An Introduction To Ocean Remote Sensing

Optical Remote Sensing is one of the main technologies used in sea surface monitoring. Optical Remote Sensing of Ocean Hydrodynamics investigates and demonstrates capabilities of optical remote sensing technology for enhanced observations and detection of ocean environments. It provides extensive knowledge of physical principles and capabilities of optical observations of the oceans at high spatial resolution, 1-4m, and on the observations of surface wave hydrodynamic processes. It also describes the implementation of spectral-statistical and fusion algorithms for analyses of multispectral optical databases and establishes physics-based criteria for detection of complex wave phenomena and hydrodynamic disturbances including assessment and management of optical databases. This book explains the physical principles of high-resolution optical imagery of the ocean surface, discusses for the first time the capabilities of observing hydrodynamic processes and events, and emphasizes the integration of optical measurements and enhanced data analysis. It also covers both the assessment and the interpretation of dynamic multispectral optical databases and includes applications for advanced studies and nonacoustic detection. This book is an invaluable resource for researches, industry professionals, engineers, and students working on cross-disciplinary problems in ocean hydrodynamics, optical remote sensing of the ocean and sea surface remote sensing. Readers in the fields of geosciences and remote sensing, applied physics, oceanography, satellite observation technology, and optical engineering will learn the theory and practice of optical interactions with the ocean.

Microwave Remote Sensing of Land Surface: Techniques and Methods brings essential coverage of the space techniques of observation on continental surfaces. The authors explore major applications and provide detailed chapters on physical principles, physics of measurement, and data processing for each technique, bringing readers up-to-date descriptions of techniques used by leading scientists in the field of remote sensing and Earth observation. Presents clear-and-concise descriptions of modern methods Explores current remote sensing techniques that include physical aspects of measurement (theory) and their applications Provides physical principles, measurement, and data processing chapters that are included for each technique described

This is an introductory text that presents the major optical ocean sensing techniques. It is suitable for professionals and managers in related disciplines, as well as students who are interested in exploring career paths in remote sensing of the ocean or ocean engineering.

Remote Sensing of the Changing Oceans is a comprehensive account of the basic concepts, theories, methods and applications used in ocean satellite remote sensing. The book provides a synthesis of various new ideas and theories and discusses a series of key research topics in oceanic manifestation of global changes as viewed from space. A variety of research methods used in the analysis and modeling of global changes are introduced in detail along with numerous examples from around the world’s oceans. The authors review the changing oceans at different levels, including Global and Regional Observations, Natural Hazards, Coastal Environment and related scientific issues, all from the unique perspective of Satellite Observation Systems. Thus, the book not only introduces the basics of the changing oceans, but also new developments in satellite remote sensing technology and international cooperation in this emerging field. Danling Tang (Lingzis) received her Ph.D from Hong Kong University of Science and Technology. She conducted research and teaching in Hong Kong, USA, Japan, and South Korea for more than 10 years; in 2004, she received “100 Talents Program of Chinese Academy of Sciences” and returned to China. She was a professor of Fudan University, and now is a Leading Professor of “Remote Sensing of Marine Ecology and Environment” at the South China Sea Institute of Oceanology, Chinese Academy of Sciences. Dr. Tang has been working on satellite remote sensing of marine ecology and environment; her major research interests include ocean dynamics of phytoplankton bloom, global environmental changes, and natural hazards. Dr. Tang has organized several international conferences, workshops, and training, she also services as member of organizing committee for several international scientific organizations; she was the Chairman of the 9th Pan Ocean Remote Sensing Conference (PORSEC 2008), and currently is the President-elect of PORSEC Association.

It is now nine years since the first edition appeared and much has changed in marine science during that time. For example, satellites are now routinely used in remote sensing of the ocean surface and hydrothermal vents at sea noor spreading centres have been extensively researched. The second edition has been considerably expanded and reorganised, and many new figures and tables have been included. Every chapter has been carefully updated and many have been rewritten. A new chapter on man's use of the oceans has been included to cover satellites and position fixing, renewable energy sources in the sea, seabed minerals, oil and gas, pollution and maritime law. In this edition we have also referred to a number of original references and review articles so that readers can find their way into the literature more easily. As in the first edition, PSM has been mainly responsible for the text and HC for the illustrations, although each has responded to advice from the other and also from many colleagues. In this context readers should note that the illustrations form an integral and major part of the book. The text will almost certainly be too concise for many readers if they do not study the illustrations carefully at the same time. The book has been written as an introductory text for students, although it can serve anyone who is beginning a study of the sea.

