[eBooks] The Atmosphere And Ocean A Physical Introduction

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The Atmosphere and Ocean-Neil Wells 1986 This book is unique in bringing together the diverse concepts and ideas of meteorologists, atmospheric physicists and oceanographers into a single coherent account of the fluid environment, with emphasis on their physical properties and inter-dependence rather than on the mathematics. It provides an up-to-date appreciation of the subject area with reference to major research programmes in Oceanography and Meteorology, and an invaluable combined perspective for undergraduates who tend to compartmentalise themselves. It also shows the way the subject is currently developing and suggests possible future research.
Radiative Transfer in the Atmosphere and Ocean-Gary E. Thomas 2002-01-28 Provides a foundation of the theoretical and practical aspects of radiative transfer, for the atmospheric, oceanic and environmental sciences.
The Atmosphere and Ocean-Neil C. Wells 2011-12-08 The Atmosphere and Ocean is a fully revised and updated student friendly physical introduction to the atmosphere and ocean. Now in its Third Edition, the book continues to provide students with an accessible description of the atmosphere and ocean with emphasis on their physical properties and inter-dependence. Clearly structured throughout, the book demonstrates that the atmosphere and ocean are both subject to the influence of the earth's rotation and therefore they have a common dynamical basis. The author clearly demonstrates the fundamental differences between the two environments and provides the reader with a much better understanding of the atmosphere and the ocean and an appreciation of their closest interactive relationship. There have been many developments in the field over the past ten years and this latest edition of a highly successful textbook brings together new material on the ocean-atmosphere system and climate, the observed circulation of the atmosphere and ocean and radiation in the atmosphere and ocean. Fully revised and updated 3rd Edition of student friendly physical introduction to the atmosphere and ocean. Now includes new chapters on observed circulation of the atmosphere and ocean, energy flows in the ocean atmosphere system, modeling the ocean and atmosphere, the ocean atmosphere system and climate. Well structured and written in an authoritative yet accessible style suitable for 2nd and 3rd year students taking courses in meteorology, oceanography and related Earth Sciences or as an introduction for graduate students. Emphasis placed on physical properties and inter-dependence of the ocean and climate. Part of the RMetS (Royal Meteorological Society) book series, Advancing Weather and Climate Science
Atmosphere, Ocean and Climate Dynamics-John Marshall 2007-12-19 For advanced undergraduate and beginning graduate students in atmospheric, oceanic, and climate science, Atmosphere, Ocean and Climate Dynamics is an introductory textbook on the circulations of the atmosphere and ocean and their interaction, with an emphasis on global scales. It will give students a good grasp of what the atmosphere and oceans look like on the large-scale and why they look that way. The role of the oceans in climate and paleoclimate is also discussed. The combination of observations, theory and accompanying illustrative laboratory experiments sets this text apart by making it accessible to students with no prior training in meteorology or oceanography. * Written at a mathematical level that is appealing for undergraduates and beginning graduate students * Provides a useful educational tool through a combination of observations and laboratory demonstrations which can be viewed over the web * Contains instructions on how to reproduce the simple but informative laboratory experiments * Includes copious problems (with sample answers) to help students learn the material.
Computational Methods for the Atmosphere and the Oceans- 2009-06-16 This book provides a survey of the frontiers of research in the numerical modeling and mathematical analysis used in the study of the atmosphere and oceans. The details of the current practices in global atmospheric and ocean models, the assimilation of observational data into such models and the numerical techniques used in theoretical analysis of the atmosphere and ocean are among the topics covered. • Truly interdisciplinary: scientific interactions between specialties of atmospheric and ocean sciences and applied and computational mathematics • Uses the approach of computational mathematicians, applied and numerical analysts and the tools appropriate for unsolved problems in the atmospheric and oceanic sciences • Contributions uniquely address central problems and provide a survey of the frontier of research
Dynamics of The Tropical Atmosphere and Oceans-Peter J. Webster 2020-05-18 This book presents a unique and comprehensive view of the fundamental dynamical and thermodynamic principles underlying the large circulations of the coupled ocean-atmosphere system Dynamics of The Tropical Atmosphere and Oceans provides a detailed description of macroscale tropical circulation systems such as the monsoon, the Hadley and Walker Circulations, El Niño, and the tropical ocean warm pool. These macroscale circulations interact with a myriad of higher frequency systems, ranging from convective cloud systems to migrating equatorial waves that attend the low-frequency background flow. Towards understanding and predicting these circulation systems. A comprehensive overview of the dynamics and thermodynamics of large-scale tropical atmosphere and oceans is presented using both a “reductionist” and “holistic” perspectives of the coupled tropical system. The reductionist perspective provides a detailed description of the individual elements of the ocean and atmospheric circulations. The physical nature of each component of the tropical circulation such as the Hadley and Walker circulations, the