Lithospheric thinning in the North China Craton: Constraints from felsic magmatism

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Recent studies indicate that the lithosphere of the North China Craton (NCC) had been significantly thinned since the early Paleozoic. Although it has been intensively discussed during the past decade, it is still controversial about when, where and why this unique geological process took place on our Earth. Considering that the lithospheric thinning would result in upwelling of the asthenospheric mantle, which subsequently heated the overlying crust, the crustal-derived felsic magmatism, therefore, will provide invaluable information about this important process.

Our studies indicate that the Phanerozoic granitic magmatism in the NCC was mainly developed during the Mesozoic (230-110 Ma). The Triassic (230-210 Ma) granites, limitedly located in the most eastern NCC, were thought to be related to collision of the Yangtze and NCC. The Jurassic (190-155) granites, belonging to I-type genetically, were almost exposed in the eastern NCC with crystallization temperature of ~750°C. In contrast, the early Cretaceous (135-110 Ma) granites were widespread in the NCC, which was thought as a giant igneous event in eastern China. Except the voluminous I-type granites, A-type granities and syenite are also developed, indicating their formation in an extensional setting. The crystallization temperatures of these early Cretaceous granites are 50-100°C higher than those of the Jurassic granites. Furthermore, asthenospheric mantle input has been also documented from the Cretaceous granites Therefore, it is concluded that the lithospheric thinning in the NCC took place during early Cretaceous and triggered by lithospheric delamination, which was related to the subduction of the Pacific plate to the east during Jurassic.

Geochemistry and SHRIMP U-Pb zircon geochronology of the Neoproterozoic Mamianshan Group in the Cathaysia Block-China: Implications for tectonic significance

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In southeastern China, several large outcrops of Precambrian metamorphic rocks are present, which oringinally called Cathaysia by Grabao. There are two metamorphic sequences in the basement of Cathaysia Block. In the northwestern Fujian province, the upper metamorphic sequence is called the Mamianshan group.

New SHRIMP U-Pb zircon dating results for the Mamianshan Group are present, including 825.5 ± 9.8 Ma for the Longbeixi Formation, 796.5 ± 9.3 Ma for the Dongyan Formation and 756.2 ± 7.2 Ma for the Daling Formation. Amphibolitic schists, greenschists and quartzofeldspathic schists from the Mamianshan Group were analyzed for Nd isotopic geochemistry. Results indicate that amphibolitic schists with εNd (796 Ma) of 3.6 and 4.8 had arc-related protoliths basalt, derived from a depleted mantle source. Greenschists with εNd (796 Ma) from -1.6~1.7 were also derived from a depleted mantle source, but exhibit minor crustal material contamination. Quartzofeldspathic schists with εNd (796 Ma) from -8.4~-10.7 may have experienced major crustal contamination of their basalt magmas.

On the basis of the above features, we propose a dynamic model for Neoproterozoic tectonic evolution of Cathaysia Block. Since the early Neoproterozoic, the Huanan oceanic plate had been subducted gradually beneath the Yangtze block, forming magmatism at 851.9±9.2Ma, volcanism of the Longbeixi Formation at 825.5±9.8Ma, strong arc-related volcanism of the Dongyan Formation at 796.5±9.3Ma, and weak volcanism of the Daling Formation at 756.2±7.2 Ma.

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