Glider Technology For Ocean Observations A Review

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.

One of the most significant, energetic, yet not well understood, oceanographic features in the Americas is the Gulf of Mexico Loop Current System (LCS), consisting of the Loop Current (LC) and the Loop Current Eddies (LCEs) it sheds. Understanding the dynamics of the LCS is fundamental to understanding the Gulf of Mexico's full oceanographic system, and vice versa. Hurricane intensity, offshore safety, harmful algal blooms, oil spill response, the entire Gulf food chain, shallow water nutrient supply, the fishing industry, tourism, and the Gulf Coast economy are all affected by the position, strength, and structure of the LC and associated eddies. This report recommends a strategy for addressing the key gaps in general understanding of LCS processes, in order to instigate a significant improvement in predicting LC/LCE position, evolving structure, extent, and speed, which will increase overall understanding of Gulf of Mexico circulation and to promote safe oil and gas operations and disaster response in the Gulf of Mexico. This strategy includes advice on how to design a long-term observational campaign and complementary data assimilation and numerical modeling efforts.

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

Emerging Technologies with High Impact for Ocean Sciences, Ecosystem Management, and Environmental Conservation

Marine Technology Society Journal

Ocean Exploration and Coastal and Ocean Observing Systems

Proceedings of the 15th IFToMM World Congress on Mechanism and Machine Science

Measuring Inner Ocean Processes and Health in the Digital Age

Advances in Coastal Hydraulics

The oceans cover 70% of the terrestrial surface, and exert a pervasive influence on the Earth's environment but their nature is poorly recognized. Knowing the ocean's role deeply and understanding the complex, physical, biological, chemical and geological systems operating within it represent a major challenge to scientists today. Seafloor observatories offer scientists new opportunities to study multiple, interrelated natural phenomena over time scales ranging from seconds to decades, from episodic to global and long-term processes. Seafloor Observatories poses the important and apparently simple question, "How can continuous and reliable monitoring at the seafloor by means of Seafloor Observatories extend exploration and improve knowledge of our planet?" The book leads the reader through: the present scientific challenges to be addressed with seafloor observatories the technical solutions for their architecture an excursus on worldwide ongoing projects and programmes some relevant scientific multidisciplinary results and a presentation of new and interesting long-term perspectives for the coming years. Current results will yield significant improvements and exert a strong impact not only on our present knowledge of our planet but also on human evolution.

Over the past decade the significant advances in real-time ocean observing systems, ocean modelling, ocean data assimilation and super-computing has seen the development and implementation of operational ocean forecast systems of the global ocean. At the conclusion of the Global Ocean Data Assimilation Experiment (GODAE) in 2008 ocean analysis and forecasting services were being supported by 12 international centres. This book is about ocean forecasting - a maturing field which remains an active area of research, and includes such topics as ocean predictability, observing system design, high resolution ocean modelling and ocean data assimilation. It presents the introduction to ocean forecasting which provides a foundation for new opportunities in areas of coupled bio-geochemical forecasting and coupled atmosphere-wave-ocean forecasting. The book describes an updated account of research and development to improve forecast systems, determining how best to service the marine user community with forecast information as well as demonstrating impact to their applications. It also discusses operational centres that are now supporting a range of real-time ocean services including online graphical and data products for their user communities and their feedback on the quality of information. The contents of this book are aimed at early career scientists and professionals with an interest in operational oceanography and related ocean science. There are excellent opportunities for exciting careers in the emerging field of operational oceanography in order to address current and future challenges as well as provide the supporting services to a rapidly growing user community.

The two-volume set LNCS 8111 and LNCS 8112 constitute the papers presented at the 14th International Conference on Computer Aided Systems Theory, EUROCAST 2013, held in February 2013 in Las Palmas de Gran Canaria, Spain. The total of 131 papers presented were carefully reviewed and selected for inclusion in the books. The contributions are organized in topical sections on modelling biological systems; systems theory and applications; intelligent information processing; theory and applications of metaheuristic algorithms; model-based system design, verification and simulation; process modeling simulation and system optimization; mobile and autonomous transportation systems; computer vision, sensing, image processing and medical applications; computer-based methods and virtual reality for clinical and academic medicine; digital signal processing methods and applications; mechatronic systems, robotics and marine robots; mobile computing platforms and technologies; systems applications.

