

Structural Analysis of Fold Interference in the West-Central Glennie Domain, Reindeer zone, Saskatchewan, Canada

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Summary

The Glennie domain, within the Reindeer zone of the 1.9-1.8 Ga Trans Hudson Orogen, is host to supracrustal and plutonic rocks that were affected by polyphase deformation resulting in the development of complex fold interference structures. In this study, we investigated fold interference patterns in the central Glennie domain using an updated regional structural dataset collected during bedrock mapping by the Saskatchewan Geological Survey in the summers of 2017, 2018 and 2019. The main goals were to identify interference patterns and characterize the sequence and geometry of the major fold sets. To do so, the area was split into thirteen structural domains, each representing a structurally coherent, sub-cylindrical portion of the folded main (S_1/S_2) foliation. Poles to this foliation from each domain were plotted on lower hemisphere, equal area stereonet to evaluate fold geometry. F_1 folds are rarely observed: where seen, they are outcrop-scale isoclinal folds entrained within the S_2 fabric, creating a composite S_1/S_2 foliation. Isoclinal to tight F_2 folds are commonly mapped at outcrop scale, but less commonly distinguished at map scale. In some structural domains isoclinal F_2 fold closures are mapped and can clearly be seen to pre-date F_4 folds. F_3 folds are typically evident at map scale, and locally at outcrop scale, across the project area. They are generally upright and open with steep axial planes and sub horizontal hinges. F_3 folds are estimated to have originally trended SE-NW. Superimposed F_4 folds are upright, open, and trend SW-NE. They typically plunge moderately to shallowly NE but are locally doubly plunging due to interference with F_3 folds. At the NW edge of the project area, F_4 appear to be overturned, verging SE, potentially due to interference with earlier D_2 structures. The nearly perpendicular relationship between both axial planes and hinge lines of F_3 and F_4 folds has given rise mainly to Type 1, Type 2 and hybrid Type 1-2 interference patterns. Petrographic study was undertaken on the range of lithologies to accompany structural analysis. The composite S_1/S_2 foliation is defined by upper amphibolite facies assemblages formed during regional D_2 deformation. D_3 and D_4 occurred under lower grade conditions producing folds that are recognized at the map scale, rather than the outcrop or microscopic scale. U-bearing minerals, including zircon and titanite, have been identified in some rock types and will be used to constrain the timing of deformation in future studies.