

Petrology, Petrogenesis, and Tectonic setting
of Jurassic rocks of the Central Cascades,
Washington, and Western Klamath Mountains,
California-Oregon

by

James H. MacDonald, Jr.

A Dissertation

Submitted to the University at Albany, State University of New York

in Partial Fulfillment of

the Requirements for the Degree of

Doctor of Philosophy

College of Arts & Sciences

Department of Earth and Atmospheric Science

2006

ABSTRACT

This dissertation consists of four independent yet related projects: 1) the petrology, geochemistry, and original tectonic setting of the Galice Formation, Klamath Mountains, Oregon-California; 2) the geochemistry, tectonic setting, and possible regional correlations of the Iron Mountain and Esmeralda Peaks units of the Ingalls ophiolite complex, central Cascades, Washington; 3) the provenance and original tectonic setting of sedimentary serpentinites and ophiolite breccias within the sedimentary rocks of the Ingalls ophiolite complex; and 4) geology, tectonics, and possible regional correlations of pre-Cenozoic rocks, central Cascades, Washington.

This research indicates that the Galice Formation represents continuous Late Jurassic deposition (Oxfordian-Kimmeridgian), within the Josephine backarc basin. Source areas for the Galice Formation included active Jurassic arcs, older Klamath terranes, and the North American craton.

The Early Jurassic Iron Mountain unit of the Ingalls ophiolite complex originated as a seamount within close proximity to an oceanic spreading ridge. The Late Jurassic Esmeralda Peaks unit of the Ingalls ophiolite complex originated in a backarc basin that included a fracture zone. The Iron Mountain unit is the rifted basement of the Esmeralda Peaks unit, and both units correlate to similar rocks within the Klamath Mountains.

Cr-spinel compositions, geochemistry, and petrography indicate that sedimentary serpentinites and ophiolite breccias within the Ingalls sedimentary rocks were locally derived. These rocks were originally deposited in a Late Jurassic fracture zone.

The Manastash inlier consists of the Hereford Meadow amphibolite, Lookout Mountain Formation, Quartz Mountain stock, and Helena-Haystack mélangé. Hereford

Meadow amphibolite is, in part, a dismembered pre-Jurassic ophiolite that originated in a supra-subduction zone. The Lookout Mountain Formation is Late Jurassic in age, had cratonic sources, and was originally located in the Klamath Mountains, Oregon-California. The Quartz Mountain stock is Late Jurassic in age, and the roots of an arc. The Helena-Haystack mélange is a major suture between Cascade terranes, and suggests that ~98 km of displacement has occurred along the Straight Creek fault.

The De Roux unit consists of metaigneous and metasedimentary rocks.

Metaigneous rocks have calc-alkaline, within-plate, and mid-ocean ridge basalt affinities.

The De Roux unit correlates with other Cascade mélanges.

ACKNOWLEDGEMENTS

Without the following, none of this would have been possible: Greg Harper, Bob Miller, Jonathan Miller, Bill Kidd, Marty Rutstein, R. H. Waines, Sally Marsh, Vince Idone, NSF, GSA, USGS, DEAS, Sigma Xi, FRAP, Diane Johnson Cornelius, Charles Knaack, Lori Suskin, punk rock, and my Mom. I would also like to thank, in no order, Mikki-Jo, Mike, Jon, Jacques, Marc, Betsy, Sam, Kevin, Brian, Vollmer, Manos, Brenner, Mary, Ante, Cindy, Ron, Adam, Jen, Tristan, Liz, Chuck, Beth, Jason, Stephan, Jim Henson, Johnny Mac, Bin, Barb, Matt, Lucas, Alexa, James, Josh, George Lucas, Mandy, my family, Diana, Sharon, Allison, Audrey, Antinous, Lynn, Kermit, Arnason, Delano, John Garver, Ned Brown, Steph, every one at the SUMAC SHRIMP-RG, Bill Blackburn, David Wark, Union College, San Jose State University, and every friend I ever had. I would also like to thank every person that had the misfortune of being my educator or my student. They all contributed, in some fashion, to the person that I am today.

"Rugged peaks of greenstone occur about the southern border of the Wenatchee Mountains, in intimate association with serpentine; some of these masses are 2 miles or more in diameter, while others are isolated peaks and crests but a few rods in circumference. The structure is here highly complex, and it is evident that the greenstones have been greatly broken and displaced..."

I. C. Russell, 1900

"The Peshastin and Hawkins formations are intricately mingled in some of the areas, making separation difficult in some cases and impossible, as far as mapping is considered, in others..."

G. O. Smith, 1904

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