Ocean Remote Sensing and Imaging II (Processdings of Spie)

Invited Paper

Overview of hyperspectral remote sensing for mapping marine benthic habitats from airborne and underwater sensors

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ABSTRACT

The seafloor, with its diverse and dynamic benthic habitats varying on meter to centimeter scales, is difficult to accurately monitor with traditional techniques. The technology used to build imaging spectrometers has rapidly advanced in recent years with the advent of smaller sensors and better signal-to-noise capabilities that has facilitated their use in mapping fine-scale benthic features. Here, the use of such sensors for hyperspectral remote sensing of the seafloor from both airborne and underwater platforms is discussed. Benthic constituents provide a so-called optical fingerprint with spectral properties that are often too subtle to be discerned with simple color photographs or multi-channel spectrometers. Applications include the recent field validation of the airborne Portable Remote Imaging SpectroMeter (PRISM), a new imaging sensor package optimized for coastal ocean processes in Elkorn Slough California. In these turbid sediment-laden waters, only subtle spectral differences differentiate seafloor with sediment from that with eelgrass. The ultimate goal is to provide robust radiometric approaches that accurately consider light attenuation by the water column and are able to be applied to diverse habitats without considerable foreknowledge.

Keywords: Hyperspectral remote sensing, coastal mapping, ocean optics, PRISM

1. INTRODUCTION

Traditional methods for characterizing the seafloor or benthos involve underwater assessments using photography, video or diver surveys. Such methods are often qualitative in scope, have limited spatial scales, and require considerable human interpretation of the primary seafloor features. Another common method involves aerial photography from aircraft using a simple camera system that measures light reflected from the water in three primary wavebands: red (R), green (G), and blue (B) or an RGB image. This simulates our human eye which has so-called RGB photoreceptor cells (cones with peak absorbance at 564, 534 and 420 nm) allowing for human trichromatic color vision [1]. Digitizing features from photographs can be painstaking and subjective work and often the primary features must be known in advance. Beds of seagrass, for example, absorb visible light for photosynthesis and make the image look darker to the eye, but such dark patches may be due to other types of seafloor or "benthic" habitats including dense macroalgae, sediment with biofilm, or even light-absorbing compounds in the water column like phytoplankton or gilven (colored dissolved organic matter) [2].

New sensors and techniques based on imaging spectroscopy have been developed to assess the spectral signature of benthic features on the seafloor. Deployed from satellites and airplanes, these sensors can detect the full spectrum of light being emitted from the sea surface and have advanced coastal habitat mapping from seagrasses to coral reefs over the last decade [3–6]. Multi-channel remote sensing can be useful in mapping clear coastal banks and bays [2], but hyperspectral remote sensing provides a more detailed spectral fingerprint that can then be used to assess the water column properties and potentially the depth and color of the seafloor when the water is "optically shallow" and photons reflected from the seafloor can be detected at the sea surface [7,8].

Sensor technology has improved dramatically in recent years and new imaging spectrometers are better able to discriminate dark coastal waters where water-leaving radiance only contributes a few percent of the total light detected at

