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Paper No. 2-4

Presentation Time: 9:05 AM

INTEGRATING MICROKINEMATIC CRYSTALLOGRAPHIC VORTICITY AXIS (CVA) ANALYSIS AND PETROCHRONOLOGY TO INVESTIGATE THE TEMPORAL DEVELOPMENT OF FABRIC IN AN INTRA-ARC SHEAR ZONE, FIORDLAND, NEW ZEALAND

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We investigate strain accommodation deep within the crust of a Cordilleran-style intra-arc shear zone by performing electron backscatter diffraction (EBSD) and crystallographic vorticity axis (CVA) analyses on six samples from the trans-crustal George Sound Shear Zone (GSSZ), in Fiordland, New Zealand. We combine these microkinematic studies with petrochronology to evaluate temporal changes in fabric development in the GSSZ due to Cretaceous development of the shear zone along an older, crustal-scale discontinuity marked by a linear distribution of Carboniferous granites. Our samples come from middle-crustal exposures of the GSSZ, where it separates the Cretaceous hornblende diorite of the Misty Pluton (MP) (117-114 Ma) from the Carboniferous Large Pluton (LP) (316-308 Ma) in Central Fiordland. We present CVA results from samples taken across the strain gradient of the GSSZ along two transects named Mary Peaks and Myth Tarn. These samples include low- and high-strain rocks from the margin of the MP, as well as low-strain granite from the LP.

CVA analysis coupled with geochronology results reveal different kinematic deformation geometries for Cretaceous and Carboniferous deformation. At Myth Tarn, the bulk CVA pattern from high- and low-strain MP samples is consistent with monoclinic pure shear dominated transpression; U-Pb zircon dates from the MP (117-114 Ma) and from cross-cutting undeformed dikes (115-113 Ma) show that the fabric is Cretaceous in age, which we correlate with the pure shear transpression CVA pattern. At Mary Peaks, the bulk CVA pattern of the low-strain MP sample suggests monoclinic general compression. In the low-strain LP at Mary Peaks, the bulk CVA pattern is most consistent with transtension, with a minor trace of monoclinic pure shear dominated transpression. U-Pb zircon dates from the LP show an older population of ages around 307.5 Ma and a younger population of 117.6 Ma, which we correlate with the CVA patterns that indicate transtension and pure shear transpression, respectively. These results suggest that Carboniferous transtensional fabrics became transposed during emplacement of the MP and initiation of the GSSZ. During the Cretaceous, deformation became dominated by pure shear transpression as strain became localized in high-strain zones within the GSSZ in the middle crust.

Session No. 2

[T13. Directly Dating Deformation, Metamorphism, and Metasomatism through Petrochronology I](#)

Tuesday, 15 March 2022: 8:00 AM-12:00 PM

CBC-A 112 (UNLV Classroom Building Complex A)

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[Back to: T13. Directly Dating Deformation, Metamorphism, and Metasomatism through Petrochronology I](#)[<< Previous Abstract](#) | [Next Abstract >>](#)