Introduction To Ocean Remote Sensing Saosey

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

Introduction to Microwave Remote Sensing offers an extensive overview of this versatile and extremely precise technology for technically oriented undergraduates and graduate students. This textbook emphasizes an important shift in conceptualization and directs it toward students with prior knowledge of optical remote sensing: the author dispels any linkage between microwave and optical remote sensing. Instead, he constructs the concept of microwave remote sensing by comparing it to the process of audio perception, explaining the workings of the ear as a metaphor for microwave instrumentation. This volume takes an "application-driven" approach. Instead of describing the technology and then its uses, this textbook justifies the need for measurement then explains how microwave technology addresses this need. Following a brief summary of the field and a history of the use of microwaves, the book explores the physical properties of microwaves and the polarimetric properties of electromagnetic waves. It examines the interaction of microwaves with matter, analyzes passive atmospheric and passive surface measurements, and describes the operation of altimeters and scatterometers. The textbook concludes by explaining how high resolution images are created using radars, and how techniques of interferometry can be applied to both passive and active sensors.

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.

Covering significant new advances in satellite oceanography, this new edition introduces remote sensing for graduate and advanced undergraduate students.

Optical Oceanography

Marine Optics

This summer school was a sequel to the summer school on Remote Sensing in Meteorology, Oceanography and Hydrology which was held in Dundee in 1980 and the proceedings of which were published by Ellis Horwood Ltd., Chichester, England. At the present summer scnool we concentrated on only part of the subject area that was covered in 1980. Although there was some repetit ion of material that was presented in 1980, because by and large we had a new set of participants, most subjects were treated in considerably greater detail than had been possible previously. The major topics covered in the present summer school were (i) the general principles of remote sensing with particular reference to marine applications, (ii) applications to physical oceanography, (iii) marine resources applications and (iv) coastal monitoring and protection. The material contained in this volume represents the written texts of most of the lectures presented at the summer school. One important set of lecture notes was not available; this was for the lectures on active microwave techniques, principally synthetic aperture radar, by W. Alpers from Hamburg. For this material we would refer the reader to "Imaging Ocean Surface Waves by Synthetic Aperture Radar - A Review" by W. Alpers,which is to appear as chapter 6 in "Satellite Microwave Remote Sensing" edited by T.D. Allan (Ellis Horwood, Chichester) which is to be published in 1983.

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.

A Beginner's Guide to the World of Satellite DataOver a thousand active satellites are in orbit around the Earth with applications including navigation, the transmission of data and satellite remote sensing; a space-based technology providing data accessible to everyone. The Practical Handbook of Remote Sensing offers a complete understanding of th

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.

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

This is a book about how ecologists can integrate remote sensing and GIS in their research. It will allow readers to get started with the application of remote sensing and to understand its potential and limitations. Using practical examples, the book covers all necessary steps from planning field campaigns to deriving ecologically relevant information through remote sensing and modelling of species distributions. An Introduction to Spatial Data Analysis introduces spatial data handling using the open source software Quantum GIS (QGIS). In addition, readers will be guided through their first steps in the R programming language. The authors explain the fundamentals of spatial data handling and analysis, empowering the reader to turn data acquired in the field into actual spatial data. Readers will learn to process and analyse spatial data of different types and interpret the data and results. After finishing this book, readers will be able to address questions such as “What is the distance to the border of the protected area?”, “Which points are located close to a road?”, “Which fraction of land cover types exist in my study area?” using different software and techniques. This book is for novice spatial data users and does not assume any prior knowledge of spatial data itself or practical experience working with such data sets. Readers will likely include student and professional ecologists, geographers and any environmental scientists or practitioners who need to collect, visualize and analyse spatial data. The software used is the widely applied open source scientific programs QGIS and R. All scripts and data sets used in the book will be

provided online at book.ecosens.org. This book covers specific methods including: what to consider before collecting in situ data how to work with spatial data collected in situ the difference between raster and vector data how to acquire further vector and raster data how to create relevant environmental information how to combine and analyse in situ and remote sensing data how to create useful maps for field work and presentations how to use QGIS and R for spatial analysis how to develop analysis scripts