Underwater Technology 2004

Real-time Coastal Observing Systems for Marine Ecosystem Dynamics and Harmful Algal Blooms

Joint Oversight Hearing Before the Subcommittee on Environment, Technology, and Standards, Subcommittee on Research, Committee on Science, and the Subcommittee on Fisheries Conservation, Wildlife, and Oceans, Committee on Resources, House of Representatives, One Hundred Seventh Congress, First Session, July 12, 2001

Sea Ice

Promoting Efficient Maritime Transportation and Improving Maritime Domain Awareness and Response Capability : Hearing Before the Subcommittee on Coast Guard and Maritime Transportation of the Committee on Transportation and Infrastructure, House of Representatives, One Hundred Thirteenth Congress, Second Session, May 21, 2014

High-resolution Seafloor Survey and Applications

The oceans are a hostile environment, and gathering information on deep-sea life and the seabed is incredibly difficult. Autonomous underwater vehicles are robot submarines that are revolutionizing the way in which researchers and industry obtain data. Advances in technology have resulted in capable vehicles that have made new discoveries on how th

Advancing Ocean Observing Technology and Industry - Science Partnerships for the Future of Ocean ScienceFrontiers Media SASelected Papers from the 2018 IEEE International Workshop on Metrology for the SeaMDPI

Challenges and Innovations in Ocean In-Situ Sensors: Measuring Inner Ocean Processes and Health in the Digital Age highlights collaborations of industry and academia in identifying the key challenges and solutions related to ocean observations. A new generation of sensors is presented that addresses the need for higher reliability (e.g. against biofouling), better integration on platforms in terms of size and communication, and data flow across domains (in-situ, space, etc.). Several developments are showcased using a broad diversity of measuring techniques and technologies. Chapters address different sensors and approaches for measurements, including applications, quality monitoring and initiatives that will guide the need for monitoring. Integrates information across key marine and maritime sectors and supports regional policy requirements on monitoring programs Offers tactics for enabling early detection and more effective monitoring of the marine environment and implementation of appropriate management actions Presents new technologies driving the next generation of sensors, allowing readers to understand new capabilities for monitoring and opportunities for another generation of sensors Includes a global vision for ocean monitoring that fosters a new perspective on the direction of ocean measurements

Regional Fisheries Oceanography of the California Current System

Using New Ocean Technologies

Supporting the Marine Environment and the Blue Economy

Coastal Ocean Observing Systems

Elements of Physical Oceanography

Characterizing the Impact of Underwater Glider Observations on the Navy Coastal Ocean Model (NCOM) in the Gulf Stream Region

Recent Advances in the Analysis of Marine Toxins, Volume 78, the newest release in the Comprehensive Analytical Chemistry series, presents chapters from the best authors in the field, making it an essential resource. Updated sections in this new volume include topics such as The importance of toxin detection and quantification: environmental issues, public health, food safety, animal health, bioterrorism, bioactive compounds, medical approach, an LC-MS/MS analysis of marine toxins, Animal bioassays: identification of toxins and mechanism of action, Receptor binding assays for the analysis of marine toxins, Immunoassays and optical biosensors (visual, SPR, fluorescence) for marine toxins, and Electrochemical biosensors for marine toxins. Chapters in this ongoing series contain practical and useful information, describing real advantages and limitations. Experts in this field contribute based on their research and personal point-of-view. Contains contributions from the best authors in the field Provides an essential resource for marine monitoring managers and scientific community

We are only now beginning to understand the climatic impact of the remarkable events that are now occurring in subarctic waters. Researchers, however, have yet to agree upon a predictive model that links change in our northern seas to climate. This volume brings together the body of evidence needed to develop climate models that quantify the ocean exchanges through subarctic seas, measure their variability, and gauge their impact on climate.

