Hyperspectral Remote Sensing Of Coral Reefs

Proceedings for the Twenty-ninth International Symposium on Remote Sensing of Environment30th International Symposium on Remote Sensing of EnvironmentTopics in OceanographyRemote Sensing and ModelingRemote Sensing of the Ocean and Sea Ice Remote Sensing and ModelingObject-Based Image AnalysisProceedings of the International Symposium on Remote Sensing of EnvironmentCoral Reef Remote SensingWorld Atlas of Coral ReefsThe Galapagos Marine ReserveMulti-sensor System Applications in the Everglades EcosystemHyperspectral Remote Sensing and ApplicationActive and Passive Remote Sensing of the OceansUAV or Drones for Remote Sensing ApplicationsRemote Sensing and Geospatial Technologies for Coastal Ecosystem Assessment and ManagementThe GEO Handbook on Biodiversity Observation NetworksAlgorithms and Technologies for Multispectral, Hyperspectral, and Ultraspectral ImageryPhotonics for Port and Harbor SecurityAssessing the Requirements for Sustained Ocean Color Research and OperationsEnvironmental Applications of Remote SensingCoral Remote Sensing Workshop, September 17-18, 1996Hyperspectral Remote SensingCoral Reef Remote SensingBiological Resources of WaterMarine Technology Society JournalHyperspectral remote sensing of coral reefsDirectory of Southeast Asianists at the Faculty of Arts and Social Sciences, National University of SingaporeRemote Assessment of Ocean Color for Interpretation of Satellite Visible ImagerySpatial Analysis of Coastal EnvironmentsProceedings for the International Symposium on Remote Sensing of Environment, the Symposium of the Canadian Remote Sensing SocietyProceedings of the International Conference on Remote Sensing for Marine and Coastal EnvironmentsHyperspectral Remote Sensing of the OceanCoral Reefs of JapanOceanography from SpaceCoral Reefs: An Ecosystem in TransitionHyperspectral Remote Sensing and Spectral Signature ApplicationsAdvanced Image Processing Techniques for Remotely Sensed Hyperspectral DataRemote Sensing of the Ocean, Sea Ice, and Large Water RegionsOutstanding Topics in Ocean Optics

Proceedings for the Twenty-ninth International Symposium on Remote Sensing of Environment

Remote sensing stands as the defining technology in our ability to monitor coral reefs, as well as their biophysical properties and associated processes, at regional to global scales. With overwhelming evidence that much of Earth’s reefs are in decline, our need for large-scale, repeatable assessments of reefs has never been so great. Fortunately, the last two decades have seen a rapid expansion in the ability for remote sensing to map and monitor the coral reef ecosystem, its overlying water column, and surrounding environment. Remote sensing is now a fundamental tool for the mapping, monitoring and management of coral reef ecosystems. Remote sensing offers repeatable, quantitative assessments of habitat and environmental characteristics over spatially extensive areas. As the multi-disciplinary field of coral reef remote sensing continues to mature, results demonstrate that the techniques and capabilities continue to improve. New developments allow reef assessments and mapping to be performed with higher accuracy, across greater spatial areas, and with greater temporal frequency. The

increased level of information that remote sensing now makes available also allows more complex scientific questions to be addressed. As defined for this book, remote sensing includes the vast array of geospatial data collected from land, water, ship, airborne and satellite platforms. The book is organized by technology, including: visible and infrared sensing using photographic, multispectral and hyperspectral instruments; active sensing using light detection and ranging (LiDAR); acoustic sensing using ship, autonomous underwater vehicle (AUV) and in-water platforms; and thermal and radar instruments. Emphasis and Audience This book serves multiple roles. It offers an overview of the current state-of-the-art technologies for reef mapping, provides detailed technical information for coral reef remote sensing specialists, imparts insight on the scientific questions that can be tackled using this technology, and also includes a foundation for those new to reef remote sensing. The individual sections of the book include introductory overviews of four main types of remotely sensed data used to study coral reefs, followed by specific examples demonstrating practical applications of the different technologies being discussed. Guidelines for selecting the most appropriate sensor for particular applications are provided, including an overview of how to utilize remote sensing data as an effective tool in science and management. The text is richly illustrated with examples of each sensing technology applied to a range of scientific, monitoring and management questions in reefs around the world. As such, the book is broadly accessible to a general audience, as well as students, managers, remote sensing specialists and anyone else working with coral reef ecosystems.

