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

by

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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 provance 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 mélange. 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.

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"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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