Unmanned marine vehicles (UMVs) is a collective term used to describe autonomous underwater vehicles, remotely operated vehicles, semi-submersibles, and unmanned surface craft. Considerable interest has been shown in UMVs by the military, civilian and scientific communities due to their ability to undertake designated missions whilst either operating autonomously and/or on co-operation with other types of vehicle. Increasing importance is also being placed on the design and development of such vehicles as they are capable of providing cost effective solutions to a number of littoral, coastal and offshore problems. This book draws attention to the advanced technology which is evolving to meet the challenges being posed in this exciting and growing field of study.

The Journal of Ocean Technology

Recent Advances in the Analysis of Marine Toxins

A derivative of the Encyclopedia of Ocean Sciences

Neural Computing and Applications to Marine Data Analytics

Volume 1

Pacific Marine Environmental Laboratory (Pmel) Strategic Plan 2013-2017

This book focuses on the survey technology, post-processing technology, mapping technology and scientific application of the submarine topography and geomorphology in detail. High-resolution submarine geomorphology is a frontier branch of Marine Geology and marine surveying and mapping, which provides a direct basis to study the seabed surface, to understand the tectonic movement and submarine evolution. In the past two decades, high-resolution submarine geomorphology with high-precision multi-beam echo sounding, side-scan sonar and shallow bottom profile as the major techniques, is developing very quickly and is one of the frontiers of international marine science and technology. These high techniques promote the traditional submarine geomorphology to high-resolution and quantitative research. At present, high-resolution submarine geomorphology is widely used in the delimitation of the continental shelf and the international seabed resources survey, marine engineering and marine military applications. In order to facilitate readers to understand how to acquire and apply scientific research based on landform data, it highlights the combination of theory, technology and scientific application. This book is useful as a reference for professional and technical personnel in related fields and also as a textbook for both graduate and undergraduate students as well.

This book comprises selected proceedings of the Fourth International Conference in Ocean Engineering (ICOE2018), focusing on emerging opportunities and challenges in the field of ocean engineering and offshore structures. It includes state-of-the-art content from leading international experts, making it a valuable resource for researchers and practicing engineers alike.

Published by the American Geophysical Union as part of the Geophysical Monograph Series, Volume 195. Monitoring and Modeling the Deepwater Horizon Oil Spill: A Record-Breaking Enterprise presents an overview of some of the significant work that was conducted in immediate response to the oil spill in the Gulf of Mexico in 2010. It includes studies of in situ and remotely sensed observations and laboratory and numerical model studies on the four-dimensional oceanographic conditions in the gulf and their influence on the distribution and fate of the discharged oil. Highlights of the book include discussions of the following: immediate responses to the Deepwater Horizon oil spill using Integrated Ocean Observing System resources; monitoring the surface and subsurface oil using satellites, aircraft, vessels, and AUVs; mapping the oceanographic conditions using satellites, aircraft, vessels, drifters, and moorings; modeling the spreading of surface oil trajectories and the three-dimensional dispersal of subsurface hydrocarbon plumes; oil spill risk analyses and statistical studies on the fate of the oil; and laboratory investigation of ocean stratification related to subsurface plumes. This book will be of value to scientists interested in the Deepwater Horizon oil spill, the Gulf of Mexico, and the potential for conveyance of oil spilled in the Gulf of Mexico to the North Atlantic. A more technical audience may include those interested in oil spill detection, trajectory model forecasting, and risk analyses and those with an interest in applied oceanography, including scientists, engineers, environmentalists, natural and living marine resource managers and students within academic institutions, agencies, and industries who are involved with the Gulf of Mexico and other regions with offshore oil and gas exploration and production.

