University of Victoria | Graduate Studies

Notice of the Final Oral Examination
for the Degree of Master of Science

of

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BSc (University of Vermont, 2014)

"Relative and absolute timing of tectonothermal events in the Pohjanmaa Belt: A structural study of the Paleoproterozoic coupled Bothnian oroclines, Finland"

School of Earth and Ocean Sciences

Friday, April 6, 2018
9:00 A.M.
Bob Wright Centre
Room A319

Supervisory Committee:
Dr. Stephen T. Johnston, School of Earth and Ocean Sciences, University of Victoria (Co-Supervisor)
Dr. Dante Canil, School of Earth and Ocean Sciences, UVic (Co-Supervisor)
Dr. Kristin Morell, School of Earth and Ocean Sciences, UVic (Member)

External Examiner:
Dr. Tom Gleeson, Department of Civil Engineering, University of Victoria

Chair of Oral Examination:
Dr. Joan Wharf Higgins, School of Exercise Science, Physical and Health Education, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

Studies on the formation of oroclines (bends of originally linear mountain belts) are restricted to the Phanerozoic. Here we provide a structural, metamorphic and geochronological study of the meta-sedimentary Pohjanmaa Belt, which lies on the most northerly limb of one of the few examples of Paleoproterozoic oroclines, the coupled Bothnian oroclines in Finland. Our primary goal is to determine if the structures in the Pohjanmaa belt are consistent with the Svecofennian orogenic belt originating as a linear feature that was subsequently deformed into a pair of coupled oroclines.

Our detailed structural mapping focused on the geometry of F1, F2, and F3 folds within the Pohjanmaa Belt in west-central Ostrobothnia, Finland. Over 170 measurements were collected including interlimb angles, the attitudes of S1 and S2 foliations, and F2 fold axes. Also, 28 oriented core samples were collected to conduct a U-Pb geochronological study of monazites and an analysis of metamorphic textures in thin section. We first provide a review and comparison of similar structures around the coupled Bothnian oroclines. In our structural analysis we address the relative timing of deformation and metamorphism and use our U-Pb monazite geochronological data to constrain the absolute timing of tectonothermal events. Our findings suggest that: 1) D1, D2, D3 deformation stem from a protracted event that records progressive deformation and strain partitioning from pure shear (D1 shortening) to simple shear (D2, D3 sinistral shear) as a result of CCW rotation; 2) D2 folding and coeval garnet + staurolite metamorphism are consistent with early Svecofennian deformation, which occurred 80-90 m. y. prior to late-stage isothermal decompression and staurolite breakdown dated at 1.80 Ga by U-Pb monazite analysis; 3) Our structural analysis, in combination with subsidiary data, provides evidence that sinistral shear during D2-3 is the result of CCW rotation of the Pohjanmaa belt possibly in response to buckling of the coupled Bothnian oroclines during the early Svecofennian Fennia event.