

Three-dimensional Reflectivity Images of Moho and Melt Sills beneath the 9°03'N Overlapping Spreading Centre at the East Pacific Rise

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In 1997, a 3D seismic reflection and tomography experiment (ARAD) was carried out over the 9°N overlapping spreading centre (OSC) at the East Pacific Rise. The 3D seismic reflection image shows wide spread presence of axial magma chambers (AMC) beneath two limbs of the OSC, which indicates the existence of a robust local magma supply. The data also show the Moho reflection beneath the AMC on the eastern limb of the OSC where the AMC is very wide (4.5 km). The presence of Moho beneath the AMC suggests that either the Moho is formed at zero-age or the crust beneath eastern limb of the OSC is old. Over a distance of 10 km along the ridge crest a rapid increase in two-way travel-time (30%) between the AMC and the Moho reflections is observed, which can be interpreted to be due to the presence of a large amount of melt in the lower crust or due to a very thick lower crust. Tomography studies from the area show the existence of low velocity anomalies in the lower crust and upper mantle, which reinforces the interpretation of a large melt anomaly in the lower crust. The absence of any other reflections between the AMC and the Moho reflection suggests that the melt in the lower crust should either be in pores or in small pockets. The localised nature of this large lower crustal melt anomaly beneath the eastern limb of the OSC suggests that this anomaly may be responsible for the southward propagation of the eastern limb and the tectonic evolution of the OSC.