

A New View of 3-D Magma Chamber Structure Beneath Axial Seamount and Coaxial Segment: Preliminary Results from the 2002 Multichannel Seismic Survey of the Juan de Fuca Ridge.

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In the summer of 2002, a multichannel seismic (MCS) experiment was conducted across all segments of the Juan de Fuca Ridge, including Axial seamount and Coaxial segment. These two segments were surveyed over a twelve-day period, with a lengthy excursion southward to the Vance/Cleft segments due to sea-state. In total, some 20 MCS profiles were collected in these two areas, including a dense survey over Axial seamount. Not to disappoint, magma bodies were imaged beneath both the Axial and Coaxial segments, although absent along portions of Coaxial where previous work suggested sub-surface melt accumulations; in contrast, a large magma body was imaged along the southeast flank of Axial seamount in a region thought to be devoid of significant amounts of melt.

MCS profiling across Axial seamount revealed a very complex set of reflections, with significant depth variations. The two-way travel-time between seafloor and melt sill reflectors varied between 600 ms to 1200 ms, with a minimum depth of about 1400 m bsf based on travel-time modeling of individual gathers. Melt appears to underlie most of the caldera, with depth variations of at least 600-800 m. Outside of the caldera, most of the melt is observed extending outward, along the southeast flank of Axial seamount to a distance of 12 km and appears to be quite extensive. No significant melt bodies were observed along either of the ridge-related rift zones.

A magma chamber reflector was also seen along extended parts of Coaxial segment, in particular a continuously bright event was observed in between the conjugate set of ridges between 46°25'N and 46°15'N. This region was the site of a recent extrusive event, although the source for this eruption was thought to lie to the south, around 46°09'N. Interestingly, the southern section of Coaxial appears to be devoid of such a melt-lens. Further south, toward Helium basin, a small stranded melt-lens was imaged at approximately 46°05'N.

Three-dimensional, interactive “fly-throughs” of magma chamber structure will be presented.