

TIMING AND P-T PATH OF GRANULITES FROM THE MCKASKLE HILLS, EASTERN AMERY ICE SHELF, ANTARCTICA, AND THEIR BEARING ON THE TECTONOTHERMAL EVOLUTION OF THE PRYDZ BELT

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Two metamorphic events, Grenvillian and Pan-African, formerly identified from garnet-bearing mafic granulites on the Sørstrene Island of East Antarctica, have resulted in a debate on the nature and role of the Prydz Belt in the context of the Gondwana assembly. An outcrop of garnet-bearing mafic granulite with typical decompressional reaction textures and exsolution textures was newly discovered in the McKaskle Hills, Eastern Amery Ice Shelf. The combined conventional, average and retrieval thermobarometric techniques restrict P-T conditions of mafic granulite to 8.5-9.2 kbar and 740-790°C for the inclusion assemblages, 9.0-9.5 kbar and 880-950°C for the matrix assemblages, and 6.6-7.2 kbar and 700-750°C for the symplectite assemblages. The similar P-T estimates of 8.9 kbar and 900°C for the core compositions and of 6.6 kbar and 790°C for the rim compositions are obtained for minerals from felsic para- and orthogneisses, and an earlier prograde heating process is also indicated by the preservation of muscovite as inclusions in garnet in a paragneiss sample. SHRIMP U-Pb zircon dating reveals a complex evolutionary history for the granulites including a Mesoproterozoic mafic and felsic magmatic intrusion at ~1160-1020 Ma, a Grenvillian metamorphism at ~1000 Ma, a Neoproterozoic sedimentation thereafter and a Pan-African metamorphism at 535-529 Ma. In contrast, Sm-Nd whole rock-mineral dating only yields a late cooling age of ~500 Ma. The comparable P-T evolution between mafic granulites and their country gneisses and the growth of the Pan-African new zircon rim on the Grenvillian detrital zircon grains in paragneisses suggest that the inferred clockwise P-T path for the rocks is coherent, resulted from a single Pan-African metamorphic cycle, rather than two distinct metamorphic events. Along with comparison with P-T results from other localities, it is reasonably believed that the Pan-African high-grade metamorphism in the Prydz Belt may have reached the peak pressures as high as 9.0-9.5 kbar at ~850-950°C during the crustal thickening, then followed by a decompression of 2-4 kbar as a consequence of orogenic exhumation and unroofing. Evidently, the present available data support the inference that the Prydz Belt represents a Pan-African suture formed by collision between the Indo-Antarctic and Australo-Antarctic continental blocks.