Computer Aided Systems Theory -- EUROCAST 2013

Defining the Role of the Northern Seas in Climate

Advances in Unmanned Marine Vehicles

Oceanobs'19: An Ocean of Opportunity. Volume I

Sustainable Development Goal 14 - Life Below Water: Towards a Sustainable Ocean

the current status of ocean science around the world

Issues in Technology Theory, Research, and Application: 2013 Edition is a ScholarlyEditions™ book that delivers timely, authoritative, and comprehensive information about Ocean Technology. The editors have built Issues in Technology Theory, Research, and Application: 2013 Edition on the vast information databases of ScholarlyNews.™ You can expect the information about Ocean Technology in this book to be deeper than what you can access anywhere else, as well as consistently reliable, authoritative, informed, and relevant. The content of Issues in Technology Theory, Research, and Application: 2013 Edition has been produced by the world's leading scientists, engineers, analysts, research institutions, and companies. All of the content is from peer-reviewed sources, and all of it is written, assembled, and edited by the editors at ScholarlyEditions™ and available exclusively from us. You now have a source you can cite with authority, confidence, and credibility. More information is available at http://www.ScholarlyEditions.com/.

Elements of Physical Oceanography is a derivative of the Encyclopedia of Ocean Sciences, 2nd Edition and serves as an important reference on current physical oceanography knowledge and expertise in one convenient and accessible source. Its selection of articles—all written by experts in their field—focuses on ocean physics, air-sea transfers, waves, mixing, ice, and the processes of transfer of properties such as heat, salinity, momentum and dissolved gases, within and into the ocean. Elements of Physical Oceanography serves as an ideal reference for topical research. References related articles in physical oceanography to facilitate further research Richly illustrated with figures and tables that aid in understanding key concepts Includes an introductory overview and then explores each topic in detail, making it useful to experts and graduate-level researchers Topical arrangement makes it the perfect desk reference

Advances in Coastal Hydraulics contains twelve papers that report on recent developments in several areas of coastal hydraulics. The papers, written by well-regarded authors, cover interesting topics such as the interaction of groundwater and coastal waters, the use of remote sensing for coastal applications, erosion in Arctic environments, the impact of marine vegetation on coastal hydrodynamics, new methods to examine the reliability of breakwater design, the development of marine kinetic energy, and methods for modeling coastal processes as well as their applications to small and large scales, such as a harbor in Hawaii (for design) and the extensive coast of India (for examining the effects of tsunamis and sea level rise). The developments presented in this book could serve not only as a reference book, but also as a starting point for new endeavors in the respective topics.

Advances in Mechanism and Machine Science

Technology and Applications of Autonomous Underwater Vehicles

2004 International Symposium on Underwater Technology : UT 04 : Proceedings : April 20-23, 2004, Howard International House, Taipei

A Record Breaking Enterprise

Understanding and Predicting the Gulf of Mexico Loop Current

A New Vision of the Earth from the Abyss

Since the HMS Challenger expedition of 1872–1876, our vision of the ocean has changed completely. We now understand that it plays a key role in biodiversity, climate regulation, and mineral and biological resources, and as such, the ocean is a major service provider for humanity. Oceans draws on data from new oceanographic and satellite tools, acquired through international interdisciplinary programs. It describes the processes that control how the ocean functions, on different spatial and temporal scales. After considering the evolution of concepts in physical, chemical and biological oceanography, the book outlines the future of a warmer, acidified, less oxygenated ocean. It shows how a view of the ocean at different scales changes how we understand it. Finally, the book presents the challenges facing the ocean in terms of the exploitation of biological and mineral resources, in the context of sustainable development and the regulation of climate change.

This Special Issue is devoted to recent developments in instrumentation and measurement techniques applied to the marine field. ¶The sea is the medium that has allowed people to travel from one continent to another using vessels, even today despite the use of aircraft. It has also been acting as a great reservoir and source of food for all living beings. However, for many generations, it served as a landfill for depositing conventional and nuclear wastes, especially in its deep seabeds, and we are assisting in a race to exploit minerals and resources, different from foods, encompassed in it. Its health is a great challenge for the survival of all humanity since it is one of the most important environmental components targeted by global warming. ¶ As everyone may know, measuring is a step that generates substantial knowledge about a phenomenon or an asset, which is the basis for proposing correct solutions and making proper decisions. However, measurements in the sea environment pose unique difficulties and opportunities, which is made clear from the research results presented in this Special Issue.