The heavily-revised Practical Handbook of Marine Science, Fourth Edition continues its tradition as a state-of-the-art reference that updates the field of marine science to meet the interdisciplinary research needs of physical oceanographers, marine biologists, marine chemists, and marine geologists. This edition adds an entirely new section devoted to Climate Change and Climate Change Effects. It also adds new sections on Estuaries, Beaches, Barrier Islands, Shellfish, Macroalgae, Food Chains, Food Webs, Trophic Dynamics, System Productivity, Physical-Chemical-Biological Alteration, and Coastal Resource Management. The Handbook assembles an extensive international collection

of marine science data throughout, with approximately 1,000 tables and illustrations. It provides comprehensive coverage of anthropogenic impacts in estuarine and marine ecosystems from local, regional, and global perspectives. Maintaining its user-friendly, multi-sectional format, this comprehensive resource will also be of value to undergraduate and graduate students, research scientists, administrators, and other professionals who deal with the management of marine resources. Now published in full color, the new edition offers extensive illustrative and tabular reference material covering all the major disciplines related to the sea.

The science and engineering of remote sensing--theory andapplications The Second Edition of this authoritative book offers readers theessential science and engineering foundation needed to understandremote sensing and apply it in real-world situations. Thoroughlyupdated to reflect the tremendous technological leaps made sincethe publication of the first edition, this book covers the gamut ofknowledge and skills needed to work in this dynamic field,including: * Physics involved in wave-matter interaction, the building blocksfor interpreting data * Techniques used to collect data * Remote sensing applications The authors have carefully structured and organized the book tointroduce readers to the basics, and then move on to more advancedapplications. Following an introduction, Chapter 2 sets forth thebasic properties of electromagnetic waves and their interactionswith matter. Chapters 3 through 7 cover the use of remote sensingin solid surface studies, including oceans. Each chapter covers onemajor part of the electromagnetic spectrum (e.g., visible/nearinfrared, thermal infrared, passive microwave, and activemicrowave). Chapters 8 through 12 then cover remote sensing in the study ofatmospheres and ionospheres. Each chapter first presents the basicinteraction mechanism, followed by techniques to acquire, measure,and study the information, or waves, emanating from the mediumunder investigation. In most cases, a specific advanced sensor isused for illustration. The book is generously illustrated with fifty percent new figures.Numerous illustrations are reproduced in a separate section ofcolor plates. Examples of data acquired from spaceborne sensors areincluded throughout. Finally, a set of exercises, along with asolutions manual, is provided. This book is based on an upper-level undergraduate and first-yeargraduate course taught by the authors at the California Instituteof Technology. Because of the multidisciplinary nature of the fieldand its applications, it is appropriate for students in electricalengineering, applied physics, geology, planetary science,astronomy, and aeronautics. It is also recommended for any engineeror scientist interested in working in this exciting field.

Fundamentals of Ocean Renewable Energy: Generating Electricity from the Sea presents the basic concepts of mechanics and introduces the various technical aspects of ocean renewable energy. Contents follow a logical sequence, starting with hydrodynamics and then separately examining each conversion technology, with special focus on tidal energy, offshore wind and wave energy, as well as current and ocean thermal energy conversion (OTEC). The authors explore key topics for resource characterization and optimization, such as monitoring and measurement methods and ocean modeling. They also discuss the sustainability, planning, integration and distribution challenges for the implementation of these technologies, including co-location with other systems. Finally, case studies of ocean energy sites and devices allow for a better understanding of how ocean energy conversion works in real-world settings. This book is an invaluable resource for students at graduate and senior undergraduate level engineering (ocean, mechanical, and civil) and oceanography with prior knowledge of fluid mechanics and mechanics of materials. Presents the fundamental physics and theory behind ocean energy systems, covering both oceanographic and engineering aspects of ocean energy Explores the most widely adopted conversion technologies, including tidal, wave, offshore wind, ocean thermal and currents

