# Petrographically constrained CHIME dating of metapelites from the Higo metamorphic terrane, Kyushu, Japan

# Daniel Dunkley[1], Kazuhiro Suzuki[2]

[1] Center for Chronological Research, Nagoya Univ, [2] Nagoya University Center for Chronological Research

The Higo metamorphic terrane is a 25km by 8km area of medium to high-grade metamorphic and plutonic rocks, located in Kumamoto Prefecture, Kyushu. Exposures are mostly of Higo Gneiss, a predominantly metasedimentary sequence with an intense east-west trending gneissosity that obscures pre-tectonic relationships. Metamorphic grade generally increases southwards, from amphibolite-facies to granulite-facies. Abundant migmatites and diatexites are present along the southern boundary of the Higo Gneiss indicating abundant partial melting in the highest-grade areas. Obata et al. (1994) associated this anatexis with the foliated Miyanohara Tonalite, which was intruded by the unfoliated Shiraishino Granodiorite.

The timing of metamorphism and tectonism in the Higo terrane is still a subject of debate. Mineral-whole rock isochrons for the Sm-Nd and Rb-Sr systems have yielded ages that cluster around the Permo-Triassic (eg. 258+-3Ma, Osanai et al., 1998) and the mid-Cretaceous (eg. 101+-1Ma, Hamamoto et al., 1999). A similar bimodal age distribution has been found in the Miyanohara Tonalite, whereas age estimates for the Shiraishino Granodiorite are Cretaceous (eg. 104+-1Ma, Kamei et al., 2000). The younger ages correspond to the timing of plutonism and high-grade metamorphism of the Ryoke Belt in Honshu.

The chemical Th-U-total Pb isochron method (CHIME) of Suzuki and Adachi (1991, 1998) was used to obtain in-situ age estimates of monazite in metapelitic granulite gneisses from the southwestern part of the Higo terrane. Monazite grains in sample KS99122501 occur in textural equilibrium with the peak metamorphic assemblage spinel-sillimanite-garnet-plagioclase-biotite, and are oriented parallel to a strong mineral foliation and gneissosity that was developed during peak metamorphism. This oriented monazite yielded a CHIME age of 108+-12Ma. Garnet grains also contain monazite grains as inclusions, which yield similar CHIME ages to the oriented monazite. On the basis of such petrographic evidence, the age estimates are interpreted as representing the time of peak metamorphism and deformation. Monazite age estimates from samples across the Higo Gneiss yield similar ages, regardless of metamorphic grade or proximity to the southern granitoids. These estimates are contrary to studies that suggest that the gneisses formed during the Permo-Triassic and that Cretaceous age estimates reflect isotopic resetting during the intrusion of the Shiraishino Granodiorite. The significance of older age estimates is unclear, but they may be related to tectonically reworked crust from a Palaeo-Ryoke terrane.

References

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