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Late Paleoproterozoic to Mesoproterozoic tectonic evolution of the Bainaimiao micro-block in the southeastern Central Asian Orogenic Belt (CAOB): Implications for reconstruction of Columbia supercontinent

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The Paleo-Mesoproterozoic Columbia supercontinent is Earth's oldest known supercontinent, as it assembled during 2.1-1.8 Ga and broke up at 1.6-1.2 Ga. Reconstruction of Columbia supercontinent paleogeographic map is essential for understanding the evolution course of early earth. The configuration of Columbia supercontinent is considerably well constrained in some major cratons (eg. South America and western Africa), whereas the positions of other small continental fragments are still poor constrained, even rendering it unsure if they were parts of the supercontinent, especially for some micro-blocks in the CAOB. The CAOB is located between the Baltica, Siberian, North China and Tarim Cratons, is the largest Phanerozoic accretionary orogeny and involves several Precambrian micro-blocks, such as the Central Tianshan micro-block, the Beishan micro-block and the Bainaimiao micro-block. It has been widely accepted that there is ancient Precambrian basement beneath these micro-blocks, but where they are from and whether they participated in the Columbia supercontinent cycle are still unclear. For example, the Bainaimiao micro-block, as a prominent part of the southeastern CAOB, are consider as part of the North China Craton, the Tarim Craton or the Gondwana continent. Here we carried out detailed field mapping, geochronological and geochemical study on the Chenjiatun metamorphic complex in eastern Bainaimiao micro-block. The Chenjiatun metamorphic complex consists of 1.75 Ga amphibolites, 1.38 Ga two-mica granites, and meta-sedimentary rocks (1.39 Ga plagioclase gneisses and 1.34 Ga mica schists, representing Paleo-Mesoproterozoic ancient basement of the Bainaimiao micro-block. The protoliths of the 1.75 Ga amphibolites show arc-like geochemical signatures at subduction zone and the 1.38 Ga two-mica granites belong to typical S-type granites at post-collisional setting. These suggest that the Bainaimiao micro-block could undergo late Paleoproterozoic subduction convergence and Mesoproterozoic extension, involved in the tectonic evolution of the Columbia supercontinent. The comparison results of zircon ages and isotopic data reveal that the Bainaimiao micro-block was possibly located on the margin of the Laurentia-Baltica continent during the Paleoproterozoic and Mesoproterozoic, rather than the North China Craton, the Tarim Craton or the Gondwana continent.