The ocean covers approximately 71% of the Earth's surface, 90% of the biosphere and contains 97% of Earth's water. The Synthetic Aperture Radar (SAR) can image the ocean surface in all weather conditions and day or night. SAR remote sensing on ocean and coastal monitoring has become a research hotspot in geoscience and remote sensing. This book--Progress in SAR Oceanography--provides an update of the current state of the science on ocean remote sensing with SAR. Overall, the book presents a variety of marine applications, such as, oceanic surface and internal waves, wind, bathymetry, oil spill, coastline and intertidal zone classification, ship and other man-made objects' detection, as well as remotely sensed data assimilation. The book is aimed at a wide audience, ranging from graduate students, university teachers and working scientists to policy makers and managers. Efforts have been made to highlight general principles as well as the state-of-the-art technologies in the field of SAR Oceanography.

Measuring Ocean Currents: Tools, Technologies, and Data covers all major aspects of ocean current measurements in view of the implications of ocean currents on changing climate, increasing pollution levels, and offshore engineering activities. Although more than 70% of the Earth is covered by ocean, there is limited information on the countless fine- to large-scale water motions taking place within them. This book fills that information gap as the first work that summarizes the state-of-the-art methods and instruments used for surface, subsurface, and abyssal ocean current measurements. Readers of this book will find a wealth of information on Lagrangian measurements, horizontal mapping, imaging, Eulerian measurements, and vertical profiling techniques. In addition, the book describes modern technologies for remote measurement of ocean currents and their signatures, including HF Doppler radar systems, satellite-borne sensors, ocean acoustic tomography, and more. Crucial aspects of ocean currents are described in detail as well, including dispersion of effluents discharged into the sea and transport of beneficial materials—as well as environmentally hazardous materials—from one region to another. The book highlights several important practical applications, showing how measurements relate to climate change and pollution levels, how they affect coastal and offshore engineering activities, and how they can aid in tsunami detection. Coverage of measurement, mapping and profiling techniques Descriptions of technologies for remote measurement of ocean currents and their signatures Reviews crucial aspects of ocean currents, including special emphasis on the planet-spanning thermohaline circulation, known as the ocean's "conveyor belt," and

its crucial role in climate change
Satellite remote sensing, in particular by radar altimetry, is a crucial technique for observations of the ocean surface and of many aspects of land surfaces, and of paramount importance for climate and environmental studies. This book provides a state-of-the-art overview of the satellite altimetry techniques and related missions, and reviews the most-up-to date applications to ocean dynamics and sea level. It also discusses related space-based observations of the ocean surface and of the marine geoid, as well as applications of satellite altimetry to the cryosphere and land surface waters; operational oceanography and its applications to navigation, fishing and defense.
Active remote sensing is the principal tool used to study and to predict short- and long-term changes in the environment of Earth - the atmosphere, the oceans and the land surfaces - as well as the near space environment of Earth. All of these measurements are essential to understanding terrestrial weather, climate change, space weather hazards, and threats from asteroids. Active remote sensing measurements are of inestimable benefit to society, as we pursue the development of a technological civilization that is economically viable, and seek to maintain the quality of our life. A Strategy for Active Remote Sensing Amid Increased Demand for Spectrum describes the threats, both current and future, to the effective use of the electromagnetic spectrum required for active remote sensing. This report offers specific recommendations for protecting and making effective use of the spectrum required for active remote sensing.
"A novel set on a remote Australian island, where a childless couple live quietly running a lighthouse, until a boat carrying a baby washes ashore"--
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.
Covering significant new advances in satellite oceanography, this new edition introduces remote sensing for graduate and advanced undergraduate students.
A wide variety of marginal basins, ranging from polar to equatorial regions, and a few sizeable enclosed basins, can all be included among the Asian Seas. The Arctic Ocean shelf seas off Siberia; the sheltered basins along the Pacific Ocean’s western rim; the coastal seas of the northernmost Indian Ocean, including the semi-enclosed Red Sea and Persian Gulf; the Caspian Sea, the remnants of the Aral Sea and a score of brackish or freshwater lakes, such as Lake Balkhash and Lake Baykal; all exhibit a multiplicity of environmental features and processes. Understanding the peculiarities of such a large and varied collection of marine and coastal types requires integrated observation systems, among which orbital remote sensing must play an essential role. This volume reviews the current potential of Earth Observations in assessing the many Asian seascapes, using both passive and active techniques in diverse spectral regions, such as measuring reflected visible and near-infrared sunlight and surface emissions in the thermal infrared and microwave range, or surface reflection of transmitted radar pulses in the microwave range. An in-depth evaluation of the available spectral regions and observation techniques, as well as of novel multi-technique methods, ensures that suitable tools are indeed accessible for exploring and managing the wealth of resources that the Asian Seas have to offer.
“Oceans and Society: Blue Planet” (www.oceansandsociety.org) is a global initiative bringing together many ocean-observing programmes with a societal benefit focus. It was created in 2011 as a Task within the Work Plan of the Group on Earth Observations (GEO). The Geneva-based GEO is a voluntary partnership of some 90 governments and 77 intergovernmental, international, and regional organisations. It is committed to integrating global observations through strengthened cooperation and coordination among global observing systems and research programmes. Blue Planet held its inaugural Symposium in Ilhabela, Brazil, in November 2012. Participants from some 25 countries, representing a diverse array of international programmes, presented and discussed issues including the coordination of and information access from global ocean observing systems for open ocean, coastal and inland ecosystems; operational ocean forecasting; applications of observations for sustainable fishery and aquaculture; and capacity building. A major outcome of the Symposium was the production of this book. The contributions to the Symposium served as a starting point, and were developed to provide a comprehensive overview of the scope and breadth of the “Oceans and Society: Blue Planet” initiative. Targeted at all stakeholders within the ocean and marine community, this volume discusses current activities and future actions and raises awareness for the further development and implementation of the Blue Planet agenda. Readers will learn more about ocean observations, how they can be integrated, and their applications to benefit society as a whole.
Wave breaking represents one of the most interesting and challenging problems for fluid mechanics and physical oceanography. Over the last 15 years our understanding has undergone a dramatic leap forward, and wave breaking has emerged as a process whose physics is clarified and quantified. Ocean wave breaking plays the primary role in the air-

