# Seismic Structure of the Endeavour Segment, Juan de Fuca Ridge: Correlations of Crustal Magma Chamber Properties with Seismicity, Faulting, and Hydrothermal Activity

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Multichannel seismic reflection data collected in July 2002 at the RIDGE2000 Integrated Studies Site at the Endeavour segment, Juan de Fuca Ridge show a high-amplitude, mid-crustal reflector underlying all of the known hydrothermal vent fields at this segment. This reflector, which has been identified with a crustal magma body [*Detrick et al.*, 2002], is found at a two-way travel time of 0.85-1.5 s (1.9-4.0 km) below the seafloor and extends approximately 25 km along axis although it is only 1-2 km wide on the cross-axis lines. The reflector is shallowest (2.5 km depth on the along-axis line) beneath the central, elevated part of the Endeavour segment and deepens toward the segment ends, with a maximum depth of 4 km. The cross axis lines show the mid-crustal reflector dipping from 9 to 50° to the east with the shallowest depths under the ridge axis and greater depths under the eastern flank of the ridge.

The amplitude-offset behavior of this mid-crustal axial reflector is consistent with a negative impedance contrast, indicating the presence of melt or a crystallizing mush. We have constructed partial offset stacks at 2-3 km offset to examine the variation of melt-mush content of the axial magma chamber along axis. We see a decrease in P-wave amplitudes with increasing offset for the mid-crustal reflector beneath the Mothra and Main Endeavour vent fields and between the Salty Dawg and Sasquatch vent fields, indicating the presence of a melt-rich body. Beneath the High Rise, Salty Dawg, and Sasquatch vent fields P-wave amplitudes vary little with offset suggesting the presence of a more mush-rich magma chamber.

Hypocenters of well-located microseismicity in this region [*Wilcock et al.*, 2002] have been projected onto the along-axis and cross-axis seismic lines, revealing that most axial earthquakes are concentrated in a depth range of 1.5 – 2.7 km, just above the axial magma chamber. In general, seismicity is distributed diffusely within this zone indicating thermal-related cracking above the magma chamber, although the cross-axis line at the Salty Dawg vent field shows seismicity localized along a steeply dipping fault-like plane that terminates just above the magma chamber. A faint reflector at ~1.5 km below the seafloor (~700 m below the layer 2a reflector) is present near the top of this axial zone of seismicity and may represent a cracking-related boundary in the porosity structure of the shallow crust.

References (not to be submitted to AGU)

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