monsoon, the incursion of extratropical phenomena into the tropics, precipitation distributions, equatorial waves and disturbances described in detail. The holistic perspective provides a physical description of how the collection of the individual components produces the observed tropical weather and climate. How the collective tropical processes determine the tropical circulation and their role in global weather and climate is provided in a series of overlapping theoretical and modelling constructs. The structure of the book follows a graduated framework. Following a detailed description of tropical phenomenology, the reader is introduced to dynamical and thermodynamical constraints that guide the planetary climate and establish a critical role for the tropics. Equatorial wave theory is developed for simple and complex background flows, including the critical role played by moist processes. The manner in which the tropics and the extratropics interact is then described, followed by a discussion of the physics behind the subtropical and near-equatorial precipitation including arid regions. The El Niño phenomena and the monsoon circulations are discussed, including their covariance and predictability. Finally, the changing structure of the tropics is discussed in terms of the extent of the tropical ocean warm pool and its relationship to the intensity of global convection and climate change. Dynamics of the Tropical Atmosphere and Oceans is aimed at advanced undergraduate and early career graduate students. It also serves as an excellent general reference book for scientists interested in tropical circulations and their relationship with the broader climate system.
Intraseasonal Variability in the Atmosphere-Ocean Climate System-William K.-M. Lau 2007-06-10 This is the first comprehensive review of intra-seasonal variability (ISV); the contents are balanced between observation, theory and modeling. Starting with an overview of ISV and historical observations, the book addresses the coupling between ocean and atmosphere, and the worldwide role of ISV in monsoon variability. Also considered are the connections between oscillations like the Madden, Julian and El Nino/Southern and short-term climate.
Atmosphere—Ocean Dynamics-Adrian E. Gill 2016-06-03 Atmosphere-Ocean Dynamics deals with a systematic and unified approach to the dynamics of the ocean and atmosphere. The book reviews the relationship of the ocean-atmosphere and how this system functions. The text explains this system through radiative equilibrium models; the book also considers the greenhouse effect, the effects of convection and of horizontal gradients, and the variability in radiative driving of the earth. Equations in the book show the properties of a material element, mass conservation, the balance of scalar quantity (such as salinity), and the mathematical behavior of the ocean and atmosphere. The book also addresses how the ocean-atmosphere system tends to adjust to equilibrium, both in the absence and presence of driving forces such as gravity. The text also explains the effect of the earth's rotation on the system, as well as the application of forced motions such as that produced by wind or temperature changes. The book explains tropical dynamics and the effects of variation of the Coriolis parameter with latitude. The text will be appreciated by meteorologists, environmentalists, students studying hydrology, and people working in general earth sciences.
Introduction to PDEs and Waves for the Atmosphere and Ocean-Andrew Majda 2003 The goals of these lecture notes, based on courses presented by the author at the Courant Institute of Mathematical Sciences, are to introduce mathematicians to the fascinating and important area of atmosphere/ocean science (AOS) and, conversely, to develop a mathematical viewpoint on basic topics in AOS of interest to the disciplinary AOS community, ranging from graduate students to researchers. The lecture notes emphasize the serendipitous connections between applied mathematics and geophysical flows in the style of modern applied mathematics, where rigorous mathematical analysis as well as asymptotic, qualitative, and numerical modeling all interact to ease the understanding of physical phenomena. Reading these lecture notes does not require a previous course in fluid dynamics, although a serious reader should supplement these notes with material such as additional information on geophysical flows, as suggested in the preface. The book is intended for graduate students and researchers working in interdisciplinary areas between mathematics and atmosphere/ocean science.
An Introduction to Dynamic Meteorology-James R. Holton 2004-04-14 This revised text presents a cogent explanation of the fundamentals of meteorology, and explains storm dynamics for weather-oriented meteorologists. It discusses climate dynamics and the implications posed for global change. The Fourth Edition features a CD-ROM with MATLABÃ® exercises and updated treatments of several key topics. Much of the material is based on a two-term course for seniors majoring in atmospheric sciences. * Provides clear physical explanations of key dynamical principles * Contains a wealth of illustrations to elucidate text and equations, plus end-of-chapter problems * Holton is one of the leading authorities in contemporary meteorology, and well known for his clear writing style * Instructor's Manual available to adopters NEW IN THIS EDITION * A CD-ROM with MATLABÃ® exercises and demonstrations * Updated treatments on climate dynamics, tropical meteorology, middle atmosphere dynamics, and numerical prediction
Atmosphere-ocean Interactions-William Allan Perrie 2006 The increase in levels of population and human development in coastal areas has led to a greater importance of understanding atmosphere-ocean interactions. This second volume on atmosphere-ocean interactions aims to present several of the key mechanisms that are important for the development of marine storms.