sea exchange of momentum, mass and heat, and it is of significant importance for ocean remote sensing, coastal and ocean engineering, navigation and other practical applications. This book outlines the state of the art in our understanding of wave breaking and presents the main outstanding problems. It is a valuable resource for anyone interested in this topic: researchers, modellers, forecasters, engineers and graduate students in physical oceanography, meteorology and ocean engineering.

This book offers a survey of the contribution of satellite data to the study of the ocean, focusing on the special insights that only satellite data can bring to oceanography. Topics range from ocean waves to ocean biology, spanning scales from basins to estuaries. Some chapters cover applications to pure research while others show how satellite data can be used operationally for tasks such as pollution monitoring or oil-spill detection.

Remote Sensing of Ocean and Coastal Environments advances the scientific understanding and application of technologies to address a variety of areas relating to sustainable development, including environmental systems analysis, environmental management, clean processes, green chemistry and green engineering. Through each contributed chapter, the book covers ocean remote sensing, ocean color monitoring, modeling biomass and the carbon of oceanic ecosystems, sea surface temperature (SST) and sea surface salinity, ocean monitoring for oil spills and pollutions, coastal erosion and accretion measurement. This book is aimed at those with a common interest in oceanography techniques, sustainable development and other diverse backgrounds within earth and ocean science fields. This book is ideal for academicians, scientists, environmentalists, meteorologists, environmental consultants and computing experts working in the areas of earth and ocean sciences. Provides a comprehensive assessment of various ocean processes and their relative phenomena Includes graphical abstract and photosets in each chapter Presents literature reviews, case studies and applications

This textbook for advanced undergraduate and graduate students presents a multidisciplinary approach to understanding ocean circulation and how it drives and controls marine biogeochemistry and biological productivity at a global scale. Background chapters on ocean physics, chemistry and biology provide students with the tools to examine the range of large-scale physical and dynamic phenomena that control the ocean carbon cycle and its interaction with the atmosphere. Throughout the text observational data is integrated with basic physical theory to address cutting-edge research questions in ocean biogeochemistry. Simple theoretical models, data plots and schematic illustrations summarise key results and connect the physical theory to real observations. Advanced mathematics is provided in boxes and appendices where it can be drawn on to assist with the worked examples and homework exercises available online. Further reading lists for each chapter and a comprehensive glossary provide students and instructors with a complete learning package.

