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Granitoid Diversity in the Southern Prince Charles Mountains: Geological and Petrographic Features

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Abstract - Granitic rocks in the southern Prince Charles Mountains vary widely in both composition and field appearance. Generally, the granitoids form syn- to post-tectonic sheet-like bodies. Variously deformed (pre-tectonic) basement granitoids also occur as large bodies. Subvertical dykes occur in many localities, and sporadically form dense networks grading into larger bodies with only scarce rafts of the country rocks. In a few localities concentrated in the Fisher Glacier area stock-like bodies occur. The deformation style also varies widely. Variously deformed granitic bodies prevail in the northern Mawson Escarpment and nearly undeformed granites occur in the Fisher Glacier area. The granite structure varies from homogeneous, equigranular to augen or highly stretched gneissic.
Two distinct gneissic rock groups occur in the southern Mawson Escarpment: biotite or hornblende–biotite granite-gneiss, and orthopyroxene-bearing granite-gneiss. The latter was probably formed during a charnockitisation process or may be magmatic, as no biotite break-down reaction has been preserved and some rocks reveal apparently magmatic structures. In the Cumpston Massif plagioclase-rich orthogneisses containing magnetite and fluorite occur. More calcic gneisses predominate in Clemence Massif.
The presumed Early Palaeozoic granitoids form three distinct groups. The granites in the northern Mawson Escarpment are biotite and rarely biotite–garnet or biotite–hornblende-bearing, in Harbour Bluff mostly muscovite–garnet-bearing, and elsewhere in the southern Prince Charles Mountains mostly muscovite or muscovite–biotite-bearing. Distinctive granitic rocks crop out on Landing Bluff (Prydz Bay coast), where they are more mafic (biotite) and contain essential amounts of accessory allanite, titanite, and fluorite. These rocks cannot be correlated with granites in the southern Prince Charles Mountains, which suggests different origins for the granites in these two regions.

INTRODUCTION

The Prince Charles Mountains (PCM) reveal the best exposed cross section through the East Antarctic Shield, extending for more than 500 km along the drainage basin of the Lambert Glacier–Amery Ice Shelf system. Two major tectonic provinces have been distinguished in the northern and in the southern PCM (Tingey 1982, 1991, Kamenev et al., 1993, Fitzsimons, 2003, Mikhalsky et al., 2006). The Meso- to Neoproterozoic Beaver and Mesoprotorozoic Fisher Terranes occupy the northern PCM, and the Archaean Ruker Terrane (Boger et al., 2006) and Palaeoproterozoic Lambert Terrane (Mikhalsky et al., 2006) occupy the southern PCM. These terranes are composed of highly variable lithologies, with granite (*s.l.*[1]) and granite-gneiss (along with metasediments) being the most common rock types forming the basement of these terranes. In the Ruker Terrane the granitic basement is overlain by a highly deformed metasedimentary cover (Phillips et al., 2005). Both the Lambert Terrane and the Ruker Terrane granitic basement rocks seem to have experienced some Early Palaeozoic tectonism. A prominent feature of the southern PCM is the widespread occurrence and, in some areas, abundance, of younger, presumably Early Palaeozoic granites that were considered to be post-tectonic or anorogenic (Sheraton et al., 1996). The major tectonic subdivisions, and sampling localities are shown in figure 1.

The age of the granites in the southern PCM has been determined as Archaean (*c.* 2700-2800 Ma, Rb-Sr isochron ages by Tingey, 1982, 1991, which most likely are metamorphic ages, and *c.* 3000 Ma, U–Pb bulk zircon data, Mikhalsky et al., 2001) or early Palaeozoic (*c.* 500 Ma, Rb–Sr whole-rock isochron and mica model ages, Halpern & Grikurov, 1975, Tingey, 1991). Boger et al. (2006) dated pre-tectonic granitoid rocks at *c.* 3185–3155 Ma and Mikhalsky et al. (2006) reported tonalite–trondhjemite emplacement at *c.* 3390–3380 Ma. A number of late Archaean to early Proterozoic ages were obtained for pegmatites from the southern PCM. Rb–Sr muscovite ages of 2580 Ma (Mount Stinear), 1708 Ma and 1995 Ma (deformed pegmatites at Keyser Ridge), and a model age of muscovite of about 2100 Ma has been obtained on a pegmatite at Mount Newton (Tingey, 1991). Recent SHRIMP zircon studies by Boger et al. (2001) showed early Palaeozoic ages of syn-, and post-tectonic granitic vein injections (*c.* 510 and 490 Ma, respectively) in the

[1]Granite *sensu largo* means phaneritic igneous rock dominated by quartz and feldspars.