The Chemical Evolution of the Atmosphere and Oceans-Heinrich D. Holland 2020-10-06 In this first full-scale attempt to reconstruct the chemical evolution of the Earth's atmosphere and oceans, Heinrich Holland assembles data from a wide spectrum of fields to trace the history of the ocean-atmosphere system. A pioneer in an increasingly important area of scholarship, he presents a comprehensive treatment of knowledge on this subject, provides an extensive bibliography, and outlines problems and approaches for further research. The first four chapters deal with the turbulent first half billion years of Earth history. The next four chapters, devoted largely to the Earth from 3.9 to 0.6 b.y.b.p., demonstrate that changes in the atmosphere and oceans during this period were not dramatic. The last chapter of the book deals with the Phanerozoic Eon; although the isotopic composition of sulfur and strontium in seawater varied greatly during this period of Earth history, the chemical composition of seawater did not.
Thermodynamics of Atmospheres and Oceans-Judith A. Curry 1999 Basic Concepts: Composition, Structure, and State. First and Second Laws of Thermodynamics. Transfer Processes. Thermodynamics of Water. Nucleation and Diffusional Growth. Moist Thermodynamics Processes in the Atmosphere. Static Stability of the Atmosphere and Ocean. Cloud Characteristics and Processes. Ocean Surface Exchanges of Heat and Freshwater. Sea, Ice, Snow, and Glaciers. Thermohaline Processes in the Ocean. Special Topics: Global Energy and Entropy Balances. Thermodynamics Feedbacks in the Climate System. Planetary Atmospheres and Surface Ice. Appendices. Subject Index.
An Ocean of Air-Gabrielle Walker 2008-08-04 We don’t just live in the air; we live because of it. It’s the most miraculous substance on earth, responsible for our food, our weather, our water, and our ability to hear. In this exuberant book, gifted science writer Gabrielle Walker peels back the layers of our atmosphere with the stories of the people who uncovered its secrets: • A flamboyant Renaissance Italian discovers how heavy our air really is: The air filling Carnegie Hall, for example, weighs seventy thousand pounds. • A one-eyed barnstorming pilot finds a set of winds that constantly blow five miles above our heads. • An impoverished American farmer figures out why hurricanes move in a circle by carving equations with his pitchfork on a barn door. • A well-meaning inventor nearly destroys the ozone layer. • A reclusive mathematical genius predicts, thirty years before he’s proved right, that the sky contains a layer of floating metal fed by the glowing tails of shooting stars.
Ocean Atmosphere Interaction and Climate Modeling-Boris A. Kagan 2006-04-20 A comprehensive 1995 treatment of all aspects of ocean-atmosphere interactions, for advanced students and professional researchers.
A Mathematical Theory of Large-Scale Atmosphere/Ocean Flow-Michael J P Cullen 2006-01-18 This book counteracts the current fashion for theories of “chaos” and unpredictability by describing a theory that underpins the surprising accuracy of current deterministic weather forecasts, and it suggests that further improvements are possible. The book does this by making a unique link between an exciting new branch of mathematics called “optimal transportation” and existing classical theories of the large-scale atmosphere and ocean circulation. It is then possible to solve a set of simple equations proposed many years ago by Hoskins which are asymptotically valid on large scales, and use them to derive quantitative predictions about many large-scale atmospheric and oceanic phenomena. A particular feature is that the simple equations used have highly predictable solutions, thus suggesting that the limits of deterministic predictability of the weather may not yet have been reached. It is also possible to make rigorous statements about the large-scale behaviour of the atmosphere and ocean by proving results using these simple equations and applying them to the real system allowing for the errors in the approximation. There are a number of other titles in this field, but they do not treat this large-scale regime. Contents:The Governing Equations and Asymptotic Approximations to ThemSolution of the Semi-Geostrophic Equations in Plane GeometrySolution of the Semi-Geostrophic Equations in More General CasesProperties of Semi-Geostrophic SolutionsApplication of Semi-Geostrophic Theory to the Predictability of atmospheric Flows Readership: Researchers and graduate students in atmosphere/ocean dynamics with some mathematical background. Keywords:Semi-Geostrophic;Optimal Transportation;Convexity;Rearrangements;Potential Vorticity;Balance;PredictabilityReviews:“This book could appeal to applied mathematicians or very mathematically inclined A&O scientists interested in A&O predictability in general, as well as in certain of its aspects ... Overall, the exposition is clear, careful, and thorough.”American Meteorological Society
Waves in the Ocean and Atmosphere-Joseph Pedlosky 2003-06-25 A study of the fundamental theory of waves appropriate for first year graduate students in oceanography, meteorology and associated sciences. Starting with an elementary overview of the basic wave concept, specific wave phenomena are then examined, including: surface gravity waves, internal gravity waves, lee waves, waves in the presence of rotation, and geostrophic adjustment. Each wave topic is used to introduce either a new technique or concept in general wave theory. Emphasis is placed on connectivity between the various subjects and on the physical interpretation of the mathematical results. The book contains numerous exercises at the end of the respective chapters.
