

The Geology, Geochemistry and Structure of the Mount
Darwin - South Darwin Peak Area,
Western Tasmania.



by

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Abstract

The Cambrian Darwin Granite intrudes calc-alkaline rhyolites of the Central Volcanic Complex on the Darwin Plateau, western Tasmania. Two distinct granite phases are recognised, an equigranular granite and a granodiorite. A biotite grade contact aureole is preserved in the Central Volcanic Complex immediate to the Darwin Granite. Debris flow deposits of volcanoclastic conglomerates and sandstones, and coherent dacite lavas of the Mid - Late Cambrian Tyndall Group unconformably overlie the Darwin Granite and Central Volcanic Complex, and are in turn overlain unconformably by pebble to boulder conglomerates of the siliciclastic Owen Conglomerate.

Stratigraphic and structural evidence recognise three deformation periods within the Mt Darwin - South Darwin Peak area: the Mid - Late Cambrian, Late Cambrian - Early Ordovician, and the Devonian Tabberabberan Orogeny. Mid - Late Cambrian deformation, evidenced by granitic and foliated volcanic clasts in basal Tyndall Group conglomerate, indicates catastrophic uplift and subsequent unroofing of the granite prior to Tyndall Group deposition. This unconformity represents a significant Cambrian hiatus in the southern Mount Read Volcanics. A second **unconformity** between the Tyndall Group and the Owen Conglomerate marks cessation of Tyndall Group deposition with the onset of deposition of large volumes of siliceous detritus. The two Devonian Tabberabberan-related deformations are characterised by, NW and N-trending dextral strike slip faulting and locally intense N-trending cleavage development. The Devonian structures dominate the region and have obscured the effects of earlier deformations. Devonian metamorphism to greenschist facies, characterised by chlorite-sericite assemblages, occurs throughout the area with intense development in shear zones.

Epigenetic, granite-related, vein and disseminated Cu-Au mineralisation occurs within and adjacent to the Darwin Granite. Sulphur isotope data indicates mixing of Cambrian seawater with magmatic-hydrothermal fluids in a hydrothermal convection cell generated during emplacement of the Darwin Granite. Depletion of Na₂O and CaO along with K₂O and FeO enrichment have occurred during pervasive K-feldspar, sericite and chlorite alteration.

Geochemical analyses of the Central Volcanic Complex and the magnetite series Darwin Granite suggest that these units were emplaced within an extensional basin (back-arc?), at an Andean-type margin. Granitic magma was generated through partial melting of an upper mantle to lower crustal source. REE data suggests that the CVC and Darwin Granite are not comagmatic, and field relationships preclude a genetic relationship between the Tyndall Group and the Darwin Granite. Elemental discrimination trends illustrates some similarities between the Darwin Granite and the most evolved phases of the Murchison Granite. However, the Darwin Granite displays no Eu anomaly in contrast to the negative Eu anomaly and HREE enrichment in the Murchison Granite, suggesting that the two granite systems are not genetically related.

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