K130-P010 **Room: Poster Session Hall** **Time: May 19**

Accessory phase behaviour and U-Th-Pb dating of UHT metamorphic rocks from Rauer Islands, Antarctica

Tomokazu Hokada[1]; Simon Harley[2]; Kazumi Yokoyama[3]

[1] NIPR; [2] Geol. and Geophysics, Edinburgh Univ.; [3] Dept. Geology and Paleontology, National Science Museum, Tokyo

The Rauer Group of islands, located on eastern side of Prydz Bay in East Antarctica, includes both Archaean and Mesoproterozoic crustal components last metamorphosed and deformed at c.500 Ma. Within the Rauer Group a distinct suite of supracrustal rocks, the Mather Paragneiss, preserves evidence for ultrahigh-temperature (UHT) metamorphism at c.1000 C followed by isothermal decompression (ITD) at 850-950 C (Harley, 1998, JMG, 16, 541-562; Kelsey et al., 2003, JMG, 21, 739-759). Mg-Al-rich gneisses in Mather Peninsula preserve UHT mineral assemblages including garnet, orthopyroxene and/or sillimanite that are locally replaced by fine-grained symplectite composed of sapphirine, cordierite, orthopyroxene, spinel or plagioclase, consistent with this proposed P-T path. These gneisses have also experienced extensive hydration, manifested in the formation of biotite-bearing reaction coronas and localized biotite-rich zones and reaction selvedges.

The major issue relating to the age and hence tectonic significance of these UHT Mather Paragneiss is whether their host Archaean gneisses (Harley et al., 1998, Precamb. Res., 89, 175-205) were reworked in the Mesoproterozoic (c.1000 Ma, Kinny et al., 1993, Antarct. Sci., 5, 193-206), or only affected by an Archaean tectonothermal event overprinted by the c.500 Ma Prydz Bay event (Hensen and Zhou, 1995, Aust. J. Earth Sci., 42, 249-258) which led to their interleaving with the Mesoproterozoic gneisses. In other words, whether the UHT metamorphic event occurred at c.500 Ma or at an earlier time is still unresolved.

We have investigated the U-Th-Pb ages of zircons and monazites related to their textural and compositional contexts in a UHT garnet-orthopyroxene gneiss using in-situ SHRIMP and electron microprobe (EMP) analysis. Zircon grains within garnet yield 527+/-12 Ma concordia and 524+/-18 Ma lower-intercept ages along with discordant linear arrays that point towards upper intercept ages from 1000 Ma to 2500 Ma obtained by SHRIMP. All of these concordant and older discordant zircons have HREE-enriched chondrite-normalized REE patterns, suggesting that they have not equilibrated with the flat-HREE garnet in the rock and hence that they formed prior to the dominant garnet or that they still preserve the chemical features of earlier zircon. In contrast, almost all monazite grains record EMP U-Th-Pb ages characterized by a major cluster 580-450 Ma and a minor population at c.700 Ma. These monazites show a distinct internal zonation, from 580-560 Ma dark-BEI cores to 550-520 Ma mid-BEI mantles and 510-500 Ma bright-BEI rims. The 580-560 Ma monazite cores have relatively high M(-H)REE whereas the 550-520 Ma mantle domains and structureless grains preserve lower M(-H)REE contents, suggesting their growth / modification under different conditions. The 510-500 Ma outermost rims have the lowest M(-H)REE concentrations.

These zircon and monazite U-Th-Pb and REE data suggest that the Mather Paragneisses did experience a high grade metamorphic event at c. 1000 Ma (Kinny et al., 1993), in which Archaean detrital zircons were variably chemically modified and underwent Pb loss. Garnet growth, along with orthopyroxene with which it has maintained REE equilibrium, occurred at or prior to c. 530-520 Ma, resulting in the depletion of M-HREE in the environment in which monazites were forming or recrystallizing and leading to the progressive M-HREE depletion seen in the younger monazite populations. In this interpretation, the c. 580-520 Ma event occurred under UHT conditions followed by extensive re-hydration and biotite formation and reaction associated with high-temperature exhumation.