Introduction to Satellite Remote Sensing: Atmosphere, Ocean and Land Applications is the first reference book to cover ocean applications, atmospheric applications, and land applications of remote sensing. Applications of remote sensing data are finding increasing application in fields as diverse as wildlife ecology and coastal recreation management. The technology engages electromagnetic sensors to measure and monitor changes in the earth’s surface and atmosphere. The book opens with an introduction to the history of remote sensing, starting from when the phrase was first coined. It goes on to discuss the basic concepts of the various systems, including atmospheric and ocean, then closes with a detailed section on land applications. Due to the cross disciplinary nature of the authors’ experience and the content covered, this is a must have reference book for all practitioners and students requiring an introduction to the field of remote sensing. Provides study questions at the end of each chapter to aid learning Covers all satellite remote sensing technologies, allowing readers to use the text as instructional material Includes the most recent technologies and their applications, allowing the reader to stay up-to-date Delves into laser sensing (LIDAR) and commercial satellites (DigitalGlobe) Presents examples of specific satellite missions, including those in which new technology has been introduced

The International Ocean Institute - Canada has compiled more than 80 insightful essays on the future of ocean governance and capacity development, based largely on themes of its Training Program at Dalhousie University in Canada, to honor the work of Elisabeth Mann Borgese (1918-2002).

An Introduction to Ocean Remote SensingCambridge University Press

Until the 1980s, a tacit agreement among many physical oceanographers was that nothing deserving attention could be found in the upper few meters of the ocean. The lack of adequete knowledge about the near-surface layer of the ocean was mainly due to the fact that the widely used oceanographic instruments (such as bathythermographs, CTDs, current meters, etc.) were practically useless in the upper few meters of the ocean. Interest in the ne- surface layer of the ocean rapidly increased along with the development of remote sensing techniques. The interpretation of ocean surface signals sensed from satellites demanded thorough knowledge of upper ocean processes and their connection to the ocean interior. Despite its accessibility to the investigator, the near-surface layer of the ocean is not a simple subject of experimental study. Random, sometimes huge, vertical motions of the ocean surface due to surface waves are a serious complication for collecting quality data close to the ocean surface. The supposedly minor problem of avoiding disturbances from ships’ wakes has frustrated several generations of oceanographers attempting to take reliable data from the upper few meters of the ocean. Important practical applications nevertheless demanded action, and as a result several pioneering works in the 1970s and 1980s laid the foundation for the new subject of oceanography – the near-surface layer of the ocean.

It is now nine years since the first edition appeared and much has changed in marine science during that time. For example, satellites are now routinely used in remote sensing of the ocean surface and hydrothermal vents at sea floor spreading centres have been extensively researched. The second edition has been considerably expanded and

reorganised, and many new figures and tables have been included. Every chapter has been carefully updated and many have been rewritten. A new chapter on man's use of the oceans has been included to cover satellites and position fixing, renewable energy sources in the sea, seabed minerals, oil and gas, pollution and maritime law. In this edition we have also referred to a number of original references and review articles so that readers can find their way into the literature more easily. As in the first edition, PSM has been mainly responsible for the text and IIC for the illustrations, although each has responded to advice from the other and also from many colleagues. In this context readers should note that the illustrations form an integral and major part of the book. The text will almost certainly be too concise for many readers if they do not study the illustrations carefully at the same time. The book has been written as an introductory text for students, although it can serve anyone who is beginning a study of the sea.

This book is a collection of the lectures, held at the International Summer School ISSAOS-2000 in L'Aquila (Italy), given by invited lecturers coming from both Europe and the USA. The goal of the book is to provide a broad panorama of spaceborne remote sensing techniques, at both microwave and visible-infrared bands and by both active and passive sensors, for the retrieval of atmospheric and oceanic parameters. A significant emphasis is given to the physical modeling background, instrument potential and limitations, inversion methods and applications. Topics on international remote sensing programs and assimilation techniques into numerical weather forecast models are also touched. The main purpose of the book is to offer to young scientists, Ph.D. or equivalent students, and to all who would like to have a broad-spectrum understanding of spaceborne remote sensing capabilities, introductory material to each remote sensing topic written by the most qualified experts in the field.

