

Early Paleoproterozoic crustal evolution during the global magmatic shutdown (2.45-2.20 Ga): Constrains from magmatic events in the southern margin of North China Craton

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Recent studies suggest that the current Palaeoproterozoic record does not favor the global magmatic shutdown (2.45-2.20 Ga) hypothesis, as magmatism at this period are found in many cratons. The scenario could involve subduction cessation following the global Archean cratonization, with contemporary initiation of subduction in the exterior ocean or within restricted small-scale ocean basins. But current data of tectono-magmatic events has not reached a sufficient mass to verify the model. During the quiet interval, 2.45-2.20 Ga magmatism are more widely distributed in the North China Craton (NCC) than previously known, especially in the Taihua Complex, southern margin of NCC. The Taihua Complex consists of the gneiss series and Khondalite-dominated supracrustal rocks. The former is composed predominantly of tonalitic-trondhjemitic-granodioritic (TTG) gneisses and associated granitic plutons, the latter is composed mainly of high-grade sillimanite-garnet gneisses, amphibolites, graphite-bearing gneisses, quartzite, banded iron formations, marble, and syn- or post-tectonic granitoid rocks. Our zircon U-Pb dating reveals that the TTG gneiss, monzonitic granite gneiss and gabbro gneiss in the Xiong'er shan Taihua Complex formed at 2308 ± 32 Ma, 2270 ± 20 Ma and 2350 ± 14 Ma, respectively. The protolith age of amphibolite (metamorphic basalt) in the Lushan area is 2315 ± 57 Ma. In addition, the depositional age of the sedimentary protoliths of the khondalite series can be roughly constrained between 2300 Ma and 1950 Ma. Zircon Hf isotopes indicate that the felsic rocks were produced by variable mixing of a juvenile materials with older crust. Geochemical data suggest that the early Paleoproterozoic metamorphic basalt exhibits island arc tholeiite. Therefore, these rocks might be produced in an Andean-type continental margin arc or island arc setting. Combination with later potassic igneous rocks which were likely formed in a post-collisional setting, we propose that there is a tectonic transformation from compression to extension at least in the southern margin of NCC between 2.45 Ga and 2.25 Ga.