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The Discovery of the Neoproterozoic rift-related felsic volcanic rocks in the northern margin of North China Craton: Implications for Rodinia reconstruction and mineral exploration

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This paper reports the first discovery of the Neoproterozoic meta-felsic volcanic rocks in the west section of the northern margin of the North China Craton. These meta-felsic volcanic rocks occur within the marine sedimentary strata of the Zha'ertaishan Group(once called Langshan Group [1]), which was thought to belong to the Mesoproterozoic succession in the past.

The rock types of the volcanic bed are rhyolite and quartz keratophyre stuff. The true thickness of the felsic volcanic bed is ～18 m±. These rocks have experienced greenschist facies metamorphism. Blastoporphyritic and blastomicrolite textures are visible, indicating rapid cooling of magma by water. The phenocrysts consist mainly of plagioclase laths and quartz, which were altered and replaced.

SHRIMP U-Pb dating of zircon crystals from the felsic volcanic rock gives an age of 806 ± 1.4Ma, which is the first estimate for the Neoproterozoic of the Zha'ertaishan Group in the western section of the northern margin of the North China Craton. The felsic Langshab volcanic rocks are characterized by light REE (rare earth elements) enrichments relative to heavy REE, pronounced negative Eu anomaly, and positive ε_{Nd} (t = 806 Ma) values from +0.5 to +1.8. The ε_{Hf} values of comagmatic zircons from the felsic volcanic rocks vary from +1 to +8, indicating that the felsic volcanic rocks formed in a continental rifting environment.

The evolutionary process with mineralization of Precambrian continental blocks of the North China Craton and the configuration of Rodinia supercontinent is widely researched [2] [3] [4] [5]. The role of Neoproterozoic magmatism in Rodinia breakup, the position of the South China Block and the North China Craton in Rodinia are among the most contentious issues. Uncertainties in Rodina reconstruction for the Chinese Precambrian continental blocks are partly due to insufficient petrochemical data for Neoproterozoic igneous rocks in the North China Craton. Thus, the discovery of Neoproterozoic felsic volcanic rocks in the western section of the northern margin of the North China Craton is significant because these volcanic rocks contain critical information that can be used for study Rodinia reconstruction and mineralization of the northern margin of the North China Craton.

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