The geology, geochronology, structure and geochemistry of the Wild Rogue Wilderness remnant of the Coast Range ophiolite, southwest Oregon: implications for the magmatic and tectonic evolution of the Coast Range ophiolite

by

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has been read by the undersigned. It is hereby recommended for acceptance to the Faculty of the University in partial fulfillment of the requirement for the degree of Doctor of Philosophy.

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ABSTRACT

The Wild Rogue Wilderness ophiolite (WRWO) has been correlated with the Coast Range ophiolite (CRO) and overlying Great Valley Sequence in California. The WRWO occurs on the east limb of a large Cretaceous syncline within a folded thrust sheet. The basement units strike NE, are subvertical and fault bounded and include from east to west: (1) a sheeted dike complex having gabbro screens; (2) a ductily, but heterogeneously deformed metatonalite containing abundant mylonites; (3) a heterogeneously deformed metagabbro having a relic magmatic foliation overprinted by solid-state deformation at amphibolite facies and lower grade conditions; (4) a 0.5 - 0.9 km wide, high-strain zone consisting of mafic and silicic ultramylonites and mylonites; (5) undeformed pillow basalts cut by mafic and silicic dikes; (6) quartz gabbro to tonalite (Half Moon Bar diorite), (7) poorly exposed metavolcanic rocks, including at least some volcaniclastics in the uppermost section of this unit.

The following events have been identified in the Wild Rogue Wilderness: (1) pre-ophiolite deformation and (regional?) amphibolite facies metamorphism (unit 3; ~171 Ma); (2) formation of the ophiolite, related normal faulting and subseafloor hydrothermal alteration (units 1, 2, and 5; ~164 Ma); (3) Post-ophiolite arc-related magmatism (units 6 and 7; 153-160 Ma); and (4) Nevadan-age ductile deformation (unit 4 and mylonites in units 2 and 3; ~149 Ma).

The trace-element analysis indicates that the WRWO consists of rocks having magmatic affinities to normal mid-ocean ridge basalt, island-arc tholeiite, calc-alkaline basalt and boninite. Compositional variations within units and between units cannot be explained with differences in the degree of partial melting and/or fractionation. A highly heterogeneous source is inferred, which was probably variably depleted by previous melting and variably re-enriched with a subduction component.

The evolution of the WRWO is similar to that of the CRO and the Josephine ophiolite, which is consistent with previously proposed models that invoke rifting of the volcanic arc built on western N. America. The geochemical diversity of the WRWO is indicative of formation in a fore-arc or intra-arc setting similar to that of the Miocene Tonga arc, SW Pacific. Rift-propagation and melting of heterogeneous, inherited mantle may have played an important role in the magmatic evolution of the WRWO.

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