

Multichronology of Harvey Nunatak, Napier Complex, East Antarctica

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Ultra-high temperature (UHT) metamorphism plays an essential role in developing and stabilizing continents through accretionary and collisional orogenesis. The Napier Complex in East Antarctica is where the regional UHT metamorphism was first recognized (Dallwitz, 1968). This complex experienced extremely high temperatures (>1100 °C) based on the mineral assemblage of sapphirine + quartz (Harley, 2016 and reference therein). The thermal history of the Napier Complex is essential for unraveling the earth's crustal evolution, including deep crust; however, geochronological constraints, such as the timing and duration of the metamorphic events, are still debated.

Zircon, a valuable accessory mineral for geochronometers, has become a powerful geochemical tool for Antarctic geological and petrological research. We report preliminary U-Pb zircon ages of rock samples (sample Nos. 170223-2A-08 and 170223-2A-10) collected from Harvey Nunatak in the Napier Complex, East Antarctica, by JARE-58 Geological Field Survey Team. The rims of zircons in the cathodoluminescence images indicated weighted means of 2463 ± 10 Ma and 2452.8 ± 9.4 Ma (95% confidence, MSWD = 1.3 and 1.4, n = 14 and 13) analyzed using a sensitive high-resolution ion microprobe (SHRIMP-IIe) in NIPR.

We also found extremely lithium (Li)-enriched zircons (Li content, [Li]: ~300-600 ppm) in an orthopyroxene-felsic-gneiss (sample No. 170223-2A-09). The zircons were characterized according to the concentration of trace elements analyzed by SHRIMP-IIe in NIPR. The Li and oxygen isotope ratios of zircons are also analyzed by SHRIMP-IIe/AMC in NIPR. The Li isotope ratios ($\delta^{7}\text{Li}$) of the Li-rich zircons indicate a wide range from -2.8‰ to 12.7‰ (average is 3.5‰), which suggests the sources of the zircons were affected by contamination of sediment. The correlation between the Nb/Yb and U/Yb of zircons suggests a magmatic arc origin. Therefore, the protolith is derived from the magmatic arc, where sediments from the continental crust are subducted with water. In addition, some zircon grains have been affected by hydrothermal alteration recently since the zircons indicate high concentrations of non-formula elements and light REE. The altered domains indicate lower Li concentrations than those of unaltered domains.

In this presentation, we also report the U-Pb and trace element data in monazite and apatite in the same felsic gneiss (sample No. 170223-2A-09) and discuss based on the data.

References

Dallwitz (1968) *Nature*, 219, 476–477.

Harley (2016) *J. Mineral. Petrol. Sci.*, 111, 50–72.