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Mesozoic episodic magmatism in the central Ogcheon belt, Korea : geochemistry and tectonic implications

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The Korean peninsula is a major link between the Pacific continental margin and the Asian mainland, providing an excellent opportunity to understand the collisional and accretionary evolution of northeastern Asia. Phanerozoic granitoids crop out about one-third of landmass of the southern part. Their precise time scale of emplacement is, however, still not well-known especially for the NE-SW trending granitic batholith intruding the interior of the peninsula. Here we report U-Pb sphene ages and geochemical characteristics of part of the batholith in the central Ogcheon belt, the late Proterozoic to Paleozoic mobile belt in middle Korea. The studied batholith mostly consists of medium- to coarse-grained biotite granites which intrude locally distributed coarse-grained diorites. Our U-Pb data yield the middle Triassic (233.1$\pm$2.0 Ma) and the middle Jurassic (177.8$\pm$1.8 $\sim$ 174.6$\pm$2.5 Ma) crystallization age for the diorites and biotite granites, respectively. The diorites have SiO_2 = 57.51 $\sim$ 62.96 %, K_2O/Na_2O = 1.42 $\sim$ 1.87, A/CNK = 0.80 $\sim$ 1.01 and A/NK = 1.43 $\sim$ 1.73, belonging to metaluminous shoshonitic series. On the other hand, the biotite granites belong to peraluminous normal to high-K series, with SiO_2 = 65.03 $\sim$ 72.28 %, K_2O/Na_2O = 0.70 $\sim$ 1.46, A/CNK = 1.04 $\sim$ 1.16 and A/NK = 1.39 $\sim$ 1.83. Their REE compositions show LREE-enriched patterns with $(La/Yb)_N$ = 24.9 $\sim$ 49.5 for the diorites and 25.8 $\sim$ 166.0 for the biotite granites. This, together with little Eu anomalies (Eu/Eu* = 0.77 $\sim$ 1.42) indicates significant amounts of residual garnet in the source of the granitoids, presumably an eclogite composed of clinopyroxene and garnet. Previously reported Rb-Sr and Sm-Nd isotopic data of the studied granitoids consistently indicate a crustal origin ($^{87}Sr/^{86}Sr_i$ = 0.7107 $\sim$ 0.7148, ε_{Nd}(t) = -20.0 $\sim$ -11.9). The ε_{Nd}(t) values of the diorites and biotite granites are indistinguishable but strongly related

to the locality of analyzed samples, indicating local heterogeneity in the source region. Feldspar Pb isotopic compositions of the granitoids are highly radiogenic both in $^{207}Pb/^{204}Pb$ and $^{208}Pb/^{204}Pb$ ratios for given $^{206}Pb/^{204}Pb$ ratios, also supporting their derivation from old sialic crust. Early Proterozoic Sm-Nd model ages of the granitoids (2.17 – 1.72 Ga) are significantly younger than the late Archean to early Proterozoic model ages of basement rocks in the neighboring Gyeonggi massif. This cannot be attributed to the crustal assimilation because the two granitoid types have similar Sm-Nd model ages in spite of the more evolved geochemical pattern of the biotite granites. Instead, it can be suggested that the granitoids were derived from the younger lower part of chronologically laminated crust. The middle Triassic intrusion age of the diorites leaves a possible tectonomagmatic link with the Chinese continental suture. The very high K contents of the diorites possibly suggest a post-collisional origin, which constrains the younger limit of suture timing in the central Ogcheon belt at 233.1 ± 2.0 Ma. After the Triassic amalgamation, the subduction of palaeo-Pacific plate might start in the middle Jurassic with the generation of biotite granites showing normal to high-K calc alkaline affinity.