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4: Utilization of Remote Sensing Data in Scientific/Societal Applications II .. in clear ocean waters using Coastal Zone Mapping and Imaging Lidar (CZMIL).SPIE Remote Sensing is an important European conference that includes atmospheric and earth surface scientists access to the most recent satellite- based imaging systems and the data generated by them, as well as a Proceedings Remote Sensing of the Ocean, Sea Ice, Coastal Waters, and Large Water Regions.1: Remote Sensing of Ocean Environment 6: Underwater Imaging 9: Lidar Sensing II Paper . Time: PM - PM.Buy Ocean Remote Sensing and Imaging: II (Proceedings of SPIE) by Robert J. Frouin, Gary D. Gilbert, Delu Pan (ISBN:) from Amazon's Book.B.e.s.t Ocean Remote Sensing and Imaging II (Processdings of Spie) Download Online download Ocean Remote Sensing and Imaging II (Processdings of Spie) .D.G. Long and J.B. Luke, "High Resolution Wind Retrieval for SeaWinds," in Proceedings of SPIE Vol. Ocean Remote Sensing and Imaging II, ed.Manual of Photogrammetry Errata Conference Proceedings Grids and SPIE Remote Sensing has become a well-attended annual international Remote Sensing of the Ocean Sea Ice Coastal Waters and Large Water Image and Signal Processing for Remote Sensing; Earth Resources and 2 Alexandra Gate.Coastal Zone Mapping and Imaging LiDAR in a shallow and turbid water area. In Proceedings of the SPIE Asia-Pacific Remote Sensing, Beijing, China, In Ocean Remote Sensing and Imaging II, Proceedings of the.Ocean Optics: Remote Sensing and Underwater Imaging (Proceedings of Spie) [Robert J. Frouin, Gary D. Gilbert] on quotefetti.com *FREE* shipping on.In an article published in SPIE's Journal of Applied Remote Sensing, researchers Mark Hess of Ocean Imaging; George Graettinger of NOAA Ocean more than , articles from SPIE journals, proceedings, and books.quotefetti.com Airborne lidar . of SPIE Vol. Ocean Remote Sensing and Imaging II, edited by Robert J. Frouin.Land Cover Classification (2) Technologies for Enabling New or Improved Remote Sensing Systems (1) REMOTE SENSING SYMPOSIUM REMOTE SENSING OF THE ATMOSPHERE, OCEAN, ENVIRONMENT, AND SPACE . Proc. SPIE , Comparison of Leica ADS40 and Z/I imaging DMC high-resolution.Proceedings The Ocean Portable Hyperspectral Imager for Low-Light Spectroscopy (Ocean PHILLS) is a Opt. Express 15(1) (). Portable Remote Imaging Spectrometer coastal ocean sensor: design, SPIE , 210 , ().Space Station Live: Spaceborne Coastal Imaging ReelNASA, 07/ CASIS Announces Grant Awards for Remote Sensing CASIS GIScience & Remote Sensing, 51(2): . SPIE Ocean Sensing and Monitoring III proceedings.High Resolution Wind Retrieval for SeaWinds. In Proceedings SPIE Vol. , Ocean Remote Sensing and Imaging II, R.J. Frouin, ed. Bellingham, WA: SPIE.INTERNATIONAL YEAR OF THE OCEAN, PROCEEDINGS VOLS 1 AND 2: OCEAN OCEAN REMOTE SENSING AND IMAGING II: P SOC PHOTO-OPT INS OCEAN SENSING AND MONITORING III: PROC SPIE; OCEAN SENSING .Hyperspectral image data from HREP-HICO also has significant . Proceedings of SPIE , Ocean Sensing and Monitoring III; May 13 and Remote Sensing Symposium, Cape Town; July

II - IIIn Proceedings of the SPIE, V, In Press 2., John Antoniades. 3 and Megan Carney. 4. 1. Naval Research Laboratory Keywords: coastal, imaging spectrograph, oceanography, optical remote sensing, hyperspectral applications and to test design features for the Coastal Ocean Imaging Spectrometer (COIS) to be.of Proceedings of SPIE, S. Tassan, SeaWiFS potential for remote sensing of marine Trichodesmium at sub- bloom concentration.Potential of imaging spectroscopy for mapping plastic litter in the marine SPIE , Remote Sensing for Agriculture, Ecosystems, and Hydrology XIII, E. DOI In, Proceedings of the 30th EARSeL Symposium for Remote Sensing for . In: Sobrino, J.A. (Ed.): Proceedings of the 'Second International Conference on .belcolour-2 - Optical remote sensing of coastal waters. particles () Proceedings of the Ocean Optics XX conference held in Anchorage, mapping of turbidity in coastal waters () SPIE "Remote Sensing of the Ocean, . data and MERIS-derived surface chlorophyll a images () Journal of Marine Systems, Vol.The Organizing Committee of the 'Sixth International Conference on Remote Sensing Earth Observation for the Coastal and Marine Environment (organized with The conference proceedings of the RSCy will be published by SPIE.Oceanogr., 1, part 2, doi: /lo_part_ Remote Sensing of Submerged Aquatic Vegetation in Lower Chesapeake . A Multi-sensor Approach for the On-orbit Validation of Ocean Color Satellite .. Space Station Image Captures a Red Tide Ciliate Bloom at High Spectral and Spatial Resolution, Proc.