# Extreme metamorphism resulted from continental collision during Late Archean in the Napier Complex, East Antarctica

# Yasuhito Osanai[1]; Masaaki Owada[2]; Tsuyoshi Toyoshima[3]; Tomokazu Hokada[4]; Hiroshi Kaiden[4]; Nobuhiko Nakano[1]; Toshiaki Tsunogae[5]

[1] Earth Sci., Kyushu Univ.; [2] Dept. Earth Sci., Yamaguchi Univ.; [3] Grad. Sch. Sci. & Tech., Niigata Univ.; [4] NIPR; [5] Univ. Tsukuba

http://www.scs.kyushu-u.ac.jp/earth/osanai/osanai.html

The Napier Complex in eastern Enderby Land, East Antarctica is one of the most famous Archean ultrahigh-temperature (UHT) metamorphic terrane in the world. The dominant rock types of the Napier Complex are Opx- and Grt-bearing quartzofeldspathic gneisses of igneous origin (Archean TTG-type tonalitic orthogneiss) with subordinate constituents of ultramafic, mafic, pelitic, calcareous, siliceous and aluminous granulites. Characteristic UHT-type mineral assemblages of Spl+Qtz and Grt+Spr+Qtz, with or without Opx and osumilite (Osm), and Opx+Sil+Qtz are widespread in the Napier Complex. Recent geochronological studies revealed that the age of high-grade UHT-metamorphism could occur during Late Archean of 2.5 to 2.8 Ga in the Napier Complex.

We have carried out geological, petrological and geochemical investigations at around Amundsen Bay (e.g. Tonagh Isl., Bunt Isl., Mt. Pardoe, Priestly Peak, Mt. Liiser-Larsen etc.). In this presentation, we will try to discuss a tectono-metamorphic evolution of the whole region of the Napier Complex using data from these areas with respect to a primitive continental growth during Archean.

Metamorphic rocks in the whole region of the Napier Complex underwent UHT-granulite facies metamorphism. Characteristic low-pressure UHT-mineral assemblages of Spl+Qtz and Grt+ Osm+Qtz are identified in the eastern part of the Napier Complex (eNC), where Opx+Sil+Qtz is unstable. However in the western part of the complex (wNC) relatively high-pressure UHT-assemblages of Spr+Opx+/-Grt+Qtz and Opx+Sil+Qtz without any Osm and Spl+Qtz are observed in anywhere. Regional-scale analysis of geological structure using a strike-line map indicates that there is a characteristic structural gap between the eNC and wNC.

Metamorphic evolution processes inferred from the eNC and the wNC are summarized below. The eNC (e.g. Bunt Isl.) shows a clockwise P-T evolution under UHT-condition, which is inferred by the Osm-forming reactions, but mineral inclusions of Opx, Sil and Qtz are also identified in Grt and Spr as an unstable previous high-pressure assemblage. This P-T path shows near isothermal decompression (ITD), which would start from 1.2 GPa or more high-pressure at around 1000 C. Fine grains of srilankite would also support the primary high-pressure condition. While in the wNC (e.g. Tonagh Isl.) change in divariant mineral assemblages from Spl+Qtz to Opx+Sil via Spr+Qtz is identified, which would show a counter clockwise P-T evolution. The inferred P-T path indicates isothermal compression (ITC) under UHT-condition and peaked at ca.1.0 GPa and ca.1100 C, which followed by near-isobaric cooling (IBC).

There is still remaining a problem to consider the age of peak metamorphic event in the Napier Complex. Detailed geochronological analyses using multi-isotope systems (Sm-Nd, U-Pb, Lu-Hf) indicate that ca. 2.5 Ga event is recorded in almost all areas in the Napier Complex, whereas bit older metamorphic event of 2.7-2.8 Ga is identified only in the eNC. Estimated source mantle compositions of the eNC and wNC are also different. The former shows a highly depleted, while the latter indicates near bulk earth composition.

We inferred that micro-continent collision would have taken place during Late Archean. After the formation of crustal pile the wNC situated beneath the eNC that is evidenced by different P-T paths between the two complexes. Metamorphic evolution of the wNC would be completely overprinted by collision metamorphism of ca. 2.5 Ga, but pre-collision history of the upward eNC is still remaining.