HIGH-RESOLUTION BOTTOM ALBEDO IMAGES AND BENTHIC HABITAT CLASSIFICATION TO DEVELOP BASELINE MANAGEMENT TOOLS IN NATURAL RESERVES

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The information retrieved from ocean color remote sensing can provide vital information of biological and biogeochemical processes in the oceans, including management of marine resources. Understating the changes associated to anthropogenic and natural factors are important to manage local marine resources and habitats like those available in La Parguera Natural Reserve located in southwest Puerto Rico. The Airborne Visible Infrared Image Spectrometer (AVIRIS) and WorldView-2 (WV2) sensors were used to derive water optical properties, combined with water depth from LiDAR data to perform a water column correction using Lee's semi-analytical algorithm, and to determine the optical bottom albedo. For the AVIRIS image, bottom albedo values for sand, seagrass, and coral-gorgonians were in good agreement with *in situ* values for these substrates in both spectral shape and intensity; spectral absorption and reflectance features were only present after the water column correction. LiDAR reflectivity was highly correlated to bottom albedo images from AVIRIS (r^2 = 0.79) and WV2 (r^2 = 0.79), and this correlation was further improved by removing the depth influence from the LiDAR reflectivity (AVIRIS, r^2 = 0.95; WV2, (r^2 = 0.94). High-resolution benthic habitat maps were created from AVIRIS- and WV2-modeled bottom albedo products for La Parguera Reserve. An ISODATA classification was performed and the segmented images were classified as coral reefs, seagrass, hardbottom, mixed sand/hardbottom/coral, mud, sand, and sand with benthic algae. The overall accuracy (AVIRIS = 63.55%, WV2 = 64.81%), kappa coefficient (AVIRIS = 55%, WV2 = 57%), and the tau coefficient (AVIRIS = 59%, WV2 = 60%) were evaluated. No major class differences were found between the AVIRIS and WV2 classification totals, except for coral reefs and sand, where the reduction in coral reefs class totals could be attributed to temporal differences in the images depicting changes in the coral reefs distribution within the reserve. A major contribution of this study was the creation of the first benthic habitat map for La Parguera Reserve that: 1) provided multi/hyperspectral information at this spatial scale (4 square meters), 2) covered the extent of the reserve, and 3) provided a baseline for future development of benthic habitat studies using an objective classification scheme.