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TITLE: 3D Seismic Reflection Images of An Off-Axis Melt Lens And Its Associated Upper Crust Around 9°39'N, East Pacific Rise

PRESENTATION TYPE: Assigned by Committee (Oral or Poster)

CURRENT SECTION/FOCUS GROUP: Ocean Sciences (OS)

CURRENT SESSION: OS10. Integrated Study of Oceanic Spreading Centers: From Mid-Ocean Ridges to Back-Arc Basins

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ABSTRACT BODY: During the 3D multi-channel seismic (MCS) survey MGL0812 aboard the R/V Langseth, several mid-crust reflectors were discovered off axis on both flanks of the East Pacific Rise from 9°35.6-57.0'N. The reversed polarity of these off-axis reflections with respect to the seafloor and Moho reflections and the high attenuation of the crust detected beneath two of them in the north suggest that they arise from melts residing at the mid-crust level outside the axial low velocity zone (Canales et al. 2010). These off-axis melt lenses (OAML) are probable sites of off-axis volcanism and potential heat sources for localized hydrothermal circulation on the ridge flanks.

We focus here on a prominent OAML discovered on the eastern flank around 9°39'N. Results from 1D travel time modeling and 2D streamer tomography of downward continued shot gathers show the presence of a thinner seismic layer 2A above the center of the OAML compared with its surrounding crust. We attribute this thinning to the effects of alteration associated with localized off-axis hydrothermal circulation driven by the OAML, where precipitation of secondary minerals infills pore space within the lower basalt section, leading to increased seismic velocities and thereby converting the lowermost seismic layer 2A into seismic layer 2B. To further constrain the respective 3D geometries of the OAML and the AMC, their spatial relations, and the spatial extent and shape of the region of altered upper crust associated with the OAML, we conduct 3D processing of a small MCS grid that encompasses most of this OAML, aimed at imaging both on- and off-axis melt lens events and the base of seismic layer 2A. This grid covers an ~4 km x 24 km area centered on the ridge crest between ~9°37.5'-40'N and extending on both flanks, within which a third order ridge axis discontinuity and two high temperature hydrothermal vents identified during Alvin dives in 1991 and 1994 are present. The data were recorded by four 468-channel streamers from two alternating-fired sources along 14 ridge-orthogonal lines with 300 m spacing, providing a static bin size of 6.25 m x 37.5 m. Processing includes 3D geometry definition, filtering and editing, amplitude correction, flexible binning, velocity analysis, CMP

stacking, and post-stack time migration, exploiting as best possible the relatively narrow coverage extent in axis-parallel direction. The stacked/migrated seismic reflection images of this 3D volume will be presented and results will be compared with the OAML imaged further north.

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INDEX TERMS: [3017] MARINE GEOLOGY AND GEOPHYSICS / Hydrothermal systems, [3025] MARINE GEOLOGY AND GEOPHYSICS / Marine seismics, [7245] SEISMOLOGY / Mid-ocean ridges.
