2008 Fall Meeting
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HR: 16:00h
AN: **V54B-01 INVITED**
TI: Near-Axis Magmatism and Hydrothermalism off the Southern Juan de Fuca Ridge: Constraints From Seismic Reflection, Petrology, and Seafloor Observations
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AB: Although magmatic accretion along mid-ocean ridges is thought to occur primarily within a narrow zone centered at the ridge crest, there is increasing amount of evidence that crustal construction also occurs along the ridge flanks a few kilometers away from the axis. The relative contribution of this off-axis magmatism is not well constrained nor understood partly because of limited off-axis sampling and observations, and because seismic reflection profiling has not yet resulted in convincing images of off-axis crustal melt sills such as those commonly observed beneath the crest of fast and intermediate-spreading ridges. Seismic reflection profiles across and along the southern Juan de Fuca Ridge (Cleft segment) reveal the presence of a ~2.4-km-long, 5-6-km-deep bright reflector located 1.4-3.2 km to the east of the spreading axis that we interpret as an off-axis melt sill within the lower crust. This seismic event correlates with a 250-ms Moho travel time anomaly, indicating thicker and/or partially molten lower crust, and with smooth, highly reflective seafloor that suggests young, volcanically repaved terrain. Geological sampling and seafloor observations in this area indicate the presence of abundant lobate and pillow lava flows with evolved compositions erupted outside of the axial region (up to ~5 km off-axis) along inward-facing faults, off-axis seamounts with primitive compositions, as well as off-axis active and relict low-temperature hydrothermal vents that are spatially related to faulted basement. In this paper we will present an integrated view of this diverse set of observations to better understand the mechanism(s) and structure(s) that may lead to off-axis crustal accretion and hydrothermal circulation, and evaluate their importance in the overall compositional and thermal structure of young oceanic crust. We hypothesize that deep off-axis melt lenses such as the one described above could be the source of at least some of the off-axis lavas, and are a likely heat source to drive off-axis low-temperature hydrothermal circulation. Faulting may play a major role in these systems by tapping deep melt reservoirs and channeling eruptions, and by providing deep-penetrating pathways that promote hydrothermal circulation and efficient cooling of the near-axis crust.
DE: 3025 Marine seismics (0935, 7294)
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DE: 7220 Oceanic crust
DE: 8413 Subduction zone processes (1031, 3060, 3613, 8170)
DE: 8424 Hydrothermal systems (0450, 1034, 3017, 3616, 4832, 8135)
SC: Volcanology, Geochemistry, Petrology [V]
MN: 2008 Fall Meeting

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