Benthic Habitat Mapping using Hyperspectral Remote Sensing

Prof. Miguel Velez-Reyes
Director, Laboratory for Applied Remote Sensing and Image Processing
Electrical and Computer Engineering Department
University of Puerto Rico at Mayaguez

Abstract
Hyperspectral remote sensing is an increasingly important tool for evaluating the complex spatial dynamics associated with estuarine and nearshore benthic habitats. Hyperspectral remote sensing is being utilized to retrieve information about coastal environments, such as coastal optical water properties and constituents, benthic habitat composition, and bathymetry. Essentially, the spectral detail offered by hyperspectral instruments facilitates significant improvements in the capacity to differentiate and classify benthic habitats. A design tradeoff in the design of existing and proposed hyperspectral spaceborne platforms is that high spectral resolution comes with a price of low spatial resolution when compared to existing multispectral spaceborne sensors. The expectation is that the high spectral resolution will compensate for the reduction in spatial resolution by providing information to retrieve some of the lost spatial detail as well as other pieces of information not possible to retrieve using multispectral sensors. This presentation will describe some approaches for unmixing of hyperspectral imagery over coastal environments. Specific methods that combine water optical properties retrieval with linear unmixing are described. Results show that water column correction is necessary for accurate mapping and that, by removing the water column, we obtain significant improvement in retrieval of bottom fractional coverage for algae, sand and reef endmembers. Furthermore, we describe how fusing hyperspectral imagery with LIDAR derived bathymetry further improves retrievals by helping algorithms to further constrain the inversion problem to resolve the water column properties. Results using hyperspectral data from SeaBED are presented. A description of the SeaBED site for testing and validation of hyperspectral remote sensing will be also presented.