

Satellite Altimetry Over Oceans And Land Surfaces

For the past three decades, it has been possible to measure the earth's static gravity from satellites. Such measurements have been used to address many important scientific problems, including the earth's internal structure, and geologically slow processes like mantle convection. In principle, it is possible to resolve the time-varying component of the gravity field by improving the accuracy of satellite gravity measurements. These temporal variations are caused by dynamic processes that change the mass distribution in the earth, oceans, and atmosphere. Acquisition of improved time-varying gravity data would open a new class of important scientific problems to analysis, including crustal motions associated with earthquakes and changes in groundwater levels, ice dynamics, sea-level changes, and atmospheric and oceanic circulation patterns. This book evaluates the potential for using satellite technologies to measure the time-varying component of the gravity field and assess the utility of these data for addressing problems of interest to the earth sciences, natural hazards, and resource communities. Consisting of more than 150 articles written by leading experts, this authoritative reference encompasses the entire field of solid-earth geophysics. It describes in detail the state of current knowledge, including advanced instrumentation and techniques, and focuses on important areas of exploration geophysics. It also offers clear and complete coverage of seismology, geodesy, gravimetry, magnetotellurics and related areas in the adjacent disciplines of physics, geology, oceanography and space science.

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.

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

Microwave Remote Sensing of Sea Ice

GeoValue

GaneL Report

Multi-purposeful Application of Geospatial Data

Sea Level Rise

Chapter 4. Remote Sensing of the Global Ocean Circulation

Satellite positioning techniques, particularly global navigation satellite systems (GNSS), are capable of measuring small changes of the Earths shape and atmosphere, as well as surface characteristics with an unprecedented accuracy. This book is devoted to presenting recent results and development in satellite positioning technique and applications, including GNSS positioning methods, models, atmospheric sounding, and reflectometry as well their applications in the atmosphere, land, oceans and cryosphere. This book provides a good reference for satellite positioning technolgies, engineers, scientists as well as user community.

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.

Advances in space-borne technologies lead to improvements in observations and have a notable impact on geodesy and its applications. As a consequence of these improvements in data accuracies, spatial and temporal resolutions, as well as the developments in the methodologies, more detailed analyses of the Earth and a deeper understanding of its state and dynamic processes are possible today. From this perspective, this book is a collection of the selected reviews and case-study articles that report the advances in methodology and applications in geodesy. The chapters in the book are mainly dedicated to the Earth's gravity field theory and applications, sea level monitoring and analysis, navigation satellite systems data and applications, and monitoring networks for tectonic deformations. This collection is a current state analysis of the geodetic research in theory and applications in today's modern world.

The book describes experience in application of coastal altimetry to different parts of the World Ocean. It presents the principal problems related to the altimetry derived products in coastal regions of the ocean and ways of their improvement. This publication is based on numerous satellite and observational data collected and analyzed by the authors of the various chapters in the framework of a set of international projects, performed in UK, France, Italy, Denmark, Russia, USA, Mexico and India. The book will contribute both to the ongoing International Altimeter Service effort and to the building of a sustained coastal observing system in the perspective of GMES (Global Monitoring for Environment and Security) and GEOSS (Global Earth Observation System of Systems) initiatives. This book is aimed at specialists concerned with research in the various fields of satellite altimetry, remote sensing, and coastal physical oceanography. The book will be also interesting for lecturers, students and post-graduate students.

Marine Renewable Energy

Problems in studying ocean surface topography with satellite altimetry

Satellite Altimetry for Earth Sciences

History and Consequences

Earth Observation of Ecosystem Services

The unique applications of satellite oceanography

The past few decades have witnessed the explosive growth of Earth Sciences in the pursuit of knowledge and understanding the planet Earth. Such a development addresses the challenging endeavour to enrich human lives with bounding Nature as well as to preserve the Planet Earth, the Moon, the other planets, in total the Cosmos, for generations to come. Geodetic Sciences aspires to define and quantify the internal structure, the surface structure, the Oceans and the Atmosphere as well as the exterior - interior structure of the planets. Basic principles of Physics and Astronomy, namely the Static Gravity Field, the time-varying Gravity Field, in short Gravodynamics, of the Earth and the other planets, the complex rotational motion for rigid bodies as well as deforming bodies of the Earth, The Moon, the Sun, and the planets and their moons and on top the time-varying Topography open a fascination Arena of Geodetic Sciences.

