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GRADUATE SCHOOL

Deformation and Metamorphism of Tectonites Exposed in the New York
and Clark Mountains, eastern California:

A case for Proterozoic mid-crustal shortening in the Mojave Province

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To my parents, John Rieser and Karen Edwards

ABSTRACT

During ~1.76-1.64 Ga crustal growth in southwest Laurentia, an oblique shear zone with components of left-lateral strike-slip and thrust motions juxtaposed two blocks of deep-seated Proterozoic crust presently exposed in the New York and Clark mountains of the Mojave tectonic province, eastern California. Two localities, Mineral Hill and Willow Wash, were subjected to peak metamorphic conditions of ~720°C, 6.5 kbar and ~780°C, 3.5 kbar, respectively, as determined by GASP barometry and Grt-Bt exchange thermometry. Ductile L-S tectonite fabrics consisting of a north-northwest striking, west-dipping tectonic and compositional foliation and a northwest-trending, shallow-plunging mineral stretching lineation characterize the penetrative deformation of both areas. High-temperature quartz c-axis fabrics confirm that peak metamorphic conditions accompanied deformation. Additionally, quartz petrofabric analysis reveals a strong lattice-preferred orientation (LPO) that is geometrically related to the stretching lineation and foliation. Asymmetric S-C foliations, folds, and feldspar “fish” measured in the field and in thin section yield reproducible top-to-the-SE shear sense indicators. Although quartz LPO is well preserved, flat-field extinction in quartz grains is interpreted as evidence of annealing related to post-kinematic regional heating. Synchronous granulite-facies metamorphism, medium metamorphic pressure, and oblique top-to-the-SE, sinistral shear suggest that the deep crust was simultaneously translated and contracted, placing 3.5 kbar crust structurally above 6.5 kbar crust. The kinematic fabrics and contrasting barometry of these two related tectonic blocks may offer a direct example of large-scale

Paleoproterozoic strike-slip motions proposed by earlier workers (Bennett and DePaolo, 1987) on the basis of isotopic mapping. The apparent contraction may be related to the 1.705 “Ivanpah Orogeny”, which juxtaposed the Yavapai and Mojave tectonic provinces (Wooden and Miller, 1990).

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