High-temperature prograde metamorphism: Newly-discovered Spr-bearing gneiss in the Khondalite belt, north China Craton (NCC)

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Introduction and Petrography

The prograde metamorphic mineral assemblage and growth zoning are difficult to perserve due to the high-temperature (HT) diffusion, so that it makes the genesis of HT-UHT granulites confusing [1]. Whereas, the prograde reaction footprint is likely to be recorded in a rapid tectonothermal process.

In the central Kondalite belt of the NCC, newly-discovered large-scale Spr-bearing gneisses preserve not only the diagnostic UHT assemblage Spr + Qz, but also the prograde reaction microtexture with Crd, Sil and/or Spl as reactants. Spr is further locally replaced by later Spl or Crd corona during the retrograde metamorphism.

Phase equilibria modeling and Monazite dating

Pseudosection calculations in the NCKFMASHTO system [2] [3], determine the peak conditons of 850-910 ºC and 7-10 kbar, and indicate that the rock has experienced a clockwise P-T path with a heating and deepening stage and subsequently a nearly isothermal decompression process. Variation of H_2O and Fe_2O_3 contents did not exhibit significant influence on the topology and position of the pseudosections.

Monazite U-Th-Pb dating of two samples from the Spr-bearing gneisses by SIMS confines the metamorphic age to be ~1.88 Ga. The tight age ranges and the single peak value suggest a rapid but HT tectonothermal evolution.

Discussion and Conclusion

The recorded clockwise P-T path, especially the HT prograde metamorphic stage, in combination with the nearby UHT as well as Barrovian metamorphism at ~1.88-1.89 Ga confirms the hot collisional orogen of the Paleoproterozoic Khondalite Belt. The Spr-bearing gneisses were exhumed quickly after being involved and brought to the lower crust.

[1] Fitzsimons & Harley (1994) *JP* **35**, 543-576. [2] Powell & Holland (1988) *JMG* **6**, 173-204. [3] Holland & Powell (1998) *JMG* **16**, 309-343.