The Marmion Shear Zone: A kinematic study of Archean terrane boundaries

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Introduction

The Marmion Shear zone marks the Archean terrane boundary between the ~3.003 Ga Marmion tonalite-trondhjemite-granodiorite (TTG) gneisses and the 2.931 – 3.003 Ga Finlayson Lake greenstone belt [1]. The shear zone is intruded by younger undeformed granites. They have not been dated, but petrologically similar units in the Eye Dashwa pluton have been dated at 2.665 Ga [1]. The low-grade (< 1 g/t) Hammond Reef gold deposit is hosted within a network of fractures and alteration zones parallel to the Marmion Shear within the Marmion gneiss and *not* in a major fault or shear zone at the boundary nor within the mafic greenstone belts as seen in most Archean gold deposits, for example in Abitibi [2,3].

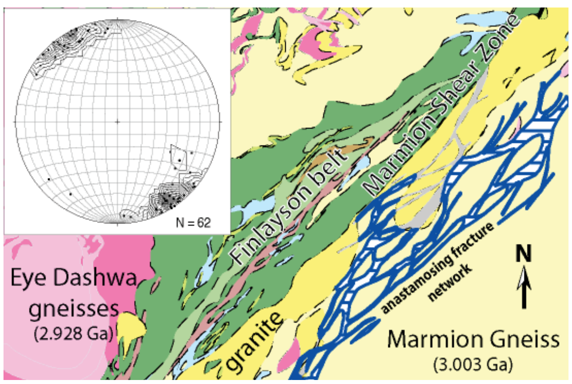

Figure 1: Geological map of the Marmion Shear area [1], showing the location of the anastamosing fracture and alteration zone (blue). The shear zone is intruded by a granite (yellow). Stereonet shows poles to flattening foliation (N = 62) across the Finlayson belt (green).

Preliminary Results and Observations

The Finlayson belt is divided into three parallel belts with different inherited ages (2.931 – 3.003 Ga [1]). At exposure level the belts are parallel to the northeast structural grain of the Marmion Shear (Figure 1). Penetrative flattening foliation is developed across the Finlayson belt (Figure 1). There are no spatial gradients in the strength of the foliation, which deforms all discontinuous lenticular lithologic units. Displaced lithologic unit boundaries demonstrate the presence of discrete faults.

The younger granite crosscuts the shear zone and ductile fabrics in the Marmion Gneiss, and has no penetrative deformation fabrics. It obscures the core of the shear zone. The deformation fabrics in both terranes bounding the Marmion Shear show a transition from ductile to discrete brittle structures, suggesting a common deformation path. The distinct anastamosing fracture network and zone of alteration which hosts the gold in the Marmion Gneiss is not seen in the Finlayson belt. This may be attributable to preferential fracturing and fluid migration within the gneiss during ore formation.

[1] Stone (2008) *Ontario Geological Survey Preliminary Map.* [2] Vearncombe (1998) *Geology* **26 (9)**, 855-858. [3] Wyman *et al.*, (1999) *Journal of Geology* **107**, 715-725

A cooling history for the Nicola Horst, British Columbia.

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Introduction

The Nicola Horst (NH), is located in the Intermontane belt of British Columbia. It is bound along the east and west by steep post-Paleocene faults [1] (Fig 1). The faults are boundries between undeformed, low grade metamorphic rocks and deformed medium grade metamorphic rocks within the NH [2]. It has been suggested by some authors that the medium grade rocks are mid-crustal and are part of an antiformal thrust duplex [2,3]. The medium grade rocks, amphibolite facies, became exposed via unroofing along the steep post-Paleocene faults. This study aims to determine both the timing of the faults and model the isostatic response caused by the unroofing along the steep post-Paleocene faults using thermochronometry.

Thermochronology and geochronology

Most of the ages gathered in and around the NH have been for determining the absolute ages (geochronology) of the rocks. To understand how the NH formed, we are using thermochronometry, which records various closure temperatures depending on the mineral and system. Previous work done by Simon Fraser University produced four, unpublished, biotite Ar-Ar ages (50.3, 50.3, 56.5, 63.8 Ma, located in the northern, western, eastern, and southern areas respectively). Our samples (Fig 1) are located along a horizontal transect in the central area of the NH and along a vertical transect in the southern area of the NH. These samples are collected for purposes of producing a complete suite of ages, spanning temperatures from 900-60°C. By comparing cooling curves around the NH to ones within, we will determine a better age of the faults around the NH and model the response of the mid-crustal rocks exposed in the NH to the unroofing along the two post-Paleocene faults.

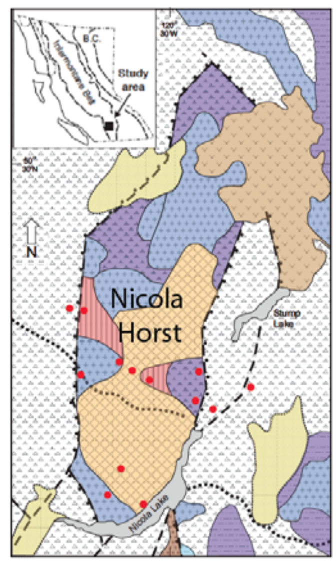

Figure 1: Nicola Horst is located in south central British Columbia. Blues, purples and red are Jurassic, Triassic and older, respectively. Browns, tans and yellows are Eocene, Tertiary and Quaternary, respectively. Red dots indicate locations of samples collected. Image modified from [2].

[1] Monger and McMillan (1989) *Geologic Survey of Canada* **Map 42-1989**. [2] Moore and Pettipas (1990a) *Ministry of Energy, Mines and Petroleum Resources* Open file **1990-29**, 3-13. [3] Erdmer, Moore, Heaman, Thompson, Daughtry, and Creaser (2001) *Canadian Journal of Earth Science* **39**, 1605-1623.