

Brittle deformation and associated hydrothermal alteration and mineralization in the southern Tantato Domain, Saskatchewan

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The Archean rocks of the Tantato Domain, north of the Athabasca basin, are overprinted by brittle faults, fractures, and veins associated with three distinct generations of brittle structures which host sub-economic occurrences of uranium and gold. Previous research has focused on the structural controls of known gold occurrences within the Domain; however, the effects of multiple, successive deformation events on the mineralization is, at this time, unknown. This project will focus on the complex, multi-stage movement and reactivation history of the faults, as well as the links between faults of different orientations and their relationships to mineralization. In addition, it will characterize the mineralizing fluids and a potential remobilization of uranium and gold will be assessed. To address these problems, detailed structural mapping of five select areas and the creation of a domain wide structural data base was completed in the summer of 2015. To complement the field data, a regional orthographic lineament study is underway using satellite images and regional magnetic maps. This data, together with other regional geophysical survey maps and geochemical data, will be used to interpret the role of brittle deformation in the metallogenic history of the southern Tantato Domain. Veins hosting mineralization and their alteration halos will be analysed using the SEM to characterize the alteration minerals associated with the veins. The lack of exposure for sub-Athabasca basin faults and the limited structural information which can be collected from exposed walls of open mine pits and diamond drill core, provide few constraints that can be used to interpret the complex kinematic histories of faults hosting uranium. However, the rocks of the Tantato Domain extend under and become basement to the Athabasca basin, therefore the analysis of the 3D architecture and slip kinematic history of faults in the Tantato Domain can provide insight into the kinematic history of sub-Athabasca basin faults and hence on the deposition of uranium mineralization under the Athabasca basin.