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Patterns of volcanism and tectonism at a slow-spreading segment of the Mid-Atlantic Ridge (Lucky Strike, 37°N): preliminary results from near-bottom geological and geophysical surveys

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Patterns of volcanism and tectonism and the mechanisms that influence them are not well understood at slow- spreading plate boundaries. Is magma supply persistent or episodic? Is tectonic strain symmetric or asymmetric? Are volcanism and tectonism distributed across the rift valley or localized along narrow bands of crust? Systematic, segment-scale observations, measurements, and sampling are needed to address these questions. During a recent cruise (GRAVILUCK, Aug. 2006) we conducted near-bottom surveys across the axial valley of the Lucky Strike segment of the Mid-Atlantic Ridge (37°N) to determine where active volcanic and tectonic processes are occurring within the rift valley and their relationship with a recently recognized mid-crustal magma body at the segment center beneath Lucky Strike volcano [Singh et al., 2006]. Using a deep-towed digital imaging system (WHOI TowCam) and a submersible (Nautile) we collected still and video imagery, high-resolution bathymetry, magnetic data, and rock samples along 11 across-axis and 3 along-axis profiles covering ~80 km. Preliminary interpretation of the seafloor imagery shows that the majority of the most recent volcanic activity is in the form of jumbled sheet flows that are concentrated within a discontinuous narrow graben along the axis of the rift valley that bisects Lucky Strike volcano. In rare cases we observe young (i.e., less sedimented and unfaulted) pillow ridges up to 3 km from the axis of the rift valley. Recent volcanic activity appears to be more prevalent south of the volcano, and cuts across distinct geologic terrains characterized by extensive sheet flows near the segment center and axial volcanic ridges to the north and south of Lucky Strike Volcano. We will present a preliminary interpretation of the distribution and relative ages of volcanic deposits and fault characteristics across the rift valley, lava compositions, and magnetic intensities. We compare these observations with existing sidescan sonar data over the segment center, and explore how the map-based distribution of these features relates to the crustal architecture, subsurface magma distribution, hydrothermal venting, and spreading history of this hot-spot influenced, slow-spreading MOR.