Waves in Oceanic and Coastal Waters describes the observation, analysis and prediction of wind-generated waves in the open ocean, in shelf seas, and in coastal regions with islands, channels, tidal flats and inlets, estuaries, fjords and lagoons. Most of this richly illustrated book is devoted to the physical aspects of waves. After introducing observation techniques for waves, both at sea and from space, the book defines the parameters that characterise waves. Using basic statistical and physical concepts, the author discusses the prediction of waves in oceanic and coastal waters, first in terms of generalised observations, and then in terms of the more theoretical framework of the spectral energy balance. He gives the results of established theories and also the direction in which research is developing. The book ends with a description of SWAN (Simulating Waves Nearshore), the preferred computer model of the engineering community for predicting waves in coastal waters.

The oceans cover 70% of the Earth’s surface, and are critical components of Earth’s climate system. This new edition of Encyclopedia of Ocean Sciences summarizes the breadth of knowledge about them, providing revised, up to date entries as well coverage of new topics in the field. New and expanded sections include microbial ecology, high latitude systems and the cryosphere, climate and climate change, hydrothermal and cold seep systems. The structure of the work provides a modern presentation of the field, reflecting the input and different perspective of chemical, physical and biological oceanography, the specialized area of expertise of each of the three Editors-in-Chief. In this framework maximum attention has been devoted to making this an organic and unified reference. Represents a one-stop. organic information resource on the breadth of ocean science research Reflects the input and different perspective of chemical, physical and biological oceanography, the specialized area of expertise of each of the three Editors-in-Chief New and expanded sections include microbial ecology, high latitude systems and climate change Provides scientifically reliable information at a foundational level, making this work a resource for students as well as active researches

R and Python for Oceanographers: A Practical Guide with Applications describes the uses of scientific Python packages and R in oceanographic data analysis, including both script codes and graphic outputs. Each chapter begins with theoretical background that is followed by step-by-step examples of software applications, including scripts, graphics, tables and practical exercises for better understanding of the subject. Examples include frequently used data analysis approaches in physical and chemical oceanography, but also contain topics on data import/export and GIS mapping. The examples seen in book provide uses of the latest versions of Python and R libraries. Presents much needed oceanographic data analysis approaches to chemical and physical oceanography Includes examples with software applications (based on Python and R), including free software for the analysis of oceanographic data Provides guidance on how to get started, along with guidance on example code and output

Marine Optics

Coastal Ocean Observing Systems provides state-of-the-art scientific and technological knowledge in coastal ocean observing systems, along with guidance on establishing, restructuring, and improving similar systems. The book is intended to help oceanographers understand, identify, and recognize how oceanographic research feeds into the various designs of ocean observing systems. In addition, readers will learn how ocean observing systems are defined and how each system operates in relation to its geographical, environmental, and political region. The book provides further insights into all of these problem areas, offering lessons learned and results from the types of research sponsored and utilized by ocean observing systems and the types of research design and experiments conducted by professionals specializing in ocean research and affiliated with observing systems. Includes international contributions from individuals working in academia, management, and industry Showcases the application of science and technology in coastal observing systems Highlights lessons learned on partnerships, governance structure, data management, and stakeholder relationships required for successful implementation Provides insight into how ocean research transfers to application and societal benefit

Data Analysis Methods in Physical Oceanography is a practical reference guide to established and modern data analysis techniques in earth and ocean sciences. This second and revised edition is even more comprehensive with numerous updates, and an additional appendix on 'Convolution and Fourier transforms'. Intended for both students and established scientists, the five major chapters of the book cover data acquisition and recording, data processing and presentation, statistical methods and error handling, analysis of spatial data fields, and time series analysis methods. Chapter 5 on time series analysis is a book in itself, spanning a wide diversity of topics from stochastic processes and stationarity, coherence functions, Fourier analysis, tidal harmonic analysis, spectral and cross-spectral analysis, wavelet and other related methods for processing nonstationary data series, digital filters, and fractals. The seven appendices include unit conversions, approximation methods and nondimensional numbers used in geophysical fluid dynamics, presentations on convolution, statistical terminology, and distribution functions, and a number of important statistical tables. Twenty pages are devoted to references. Featuring: • An in-depth presentation of modern techniques for the analysis of temporal and spatial data sets collected in oceanography, geophysics, and other disciplines in earth and ocean sciences. • A detailed overview of oceanographic instrumentation and sensors - old and new - used to collect oceanographic data. • 7 appendices especially applicable to earth and ocean sciences ranging from conversion of units, through statistical tables, to terminology and non-dimensional parameters. In praise of the first edition: "(...)This is a very practical guide to the various statistical analysis methods used for obtaining information from geophysical data, with particular reference to oceanography(...) The book provides both a text for advanced students of the geophysical sciences and a useful reference volume for researchers." Aslib Book Guide Vol

