Geophysical Research Abstracts
Vol. 20, EGU2018-2414, 2018
EGU General Assembly 2018
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Geochemistry and petrogenesis of Early Paleozoic-Mesozoic granites in Ganzhou, Jiangxi Province, South China Block

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The South China Block (SCB) plays an important role in the tectonic framework in southeastern Asia, with complex geological and tectonic evolution. The events of Intraplate collision event in early Paleozoic, intracontinental orogen in early Mesozoic, extensional regime induced by subduction of the Palo-Pacific plate result in widespread metamorphic deformation and massive magmatic activities in SCB, as well as the generation of a large number of polymetallic, rare metals and rare earth ore deposits. Our study area is located in the Ganzhou area in the southern part of Jiangxi Province, South China; geotectonically it is located in the eastern part of Caledonian organic belt, belonging to Cathaysia Block. The magmatic activity in the study area is divided into three stages by zircon U-Pb dating: early Paleozoic (Silurian, 425–445 Ma, Caledonian), early Mesozoic (Triassic, 220–235 Ma, early Indosinian), and late Mesozoic (late Jurassic, ∼150 Ma, early Yanshanian). Tanghu, Danqian and Hanfang plutons of early Paleozoic are high-K calc-alkaline syenite, monzonite and granodiorite, and belong to metaluminous to weak peraluminous to peraluminous I-S type genesis, while Dabu pluton belongs to S-type genesis. Qingxi pluton in Triassic and Liangcun granite in late Jurassic are high-K calc-alkaline syenite and monzonite, and belong to weak peraluminous to peraluminous I-type genesis with high evolution characteristics. The total six granites have significant heterogeneity, but most of them have relatively negative zircon εHf(t) values (peak value of -6.6), and two stage Nd isotopic model ages and zircon Hf isotopic model ages clusterly range from 1.6 Ga to 1.8 Ga, suggesting the granites in the studied area were derived from partial melting of crustal source rocks with Palaeoproterozoic model ages. Among them, the early Paleozoic and early Mesozoic granites show positive εHf(t) values, indicating depleted mantle components may have been incorporated into the source with interactions between asthenosphere-derived magma and hybridized source formed by mixing of the two components represented by ancient metapelitic and metabasaltic rocks. Combined with the previous studies on syn-geochronological igneous rocks, we conclude that most of early Paleozoic granites of SCB are proved to belong to post-collisional granites and formed in an extensional environment; most Triassic granites in interior SCB are formed in the early Mesozoic extensional background after the multi-plate convergence, meanwhile Triassic granites in northeastern margin of SCB are mainly affected by the subduction of the paleo-Pacific plate; in addition, early Yanshanian granites of SCB are formed in the extensional tectonic setting due to the paleo-Pacific plate subduction.