Overview of sea ice growth and properties / Chris Petrich & Hajo Eicken -- Sea ice thickness distribution / Christian Haas -- Snow in the sea-ice system : friend or foe? / Matthew Sturm & Robert A. Massom -- Sea ice and sunlight / Donald K. Perovich -- The sea ice-ocean boundary layer / Miles G. McPhee -- The atmosphere over sea ice / Ola Persson & Timo Vihma -- Sea ice and arctic ocean oceanography / Finlo Cottier, Mike Steele & Frank Nielsen -- Oceanography and sea ice in the southern ocean / Michael P. Meredith & Mark A. Brandon -- Methods of satellite remote sensing of sea ice / Gunnar Spreen & Stefan Kern -- Gaining (and losing) antarctic sea ice : variability, trends and mechanisms / Sharon Stammerjohn & Ted Maksym -- Losing arctic sea ice : observations of the recent decline and the long-term context / Walt N. Meier -- Sea ice in earth system models / Dirk Notz & Cecilia M. Bitz -- Sea ice as a habitat for bacteria, archaea and viruses / Jody W. Deming & R. Eric Collins -- Sea ice as a habitat for primary producers / Kevin R. Arrigo -- Sea ice as a habitat for micrograzers / David A. Caron, Rebecca J. Gast & Marie-Eve Garneau -- Sea ice as a habitat for macrograzers / Bodil A. Bluhm, Kerrie M. Swadling & Rolf Gradinger -- Nutrients, dissolved organic matter and exopolymers in sea ice / Klaus M. Meiners & Christine Michel -- Gases in sea ice / Jean-Louis Tison, Bruno Delille & Stathys Papadimitriou -- Transport and transformation of contaminants in sea ice / Feiyue Wang, Monika Pucko & Gary Stern -- Numerical models of sea ice biogeochemistry / Martin Vancoppenolle & Letizia Tedesco -- Arctic marine mammals and sea ice / Kristin L. Laidre & Eric V. Regehr -- Antarctic marine mammals and sea ice / Marthán N. Bester, Horst Bornemann & Trevor McIntyre -- A feathered perspective : the influence of sea ice on arctic marine birds / Nina J. Karnovsky & Maria V. Gavrilo -- Birds and antarctic sea ice / David Ainley, Eric J. Woehler & Amelie Lescroel -- Sea ice is our beautiful garden : indigenous perspectives on sea ice of sea ice in the arctic / Henry P. Huntington, Shari Gearheard, Lene Kielsen Holm, George Noongwook, Margaret Opie & Joelie Sanguya -- Advances in palaeo sea-ice estimation / Leanne Armand, Alexander Ferry & Amy Leventer -- Ice in subarctic seas / Hermanni Kaartokallio, Mats A. Granskog, Harri Kuosa & Jouni Vainio

SEAFLOOR OBSERVATORIES

Global ocean science report

Frontiers in Seafloor Geodesy

14th International Conference, Las Palmas de Gran Canaria, Spain, February 10-15, 2013. Revised Selected Papers, Part II

Advancing Ocean Observing Technology and Industry - Science Partnerships for the Future of Ocean Science

Proceedings of the Fourth International Conference in Ocean Engineering (ICOE2018)

This book gathers the proceedings of the 15th IFToMM World Congress, which was held in Krakow, Poland, from June 30 to July 4, 2019. Having been organized every four years since 1965, the Congress represents the world's largest scientific event on mechanism and machine science (MMS). The contributions cover an extremely diverse range of topics, including biomechanical engineering, computational kinematics, design methodologies, dynamics of machinery, multibody dynamics, gearing and transmissions, history of MMS, linkage and mechanical controls, robotics and mechatronics, micro-mechanisms, reliability of machines and mechanisms, rotor dynamics, standardization of terminology, sustainable energy systems, transportation machinery, tribology and vibration. Selected by means of a rigorous international peer-review process, they highlight numerous exciting advances and ideas that will spur novel research directions and foster new multidisciplinary collaborations.

