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275-4: PARTITIONING OF STRAIN IN MID- AND LOWER-CRUSTAL LEVELS DURING AN ARC FLARE-UP, MEDIAN BATHOLITH, FIORDLAND, NEW ZEALAND

Tuesday, 24 October 2017

09:00 AM - 06:30 PM

📍 *Washington State Convention Center - Halls 4EF*

In Fiordland, New Zealand, rocks of the Western Fiordland Orthogneiss batholith were emplaced into the middle and lower crust of a continental arc that formed along the margin of Gondwana during the Early Cretaceous. We used structural analyses, $^{206}\text{Pb}/^{238}\text{U}$ zircon dates (SHRIMP-RG), and $^{206}\text{Pb}/^{238}\text{U}$ titanite dates (LASS-ICP-MS) to examine relationships among deformation, metamorphism, and pluton emplacement at different crustal levels during and after a flare-up in arc magmatism.

At Adams Burn, in central Fiordland, Tertiary thrust faults juxtapose middle and lower crustal levels. Here, exposures of the lower crust record emplacement of the Early Cretaceous, mostly dioritic, Misty Pluton. The pluton's eastern contact is marked by the Misty shear zone (MSZ), a ~1 km thick, NE-striking and moderately NW-dipping, gneissic and migmatitic domain that records sinistral-reverse shearing parallel to the axis of the arc. The timing of shearing is bracketed by zircon dates: a published date interpreted to represent pluton crystallization at 122.6 ± 1.9 Ma, and an undeformed, post-tectonic dike dated at 119.9 ± 2.0 Ma. Igneous flow fabrics parallel shear fabrics, suggesting the shear zone developed during pluton emplacement. Structurally below the MSZ to the east, mid-crustal rocks are deformed by a gently dipping, high-strain zone named the South Adams Burn thrust (SABT) that records shortening orthogonal to the trend of the arc. The timing of deformation in the SABT is bracketed by new zircon dates from a pre-tectonic dike (113.7 ± 2.3 Ma) and a cross-cutting undeformed tonalite pluton of the West Arm Leucogranite (111 ± 1.1 Ma). Titanite in sheared calc-silicate horizons records pulses of amphibolite-facies metamorphism accompanying magma emplacement at ~111 and ~113 Ma. Post-tectonic dikes yield zircon dates that range from ~108 – 97 Ma.

The results suggest that gently dipping sheets of the Misty pluton were emplaced incrementally into the MSZ during regional transpression. In contrast, arc-normal and arc-parallel components of the deformation were separated in the middle crust, and more felsic magmatism appears to have often outlasted deformation rather than having been emplaced into active shear zones. This study highlights coeval processes operating at middle and lower crustal levels during continental arc growth.

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