than isochrones. Another sample was taken within the area recently delineated as having experienced eclogite facies metamorphism prior to overprinting in the epidote-amphibolite facies (Taguchi et al., 2018). This implies that the eclogite facies metamorphism took place after 90 Ma, the maximum deposition age of the protolith.

Within the detrital zircon populations contained in the Sanbagawa meta-sediments several 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 eHf(T) values suggesting higher input of material derived from the depleted mantle. For example, eHf(T) values of zircons of the age group 82-116 Ma range from -2.4 to +9.6 and those of the 127-146 Ma group have altogether positive eHf(T) values of +11.5 to +19.0 indicating depleted mantle sources. 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 eHf(T) ranging from -2.3 to -15.2, suggesting re-melting of already existing crust.

Keywords: Sanbagawa Belt, detrital zircon, U-Pb dating, Hf-isotopes