Tectonic Evolution of Marie Byrd Land, West Antarctica: Disassembly of the Mesozoic Margin and Cenozoic Activity Related to the West Antarctic Rift System

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Marie Byrd Land records a history of early middle Paleozoic convergence, followed by a quiescent period during which the region provided clastic material to the Permian-Triassic Beacon Supergroup of the Transantarctic Mountains. During Mesozoic time, Marie Byrd Land (MBL) and New Zealand (NZ) shared a common tectonic history, culminating in granite plutonism and exhumation of mid-crustal rocks during Cretaceous rifting between the two provinces. Metamorphic core complexes were active in NZ. In the Ford Ranges of western MBL, rapid tectonic evolution during MBL-NZ separation involved granite crystallization, migmatization, and mylonitization between 105-90 Ma, based on $^{40}Ar/^{39}Ar$ mineral ages.

Separation between MBL and NZ-Campbell Plateau was apparently induced by encroachment of the Phoenix-Pacific spreading center upon a convergent margin outboard of NZ-Campbell Plateau. A remnant of the Phoenix oceanic crust (Bellingshausen plate) persisted as an independent microplate adjacent to MBL for ~16 m.y. before integration into the Antarctic tectonic plate. The tectonic plate reorganization is recorded on land by apatite fission track ages of ca. 70 Ma. Fault block mountains bounded by NW structures developed in western MBL at this time. The Ford Ranges now form the eastern Ross Sea margin, and represent significant topography in an area of crust thinned during MBL-NZ rifting. Regional elevations increase into central Marie Byrd Land (>3300 m), where Oligocene to Quaternary volcanism since 25 Ma is potentially related to mantle plume activity.