Mapping of Seagrass and Other Benthic Habitats in Bolinao, Pangasinan Using Worldview-2 Satellite Image

Ayin M. Tamondong[1], Ariel C. Blanco[1], Miguel D. Fortes[2]

[1]Department of Geodetic Engineering, University of the Philippines – Diliman, 1101
[2]Marine Science Insititute, University of the Philippines – Diliman, 1101
Corresponding author: ayin_t@yahoo.com; +639228257230

Abstract. The objective of this research is to determine the suitability of Worldview-2 high resolution multispectral data in classifying and mapping benthic habitats, specifically seagrass. Worldview-2 offers an increased number of spectral bands for high-resolution image, from the traditional 4bands to 8 bands. It boasts of the ability to enhance mapping and monitoring of benthic habitats with the addition of the Coastal Band. This was investigated in this research using a Worldview-2 image of Bolinao, Pangasinan acquired on March 2010. The study site, Bolinao, has the highest single concentration of seagrass in the northern part of the Philippines. To achieve more accurate results, geometric, atmospheric and water column corrections were applied to the images. For geometric correction, a Differential Global Positioning System Topcon Hiper Ga model receiver was used to obtain highly accurate ground control points. Atmospheric correction was performed in ENVI using the Fast Line-of-Sight Atmospheric Analysis (FLAASH) model. Three water column correction models were applied and compared in this research, Lyzenga's Optical Model, Stumpf's Ratio Model and Simple Radiative Transfer Model. A spectral library was created using in situ reflected spectral radiances on both submerged and emerged vegetation to aid in image classification. Different benthic covers, seagrass, sand, corals and rocks are significantly separable spectrally based on spectral signatures obtained on field using a USB 4000 Fiber Optic Spectrometer. Maximum likelihood supervised classification in ENVI 4.8 is utilized for mapping. Using Worldview 2's coastal, green, yellow and red bands and applying the Simple Radiative Transfer Model produced the highest overall accuracy (88.3%) among the classification results. Using the same bands, Stumpf's Ratio Model produced 87.84% overall accuracy while Lyzenga's optical model achieved 75.54%. Moran's I spatial autocorrelation was implemented to increase the classification accuracy. Using lag 1 slightly increased Stumpf's Model's overall accuracy, from 87.84% to 88.08% while using lags 5 and 10 decreased the overall accuracy with 83.91% and 84.25% respectively.

Keywords: Remote Sensing, Seagrass Mapping, Worldview-2, Simple Radiative Transfer Model, Stumpf's Ratio Model