30th International Symposium on Remote Sensing of Environment

Topics in Oceanography

This book is geared for advanced level research in the general subject area of remote sensing and modeling as they apply to the coastal marine environment. The various chapters focus on the latest scientific and technical advances in the service of better understanding coastal marine environments for their care, conservation and management. Chapters specifically deal with advances in remote sensing coastal classifications, environmental monitoring, digital ocean technological advances, geophysical methods, geoacoustics, X-band radar, risk assessment models, GIS applications, real-time modeling systems, and spatial modeling. Readers will find this book useful because it summarizes applications of new research methods in one of the world’s most dynamic and complicated environments. Chapters in this book will be of interest to specialists in the coastal marine environment who deals with aspects of environmental monitoring and assessment via remote sensing techniques and numerical modeling.

Remote Sensing and Modeling

Provides a comprehensive introduction to the coral reefs of Japan and the current state of Japan's efforts to protect them. Ch. 6 provides detailed descriptions of 12 coral reef regions around the country that provide location, marine meteorological

data, total area, and protected areas of each. Appendix 1-6 lists protected areas in coral distribution

Remote Sensing of the Ocean and Sea Ice

In this landmark publication, leading experts detail how remote sensing and related geospatial technologies can be used for coastal ecosystem assessment and management. This book is divided into three major parts. In the first part several conceptual and technical issues of applying remote sensing and geospatial technologies in the coastal environment are examined. The second part showcases some of the latest developments in the use of remote sensing and geospatial technologies when characterizing coastal waters, submerged aquatic vegetation, benthic habitats, shorelines, coastal wetlands and watersheds. Finally, the last part demonstrates a watershed-wide synthetic approach that links upstream stressors with downstream responses for integrated coastal ecosystem assessment and management.

Remote Sensing and Modeling

Since the pioneering work of Clarke et a1. (1970) it has been known that chlorophyll a (or. more generally. pigments) contained in phytoplankton in near-surface waters produced systematic variations in the color of the ocean which could be observed from aircraft. As a direct result of this work. NASA developed the Coastal Zone Color Scanner (CZCS). which was launched on Nimbus-G (now Nimbus-7) in October 1978. (A short description of the CZCS is provided in Appendix I.) Shortly before launch. at the IUCRM Colloquium on Passive Radiometry of the Ocean (June 1978). a working group on water color measurements was formed to assess water color remote sensing at that time. A report (Morel and Gordon. 1980) was prepared which summarized the state-of-the-art of the algorithms for atmospheric correction. and phytoplankton pigment and seston retrieval. and which included recommendations concerning the design of next generation sensors. The water color session of the COSPAR/SCOR/IUCRM Symposium 'Oceanography from Space' held in Venice (May 1980. i. e •• in the post-launch period) provided the opportunity for a reassessment of the state-of-the-art after having gained some experience in the analysis of the initial CZCS imagery. Such an assessment is the purpose of this review paper. which will begin with an outline of the basic physics of water color remote sensing and the fundamentals of atmospheric corrections. The present state of the constituent retrieval and atmospheric correction algorithms will then be critically assessed.