The Encyclopedia of Ocean Sciences is the most current, authoritative, and comprehensive resource on the science of the oceans. This ambitious work includes contributions from leading scientists around the world on the physical processes that drive the oceans and the chemical, biological, and geological disciplines. The Encyclopedia also covers ancillary topics such as ocean technology, law of the oceans, global programs, marine policy, the use of the oceans for food and energy, and the impact of pollution and climate changes. The many different methods used to study the oceans are covered, from ship-based systems to satellite remote sensing. Users will enjoy easy access to more than 400 articles, each approximately 3000-4000 words in length with further reading lists and extensive cross referencing. Each article provides comprehensive coverage of a particular topic, and is designed for a wide audience of students, academics, researchers, and professionals. The articles are written at a level that allows undergraduate students to understand the material, while providing active researchers with the latest technical information. Also available online on ScienceDirect. For online version information, please visit http://www.info.scienceirect.com/reference_works Presents 402 original articles covering all the physical, chemical and biological aspects of ocean science Brings together classic scientific theories with the newest discoveries, technologies, and applications Written by the world's leading researchers and developed by a prestigious editorial board Makes information easy to find with an intuitive format, extensive cross references, further reading lists, and complete index. Illustrated with more than 1900 figures and full color throughout Developed alongside each other, the Encyclopedia of Ocean Sciences together with the Encyclopedia of Atmospheric Sciences provide readers a with comprehensive resource, and a link between these two fields.

To all those sailors / Who dreamed before us / Of another way to sail the ocean, The dedication of this Volume is not to recall, and honour, the bold pioneers of ocean exploration, ancient as well as modern. As a marine scientist, dealing with the oceans through the complex tools, 'bers and mechanisms of contemporary research, I have always wondered what it was like, in centuries past, to look at that vast ho- zon with the naked eye, not knowing what was ahead, and yet to sail on. I have tried to imagine what ancient sailors felt, when "the unknown swirls around and engulfs the mind", as a forgotten author simply described the brave, perhaps reckless, act of facing such a hostile, menacing and yet fascinating adventure. Innovation has always been the key element. I think, for their success: another way, a better way, a more effective, safer and worthier way to the proper answer to the challenge. The map of our world has been changed time and again, from the geographical as well as the social, economic and scient'ic points of view, by the new discoveries of those sailors. One of the positive qualities of human beings is without doubt the inborn desire to expand their horizons, to see what lies beyond, to learn and understand.

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 sea ice itself and more about its role in the climate system. This change in emphasis has been the prime stimulus for this book.

A Handbook of Techniques and Applications

A Report of the Ministry of Earth Sciences (MoES), Government of India

The effect of ocean tidal loading on satellite altimetry over Antarcitica

Straightforward Spherical Harmonic Expansion

Orthogonal Functions Over the Oceans and Applications to the Determination of Orbit Error, Geoid and Sea Surface Topography from Satellite Altimetry

TOPEX/POSEIDON Science Investigations Plan

Satellite altimetry is a radar technique for measuring the topography of the Earth's surface. It was initially designed for measuring the ocean's topography, with reference to an ellipsoid, and for the determination of the marine geoid. Satellite altimetry has provided extremely valuable information on ocean science (e.g., circulation surface geostrophic currents, eddy structures, wave heights, and the propagation of oceanic Kelvin and Rossby waves). With more than 25 years of observations, it is also becoming vital to climate research, providing accurate measurements of sea level variations from regional to global scales. Alimetry has also demonstrated a strong potential for geophysical, cryospheric, and hydrological research and is now commonly used for the monitoring of Arctic and Antarctic ice sheet topography and of terrestrial surface water levels. This book aims to present reviews and recent advances of general interest in the use of radar altimetry in Earth sciences. Manuscripts are related to any aspect of radar altimetry technique or geophysical applications. We also encourage manuscripts resulting from the application of new altimetric technology (SAR, SARin, and Ka band) and improvements expected from missions to be launched in the near future (i.e., SWOT).

This book presents the views of leading scientists on the knowledge of the global ocean circulation following the completion of the observational phase of the World Ocean Circulation Experiment. WOCE's in situ physical and chemical measurements together with satellite altimetry have produced a data set which provides for development of ocean and coupled ocean-atmosphere circulation models used for understanding ocean and climate variability and projecting climate change. This book guides the reader through the analysis, interpretation, modelling and synthesis of this data.

