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Using Geomagnetics to Identify a Previously Unrecognized Fault within the Olympic Peninsula

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Introduction

The most prominent geologic feature in the Olympic Peninsula is the Crescent Formation. The Crescent Formation (CF) is a massive unit of basalt up to 18 km thick which was accreted 52-48Ma. The Blue Mountain Unit (BMU) is a unit of continentally derived sediments which has previously been believed to be the sedimentary basement upon which the Crescent Formation (CF) was deposited ~50 Ma (Fig.1) Recent research conducted by Prof. Ken Clark, Michael Eddy, Michael Polenz and multiple UPS grads found discontinuities which suggest that the BMU and CF are not part to the same coherent unit. Previous work suggests that a chemical and temporal discontinuity indicative of a major fault exists between the CF and the BMU. This study aimed to discover geophysical and geochemical evidence of this fault between the CF and BMU in the eastern Olympics. (Fig.1) This previously unidentified thrust fault is herein referred to as the Dusk Point Fault (DPF)

Purpose

The Dusk Point Fault (DPF) lies east of Hurricane ridge and separates the BMU from the CF; the purpose of this study was to discover, through magnetic surveys in the eastern Olympic Peninsula, geophysical and geochemical evidence which supports Prof. Clark’s hypothesis of the DPF and to add to the body of work by Kenneth Clark and previous University of Puget Sound students. The implications of the DPF are significant because if the BMU and the CF are not a cohesive unit then a model where the BMU and the CF are not a cohesive unit. Previous work suggests that a chemical and temporal discontinuity exists between the CF and the BMU in the eastern Olympics. (Fig.1) This previously unidentified thrust fault is herein referred to as the Dusk Point Fault (DPF).

Fig.2 This figure depicts the four traverses which were completed in the easternmost Olympic Peninsula as well as graphs of the geomagnetic data collected there. Traverses are as listed from north to south: Big Quilcene, Duckabush, Dosewallips, and Hamma Hamma.

Fig.3 Graphs of geomagnetic data in order from north to south: Big Quilcene, Duckabush, Dosewallips, and Hamma Hamma transects. Red circles indicates potential change in magnetic signature consistent with DPF. Brown ovals indicate synthetic interference.

METHODS

Four linear geomagnetic surveys were conducted using a G-856 proton precision magnetometer along forest roads and trails trending east-west in the eastern Olympic Peninsula. Measurements were taken every 10-20 feet. The locations of surveys were selected based on the work of previous research and under the assumption that the DPF runs relatively parallel to the Hurricane Ridge Fault.

Magnetic data was displayed on graphs and anomalies indicating a fault were displayed on a map.

Rock samples were collected at locations where bedrock was exposed along DPF traverses. Samples will be prepared in house and then sent to ALS, a laboratory in B.C for chemical analysis. Trace element analysis will be used to identify rocks with chemical fingerprints consistent with those recorded in previous DPF studies in the southern Olympic Peninsula (Eddy et al., 2017).

Conclusion

This study resulted in locating the Dusk Point Fault (DPF) in the Eastern Olympic Peninsula. This will simplify future DPF research by narrowing the area of interest. Future work may include: the continuation of magnetic surveying in the northern Olympic Peninsula.

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References

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