The California Current System is one of the best studied ocean regions of the world, and the level of oceanographic information available is perhaps only surpassed by the northeast and northwest Atlantic. The current literature (later than 1993) offers no comprehensive, integrated review of the regional fisheries oceanography of the California Current System. This volume summarizes information of more than 60-year California Cooperative Oceanic Fisheries Investigation (CalCOFI). While providing a large bibliography, the intent was to extract themes relevant to current research rather than to prepare a compendious review of the literature. The work presents a useful review and reference point for multidisciplinary fisheries scientists and biological oceanographers new to working in the California Current System, and to specialists wishing to access information outside their core areas of expertise. In addition it aims to deliver an up to date reference to the current state of knowledge of fisheries oceanography in the California Current System.

"The Global Ocean Science Report (GOSR) assesses for the first time the status and trends in ocean science capacity around the world. The report offers a global record of who, how, and where ocean science is conducted: generating knowledge, helping to protect ocean health, and empowering society to support sustainable ocean management in the framework of the United Nations Agenda 2030. The GOSR identifies and quantifies the key elements of ocean science at the national, regional and global scales, including workforce, infrastructure and publications. This is the first collective attempt to systematically highlight opportunities as well as capacity gaps to advance international collaboration in ocean science and technology. This report is a resource for policy makers, academics and other stakeholders seeking to harness the potential of ocean science to address global challenges. A comprehensive view of ocean science capacities at the national and global levels takes us closer to developing the global ocean science knowledge needed to ensure a healthy, sustainable ocean"--GOSR's website.

Evolving Concepts

Arctic-Subarctic Ocean Fluxes

Issues in Technology Theory, Research, and Application: 2013 Edition

Oceans

Measurement for the Sea

Selected Papers from the 2018 IEEE International Workshop on Metrology for the Sea

The ocean is an integral component of the Earth's climate system. It covers about 70% of the Earth's surface and acts as its primary reservoir of heat and carbon, absorbing over 90% of the surplus heat and about 30% of the carbon dioxide associated with human activities, and receiving close to 100% of fresh water lost from land ice. With the accumulation of greenhouse gases in the atmosphere, notably carbon dioxide from fossil fuel combustion, the Earth's climate is now changing more rapidly than at any time since the advent of human societies. Society will increasingly face complex decisions about how to mitigate the adverse impacts of climate change such as droughts, sea-level rise, ocean acidification, species loss, changes to growing seasons, and stronger and possibly more frequent storms. Observations play a foundational role in documenting the state and variability of components of the climate system and facilitating climate prediction and scenario development. Regular and consistent collection of ocean observations over decades to centuries would monitor the Earth's main reservoirs of heat, carbon dioxide, and water and provides a critical record of long-term change and variability over multiple time scales. Sustained high-quality observations are also needed to test and improve climate models, which provide insights into the future climate system. Sustaining Ocean Observations to Understand Future Changes in Earth's Climate considers processes for identifying priority ocean observations that will improve understanding of the Earth's climate processes, and the challenges associated with sustaining these observations over long timeframes.

In the history of humankind, the sea has always played a key role as a privileged medium for communication, commerce and contact among population centers. It constitutes an essential ecosystem, and an invaluable reservoir and source of food for all living beings. Therefore, its heath is a critical challenge for the survival of all humanity, particularly as one the most important environmental components targeted by global warming. Measuring and monitoring techniques are key tools for managing the marine environment and for supporting the Blue Economy. With this perspective, a series of annual international events, entitled MetroSea (Metrology for the Sea) was begun in 2017. Their increasing success inspired this book, which provides an anthology of tutorials dealing with a representative selection of topics of concern to a broad readership. The book covers two broad application areas, marine hydrography and meteorology, and then deals with instrumentation for measurement at sea. Typical metrological issues such as calibration and traceability, are considered, for both physical and chemical quantities. Key techniques, such as underwater acoustic investigation, remote sensing, measurement of waves and monitoring networks, are treated alongside marine geology and the monitoring of animal species. Economic and legal aspects of metrology for navigation are also discussed. Such an unparalleled wide vision of measurement for the sea will be of interest to a broad audience of scientists, engineers, economists, and their students. .

