Early Mesozoic rejuvenation and reworking of continental crust in South China

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Ancient continents are generally modified by structural, magmatic and metamorphic processes after their formation to form new structural fabrics and juvenile crust (i.e., reworking and rejuvenation). South China has experienced collision with Indochina and North China blocks and subduction of the Paleo-Pacific Ocean plate since the Mesozoic, associated with multiple stages of magmatism and tectonic activities. The large scale of igneous rocks provide powerful evidence and important information regarding rejuvenation and reworking of continental crust. Here we present new zircon U-Pb-Hf-O data and whole rock geochemistry of Jurassic A-type granite, syenite and gabbro in the south Jiangxi Province to trace their ages, magmatic source and petrogenesis, and to further constrain the Early Mesozoic rejuvenation and reworking of continental crust of South China.

Zircon U-Pb dating gives the emplace age of 198-195 Ma for syenites, 190 Ma for Kf granites and 188 Ma for gabbros, respectively. The Early Jurassic syenites have low $(^{87}Sr/^{86}Sr)_i$ ratios (0.7023-0.7056) and positive εNd(t) (0.3 to 5.3) and εHf(t) (3.3 to 12) value. Zircons have εHf(t) values of 8.8-15 and $\delta^{18}O$ values of 4.5-5.3 ‰. They were possibly derived from an enriched mantle source with crystal fractionation. The Early Jurassic Kf granites have typical geochemical features of peraluminous A-type granites, with high Ga/Al ratios, and Zr, Hf, Nb and total alkali contents. They have εNd(t) (-0.5 to -4.2) and εHf(t) (0.9 to 4.9) values for whole rocks, and εHf(t) values of -3.0 to 8.7 and $\delta^{18}O$ values of 4.0-7.3 ‰ for zircons, indicating a young crustal source. The Early Jurassic gabbros have εNd(t) (-1.5 to 0.6) and εHf(t) (-1.6 to 5.7) values for whole rocks and εHf(t) values of 3.9-6.4 and $\delta^{18}O$ values of 4.9-5.9 ‰ for zircons, suggesting that they resulted from crustal assimilation of enriched lithospheric mantle-derived melts. The distinct sources of the Early Mesozoic igneous rocks indicate that the continental crust of South China was reworked and rejuvenated by mafic magma underplating and intracrustal melting possibly related to tectonic transition from Tethys orogenic regime to Paleo-Pacific regime during Early Mesozoic.