

# **Metamorphic records in the Lüliang mafic granulites and metapelites: implications for the tectonic evolution of the Trans-North China Orogen, North China Craton**

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The North China Craton (NCC), as one of the three largest Precambrian cratons in China, plays a significant role in studying the evolution of the Columbia supercontinent. The Trans-North China Orogen (TNCO) had been known as a Palaeoproterozoic (*c.*1.85 Ga) orogenic belt in the NCC. However, in recent years, some other metamorphic data, such as *c.*1.95 Ga and *c.*2.5 Ga, have been reported from the metamorphic complexes in the TNCO. It indicates that the TNCO underwent a long and complicated formation process.

Mafic granulite and metapelite are cropped out in southern Lüliang metamorphic complex, the middle of the TNCO. Prograde, peak and retrograde assemblages were identified in these rocks, with some garnets preserving prograde zoning. Garnet-sillimanite-bearing metapelitic gneiss preserved a spectacular “white eye socket”-like symplectites. Clockwise *P-T* paths with nearly isothermal decompression were defined based on the mineral composition and metamorphic reaction microstructure preserved in the rocks. Peak conditions experienced by the mafic granulite and metapelite reach up to 790 °C / 9.4 kbar and 750 °C / 7.0 kbar, respectively. Uranium-Pb dating analyses of metamorphic zircons from granulite and metapelite reveal two discrete, meaningful age groups of metamorphism: an older age group yielded by most metamorphic zircon grains reflects peak metamorphism occurred at 1935–1920 Ma, whereas a smaller, a younger age group reflects a retrogression between 1859 Ma and 1815 Ma. The regional metamorphism in the complex was related to the tectonic process of subduction-collision-exhumation between the Eastern and Western Blocks along the TNCO. A crust thickening stage in this area probably occurred at *c.*1.93 Ga, followed by an uplift stage at *c.*1.85 Ga.