The Pacific Marine Environmental Laboratory's (PMEL's) core values of integrity, excellence, and leadership have helped us to combine scientific independence with strategic integration and societal relevance. The laboratory is more than a collection of individual scientists; it provides an infrastructure that promotes interaction between researchers with related interests to achieve the NOAA, OAR, and PMEL missions. This document outlines PMEL's 20 year vision and mission statements, as well as a set of 5 year strategic goals to achieve that long-term vision. Much of the laboratory's success is based on its ability to establish and maintain critical partnerships that allow PMEL scientists to leverage its base resources for the benefit of NOAA and the larger scientific community. Although the Laboratory faces many challenges in both the short and long term, PMEL is dedicated to the NOAA mission and optimistic about its ability to continue its preeminent research in the future.

Operational Oceanography in the 21st Century

Sustaining Ocean Observations to Understand Future Changes in Earth's Climate

Critical Gaps and Recommendations

theory, instrumentation and modelling

Observing the Oceans in Real Time

The proliferation of harmful phytoplankton in marine ecosystems can cause massive fish kills, contaminate seafood with toxins, impact local and regional economies and dramatically affect ecological balance. Real-time observations are essential for effective short-term operational forecasting, but observation and modelling systems are still being developed. This volume provides guidance for developing real-time and near real-time sensing systems for observing and predicting plankton dynamics, including harmful algal blooms, in coastal waters. The underlying theory is explained and current trends in research and monitoring are discussed.Topics covered include: coastal ecosystems and dynamics of harmful algal blooms; theory and practical applications of in situ and remotely sensed optical detection of microalgal distributions and composition; theory and practical applications of in situ biological and chemical sensors for targeted species and toxin detection; integrated observing systems and platforms for detection; diagnostic and predictive modelling of ecosystems and harmful algal blooms, including data assimilation techniques; observational needs for the public and government; and future directions for research and operations.

The United States has jurisdiction over 3.4 million square miles of ocean in its exclusive economic zone, a size exceeding the combined land area of the 50 states. This expansive marine area represents a prime national domain for activities such as maritime transportation, national security, energy and mineral extraction, fisheries and aquaculture, and tourism and recreation. However, it also carries with it the threat of damaging and outbreaks of waterborne pathogens. The 2010 Gulf of Mexico Deepwater Horizon oil spill and the 2011 Japanese earthquake and tsunami are vivid reminders that ocean activities and processes have direct human implications both nationally and worldwide, understanding of the ocean system is still incomplete, and ocean research infrastructure is needed to support both fundamental research and societal priorities. Given current struggles to maintain, operate, and upgrade major infrastructure elements while maintaining a robust research portfolio, a strategic plan is needed for future investments to ensure that new facilities provide the greatest value, least redundancy, and highest efficiency in terms of operation and flexibility to incorporate new technological advances. Critical Infrastructure for Ocean Research and Societal Needs in 2030 identifies major research questions anticipated to be at the forefront of ocean science in 2030 based on national and international assessments, input from the worldwide scientific community, and ongoing research planning activities. This report defines categories of infrastructure that should be included in planning for the nation's ocean research infrastructure of 2030 and that will be required to answer the major research questions of the future. Critical Infrastructure for Ocean Research and Societal Needs in 2030 provides advice on the criteria and processes that could be used to set priorities for the development of new ocean infrastructure or replacement of existing facilities. In addition, this report recommends ways in which the federal agencies can maximize the value of investments in ocean infrastructure.

Monitoring and Modeling the Deepwater Horizon Oil Spill

The CalCOFI program
Critical Infrastructure for Ocean Research and Societal Needs in 2030
Challenges and Innovations in Ocean In Situ Sensors