The oceans cover approximately 71% of Earth's surface, 90% of the biosphere and contains 97% of Earth's water. Since the first launch of SEASAT satellite in 1978, an increasing number of SAR satellites have or will become available, such as the European Space Agency's ERS-1/-2, ENVISAT, and Sentinel-1 series; the Canadian RADARSAT-1/-2 and the upcoming RADARSAT Constellation Mission series satellites; the Italian COSMO-SkyMed satellites, the German TERRASAR-X and TANDEM-X, and the Chinese GAOFEN-3 SAR, among others. Recently, European Space Agency has launched a new generation of SAR satellites, Sentinel-1A in 2014 and Sentinel-1B in 2016. These SAR satellites provide researchers with free and open SAR images necessary to carry out their research on the global oceans. The scope of Advances in SAR Remote Sensing of Oceans is to demonstrate the types of information that can be obtained from SAR images of the oceans, and the cutting-edge methods needed for analysing SAR images. Written by leading experts in the field, and divided into four sections, the book presents the basic principles of radar backscattering from the ocean surface; introduces the recent progresses in SAR remote sensing of dynamic coastal environment and management; discusses the state-of-the-art methods to monitor parameters or phenomena related to the dynamic ocean environment; and deals specifically with new techniques and findings of marine atmospheric boundary layer observations. Advances in SAR Remote Sensing of Oceans is a very comprehensive and up-to-date reference intended for use by graduate students, researchers, practitioners, and R&D engineers working in the vibrant field of oceans, interested to understand how SAR remote sensing can support oceanography research and applications.

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.

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.

The objective of this book is to provide a systematic introduction of the principles, state-of-the-art methods and applications of high frequency surface/sky wave radar, microwave marine radar for ocean remote sensing and global navigation satellite system (GNSS) based radar for ocean observation.

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.

A self-contained introduction to tides, explaining the origin of tidal constituents and their wave propagation in oceans and coastal seas.

This book provides contributions from leading experts on the integration of novel sensing technologies to yield unprecedented observations of coupled biological, chemical, and physical processes in the ocean from the macro to micro scale. Authoritative entries from experts around the globe provide first-hand information for oceanographers and researchers looking for solutions to measurement problems.

Ocean observational techniques have seen rapid advances in the last few years and this book addresses the need for a single overview of present and future trends in near real time and real time. First the past, present and future scenarios of ocean observational tools and techniques are elucidated. Then this book divides into three modes of ocean observations: surface, upper ocean and deep ocean. This is followed by data quality and modelling. Collecting a summary of methods and applications, this

book provides first-hand information for oceanographers and researchers looking for solutions to measurement problems. This book is also suitable for final year undergraduate students or beginning graduate students in ocean engineering, oceanography and various other engineering students (such as Mechanical, Civil, Electrical, and Bioengineering) who are interested in specializing their skills towards modern measurements of the ocean.

Space Remote Sensing Systems: An Introduction discusses the space remote sensing system, which is a modern high-technology field developed from earth sciences, engineering, and space systems technology for environmental protection, resource monitoring, climate prediction, weather forecasting, ocean measurement, and many other applications. This book consists of 10 chapters. Chapter 1 describes the science of the atmosphere and the earth's surface. Chapter 2 discusses spaceborne radiation collector systems, while Chapter 3 focuses on space detector and CCD systems. The passive space optical radiometer and spectrometer systems are presented in Chapters 4 and 5. Chapter 6 elaborates the passive space microwave radiometer systems. Chapters 7 and 8 deliberate the active space lidar systems, active space synthetic aperture radar, and scatterometer systems. The low-earth-orbit large satellite systems and applications are covered in Chapter 9. The last chapter considers the geosynchronous-orbit large satellite systems. This publication is written for scientists, engineers, and seniors or graduate students who are interested in the field of space remote sensing systems.

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).

Over the last two decades there has been increasing recognition that problems in oceanography and fisheries sciences and related marine areas are nearly all manifest in the spatio-temporal domain. Geographical Information Systems (GIS), the natural framework for spatial data handling, are being recognized as powerful tools with useful applications

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.