Object-Based Image Analysis

This book covers in one volume materials scattered in hundreds of research articles, in most cases focusing on specialized aspects of coral biology. In addition to the latest developments in coral evolution and physiology, it presents chapters devoted to novel frontiers in coral reef research. These include the molecular biology of corals and their symbiotic algae, remote sensing of reef systems, ecology of coral disease spread, effects of various scenarios of global climate change, ocean acidification effects of increasing CO2 levels on coral calcification,

and damaged coral reef remediation. Beyond extensive coverage of the above aspects, key issues regarding the coral organism and the reef ecosystem such as calcification, reproduction, modeling, algae, reef invertebrates, competition and fish are re-evaluated in the light of new research and emerging insights. In all chapters novel theories as well as challenges to established paradigms are introduced, evaluated and discussed. This volume is indispensible for all those involved in coral reef management and conservation.

Proceedings of the International Symposium on Remote Sensing of Environment

Proceedings of SPIE present the original research papers presented at SPIE conferences and other high-quality conferences in the broad-ranging fields of optics and photonics. These books provide prompt access to the latest innovations in research and technology in their respective fields. Proceedings of SPIE are among the most cited references in patent literature.

Coral Reef Remote Sensing

World Atlas of Coral Reefs

This book explores the applicability of multiple remote sensors to acquire information relevant to restoration and conservation efforts in wetlands using data collected from airborne and space multispectral/hyperspectral sensors, light detection and ranging (LiDAR), Unmanned Aircraft Systems (UAS), and a hand-held spectroradiometer. This book also examines digital data processing techniques such as object-based image analysis, machine learning, texture analysis, and data fusion. After an introduction to the Everglades and to remote sensing, the book is divided into four parts based on the sensor systems used. There are chapters on vegetation mapping, biomass and water quality modeling, applications of hyperspectral data for plant stress analysis and coral reef mapping, studies of airborne LiDAR data for coastal vulnerability analysis and DEM improvement, as well as chapters that explore a fusion of multiple sensors for different datasets. Features Introduces concepts, theories, and advanced processing techniques A complete introduction of machine learning, object-based image analysis, data fusion, and ensemble analysis techniques in processing data from multiple remote sensors Explains how multiple remote sensing systems are applied in the wetland ecosystems of Florida The author had been teaching and using both systems and her research is widely recognized Multi-sensor System Applications in the Everglades Ecosystems provides a comprehensive application of remote sensing techniques in the Florida Everglades and its coastal ecosystems. It will prove an invaluable resource for the restoration and conservation of the Florida Everglades and beyond, for global wetlands in general. Any professional, scientist, engineer, or student working with remote sensing and wetland ecosystems will reap enormous benefits from this book.

The Galapagos Marine Reserve

Oceanography is the par excellence interdisciplinary science thanks to its peculiar setting within a fluid environment that makes connections extremely efficient. The oceans connections are well mirrored in the chapters of this book that share a quite explicit multidisciplinary and multi-environmental character. The book provides chapters on very different topics under very different settings, some with a focused angle, others with a broader approach, yet all sharing the idea that we need to understand the small pieces in order to put together the big picture for a much larger mechanism, the functioning of the ocean as a whole.

Multi-sensor System Applications in the Everglades Ecosystem

Biodiversity observation systems are almost everywhere inadequate to meet local, national and international (treaty) obligations. As a result of alarmingly rapid declines in biodiversity in the modern era, there is a strong, worldwide desire to upgrade our monitoring systems, but little clarity on what is actually needed and how it can be assembled from the elements which are already present. This book intends to provide practical guidance to broadly-defined biodiversity observation networks at all scales, but predominantly the national scale and higher. This is a practical how-to book with substantial policy relevance. It will mostly be used by technical specialists with a responsibility for biodiversity monitoring to establish and refine their systems. It is written at a technical level, but one that is not discipline-bound: it should be intelligible to anyone in the broad field with a tertiary education.

Hyperspectral Remote Sensing and Application

This book focuses on how marine systems respond to natural and anthropogenic perturbations (ENSO, overfishing, pollution, tourism, invasive species, climate-change). Authors explain in their chapters how this information can guide management and conservation actions to help orient and better manage, restore and sustain the ecosystems services and goods that are derived from the ocean, while considering the complex issues that affect the delicate nature of the Islands. This book will contribute to a new understanding of the Galapagos Islands and marine ecosystems.

