Early Neoproterozoic magmatic event in the continental nucleus of South China and its significance

WEN-LI LING[1,2*], HUI WU[1,2], YING-HUA ZHANG[1,2], BERKANA WAFA[1,2], XIAO BAI[1,2]

[1] State Key Laboratory of Geological Process and Mineral Resources, China University of Geosciences, Wuhan 430074, China (*correspondence: wlling@cug.edu.cn)

[2] Faculty of Earth Sciences, China University of Geosciences, Wuhan 430074, China

The Neoproterozoic history of South China has long been hotly debated, due mostly to competing interpretations of the nature and their relationship of the Neoproterozoic magmatic events. Most of the Neoproterozoic magmatism in South China show ages of ~820-780 Ma, and are located mainly along the margins of the Yangtze block and its welding boundary with the Cathaysian block. Though some early Neoproterozoic igneous suites along these marginal areas have also been documented, few are founded in its central terrains. We report here an assemblage of newly identified ~865-845 Ma intrusive suites in the interior of the Yangtze block, aiming to provide new insight into the early Neoproterozoic evolution of South China.

The intrusions were emplaced into the Kongling Archean crystalline basement, the continental nucleus of South China. They comprise lithologically amphibolized gabbro, diorite and rapakivi-textured granite, and were intruded by the ~820-790 Ma Huangling intrusive complex. U-Pb zircon dating indicates that the gabbros formed at 864±7Ma and 845±8Ma, the diorite at 859±4Ma, and the rapakivi-textured granites at 865±7Ma and 857±5Ma. Inherited zircons of 865-845 Ma have been frequently identified in the 820-790 Ma intrusive complex, this work first confirms the presence of this episode of magmatism. The ~865-845 Ma intrusions are calc-alkaline, and display LREE-enriched patterns, marked depletion in HFSE and variable extents of positive Sr, Ba and Pb anomalies. Zircons from the gabbro and diorite have $\varepsilon_{Hf}(t)$ values of -5.93 to +3.09 and -3.06 to -6.07, respectively, suggesting a moderately enriched mantle source; whereas those from the rapakivi-textured granite have a range of -15.5 to -3.20, suggesting a reworked crustal source. These bimodal intrusive suites are thus inferred to have formed at a back-arc-related extensional setting.

Given the recently reported ~1.1 Ga arc-related volcanics in the adjacent Shennongjia area, a double-subduction model is applied for the amalgamation between the Shennongjia and Kongling terrains, providing new evidence of accretionary orogenic process for the unification of South China.