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Determination of the age of basic volcanic rocks of the former Paleoproterozoic Xiong'er group on the southwestern margin of the North China Craton based on detrital zircon geochronology

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A succession of low-grade metamorphic rocks outcropping along the southwestern margin of the North China craton (SMNCC) has long been considered to be part of the Paleoproterozoic Xiong'er Group. The Xiong'er Group which is located within the Meso-Cenozoic Liupanshan fault system in the Southwestern Margin of the North China Craton (SMNCC) consists mainly of the low-grade metamorphic sedimentary rocks and greenschist. Both of the component lithologies are in contact along a normal fault with the greenschists located on the hanging wall of the fault. Petrology and geochemistry of the greenschists reveal that their protolith was continental tholeiites that developed in a regional extensional setting similar to a continental rift. In order to determine the age of the protolith of the greenschist, precise U-Pb ages of the detrital zircons of two siltstone interlayers in the greenschist were determined in this study by LA-ICP-MS dating. The clastic zircons yield ages from 3039 Ma to 194 Ma, and all of the detrital zircons are magmatic in origin. Combined with regional tectonic analysis, it is proposed that the protolith of the greenschist was Late Triassic – Early Jurassic (206~194 Ma) basic volcanic rocks (LTEJBVR), and that the basic volcanic rocks were transformed into greenschists associated with the Meso-Cenozoic structural movement of the Liupanshan fault system. Thus, the greenschists should disintinguished from the former Paleoproterozoic Xiong'er Group. Although a large number of Late Triassic magmatic rocks have been reported in the western Qinling orogenic belt adjacent to the study area, the LTEJBVR are revealed for the first time in the SMNCC and, in particular, evidence for Early Jurassic magmatismis revealed. The LTEJBVR indicate that the SMNCC was in as extensional tectonic setting during Late Triassic – Early Jurassic, and that extension resulted mainly from continental rifting. Such tectonic setting is consistent with the Late Triassic sedimentary environment in the SMNCC which is characterized by deepening of water and extension of sedimentary basin. Our results contribute to a better understanding to the Late Triassic sedimentary environment in the SMNCC.