Active and Passive Remote Sensing of the Oceans

UAV or Drones for Remote Sensing Applications

Contributed papers presented at the National Seminar on "Hyperspectral Remote Sensing and Spectral Signature Databse Management System," held on February 14-15, 2008 at Annamalai University.

Remote Sensing and Geospatial Technologies for Coastal Ecosystem Assessment and Management

The GEO Handbook on Biodiversity Observation Networks

Algorithms and Technologies for Multispectral, Hyperspectral, and Ultraspectral Imagery

Provides photographs and text to discuss the geographic distribution and conservation status of coral reefs in the Atlantic and Eastern Pacific, the Indian Ocean and Southeast Asia, and the Pacific.

Photonics for Port and Harbor Security

Assessing the Requirements for Sustained Ocean Color Research and Operations

The first of its kind, this book reviews image processing tools and techniques including Independent Component Analysis, Mutual Information, Markov Random Field Models and Support Vector Machines. The book also explores a number of experimental examples based on a variety of remote sensors. The book will be useful to people involved in hyperspectral imaging research, as well as by remote-sensing data like geologists, hydrologists, environmental scientists, civil engineers and computer scientists.

Environmental Applications of Remote Sensing

Coral Remote Sensing Workshop, September 17-18, 1996

Hyperspectral Remote Sensing

Coral Reef Remote Sensing

Hyperspectral remote sensing is an emerging, multidisciplinary field with diverse applications that builds on the principles of material spectroscopy, radiative transfer, imaging spectrometry, and hyperspectral data processing. While there are many resources that suitably cover these areas individually and focus on specific aspects of the hyperspectral remote sensing field, this book provides a holistic treatment that thoroughly captures its multidisciplinary nature. The content is oriented toward the physical principles of hyperspectral remote sensing as opposed to applications of hyperspectral technology. Readers can expect to finish the book armed with the required knowledge to understand the immense literature available in this technology area and apply their knowledge to the understanding of material spectral properties, the design of hyperspectral systems, the analysis of hyperspectral imagery, and the application of the technology to specific problems.

Biological Resources of Water

At the convergence of the land and sea, coastal environments are some of the most dynamic and populated places on Earth. This book explains how the many varied forms of spatial analysis, including mapping, monitoring and modelling, can be applied to a range of coastal environments such as estuaries, mangroves, seagrass beds and coral reefs. Presenting empirical geographical approaches to modelling, which draw on recent developments in remote sensing technology, geographical information science and spatial statistics, it provides the analytical tools to map, monitor and explain or predict coastal features. With detailed case studies and accompanying online practical exercises, it is an ideal resource for undergraduate courses in spatial science. Taking a broad view of spatial analysis and covering basic and advanced analytical areas such as spatial data and geostatistics, it is also a useful reference for ecologists, geomorphologists, geographers and modellers interested in understanding coastal environments.

Marine Technology Society Journal

This volume is based on the proceedings of the COSPAR/SCOR/ IUCRM Symposium "Oceanography From Space" held in May 1980 in Venice, Italy. COSPAR (The Committee for Space Research) suggested holding a joint symposium with SCOR (The Scientific Committee for Oceanic Research) as a major review of space oceanography. Since this meeting fitted well with a series of colloquia organized by the IUCRM (The Inter-Union Commission on Radio Meteorology), these three bodies joined in sponsoring the meeting. The conference was hald 16 years after the first discussions of possible spaceborne observations of the ocean at a meeting organized in 1964 in Woods Hole. Gifford'Ewing was then keen to see oceanography benefit from the new satellite technology being developed, and he begins this volume by noting that most of the suggestions put forward in 1964 have now, at last, been successfully demonstrated in practice. The papers that follow show the variety of measurement techniques available or possible, and many of the types of studies in which they can be used. Papers are arranged in a general section, and in 6 specialized sections each of which starts with a brief introduction summarizing important results.

