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Spatially heterogeneous burial and high-*P*/*T* metamorphism in the Crescent Formation, Olympic Peninsula, Washington

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Abstract

The 16 km thick early to middle Eocene Crescent Formation exposed on the Olympic Peninsula represents one of the thickest stacks of basalt on Earth. It is variably metamorphosed at low grade, with evidence of both medium- and high-*P*/*T* conditions. Metasomatism is localized within a small number of layers, with variation relative to average values of as much as five standard deviations. The upper section tends to be lower grade but few systematic trends in mineralogy or mineral composition correlate with stratigraphic position. The boundary region between the lower and upper members contains the most dramatic metasomatic alteration as well as the best examples of barroisitic amphibole. Observations are consistent with a model in which extrusion of the basalt stack led to medium-*P*/*T* burial recrystallization in the zeolite and prehnite-pumpellyite facies, followed by localized, possibly fluid-facilitated lower-blueschist facies metamorphism; this high-*P*/*T* metamorphism may reflect the lowering of isotherms caused by subduction-zone refrigeration to the west of these rocks.

Keywords: Olympic Peninsula, metabasalt, high *P*/*T*, blueschist, greenschist, Crescent Formation