# U-Pb zircon ages younger than regional metamorphism obtained from gneissose granitoids in the Mikawa area, Ryoke belt

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The Ryoke belt consists of Late Cretaceous high-T/low-P type metamorphic and plutonic rocks, and records magmatic activity at the continental margin of East Asia. In the Mikawa area, the temporal and spatial distribution of protracted magmatism associated with subduction and its effects on the development of high-T/low-P type metamorphism can be observed, because plutonic rocks intrude continuously during and after Ryoke regional metamorphism [1].
Granitoids in the Mikawa area have been classified based on their lithology and intrusive relationships [2]. The Kamihara tonalite and the Tenryukyo granite have gneissose structures and are classified into the Older Ryoke granitoids. They are considered to be the heat source of regional metamorphism [3]. This interpretation is supported by CHIME monazite (Mnz) ages from the Ryoke metamorphic rocks (102-98 Ma), the Kamihara tonalite, (ca. 95 Ma) and the Tenryukyo granite (ca. 91 Ma) [1] and by the fact that most of the Older Ryoke granitoids occur structurally below the Ryoke metamorphic rocks.
However, it has been reported that granitoids in the Yanai area show discrepancies between U-Pb zircon (Zrn) ages and CHIME Mnz ages; some massive granitoids yielded U-Pb Zrn ages older than those of gneissose granitoids [4]. In this study, we carried out LA-ICP-MS U-Pb Zrn dating of gneissose granitoids in the Mikawa area in order to discuss whether the classification of granitoids based on their gneissose structure is consistent with U-Pb Zrn ages or not.
Granitoid samples were collected from Toyokawa, Gamagori and Shimoyama localities (2 samples each); they are mapped as parts of the Kamihara tonalite or the Tenryukyo granite. All samples show a gneissose structure which is defined by the arrangement of biotite and/or hornblende, and is concordant with the foliation of the surrounding metamorphic rocks. Granitoids collected from Toyokawa intrude into the highest grade metamorphic rocks of the garnet-cordierite zone [5], and those from Gamagori intrude structurally below the sillimanite-K-feldspar zone [6]. The contact between these granitoids and metamorphic rocks was not observed. Granitoids from Shimoyama are located structurally above the biotite zone, but the actual intrusive relationship with metamorphic rocks is not known.
The results of LA-ICP-MS U-Pb Zrn dating are given below as weighted means of $^{238}U$-$^{206}Pb$ ages (±2σ error) calculated with concordant data. Two granitoid samples from Toyokawa gave 77.5±0.6 Ma and 77.1±0.6 Ma, and two granitoid samples from Gamagori gave a similar age of 81.1±1.0 Ma. Two granitoid samples from Shimoyama gave 98.9±0.9 Ma and 99.4±0.9 Ma. These ages are interpreted to represent the timing of solidification of the granitoids.
In the Gamagori locality, a CHIME Mnz age of 92.2±6.0 Ma [1] is reported from the same body as the one dated in this study, and is about 10 Ma older than the U-Pb Zrn age. The U-Pb Zrn age obtained for gneissose granitoid samples from Shimoyama (ca. 99 Ma) is similar to CHIME Mnz ages (102-98 Ma) [1] reported from the neighbouring metamorphic rocks. On the other hand, U-Pb Zrn ages of gneissose granitoid samples from Toyokawa and Gamagori (81-77 Ma) are younger than SHRIMP U-Pb Zrn ages from migmatites (87.4±0.2 Ma, 87.1±0.5 Ma) [7] that are thought to represent the age of peak regional metamorphism.
These results show that the development of a gneissosity in granitoids is not a suitable criterion for estimating the relative timing of intrusions. Furthermore, since the ages of gneissose

 

granitoids in Toyokawa and Gamagori are younger than that of peak regional metamorphism, these granitoids could not represent a heat source of the Ryoke regional metamorphism.

References
[1]Suzuki & Adachi, 1998. [2]Ryoke Research Group, 1972. [3]Harayama et al, 1985. [4]Skrzypek et al., in review. [5]Miyazaki et al, 2008. [6]Asami, 1977. [7]Nakajima et al, 2013.

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