Hyperspectral remote sensing of coral reefs

Directory of Southeast Asianists at the Faculty of Arts and Social Sciences, National University of Singapore

Remote Assessment of Ocean Color for Interpretation of Satellite Visible Imagery

The book is divided into two sections and represents the current trend of research in aquatic bioresource. In the section "Biology, Ecology and Physiological Chemistry", high-impact articles are contributed on reproduction, population genetics, evolution, biodiversity, biology and ecology of different aquatic faunas. Physiological chemistry of lipid, bioactive pharmaceuticals and chemical ecological aspects of aquatic organisms were discussed. In the section entitled "Conservation

and Sustainable Management", authors highlighted conservation- and management-related issues of various bioresources in different regions of the earth. The book mentions the biological, ecological, physiological and genetic significance of aquatic organisms with resource potential. The authors stressed on rational utilisation and management of bioresource ensuring minimal damage of the aquatic ecosystem. This book would provide a direction towards sustainable ecological management of bioresource.

Spatial Analysis of Coastal Environments

This book is geared for advanced level research in the general subject area of remote sensing and modeling as they apply to the coastal marine environment. The various chapters focus on the latest scientific and technical advances in the service of better understanding coastal marine environments for their care, conservation and management. Chapters specifically deal with advances in remote sensing coastal classifications, environmental monitoring, digital ocean technological advances, geophysical methods, geoacoustics, X-band radar, risk assessment models, GIS applications, real-time modeling systems, and spatial modeling. Readers will find this book useful because it summarizes applications of new research methods in one of the world’s most dynamic and complicated environments. Chapters in this book will be of interest to specialists in the coastal marine environment who deals with aspects of environmental monitoring and assessment via remote sensing techniques and numerical modeling.

Proceedings for the International Symposium on Remote Sensing of Environment, the Symposium of the Canadian Remote Sensing Society

Remote sensing stands as the defining technology in our ability to monitor coral reefs, as well as their biophysical properties and associated processes, at regional to global scales. With overwhelming evidence that much of Earth’s reefs are in decline, our need for large-scale, repeatable assessments of reefs has never been so great. Fortunately, the last two decades have seen a rapid expansion in the ability for remote sensing to map and monitor the coral reef ecosystem, its overlying water column, and surrounding environment. Remote sensing is now a fundamental tool for the mapping, monitoring and management of coral reef ecosystems. Remote sensing offers repeatable, quantitative assessments of habitat and environmental characteristics over spatially extensive areas. As the multi-disciplinary field of coral reef remote sensing continues to mature, results demonstrate that the techniques and capabilities continue to improve. New developments allow reef assessments and mapping to be performed with higher accuracy, across greater spatial areas, and with greater temporal frequency. The increased level of information that remote sensing now makes available also allows more complex scientific questions to be addressed. As defined for this book, remote sensing includes the vast array of geospatial data collected from land, water, ship, airborne and satellite platforms. The book is organized by technology, including: visible and infrared sensing using photographic, multispectral and hyperspectral instruments; active sensing using light detection and ranging (LiDAR); acoustic sensing using ship, autonomous underwater vehicle (AUV) and in-

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Proceedings of the International Conference on Remote Sensing for Marine and Coastal Environments

This book is a printed edition of the Special Issue "UAV or Drones for Remote Sensing Applications" that was published in Sensors

