Metamorphic $P$-$T$-$t$ paths of Neoarchean pelitic granulites from the Qingyuan terrane, eastern North China Craton

Gang Liu, Jun-sheng Lu, Xu Kong, Qiang Feng, Yu-ting Li, and Yi-yi Zhang
State Key Laboratory of Continental Dynamics, Department of Geology, Northwest University, Xi’an 710069, China
(leogcn@126.com)

Precambrian high-pressure (HP) granulites can provide crucial information for reconstructing ancient continental nuclei. Here we report the pelitic granulites from Qingyuan terrane, eastern North China Craton (NCC), which are archean supracrustal rocks occurred as enclaves in gneisses. Two samples from the pelitic granulites both record clockwise P-T paths involving prograde stage ($M_1$), peak stage ($M_2$) and post-peak stage ($M_3$). Prograde stage is represented by biotite, plagioclase, quartz, rutile and ilmenite, preserved as mineral inclusions within garnet porphyroblasts, formed at P-T conditions of 8-9 kbar/670-700 ℃ constrained by mineral assemblages within garnet porphyroblasts and Ti-in-quartz geothermometer. The peak stage ($M_2$) can be represented by the garnet cores, matrix rutile, kyanite, K-feldspar and the P-T conditions are constrained to be ~12 kbar/800-820 ℃ by the isopleths of $X_{py}$ and $X_{Grs}$ from the core of garnet grains. The followed post-peak stage ($M_3$) can be represented by matrix minerals assemblages including garnet, biotite, K-feldspar, sillimanite, ilmenite, quartz and plagioclase, revealing isothermal decompression process to ~9 kbar constrained by the isopleths of $X_{py}$ and $X_{Grs}$ from inner rims of garnet grains. Monazite age dating suggests that the pelitic granulites possibly reached the peak metamorphic stage at ~2.47 Ga, slightly later than TTG magmatic events. The clockwise P-T paths including sequential isothermal decompression (ITD) segments recorded by the pelitic granulites may be caused by a subduction-collision event during the late Neoarchean in the eastern NCC.