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Introduction to surficial seafloor mapping and characterization

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Seafloor maps including depth and acoustic backscatter provide important baseline information for many marine geological studies. However, products derived from these data such as seafloor geology and benthic habitats, confirmed with ground-truth information, are often more useful to marine researchers and coastal managers. These maps are crucial components necessary to guide ocean-management decisions, including designating and monitoring marine reserves, understanding sediment transport and sand resources, ensuring shipping safety, and helping identify offshore hazards.

The papers in the Surficial Seafloor Mapping and Characterization Section describe interpretations of higher resolution sonar data in two regions of Southern California. Dartnell and Gardner (this volume, Chapter 1.2) describe an empirical terrain analysis used to delineate six seafloor provinces over the greater Los Angeles Margin and San Pedro Basin including: high-relief shelf, low-relief shelf, steep-basin slope, gentle-basin slope, gullies and canyons, and basins. The terrain analysis uses multibeam bathymetry data to calculate two seafloor indices—a seafloor slope and a Topographic Position Index. The derived grids along with depth are analyzed in a hierarchical, decision-tree classification model. The paper also describes the morphology of the deeper San Pedro Basin based on recently compiled, multibeam bathymetry data revealing detail not described in previous studies.

Cochrane and Greene (this volume, Chapter 1.3) describe an empirical, video-supervised, classification method to characterize the seafloor in an area north of Anacapa Island. Textural derivative grids are calculated from sonar data, and statistical signatures of these grids are developed at co-registered, seafloor video-observation points. This technique identified areas of thick sediments forming soft bottoms, high-relief rocks forming hard bottoms, and a mixed hard and soft bottom class. The classification results were compared to point data from the usSEABED database and proved to be ~90% accurate in terms of identifying soft-bottom habitats. This study showed that a region previously described as exposed rocky bottom based on low-resolution seismic profiles is actually mainly composed of soft sediment with only 10% of the area covered by exposed rock. The high-resolution, acoustic, remote-sensing technique demonstrated in this study will be useful for continued monitoring and analysis of Marine Protected Areas and habitat areas for threatened and endangered species.

REFERENCES CITED

Cochrane, G.R., and Greene, H.G., 2009, this volume, Estimating rocky seafloor extent on the Southern California continental shelf, *in* Lee, H.J., and Normark, W.R., eds., Earth Science in the Urban Ocean: The Southern California Continental Borderland: Geological Society of America Special Paper 454, doi: 10.1130/2009.2454(1.3).

Dartnell, P., and Gardner, J.V., 2009, this volume, Seafloor terrain analysis and geomorphology of the greater Los Angeles Margin and San Pedro Basin, Southern California, *in* Lee, H.J., and Normark, W.R., eds., Earth Science in the Urban Ocean: The Southern California Continental Borderland: Geological Society of America Special Paper 454, doi: 10.1130/2009.2454(1.2).

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