東南極ナピア岩体西部における始生代大陸地殻の痕跡の対比

堀江憲路[1]、外田智千[1]、廣井美邦[2]、本吉洋一[1]、白石和行[1]
[1] *国立極地研究所*
[2] *千葉大学理学部*

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

Kenji Horie[1], Tomokazu Hokada[1], Yoshikuni Hiroi [2], Yoichi Motoyoshi[1] and Kazuyuki Shiraishi[1]
[1]*NIPR*
[2]*Chiba University*

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) and >1000˚C ultrahigh-temperature (UHT) metamorphism in a regional scale (e.g., Sheraton et al., 1987; Harley & Hensen 1990). Especially, Mt.Sones and Gage Ridge regions in the Napier Complex are famous as evidence of early Archean (Black et al., 1986; Harley & Black 1997). For other regions, previous workers also reported possibility of the early Archean crust. 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) reported >3600 Ma zircon ages using electron microprobe for quartzo-feldspathic gneiss from Mt. Cronus. For both area, 3000 Ma or younger protolith ages are also reported in there literatures. It is quite important to confirm the reported early Archaean crustal ages to make more detailed discussion about the Archean 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 orthogneisses and 1 quartzite) from Fyfe Hills and three samples (1 paragneiss and 2 quartzites) from Mt. Cronus. The studied samples were collected by Y.H. during the field work at the 2004-2005 Japanese Antarctic Research Expedition. Zircon grains were concentrated using conventional mineral-separation techniques, including crushing and pulverizing, followed by separations using methylene iodide. More than 100 zircon grains were picked up from each sample and mounted with standard zircons. In-situ U–Pb analyses were performed using a sensitive high resolution ion microprobe (SHRIMP II) at National Institute of Polar Research, Japan. An O_2^- primary ion beam of 3.6-6.0 nA was used to sputter an analytical spot of ~ 25 μm diameter on the polished mount. The procedures for Pb and U isotopic analyses of zircon are after Horie et al. (2006).

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 small amounts of inheritance ranging from 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 2 quartzites of Mt. Cronus yielded several age peaks centered around 3015, 2870, 2760, 2680, 2580, and 2490 Ma.

Our U–Pb zircon results can be compiled in the following figure. There is no evidence of older than Paleoarchean for Fyfe Hills and Mt.Cronus. Thus, ancient >3800-3600 Ma ages are not always dominant in these area. The newly obtained 3000–2600 Ma protplith ages are somewhat similar with those reported for the other areas (e.g., Mt. Riiser-Larsen, Tonagh Island) in the Napier Complex. We could suggest that magmatic protoliths of some orthogneisses from Fyfe Hills are formed at 2740 Ma. This magmatic protolith age is new information for the Archean magmatism in the Napier Complex. 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 pargneisses in Mt. Cronus range from 3015Ma to 2580 Ma with metamorphic age of ~2490 Ma. The interesting thing 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 constraintes for the process of ultrahigh-temperature metamorphism.

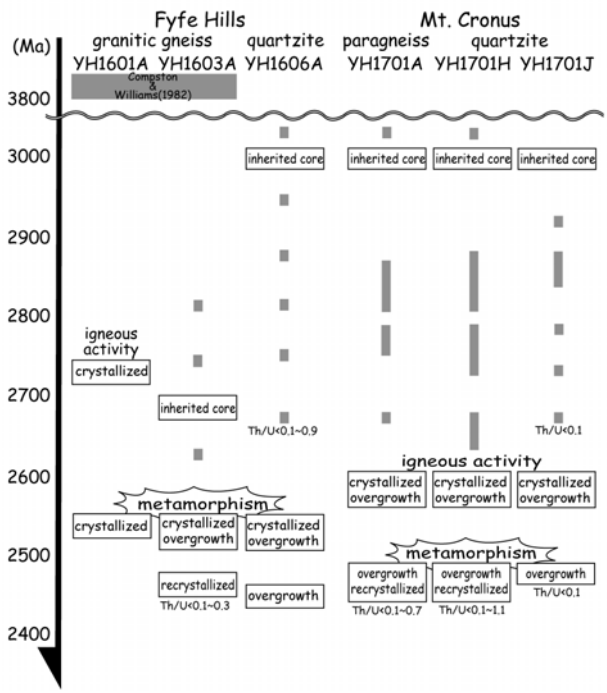

Figure 1. Compiled U–Pb zircon results in Fyfe Hills and Mt.Cronus.

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