63, No. 9, 1998 "(...)This is an excellent book that I recommend highly and will definitely use for my own research and teaching." EOS Transactions, D.A. Jay, 1999 "(...)In summary, this book is the most comprehensive and practical source of information on data analysis methods available to the physical oceanographer. The reader gets the benefit of extremely broad coverage and an excellent set of examples drawn from geographical observations." Oceanography, Vol. 12, No. 3, A. Plueddemann, 1999 "(...)Data Analysis Methods in Physical Oceanography is highly recommended for a wide range of readers, from the relative novice to the experienced researcher. It would be appropriate for academic and special libraries." E-Streams, Vol. 2, No. 8, P. Mofjelf, August 1999

An account of some aspects of marine geology and marine geophysics, comprehensible to those at an early stage in their study of geology and to scientists who are not specialists in these fields. There are many biologists, chemists, mathematicians or physicists who work in the laboratory or on board ship with geologists and geophysicists and this book will help them to understand the aims of their colleages' experiments. Wherever possible, without a loss of necessary precision, terminology is deliberately simplified.

Satelli te oceanography, as the term is used in this book, is a generic term that means application of the technology of aerospace electromagnetic remote sensing to the study of the oceans. The key words here are "application of technology ••. to the study of the oceans." The goal is to learn more about our planet's hydrosphere. As such, remote sensing technology is another tool in the oceanographer's sea bag, just like a bathythermograph or a plankton net. But is a whole book necessary if remote sensing is just another tool? While it is true that no one has written a whole book on plankton nets, volumes have been written about what is found in those nets. Today's state-of-the-art measurements from spacecraft or aircraft first must be interpreted in terms of their physics; then the interpretations must be understood in terms of oceanic processes. This is not materially different from the analogy to Ii plankton net; marine biolo gists still argue about what didn't get caught in the net.

A graduate-level 2004 textbook describing the use of satellites to study oceanic physical and biological properties.

Optical Oceanography

This a text intended to occupy the middle ground between brief review papers on oceanographic applications of remote sensing and detailed technical reports about sensors and satellites. It provides marine scientists with a broad introduction to the subject from first principles and an explanation of the different techniques for applying satellite data in oceanography. It also gives sensor technologists and remote sensing specialists an oceanographer's perspective of satellite remote sensing in ocean study and provides a view across all types of satellite remote sensing of the ocean, visible, infrared and microwave frequencies, and both active and passive sensors.

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.

This book covers the fundamental principles of measuring oceans from space, and also contains state-of-the-art developments in data analysis and interpretation and in sensors. Completely new will be material covering advances in oceanography that have grown out of remote sensing, including some of the global applications of the data. The variety of applications of remotely sensed data to ocean science has grown significantly and new areas of science are emerging to exploit the gobal datasets being recovered by satellites, particularly in relation to climate and climate change, basin-scale, air-sea interaction processes (e.g. El Nino) and the modelling, forecasting and prediction of the ocean.

This new and completely updated edition gives a detailed description of radiative transfer processes at a level accessible to advanced students. The volume gives the reader a basic understanding of global warming and enhanced levels of harmful ultraviolet radiation caused by ozone depletion. It teaches the basic physics of absorption, scattering and emission processes in turbid media, such as the atmosphere and ocean, using simple semi-classical models. The radiative transfer equation, including multiple scattering, is formulated and solved for several prototype problems, using both simple approximate and accurate numerical methods. In addition, the reader has access to a powerful, state-of-the-art computational code for simulating radiative transfer processes in coupled atmosphere-water systems including snow and ice. This computational code can be regarded as a powerful educational aid, but also as a research tool that can be applied to solve a variety of research problems in environmental sciences.