

Contrasting Archaean crustal records in western part of the Napier Complex, East Antarctica

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The Napier Complex in East Antarctica has attracted considerable interest from a viewpoint of long Archaean crustal history from 3800 Ma to 2500 Ma (e.g., Harley & Black 1997, Antarctic Science) and >1000°C ultrahigh-temperature (UHT) metamorphism in a regional scale (e.g., Sheraton et al., 1987, BMR Bulletin; Harley & Hensen 1990; GSL). Fyfe Hills and Mt. Cronus regions in the western part of the Napier Complex are the areas where ancient >3800-3600 Ma zircon ages have been obtained. Compston and Williams (1982) reported the preliminary data but >3800 Ma SHRIMP zircon upper intercept ages for granitic orthogneiss from Fyfe Hills. Asami et al. (2002 Precamb. Res.) reported >3600 Ma zircon ages using electron microprobe for quartzofeldspathic gneiss from Mt. Cronus. For both area, 3000 Ma or younger protolith ages are also reported in their literatures. It is quite important to confirm the reported early Archaean crustal ages to make more detailed discussion about the Archaean crustal history of the Napier Complex. In addition, the timing of ultrahigh-temperature metamorphism is in argument either >2550 Ma or <2480 Ma (Kelly and Harley, 2005).

We have studied three samples (2 felsic orthogneiss, 1 quartzite) from Fyfe Hills and two samples (paragneiss and quartzite) from Mt. Cronus using SHRIMP II. The felsic orthogneiss of Fyfe Hills yielded two age peaks centered at ca. 2740 and ca. 2530 Ma. Another orthogneiss shows two major age populations centered at ca. 2530 and ca. 2480 Ma with inheritance at ca. 2800 and ca. 2635 Ma. U-Pb data of the quartzite of Fyfe Hills are scattered from ca. 3045 to ca. 2400 Ma and show peaks around 3020, 2940, 2875, 2760, 2680, 2520, and 2440 Ma. On the other hand, paragneiss and quartzite of Mt. Cronus yielded several age peaks centered around 3015, 2870, 2760, 2680, 2580, and 2490 Ma.

Thus, there is no evidence of older than Paleoproterozoic for both area. We could suggest that magmatic protolith of some of orthogneiss from Fyfe Hills are formed at 2740 Ma. The paragneiss in the same area sourced from 3020-2760 Ma sediments. Both orthogneiss and paragneiss have record of metamorphic age at ~2520 Ma. Contrary to this, sedimentary sources of paragneisses in Mt. Cronus range from 3015 Ma to 2580 Ma with metamorphic age of ~2490 Ma.

Our new data suggest that ancient >3800-3600 Ma ages are not always dominant in these area, and that the newly obtained 3000-2600 Ma protolith ages are somewhat similar with those reported for the other areas (e.g., Mt. Riiser-Larsen, Tonagh Island) in the Napier Complex. Also interesting is that recorded protolith and metamorphic age components for these two areas, Fyfe Hills and Mt. Cronus - about 50km away from each other, differ systematically. The data can provide insight into the Archaean crustal development in this part of Antarctica and also time constraints for the process of ultrahigh-temperature metamorphism.

Keywords: Napier Complex, SHRIMP, zircon, U-Pb dating, Archaean crust