

COMPARISON OF BASIC DYKES FROM CAPE DENISON (ANTARCTICA) AND PORT LINCOLN (SOUTH AUSTRALIA)

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The predominant rock type exposed at Cape Denison is a megacrystic feldspar granitic to granodioritic gneiss, zircons from which have been dated at 2366 ± 33 Ma. An early S^1 foliation, which varies in intensity, trends NNW — SSE and dips steeply to the east or is involved in D^2 folding with axial planes also trending NNW — SSE and dipping steeply to the east and with gently south-plunging fold axes.

Basic dykes for the most part, are oriented parallel to the NNW — SSE trending S^1 foliation and apparently have been emplaced subsequent to the initial development of this foliation. Occasional folding of the dykes and common intrafolial folding of narrow leucosomes within the dykes indicates that emplacement of the dykes was pre D^2 . The dykes themselves are variously foliated, thus suggesting a post-emplacement continuation of the S^1 producing strain parallel to the axial planes of the D^2 folding.

Petrographically, the dyke rocks are amphibolites, resulting from amphibolite facies metamorphism of presumed original dolerites. Relict ophitic texture is apparent in some specimens but no original igneous mineralogy is preserved. Hornblende and plagioclase are predominant. Biotite content is variable, from 0 to 25%, usually with parallel orientation, manifesting the foliation visible in many of the outcrop areas. Small amounts of quartz occur in many samples. Accessory sphene, ilmenite and epidote-clinozoisite are common.

Major and minor elements of twenty one dyke rock samples have been analysed. Most dykes are strongly hypersthene normative tholeiites. Only a few intensely foliated dykes with relatively abundant biotite are nepheline normative; this is probably a result of addition of K during deformation. Two, chemically distinct, groups of dykes can be recognised. Group I dykes are slightly quartz or olivine normative, with Mg (atomic Mg/(Mg+total Fe)) — 39-41, and relatively high TiO_2 , Zr and Nb. Group II dykes are mostly olivine normative and have Mg 49-60.

Rocks outcropping in the Port Lincoln area are predominantly of the Lincoln Complex which comprises granitic gneisses, migmatites, and granulite augen gneisses. Granitoids from this complex are dated (U-Pb) at ca 1800 Ma. Mafic dykes cutting granitoids of the Lincoln Complex range from igneous-textured dolerites to recrystallised mafic granulites. Orientation of these dykes tends to be random. Bounding the Lincoln Complex to the west is the Kalinjala Mylonite Zone, trending N-S in the Port Lincoln area. The mylonite foliation is regarded as a high strain, axial plane manifestation of regional D^3 folding. Within a kilometre or so to the east of the Kalinjala Mylonite Zone orthopyroxene granitoids are variably foliated and amphibolised as are the mafic dykes cutting them. The foliation, and the dykes themselves, trend N-S, parallel to the mylonite zone.

Petrographically, three groups of dykes display essentially igneous mineralogy, viz. i) coarse-grained norites, gabbro-norites and rare pyroxenites, ii) fine-grained, plagioclase-phyric, pyroxene phyric and olivine-phyric dolerites, iii) very fine-grained aphyric rocks. In addition there are recrystallised dykes, viz. i) granoblastic pyroxene granulites and hornblende granulites and ii) foliated amphibolites, alluded to above.

Chemically, the igneous-textured dykes are largely olivine-normative and the amphibolites quartz normative, tholeiites. The former are readily distinguished by their different Hf/D_1 ratios. All three igneous-textured groups are LREE enriched, but they differ in the different degrees of HREE fractionation, distinct Zr/Ti and Zr/Y ratios and different combinations of normalised negative Ti, Nb, P, Sr and V anomalies.

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Justification for comparing the basic dykes of Cape Denison with those of the Port Lincoln area stems from the suggested correlation of the granite-granodiorite gneiss at Cape Denison with a similar lithology at Cape Carnot dated at ca 2400 Ma, and an inferred former juxtaposition of these two areas, postulated previously by Oliver, Cooper and Truelove.

The date of emplacement of the basic dykes at Port Lincoln is thought to be in the vicinity of 1600 Ma. The date of emplacement of the dykes at Cape Denison is unknown.

From a chemical point of view, Group II amphibolites from Cape Denison are most similar to gabbro-norite B36 at Port Lincoln. The former tend to resemble the most fractionated (lowest Ni, Cr) norites, but these latter have lower Ti/Zr and P. Zr, as well as higher SiO₂.

Group I dykes from Cape Denison resemble gabbro-norite B82, though this Port Lincoln rock has lower Ce/Y P/Zr and Nb/Zr. The major elements of both Groups I and II are similar to those of the gabbro-norites. In view, however, of the degree of metamorphism and deformation, and the probable resulting chemical changes undergone by the Cape Denison dykes, correlation of these with the dykes of the Port Lincoln area, on the basis of chemistry, must be tentative.