Hyperspectral Remote Sensing of the Ocean

Coral Reefs of Japan

Oceanography from Space

The ocean is a fundamental component of the earth's biosphere. It covers roughly 70 percent of Earth's surface and plays a pivotal role in the cycling of life's building blocks, such as nitrogen, carbon, oxygen, and sulfur. The ocean also contributes to regulating the climate system. Most of the primary producers in the ocean comprise of microscopic plants and some bacteria; and these photosynthetic organisms (phytoplankton) form the base of the ocean's food web. Monitoring the health of the ocean and its productivity is critical to understanding and managing the ocean's essential functions and living resources. Because the ocean is so vast and difficult for humans to explore, satellite remote sensing of ocean color is currently the only way to observe and monitor the biological state of the surface ocean globally on time scales of days to decades. Ocean color measurements reveal a wealth of ecologically important characteristics including: chlorophyll concentration, the rate of phytoplankton photosynthesis, sediment transport, dispersion of pollutants, and responses of oceanic biota to long-term climate changes. Continuity of satellite ocean color data and associated climate research products are presently at significant risk for the U.S. ocean color community. Assessing Requirements for Sustained Ocean Color Research and Operations aims to identify the ocean color data needs for a broad range of end users, develop a

consensus for the minimum requirements, and outline options to meet these needs on a sustained basis. The report assesses lessons learned in global ocean color remote sensing from the SeaWiFS/MODIS era to guide planning for acquisition of future global ocean color radiance data to support U.S. research and operational needs.

Coral Reefs: An Ecosystem in Transition

Nowadays, the innovation in space technologies creates a new trend for the Earth observation and monitoring from space. This book contains high quality and compressive work on both microwave and optical remote sensing applications. This book is divided into five sections: (i) remote sensing for biomass estimation, (ii) remote sensing-based glacier studies, (iii) remote sensing for coastal and ocean applications, (iv) sewage leaks and environment disasters, and (v) remote sensing image processing. Each chapter offers an opportunity to expand the knowledge about various remote sensing techniques and persuade researchers to deliver new research novelty for environment studies.

Hyperspectral Remote Sensing and Spectral Signature Applications

Ocean optics is a branch of oceanography which is firmly embedded in studies of a great variety of ocean science and engineering questions. The interactive nature between radiative transfer of light and various dissolved and particulate constituents of seawater is at the core of ocean optics science and applications. The transfer of radiant solar energy has vital implications to life and climate on Earth, and the large variety of subjects of ocean optics ranges from the subtle problems of physical optics to optical remote sensing towards a better understanding of ocean biology, biogeochemistry and ecosystems and their roles in the Earth's system processes. The intention of this book is to present a collection of papers that generally share a common denominator of frontier topics in ocean optics which are unique, uncommon or outstanding in the literature, and to provide a balanced view of the extraordinary breadth of research in this field. Topics as diverse as measurements and modeling of radiative transfer, light fields, light scattering and polarization, ocean color, benthic optical properties, and the use of optics for characterizing seawater constituents are addressed in this book. The book is expected to be of interest and useful to a broad audience of professional ocean scientists, engineers and advanced students with an interest in ocean optics and applications of optical methods in oceanography.

Advanced Image Processing Techniques for Remotely Sensed Hyperspectral Data

Remote Sensing of the Ocean, Sea Ice, and Large Water Regions

This book brings together a collection of invited interdisciplinary persp- tives on the recent topic of Object-based Image Analysis (OBIA). Its c- st tent is based on select

papers from the 1 OBIA International Conference held in Salzburg in July 2006, and is enriched by several invited chapters. All submissions have passed through a blind peer-review process resulting in what we believe is a timely volume of the highest scientific, theoretical and technical standards. The concept of OBIA first gained widespread interest within the GIScience (Geographic Information Science) community circa 2000, with the advent of the first commercial software for what was then termed ‘obje- oriented image analysis’. However, it is widely agreed that OBIA builds on older segmentation, edge-detection and classification concepts that have been used in remote sensing image analysis for several decades. Nevert- less, its emergence has provided a new critical bridge to spatial concepts applied in multiscale landscape analysis, Geographic Information Systems (GIS) and the synergy between image-objects and their radiometric char- teristics and analyses in Earth Observation data (EO).

Outstanding Topics in Ocean Optics

Divided into four sections, these conference papers cover: sensors, calibration, and program overviews; minerals and geology; vegetation and forests; and feature extraction and classification algorithms.