The past decade has seen tremendous progress in the application of ocean remote sensing to the study of the global ocean circulation. This chapter provides a summary of the resultant advances in our understanding of the key processes of the ocean that affect climate variability. Many of the advances result from the combined usage of remote sensing from multiple types of measurement and in situ observations. Remotely sensed ocean variables include sea surface height, wind, temperature, salinity and color, as well as the variable mass of the ocean and ice from spaceborne measurement of the earth's gravity field. These observations have often been analyzed with various in situ observations, including moored buoys, hydrographic profiles, surface drifters, and Argo floats. The general circulation of the ocean as manifested by the ocean surface dynamic topography from satellite altimetry, and the geoid from satellite gravity measurements, can now be determined at scales approaching 100km. The information from surface drifters and Argo floats has added more details through the upper ocean depths. The large-scale changes of the ocean on decadal scales reveal complex geophysical patterns in relation to the changes in the atmospheric forcing. The causes for the slow rise of the global mean sea level are diagnosed in terms of the steric and mass change of the ocean. The bottom pressure inferred from ocean mass change measured from space provides direct observation of the barotropic variability of the ocean. The detailed information of ocean surface wind measured from scatterometry and temperature from infrared and microwave radiometry reveals a positive correlation between the two, leading to new understanding of air–sea interactions at scales below 1000km. Data combined from multiple satellite altimeters through optimally designed processing have revolutionized the study of the global ocean mesoscale processes, revealing new information on the spectral transfer of energy and on global eddy propagation characteristics, which vary in relation to the mean circulation, bottom topography, and the nonlinearity of eddy dynamics. The gridded fields of remote sensing data have made satellite observations routinely accessible to general users for scientific and operational applications. The outlook for future development in ocean remote sensing is also discussed.

Sea level rise shows that sea level has risen about 7 inches during the 20th century, and recent satellite data show that the rate of sea-level rise is accelerating. As Earth warms, sea levels are rising mainly because ocean water expands as it warms; and water from melting glaciers and ice sheets is flowing into the ocean. Sea-level rise poses enormous risks to the valuable infrastructure, development, and wetlands that line much of the 1,600 mile shoreline of California, Oregon, and Washington. As those states seek to incorporate projections of sea-level rise into coastal planning, they asked the National Research Council to make independent projections of sea-level rise along their coasts for the years 2030, 2050, and 2100, taking into account regional factors that affect sea level. Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future explains that sea level along the U.S. west coast is affected by a number of factors. These include: climate patterns such as the El Niño, effects from the melting of modern and ancient ice sheets, and geologic processes, such as plate tectonics. Regional projections for California, Oregon, and Washington show a sharp distinction at Cape Mendocino in northern California. South of that point, sea-level rise is expected to be very close to global projections. However, projections are lower north of Cape Mendocino because the land is being pushed upward as the ocean plate moves under the continental plate along the Cascadia Subduction Zone. However, an earthquake magnitude 8 or larger, which occurs in the region every few hundred to 1,000 years, would cause the land to drop and sea level to suddenly rise.

On Estimating the Basin-Scale Ocean Circulation from Satellite Altimetry, Part 1

Resource Characterization and Physical Effects

Encyclopedia of Ocean Sciences

Mathematical Foundations

Encyclopedia of Geodesy

Encyclopedia of Remote Sensing

TOPEX/POSEIDON is a satellite mission that will use the technique of radar altimetry to make precise measurement of sea level with a primary goal of studying the global ocean circulation . The mission represents the culmination of the development of satellite altimetry over the past two decades. The major thrust of the mission is a commitment to measuring sea level with an unprecedented accuracy such that the small-amplitude, basinwide sea level changes that bear significant effects on global change can be detected. The mission will be conducted jointly by the United States National Aeronautics and the Space Administration and the french space agency, Centre National d'Etudes Spatiales. The 3- to 5-year mission will study the long-term mean and variability of ocean circulation. This document provides brief descriptions of the planned instrument s as well as a summary of the major elements of the mission.

Estuaries and their surrounding wetland regions are among the most productive ecosystems in the world, with more than half of humanity inhabiting their shores. Anthropogenic factors make estuaries highly susceptible to ecosystem degradation. Coastal waters are closely connected with human activity, and their dynamic processes may greatly affect coastal environments. This book provides a compendium of studies on estuarine dynamics, river plumes, and coastal water dynamics, studies that have investigated the changes in estuarine and coastal zones in response to sea-level rise and other environmental changes. Policy and management strategies to ensure the health and economy of coastal zones. This book aims to display novel frontiers in these fields and may help to inspire in-depth studies in the future.