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.

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

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 book provides an advanced introduction to the science behind automated prediction systems, focusing on sea ice analysis and forecasting. Starting from basic principles, fundamental concepts in sea ice physics, remote sensing, numerical methods, and statistics are explained at an accessible level. Existing operational automated prediction systems are described and their impacts on

information providers and end clients are discussed. The book also provides insight into the likely future development of sea ice services and how they will evolve from mainly manual processes to increasing automation, with a consequent increase in the diversity and information content of new ice products. With contributions from world-leading experts in the fields of sea ice remote sensing, data assimilation, numerical modelling, and verification and operational prediction, this comprehensive reference is ideal for students, sea ice analysts, and researchers, as well as decision-makers and professionals working in the ice service industry.

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.

This book demonstrates the capabilities of passive microwave technique for enhanced observations of ocean features, including the detection of (sub)surface events and/or disturbances while laying out the benefits and boundaries of these methods. It represents not only an introduction and complete description of the main principles of ocean microwave radiometry and imagery, but also provides guidance for further experimental studies. Furthermore, it expands the analysis of remote sensing methods, models, and techniques and focuses on a high-resolution multiband imaging observation concept. Such an advanced approach provides readers with a new level of geophysical information and data acquisition granting the opportunity to improve their expertise on advanced microwave technology, now an indispensable tool for diagnostics of ocean phenomena and disturbances.

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.

This book considers the formation of the signal reflected from the sea surface when sensing in the radio and optical range. Currently, remote sensing from space is the main source of information about the processes taking place in the atmosphere and ocean. The correct interpretation of remote sensing data requires detailed information about the rough surface that forms the reflected signal. The first three chapters describe the statistical and spatial-temporal characteristics of the sea surface, focusing on the effects associated with the nonlinearity of sea surface waves. The analysis makes extensive use of data obtained by the authors on a stationary oceanographic platform located on the

Black sea. In the next seven chapters, the authors analyze how the nonlinearity of waves affects the formation of a signal reflected from the sea surface. 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. It is of value to scientists and engineers involved in the development of methods and instruments of remote sensing, analysis and interpretation of data. It is useful for students who have decided to devote themselves to the study of the oceans.
This study on the application of satellite remote sensing in disaster management is unique in the sense that it is based on 13 years of empirical study, takes human factors (users) into account. It provides an overview of satellite remote sensing, detailing how it works and for what fields of disaster management it can be used. This book will particularly appeal to practitioners (such as disaster responders, policy makers, and administrative officials) and researchers in the field of disaster management, as well as researchers in the satellite-remote-sensing field.
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 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.

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.

Published by the American Geophysical Union as part of the Geophysical Monograph Series, Volume 68. Human activities in the polar regions have undergone incredible changes in this century. Among these changes is the revolution that satellites have brought about in obtaining information concerning polar geophysical processes. Satellites have flown for about three decades, and the polar regions have been the subject of their routine surveillance for more than half that time. Our observations of polar regions have evolved from happenstance ship sightings and isolated harbor icing records to routine global records obtained by those satellites. Thanks to such abundant data, we now know a great deal about the ice-covered seas, which constitute about 10% of the Earth's surface. This explosion of information about sea ice has fascinated scientists for some 20 years. We are now at a point of transition in sea ice studies; we are concerned less about ice itself and more about its role in the climate system. This change in emphasis has been the prime stimulus for this book.

Many of the pollutants discharged into the sea are directly or indirectly the result of human activities. Some of these substances are biodegradable, while others are not. This study is devoted to monitoring areas of the environment. Methods

assessment is based on monitoring data and an evaluation of the impact of pollution.Surveillance provides a scientific basis for standards development and application. The methodology of marine pollution control is governed by algorithms and models. A monitoring strategy should be put in place, coupled with an environmental assessment concept, through targeted research activities in areas identified at local and regional levels. This concept will make it possible to diagnose the state of "health" of these zones and consequently to correct any anomalies. Monitoring of the marine and coastal environment is based on recent methods and validated after experiments in the field of marine pollution.
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.