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TITLE: Crustal thickness from 3D MCS data collected over the fast-spreading East Pacific Rise at 9°50’N

PRESENTATION TYPE: Poster Requested

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: We compute, analyze and present crustal thickness variations for a section of the fast-spreading East Pacific Rise (EPR). The area of 3D coverage is between 9°38’N and 9°58’ N (~1000 km2), where the documented eruptions of 1990-91 and 2005-06 occurred. The crustal thickness is computed by depth converting the two-way reflection travel times from the seafloor to the Moho. The seafloor and Moho reflections are picked on the migrated stack volume produced from the 3D multichannel seismic (MCS) data collected on R/V Marcus G. Langseth in summer of 2008 during cruise MGL0812. The crustal velocities used for depth conversion were computed by Canales et al. (2003; 2011) by simultaneous inversion of seismic refractions and wide-angle Moho reflection traveltimes from four ridge-parallel and one ridge-perpendicular ocean bottom seismometer (OBS) profile for which data were collected during the 1998 UNDERSHOOT experiment. The MCS data analysis included 1D and 2D filtering, offset-dependent spherical divergence correction, surface-consistent amplitude correction, common midpoint (CMP) sort with flex binning, velocity analysis, normal moveout, and CMP stretch mute. The poststack processing includes seafloor multiple mute and 3D Kirchhoff poststack time migration. Here we use the crustal thickness and Moho seismic signature variations to detail their relationship with ridge segmentation, crustal age, bathymetry, and on- and off-axis magmatism. On the western flank (Pacific plate) from 9°41’ to 9°48’, the Moho reflection is strong. From 9°48’ to 9°52’, the Moho reflection varies from moderate to weak and disappears from ~3 km to ~9 km from the ridge axis. On the eastern flank (Cocos plate) from 9°41’ to 9°51’, the Moho reflection varies from strong to moderate. From 9°51’ to 9°54’ the Moho reflection varies from moderate to weak and disappears beneath a region ~3 km to ~9 km from the axis. On the Cocos plate, across-axis crustal thickness variations (5.5-6.2 km) show a higher degree of correlation with age than on the Pacific plate (5.6-6 km). The mean crustal thickness from 9°41’ to 9°56’ on the Cocos plate is 5.8 km and 5.7 km for the Pacific plate excluding the crustal thickness beneath the Lamont seamount. Assuming maximum picking error of 100 ms, the uncertainty in crustal thickness estimation is 360 m. Faulting contributes to crustal thickness variations on both plates. Our results also provide insight into the mantle upwelling pattern, which is actively debated for the study area, and

give us new insight into the 3D structure of the Moho Transition Zone (MTZ).

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INDEX TERMS: [3035] MARINE GEOLOGY AND GEOPHYSICS / Midocean ridge processes.