The book content corresponds to a course of the International Summer School of Theoretical Geodesy held every 4 years under the sponsorship of the International Association of Geodesy. This particular course, that was given at the International Centre for Theoretical Physics in Trieste, was been dedicated to the theory of satellite altimetry as a response to the increasing need of scientific work in this field due to important recent and forthcoming space mission. The course was conceived to supply a good theoretical basis in both disciplines, i.e. geodesy and oceanography, which are deeply involved in the analysis and in the use of the altimetric signal. The main items of interest are the physical theory of ocean circulation, the theory of tides and the ocean time-variability, from the point of view of oceanography and the orbit theory, with particular regard to the formation of the radial orbital error, the so-called cross over adjustment, the analysis of geodetic boundary value problems, the integrated determination of the gravity field and of the radial orbital error, from the point of view of geodesy. All these arguments are treated from the foundation by very-well experts of the various fields, to introduce the reader into the more difficult subjects on which advanced research is currently performed. The physical theory of the book is in its interdisciplinarity as it can serve to both communities of oceanographers and geodesists to get acquainted with advanced aspects one of the other.

This open access book discusses the impact of human-induced global climate change on the regional climate and monsoons of the Indian subcontinent, adjoining Indian Ocean and the Himalayas. It documents the regional climate change projections based on the climate models used in the IPCC Assessment Report (AR5) and climate change modeling studies using the IITM Earth System Model (ESM) and CORDEX South Asia datasets. The IPCC assessment reports, published every 6–7 years, constitute important reference materials for major policy decisions on climate change, adaptation, and mitigation. While the IPCC assessment reports largely provide a global perspective on climate change, the focus on regional climate change aspects is considerably limited. The effects of climate change over the Indian subcontinent involve complex physical processes on different space and time scales, especially given that the mean climate of this region is generally shaped by the Indian monsoon and the unique high-elevation geographical features such as the Himalayas, the Western Ghats, the Tibetan Plateau and the adjoining Indian Ocean, Arabian Sea, and Bay of Bengal. This book also presents policy relevant information based on robust scientific analysis and assessments of the observed and projected future climate change over the Indian region.

An Introduction to Ocean Remote Sensing

Measuring Ocean Currents

Oceanography from Space

The Socioeconomic Value of Geospatial Information

Satellite Positioning

Encyclopedia of Solid Earth Geophysics

Satellite Altimetry Over Oceans and Land SurfacesCRC Press

Satellite Gravimetry and the Solid Earth: Mathematical Foundations presents the theories behind satellite gravimetry data and their connections to solid Earth. It covers the theory of satellite gravimetry and data analysis, presenting it in a way that is accessible across geophysical disciplines. Through a discussion of satellite measurements and the mathematical concepts behind them, the book shows how various satellite measurements, such as satellite orbit, acceleration, vector gravimetry, gravity gradiometry, and integral energy methods can contribute to an understanding of the gravity field and solid Earth geophysics. Bridging the gap between geodesy and geophysics, this book is a valuable resource for researchers and students studying gravity, gravimetry and a variety of geophysical and Earth Science fields. Presents mathematical concepts in a pedologic and straightforward way to enhance understanding across disciplines Explains how a variety of satellite data can be used for gravity field determination and other geophysical applications Covers a number of problems related to gravimetry and the gravity field, as well as the effects of atmospheric and topographic factors on the data Addresses the regularization method for solving integral equations, isostasy based on gravimetric and flexure methods, elastic thickness, and sub-lithospheric stress

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 defence.

This book is dedicated toward space technology application in Earth studies based on the use of a variety of methods for satellite information classification and interpretation. Advantages of geospatial data use in a large-scale area of observation and monitoring as a source of decision-making stage have been demonstrated. The book describes navigation systems providing data estimation method and review of existing data in the literature relevant to remote sensing sensors delivering main information electromagnetic spectrum and a variety of sensor applications. This aspect is important when combining/integrating satellite data processing into the field measurements. Satellites and satellite data application for the study of Earth features have been demonstrated as the next step of geospatial data application. The use of different purposeful processing technology applications of satellite data is one of the vital aspects of space technology advances. The use of GNSS GPS technology in industry and MODIS images and data interpretation for agriculture purposes has been presented. It was the aim of the book to create an attractive environment by presenting space technology application in the wide areas of Earth study. For this purpose, some of the book chapters are dedicated toward space technology advances in climate monitoring, natural disaster factor detection, satellite data processing optimization, and GIS technology for meteorology information with the aim of agriculture developments.

