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3D multi-channel seismic imaging of melt-rich lenses beneath and off the East Pacific Rise Integrated Study Site

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Melt has a particularly strong effect on shear velocity, and therefore affects the amplitude versus offset behavior of P- and S-converted waves reflected off a crustal melt lens. The first 3D multi-streamer seismic reflection experiment conducted aboard R/V Langseth (Cruise MGL0812) collected a very dense dataset along and across the northern East Pacific Rise (EPR, ~9°34'N-9°58'N). In addition to P waves reflecting off the top of the axial magma chamber (AMC), this dataset contains evidence for the S-converted phase PAMCS, which allows us to qualitatively image melt-rich sections of the AMC (i.e., portions of the melt lens in which crystals are disconnected and cannot transmit shear stresses) by producing and comparing P- and S-wave partial-offset stacks. Reflection images obtained from a subset of data collected along the ridge crest between 9°42'N-9°54'N show a prominent melt-rich zone at ~9°42'N-9°44'N, ~10-12 km to the south of the southern end of the 2005-06 volcanic eruption. The preliminary images also show evidence for two other melt-rich sections where abundant hydrothermal activity has been documented: at ~9°47'N-9°48'N (southern edge of the 2005-06 eruption), and at ~9°50'N-9°52'N (near the center of the 2005-06 eruption), although data from these two areas require more analysis to confirm this finding. The melt-rich zones are ~2-4 km long and spaced every ~10-15 km along the ridge axis. We will also present results from data collected over melt lenses located several kilometers off-axis (see Canales et

al., this meeting). This high resolution imaging of the distribution of crustal melt bodies and correlation with seafloor hydrothermal and biological activity will provide a key piece of information that is currently missing from our knowledge of the EPR mantle-to-microbe system.

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