Geophysical Research Abstracts
Vol. 21, EGU2019-2747, 2019
EGU General Assembly 2019

Early Silurian I-type Granitoids in the Eastern Yangtze Block: Implications for Early Paleozoic Orogensis in South China

Chao Yuan (1), Xiaoping Long (2), and Min Sun (3)

(1) State Key Laboratory of Isotope Geochemistry, Guangzhou Institute of Geochemistry, Chinese Academy of Sciences, Guangzhou 510640, China (yuanchao@gig.ac.cn), (2) State Key Laboratory of Continental Dynamics, Department of Geology, Northwest University, Northern Taibai Street 229, Xi'an 710069, China (longxp@nwu.edu.cn), (3) Department of Earth Sciences, The University of Hong Kong, Pokfulam Road, Hong Kong (minsun@hhku.hk)

The South China Block (SCB) consists of the Yangtze and Cathysia blocks, which were amalgamated during the assemblage of Rodinia. After the amalgamation, the SCB experienced an Early Paleozoic orogenic event, i.e. Wuyi-Yunkai Orogen, which has been suggested to be an intracontinental orogen in response to the closure of the pre-existing Nanhua rift. The Wuyi-Yunkai Orogen is characterized by extensive distribution of Early Paleozoic granites, which are overwhelmingly dominated by S-type granitoids. I-type granitoids are sporadically exposed and their genesis and relationship to the orogensis remain to be unclear.

Two spatially associated granodiorite plutons in the northwestern rim of the Wuyi-Yunkai Orogen, namely the Banshanpu pluton (BP) and Hongxiaqiao pluton (HP) have been studied. The two plutons share many lithological similarities, except for the presence of abundant mafic microgranular enclaves (MMEs) in the HP. Zircon U-Pb dating has yielded weighted mean 206Pb/238U ages of 432±3 Ma and 429±5 Ma for the HP and the enclosed MMEs, respectively. The ages are identical to the dating result for the BP (434±3 Ma), suggesting that the two plutons were emplaced coevally in the early Silurian.

Rocks from the two plutons possess similar Nd-Sr isotope compositions, indicating that they were derived from a similar crustal source. However, rocks from the BP are mediate- to high-K calc-alkaline and show strongly peraluminous, adakite-like characteristics, suggesting an origin of partial melting of amphibolite in the garnet stability field. Samples from the HP contain lower SiO_2 but considerably higher Fe2O_3T, TiO_2, P2O5 and highly incompatible elements than those of the BP. Rocks from the HP possess Sr contents equivalent to that of samples from BP, but their relatively high HREE, Y and low Sr/Y ratios make themselves distinct from typical adakitic rocks. MMEs from the HP possess relatively high P2O5, wide ranges of SiO_2, Al2O_3 and Mg#, and their Nd and Sr isotope compositions are well in the range of their host rocks, suggesting an origin from metasomatized lithospheric mantle. Their host rocks (HP) was hence produced by magma mixing between a crustal melt and a lithospheric mantle-derived melt. Because the MMEs have relatively low Sr/Y and (La/Yb)N ratios, mixing of the lithospheric mantle-derived melt with an adakite-like melt would dilute the adakitic signature and make the mixture's composition deviating from adakitic characteristics.

A comprehensive evaluation of geochronological data for magmatism and metamorphism in the orogeny reveals two phases of orogenesis in South China during the Early Paleozoic, with the turning point at ca. 440 Ma. The orogensis started in the Wuyi-Yunkai domains of the Cathysia Block in the Ordovician and propagated westward into the Yangtze Block in the Silurian. It is suggested that delamination and subsequent upwelling of the asthenospheric mantle, after the intensive shortening and thickening of the crust, make the Early Paleozoic intracontinental orogen of South China so different from those typical ones in the world.