Satellite Gravity and the Geosphere

Geodetic Sciences

Estuaries and Coastal Zones

Satellite Altimetry in Geodesy and Oceanography

Tools, Technologies, and Data

Proceedings of the International Review Workshop on Satellite Altimetry Cal/Val Activities and Applications

Direct estimation of the absolute dynamic topography from satellite altimetry has been confined to the largest scales (basically the basin-scale) owing to the fact that the signal-to-noise ratio is more unfavorable everywhere else. But even for the largest scales, the results are contaminated by the orbit error and geoid uncertainties. Recently a more accurate Earth gravity model (GEM-T1) became available, providing the opportunity to examine the whole question of direct estimation under a more critical limelight. It is found that our knowledge of the Earth's gravity field has indeed improved a great deal. However, it is not yet possible to claim definitively that our knowledge of the ocean circulation has improved through direct estimation. Yet, the improvement in the gravity model has come to the point that it is no longer possible to attribute the discrepancy at the basin scales between altimetric and hydrographic results as mostly due to geoid uncertainties. A substantial part of the difference must be due to other factors; i.e. the orbit error, or the uncertainty of the hydrographically derived dynamic topography. Tai, Chang-Kou Unspecified Center NAGW-808.

This book contains selected papers from the Intarnational Review Workshop on Satellite Altimetry Cal/Val Activities and Applications, held in Chania, Crete, Greece, on 23-26 April 2018. Organised in the context of the European Space Agency Project “Fiducial Reference Measurements for Altimetry” the workshop was cosponsored by the International Association of Geodesy (in particular by the IAG Commission 2, Gravity Field), the European Space Agency, the European Union (the Copernicus Programme), the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT), Spain Geomatica P.C., and the Municipality of Chania. The workshop presented the latest research in the field of satellite altimetry calibration and altimetry applications for monitoring ocean changes and improving Earth observation in an objective, continuous, homogeneous and reliable manner, free of errors and biases. Further, it supported long-term monitoring of climate change by providing a better understanding of environmental changes in the world's oceans, terrestrial surface-waters, and Arctic and Antarctic Regions. The outcome was the creation of a scientific roadmap with procedures, protocols, guidelines, and best practices to help international groups working on satellite altimetry to establish SI (Syst è International Unit é s) traceability of their measurements, results and data products.

Quantifying the social and economic value that geospatial information contributes to modern society is a complex task. To construct reliable and consistent valuation measures requires an understanding of the sequence of processes that starts with data acquisition, and leads to decision-makers’ choices that impact society. GEOValue explores each step in this complex value chain from the viewpoint of domain experts spanning disciplines that range from the technical side of data acquisition and management to the social sciences that provide the framework to assess the benefit to society. The book is intended to provide foundational understanding of the techniques and complexities of each step in the process. As such it is intended to be assessable to a reader without prior training in data acquisition systems, information systems, or valuation methods. In addition, a number of case studies are provided that demonstrate the use of geospatial information as a critical input for evaluation of policy pertaining to a wide range of application areas, such as agricultural and environmental policy, natural catastrophes, e-government and transportation systems.

Sea Level Rise, History and Consequences includes a special emphasis on the evidence for historical sea level change; case studies are used to demonstrate the resulting consequences. A CD-ROM is included which contain tide gauge data and trends of relative sea level from the Permanent Service for Mean Sea Level. The material on the CD-ROM is either in the form of text files, or web sites that can be opened by widely available web-browsers. Sea level is expected to rise as much as 60-100 centimeters over the next century due to greenhouse-induced global warming -- or at least that is what the some scientists predict. However, the concept of sea level is extremely complex, which makes the prediction of sea level rise anything but certain. The reviewers are in consensus in enthusiastically endorsing this comprehensive book and CD-ROM treatment. This book will be a comprehensive review of the subject using the data themselves (on CD-ROM) to illustrate the principles involved, rather than detailed mathematical treatments. The book should be readily accessible to upper division and first-year graduate students in the environmental sciences, geography, geology, and other interdisciplinary fields. Four pages (up to 16 pages) of color in the printed text. The book will have wide appeal. It will be read by geologists, geophysicists, climatologists, oceanographers, meteorologists, environmental scientists, geomorphologists, coastal engineers, and policy makers in all of these fields.

