



## **Metamorphic P-T path of the Qianlishan and Zhuozishan Khondalites in the Western Block of the North China Craton and its tectonic implications**

**C.Q. Yin, G.C. Zhao, M. Sun and W.H. Leung**

Department of Earth Sciences, the University of Hong Kong, Pokfulam Road, Hong Kong  
(changqing\_yin@hkusua.hku.hk)

A major advance has been made in understanding the Paleoproterozoic amalgamation of the North China Craton following recognition of a Paleoproterozoic collisional belt, named the Trans-North China Orogen, along which the two discrete Archean to Paleoproterozoic blocks, called the Eastern and Western Blocks, were jointed together to form the basement of the North China Craton at  $\sim 1.85$  Ga. There is now a coherent outline of the timing and tectonic processes involved in the Paleoproterozoic amalgamation and much intensive knowledge concerning the pre-collisional history of the Eastern and Western Blocks that were subsequently incorporated into the North China Craton. However, much of the tectonic history of the interiors of the two blocks still remains unknown. In this study, we present metamorphic data for the khondalites in the Qianlishan-Zhuozishan Complex, which is located in the nearly westernmost part of the recently-proposed Paleoproterozoic collisional belt, called the Khondalite Belt, along which the Yinshan Terrane in the north and the Ordos Terrane in the south collided to form the Western Block at  $\sim 1.93$  Ga. Petrographic studies show that the Al-rich gneisses from the Qianlishan-Zhuozishan Complex underwent four distinct metamorphic stages: M1-M4. M1 is represented by quartz + plagioclase+muscovite+biotite + garnet (core)  $\pm$  kyanite forming at  $550\text{-}650^\circ\text{C}$  and 6-8 Kbar. The M2 stage formed sillimanite, garnet, cordierite, K-feldspar, spinel, plagioclase and quartz at the conditions of  $750\text{-}800^\circ\text{C}$  and 6-7 kbar, indicating the peak metamorphism. The peak metamorphic (M2) stage was followed by the M3 stage that represents the formation of cordierite coronas surrounding garnet, indicating a nearly isothermal decompression. Finally, the rock experienced a cooling or retrogressive stage (M4) represented by the appearance of andalusite and late muscovite. These

mineral assemblages and their approximate P-T estimates define a clockwise P-T path for the Qianlishan-Zhuozishan complex, supporting the recently proposed model that the Western Block formed by the collision between the Yinshan and Ordos Terranes along the Khondalite Belt in the Paleoproterozoic.

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