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STRAIN ACCOMMODATION AND 3D KINEMATICS OF TRANSPRESSIONAL FLOW WITHIN THE LOWER CRUST OF A CRETACEOUS MAGMATIC ARC IN FIORDLAND NEW ZEALAND

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The steeply dipping George Sound shear zone (GSSZ) in Fiordland, New Zealand allowed us to reconstruct the kinematics of transpressive flow in >100 km^2 of exhumed Cretaceous lower crust. We compare the 3-D characteristics of the deformation to theoretical models of transpression that assume steady-state flow in a homogeneous medium. Structural analyses and LA-SF-ICPMS and SHRIMP-RG zircon dates show that the transpression began during magmatism that resulted in emplacement of the uniformly dioritic Worsley pluton at 124-122 Ma and the granitic McKerr pluton at ~119 Ma. Initially, synmagmatic deformation was distributed over a zone at least ~5 km wide. Ages from granitic dikes show that the deformation later localized into a 2 km-wide zone of upper amphibolite facies mylonite by 119-115 Ma and had ceased by ~108 Ma. Finite strain analyses were performed in 3-D on 14 samples using the Rf/ϕ, Fry, and Intercept methods. SPO fabric ellipsoids show how initially prolate fabrics rotated and transitioned into oblate fabrics as strains accumulated. These changes were accompanied by a progressive steepening of plagioclase, pyroxene and hornblende stretching lineations and by changes in foliation orientation. Hornblende fish show a consistent top-down-to-the-SW, apparent normal shear sense with a sinistral component. The Z-axes of oblate SPO ellipsoids define the vorticity normal section and the vorticity vector, with the latter plunging moderately to the WNW. Foliation deflections relative to the shear zone boundaries with increasing strain yielded a vorticity magnitude (W_k) of ≥0.86. The results suggest that within areas of uniform composition, the GSSZ records a non-partitioned style of inclined, triclinic transpression with near vertical extrusion and sinistral, top-down-to-the-SW simple shear-dominated flow. Our analysis suggests that most flow parameters, when averaged over the entire shear zone and over the 14-16 Ma duration of deformation, match the predictions of homogeneous, steady-state flow fairly well. Comparisons with other shear zones suggest that lithologic heterogeneities increase the degree of strain partitioning and cause local changes in vorticity. Near vertical extrusion during transpression, regardless of partitioning, aided the transport of magma through the lower crust.

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D60. Structural Geology (Posters)
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