Nature of the Ryoke plutonism and their isotopic characteristics in Kinki district, Japan

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Igneous activity in the Kinki district of the Ryoke Belt is classified into two stage according to the age: early to middle Jurassic and late Cretaceous.

The Jurassic igneous activities are composed of gabbroic rocks and metadiabase, which are sporadically distributed in the Ryoke granitic rocks as xenolithic blocks.

The Sm-Nd whole rock isochron age of hornblende gabbro, norite and metadiabase is 192 Ma (Kagami et al.,1995). Cretaceous granitoids in the Kinki Ryoke Belt are divided into four igneous stage based upon internal texture and their structural relationship to the surrounding metamorphic wall rock.

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The Sm-Nd whole rock isochron age of hornblende gabbro, norite and and metadiabase is 192 Ma (Kagami et al., 1995). An age of 169 Ma has been determined for anorthitic gabbro, which occurrs as irregular shaped blocks in hornblende gabbro and norite.

Sm-Nd and Rb-Sr whole-rock and mineral isochron ages of hornblende gabbro are 97.7 Ma and 71.8 Ma, which indicate thermal resetting of the gabbro by intrusion of granitic plutons.

Quartz diorite gives an age of 161 Ma by method of Rb-Sr whole rock (Fujii et al.,1999).

Cretaceous granitoids in the Kinki Ryoke Belt are divided into four igneous stages based upon internal texture and their structural relationship to the surrounding metamorphic wall rocks as follows;

first stage granite: 81.4 Ma, 80.7 Ma (U-Pb zircon; Herzig et al., 1998), 82.2 Ma (SHRIMP; Watanabe et al., 1999)

second stage granite: 108.6 Ma, 79.8 Ma, 74.6 Ma (Rb-Sr whole rock; Morioka et al., 1999), 81.5 Ma (U-Pb zircon; Herzig et al.,1998), 87 Ma (SHRIMP; Watanabe et al.,1999), 72.1 Ma (K-Ar biotite; Shimada et al., 1999)

third stage granite: 82.0 Ma (U-Pb zircon; Herzig et al., 1998)

forth stage granite: 72.8 Ma (Rb-Sr whole rock; Morioka et al., 1999), 91 Ma, 83 Ma (SHRIMP; Watanabe et al., 1999), 75.3 Ma (U-Pb zircon; Herzig., 1998), 67.0 Ma (K-Ar biotite; Shimada et al.,1999)

Prior radiometric dating using the K-Ar and Rb-Sr techniques has reported this classification in a general way, but there is significant overlap in age between the igneous stage. Stage 1 granite and stage 4 granite on Kinki Ryoke Belt were emplaced within a short time interval between 81 and 82 Ma by method of U-Pb zircon.

Stage 4 granite crystallized at 75 Ma. Zircon U-Pb SHRIMP dating was carried out on three types of granitic rocks from Kinki district. The results give ages of granitic magmatism in Kinki district of between 87 and 83 Ma.

Compilation of whole rock plutonism occurred from 80 Ma to 110 Ma, although older ages are reported from the western part (Awaji Island), and younger (70 Ma) plutonism occurred in four stage granite. The late Cretaceous igneous activity, commenced with intermediate magmatism (ca.110 Ma),

followed by voluminous granitic plutonism at 100-95 Ma and 80-75 Ma.