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Upper Crustal Structure above Off-axis Magma Lenses at RIDGE-2000 East Pacific Rise Integrated Study Site from 2008 3D Multichannel Seismic Reflection Data

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During the 2008 multi-streamer 3D seismic reflection experiment conducted aboard the R/V Marcus Langseth at the RIDGE-2000 Integrated Study Site at the East Pacific Rise between 9°37'N and 9°57'N, three regions with prominent near-axis crustal reflectors (near 9° 54'N, 9° 52'N, 9° 39'N) were discovered and interpreted as off-axis melt lenses (OAML) injected at mid-crustal levels to both the east and west of the ridge crest. To study the effects of OAML on upper crustal structure, we applied 2-D processing on two across-axis lines of a small 3D grid that crosses part of the southernmost OAML: Line 1428P (9° 38'N) across the middle part of the OAML and line 1476P (9° 39'N) across the northern end of this OAML. The preliminary results show that the OAML reflections are clear and bright on profile 1428P whereas a weak OAML reflection is imaged on 1476P. The axial magma lens reflections on both lines are at similar depths of 620 ms twtt. The OAML reflection on 1428P is at 700 ms twtt while the OAML reflection on 1476P lies 200 ms twtt deeper, indicating it may be the diffraction from the northern edge of the OAML. Continuous layer 2A events are seen on both 1428P and 1476P profiles with layer 2A thickness approximately 150 ms twtt on-axis and 300 ms off-axis. On 1428P, optimal stacking velocities for layer 2A above the OAML on the eastern flank are about 50 m/s lower than the velocities for layer 2A on the western flank. However, on 1476P, no differences in layer 2A velocities between the western and eastern flank are evident. These observations of layer 2A structure indicate that the presence of OAML is accompanied by changes in upper crustal structure, which may reflect off-axis magmatism and alteration associated with off-axis hydrothermal circulation. One-dimensional forward modeling of CMP gathers will be conducted to further characterize layer 2A and upper 2B velocity structure.