# New Multichannel Seismic Constraints on the Crustal Structure of the Endeavour Segment, Juan de Fuca Ridge: Evidence for a Crustal Magma Chamber

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Although hydrothermal systems along the Juan de Fuca's Endeavour segment have been extensively studied over the past two decades, the existence of a crustal magma chamber in this area has been controversial. A single cross-axis MCS profile collected in the late 1980s showed a weak, mid-crustal reflector 2.3 km below the axis, but a 2-D seismic tomography experiment in this same area found no evidence for anomalously low velocities below the ridge axis. These observations, the existence of microearthquakes to ~3.5 km depth in the near-axis region, the size and longevity of Endeavour's hydrothermal systems, and the extensive fissuring of the ridge axis and lack of recent magmatism led to the view that hydrothermal activity at Endeavour segment was driven by heat extraction from an irregular cracking front that is actively penetrating hot rock at mid-crustal depths, rather than by cooling of a crustal magma body. However, new MCS reflection data collected by the R/V Maurice Ewing at the Endeavour segment in July, 2002 show a bright, mid-crustal reflector beneath the Endeavour vent fields that we associate with a crustal magma body. This AMC event is strongest and shallowest (~1-1.1 s subseafloor TWTT or ~ 2.3-2.6 km depth) beneath the inflated central part of the Endeavour segment, but can be followed along-axis for at least another 15 km to the south as a weak event which deepens to $>$1.3 s TWTT. Cross-axis lines show that the magma lens is narrow ($<$1000 m wide), and on some profiles is asymmetrically located beneath the axis and eastern wall of the rift valley. On the ridge axis Layer 2A is thick (~0.4-0.5 s TWTT; ~500-600 m), and does not appear to thicken significantly off-axis. Moho is imaged on both ridge flanks between 2 and 2.2 s subseafloor TWTT, which typically indicates crustal thicknesses of ~6-6.5 km. These new results suggest hydrothermal systems at the intermediate spreading Endeavour segment and fast spreading EPR are not fundamentally different - both are thermally driven by heat conduction from the top of a crustal magma body.