

Preliminary Results From the SISMOMAR Seismic Study of the Lucky Strike Segment, 37N Mid-Atlantic Ridge

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The 2005 SISMOMAR expedition explored the crustal structure of the Lucky Strike segment of the Mid-Atlantic ridge (MAR) and the three-dimensional structure of its central volcano. This segment is one of the focus points of the InterRIDGE MoMAR (Monitoring of the Mid-Atlantic Ridge) program and has been proposed as a RIDGE2000 collaboration site. The Lucky Strike volcano, situated near the segment center, spans approximately 10 km of the median valley across-axis and hosts a high-temperature hydrothermal field. We performed seismic surveys at three different scales centered over the volcano: a 3.8x18 km 3D reflection box, an 18x18 km 3D refraction box, and 115 km along- and across-axis 2D lines. The reflection survey was recorded on a 4.5 km, 360-channel digital streamer and the refraction data were recorded by 25 OBSs deployed at 42 sites. The streamer remained deployed for most of the refraction survey and for additional lines over the "Menez Holm" massif, which hosts low-temperature hydrothermal vents. The close spacing of the seismic lines allowed us to obtain detailed bathymetry, surface gravity and magnetic field maps. We present the first results of the SISMOMAR expedition, including gravitational and magnetic maps, a preliminary interpretation of the 2D along- and across-axis lines, and highlights of 3D seismic reflection and refraction processing and microearthquake locations. The 3D reflection data indicates an axial magma chamber (AMC) beneath much of the volcano, whereas the gravity minimum is offset northwest of the volcano. The bathymetry data show no evidence for large surface eruptions since the 1997 FLORES cruise. We use the 2D seismic velocity structure to compare with crustal structure at other MAR segments, to study whether the AMC overlies a strong lower crustal low velocity zone and to indicate whether the gravity minimum is due to an offset deep melt supply.