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Deformation history of the Sanagak Lake shear zone, Boothia Peninsula, Nunavut

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Summary

Boothia Peninsula, Nunavut, is transected by a ~165 km long, SW-striking, steeply (70°NW) dipping corridor of highly strained rocks, the Sanagak Lake shear zone. In this zone, microtextures observed in quartz ribbons include grain boundary migration and chessboard extinction indicating that deformation occurred at temperatures >650°C. Strain was subsequently localized along discrete zones (shear bands), which increase in abundance and thickness towards the interior of the shear zone. In these shear bands, quartz ribbons are recrystallized by sub-grain rotation and bulging, suggesting that subsequent high-strain deformation occurred at 1) lower metamorphic grade than the surrounding rocks, or 2) higher strain rate. Quartz c-axes of non-recrystallized quartz ribbons yield asymmetric type-I and type-II crossed-girdle fabrics with opening angles of 75-105°, correlating to deformation temperatures between 570-750°C and sinistral sense of movement. Recrystallized quartz ribbons have point maxima fabrics consistent with rhomb <a> and prism <a> slip. The significance of these results is currently being interpreted. LA-MC-ICPMS U-Pb data from monazite and titanite provide broad constraints on the timing of deformation. Monazite in a peraluminous granitoid not overprinted by the high-strain deformation event yields a $^{207}Pb/^{206}Pb$ age of ca. 1912 Ma. This age is interpreted to reflect late-stage regional metamorphism associated with the Thelon Orogeny. A strongly overprinted sample of this lithology contains monazite that yield two $^{207}Pb/^{206}Pb$ age populations at ca. 1810 Ma and 1775 Ma; more analytical work is being done on this sample. A metaluminous granitoid within the shear zone contains titanite that occurs in recrystallized mafic-rich bands (hornblende + biotite) interlayered with feldspar-rich bands and

quartz ribbons. Regardless of the overprinting textures present in the sample, titanite yield U-Pb ages of ca. 1810 Ma and have consistent Zr concentrations, suggesting that titanite (re)crystallized at this time. This is interpreted to be the timing of shear zone development. Presently, it is unclear why a shear zone of this magnitude and age occurs in this area since it does not represent a major geological boundary. It is possible that strain was localized along a preexisting structure or is an extension of a regional structure. For example, the magnetic-high signature of the shear zone can be extrapolated SW towards the boundary between the Sherman Basin and the Queen Maud granitoids, however, the nature of this boundary and its relationship to the Sanagak Lake shear zone is not currently known.