Remote Sensing of the Asian Seas

Coastal Altimetry

Fiducial Reference Measurements for Altimetry

Dynamics and Response to Environmental Changes

Satellite Altimetry and Earth Sciences

Geoid and its Geophysical Interpretations explains how an accurate geoid can be constructed and used for a variety of applied and theoretical geophysical purposes. The book discusses existing techniques for geoid computation, recently developed mathematical and computational tools designed for applications, and various interpretations. Principles and results are well illustrated. This book will be an excellent reference for geodesists, geophysicists, geophysical prospectors, oceanographers, and researchers and students in geophysics and geodesy.

This complete reference to marine renewable energy covers aspects of resource characterization and physical effects of harvesting the ocean's vast and powerful resources—from wave and tidal stream to ocean current energy. Experts in each of these areas contribute their insights to provide a cohesive overview of the marine renewable energy spectrum based on theoretical, numerical modeling, and field-measurement approaches. They provide clear explanations of the underlying physics and mechanics, and give close consideration to practical implementation aspects, including impacts on the physical system. Engineers, researchers, and students alike will find invaluable tools and studies that will aid them in realizing significant sustainable energy production from near-shore and ocean environments.

A book of scientific approaches based on remote sensing tools and methods to assess and monitor biodiversity, carbon and water cycles, and the energy balance of terrestrial ecosystems. Earth Observation of Ecosystem Services highlights the advantages Earth observation technologies offer for quantifying and monitoring multiple ecosystem functions and services. It provides a multidisciplinary reference that expressly covers the use of remote sensing for quantifying and monitoring multiple ecosystem services. Rather than exhaustively cover all possible ecosystem services, this book takes a global look at the most relevant remote sensing approaches to estimate key ecosystem services from satellite data. Structured in four main sections, it covers carbon cycle, biodiversity, water cycle, and energy balance. Each section contains a review of conceptual and empirical methods, techniques, and case studies linking remotely sensed data to the biophysical variables and ecosystem functions associated with key ecosystem services. The book identifies relevant issues and challenges of assessment, presents cutting-edge sensing techniques, uses globally implemented tools to quantify ecosystem functions, and presents examples of successful monitoring programs. Covering recent developments undertaken on the global and national stage from Earth observation satellite data, it includes valuable lessons and recommendations and novel ways to improve current global monitoring systems. The book delineates the use of Earth observation data so that it can be used to quantify, map, value, and manage the valuable goods and services that ecosystems provide to societies around the world.

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 researchers

Contributions to the Study of the Solid Earth and Its Fluid Envelopes

Ocean Circulation and Climate

Geoid and its Geophysical Interpretations

Satellite Altimetry Over Oceans and Land Surfaces

Satellite Gravimetry and the Solid Earth

This first encyclopaedic reference on remote sensing describes the concepts, techniques, instrumentation, data analysis, interpretation, and applications of remote sensing, both airborne and space-based. Scientists, engineers, academics, and students can quickly access answers to their reference questions and direction for further study.

The new level of precision and global coverage provided by satellite altimetry is rapidly advancing studies of ocean circulation. It allows for new insights into marine geodesy, ice sheet movements, plate tectonics, and for the first time provides high-resolution bathymetry for previously unmappped regions of our watery planet and crucial information on the large-scale ocean features on intra-season to interannual time scales. Satellite Altimetry and Earth Sciences has integrated the expertise of the leading international researchers to demonstrate the techniques, missions, and accuracy of satellite altimetry, including altimeter measurements, orbit determination, and ocean circulation models. Satellite altimetry is helping to advance studies of ocean circulation, tides, sea level, surface waves and allowing new insights into marine geodesy. Satellite Altimetry and Earth Sciences provides high resolution bathymetry for previously unmappped regions of our watery planet. Satellite Altimetry and Earth Sciences is for a very broad spectrum of academics, graduate students, and researchers in geophysics, oceanography, and the space and earth sciences. International agencies that fund satellite-based research will also appreciate the handy reference on the applications of satellite altimetry.

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*

Altimetric System

Discovering the Ocean from Space

Assessment of Climate Change over the Indian Region

Theory, Applications and Recent Developments

Observing and Modelling the Global Ocean

Past, Present, and Future