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Geochronology and tectonic implications of metamorphic rocks in the SON LA area, northwestern Vietnam

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The metamorphic rocks are widely distributed in the Nam Co Complex (NCC) and Ta Khoa antiform (TK), in the Son La area, northwestern Vietnam. Petrographic observations and minerals chemical analyses by electron microprobe reveal that (Grt)-Ph schists in TK recorded high pressure metamorphism. We also applied LA-ICP-MS and SHRIMP zircon U-Pb and LA-ICP-MS monazite U-Th-Pb dating techniques to constrain the metamorphic and depositional ages in order to decipher their provenances as well as their tectonic significance.

Based on cathodoluminescence (CL) imaging and connecting U-Pb geochronology, zircon grains separated from metamorphic rocks were subdivided into detrital cores and metamorphic rims. Major population (over 50%) of detrital cores from NCC and TK display strongly or weakly oscillatory zoning, which is typical for magmatic origin, and yield U-Pb age peaks at ca. 870 Ma and ca. 795 Ma, respectively. Minor population obtains U-Pb ages scattering between 3000 to 1200 Ma. On the other hand, metamorphic rims from NCC and TK yield weighted mean ages of ca. 247-240 Ma and 259 Ma, respectively.

Monazite grains separated from two samples of NCC display homogeneous and light luminescent in the BSE (back-scatter electron) images. These monazite grains yield weighted mean ages of ca. 240 Ma. Coupled with metamorphic zircon and monazite dating techniques, these results indicate the metamorphic ages of ca. 247-240 Ma and 259 Ma for NCC and TK, respectively.

The new geochronological data suggest that the age peaks of ca. 870 Ma and ca. 795 Ma represent the maximum depositional age of NCC and TK, respectively. The detrital zircons from NCC and TK show broadly similar U-Pb age patterns with those of the Southwestern and Southeastern Yangtze block. Thus, it is concluded that the clastic sediments transported from the Southwestern and Southeastern Yangtze block provided sources for the metamorphic rocks of the NCC and TK and deposited in the southwestern margin of Yangtze block during the Neoproterozoic. In the time period of the collisional orogeny between Yangtze block and Indochina craton, the metamorphic rocks of NCC and TK experienced high pressure metamorphism.