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TITLE: Morphology of the Alarcón Rise spreading axis from 1-m resolution AUV bathymetry surveys

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ABSTRACT BODY: The Alarcón Rise is a 50 km long spreading segment at the northernmost end of the East Pacific Rise, just SE of the Gulf of California. During April 2012, the MBARI AUV D. Allan B. was used to collect high-resolution bathymetry along this segment's neovolcanic zone, extending northward from the Tamayo Fracture Zone to the Pescadero Fracture Zone.

The AUV fields a 200 kHz multibeam sonar, 110 kHz chirp sidescan sonar, and a 1-6 kHz chirp subbottom profiler for 17.5-hour duration missions. Flying at 1.5 m/s (5.4 km/hr) at a 50 m altitude, the processed AUV bathymetry has a 0.1 m vertical precision and a 1 m lateral resolution. Ten survey missions achieved full coverage of the neovolcanic zone, with across-axis survey widths ranging from 1500 m to over 3000 m in the vicinity of a large sheet flow extending well off-axis.

The Alarcón Rise axis exhibits considerable along-strike variability in gross morphology, the volcanic eruption style, and the distribution of faults and fissures. The axis trends NE (~032°) overall, but curves smoothly into the bounding transform faults at both ends. Axial depths range from 2250 m to 2400 m. An asymmetric, 50-100 m deep, 600-1200 m wide axial graben exists along much of the axis, but in many places is filled or buried by constructional volcanic edifices, some of which are in turn faulted or fissured. The asymmetry of the normal faulting switches orientation along-strike several times, indicating that tectonically the 50 km axis is composed of discrete, ~5-8 km long half-graben structures.

The volcanic morphology also varies on scales of 5-10 km. The northernmost 6 km of this segment axis consists of an 800-m to 1200-m wide, ~100-m high ridge composed of steep-sided, discrete pillow mounds. Most of this ridge is pervasively faulted, and both the ridge itself and the fault scarp trends rotate NW into the

Pescadero Fracture Zone. At 23°34.6'N there is an abrupt transition to a clear axial graben floored on the east by lower-relief pillow mounds, a few of which post-date the most recent faulting. Along the western boundary fault is a rugged ridge punctuated by three volcanic domes, one of which was found by Clague et al. (this session) to be rhyolitic. This morphology extends southward for 9 km to 23°30.7'N, the northern limit of sheet flows. Between 23°24.5'N and 23°30.7'N (12 km) the neovolcanic zone is covered by a combination of sheet flows, pillow mounds, and two larger edifices. The low relief northern edifice is a 4-km long, 70-m high shield volcano with a 200-m wide, 25 m deep summit crater. The southern edifice is a 100 m high, 800 m wide, flat-topped cone centered on the east side of the axial graben and located at the center of the overall segment. From 23°23.8'N to 23°19.0'N (11 km), the axis is dominated by a single sheet flow that erupted from an 8.5-km long fissure system also located on the east side of the axial graben. This voluminous, unfaulted flow fills the graben, extends to the north and south of the eruptive fissure, and spills down the east side of the axial high beyond the high resolution bathymetric coverage. South of this flow, the axis is characterized by discrete pillow mounds, occasional sheet flows, and fault trends that curve southeastward into the Tamayo Fracture Zone. The southern terminus is less tectonized and has lower relief pillow mounds than the northern end of the segment.

INDEX TERMS: [3045] MARINE GEOLOGY AND GEOPHYSICS / Seafloor morphology, geology, and geophysics, [3035] MARINE GEOLOGY AND GEOPHYSICS / Midocean ridge processes, [8416] VOLCANOLOGY / Mid-oceanic ridge processes.

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