The Chemistry of the Atmosphere and Oceans-Heinrich D. Holland 1978 New York : Wiley, c1978.
Introductory Physics of the Atmosphere and Ocean-L. Hasse 1986 The two chapters of this book originally appeared in "Air Sea Exchange of Gases and Particles", edited by P.S. Liss and W.G.N. Slinn. We wrote them as a general introduction to the physical processes in the atmosphere and ocean which govern the transport of gases and particles in and between the two media. Our audience was to be graduate students in physical chemistry of air and sea, and research workers wishing to get started in this or a related field. It was Dr. Alan Longhurst, Director-General of the Atlantic Region, Canada Department of Fisheries and Oceans, who pointed out that our introduction had a far wider audience: in fact, anyone with a scientific background who needs a basic under standing of the physics of the atmosphere and ocean. Dr. D.J. Larner of Reidel agreed, and this book is the result. Since we expended considerable effort to satisfy the demands of the physical chemists, and also discussed the explanations much with our colleagues at home, we expect the reader will find the two parts to be complementary and useful as a unified reference text. On the other hand, since it was designed as background material for a text on air-sea gas exchange and trans port, the more experienced reader will be aware that the picture presented emphasizes transport and exchange processes while it ignores others. No mention is made, for example, of weather forecasting; neither is large-scale ocean modelling considered.
Ocean-Atmosphere Interactions of Gases and Particles-Peter S. Liss 2013-12-18 The oceans and atmosphere interact through various processes, including the transfer of momentum, heat, gases and particles. In this book leading international experts come together to provide a state-of-the-art account of these exchanges and their role in the Earth-system, with particular focus on gases and particles. Chapters in the book cover: i) the ocean-atmosphere exchange of short-lived trace gases; ii) mechanisms and models of interfacial exchange (including transfer velocity parameterisations); iii) ocean-atmosphere exchange of the greenhouse gases carbon dioxide, methane and nitrous oxide; iv) ocean atmosphere exchange of particles and v) current and future data collection and synthesis efforts. The scope of the book extends to the biogeochemical responses to emitted / deposited material and interactions and feedbacks in the wider Earth-system context. This work constitutes a highly detailed synthesis and reference; of interest to higher-level university students (Masters, PhD) and researchers in ocean-atmosphere interactions and related fields (Earth-system science, marine / atmospheric biogeochemistry / climate). Production of this book was supported and funded by the EU COST Action 735 and coordinated by the International SOLAS (Surface Ocean- Lower Atmosphere Study) project office.
On the Effect of Offshore Wind Farms on the Atmosphere and Ocean Dynamics-Elke Ludewig 2014-10-31 Renewable energy resources now play an essential role in the energy supply debate, and especially a new interest in wind energy has resulted in the intensified construction of wind farms. Thanks to the growing demand for renewable energy, offshore wind farms (OWFs) are increasingly gaining in popularity, since yields over sea are greater and more reliable than over land. Against this background it is becoming particularly urgent to determine whether and if so to what extent such OWF expansion affects our oceans and local climates. OWFs produce a downstream wind speed reduction, the so-called wind-wake effect, which impacts atmospheric boundary layers, alters local wind characteristics and in turn affects ocean dynamics. This book will help readers to understand in detail these OWF-induced changes in the atmosphere and ocean by analyzing model simulations and measurements. In this context, OWF-induced upwelling and downwelling are key aspects.
High Resolution Numerical Modelling of the Atmosphere and Ocean-Kevin Hamilton 2007-12-25 This highly relevant text documents the first international meeting focused specifically on high-resolution atmospheric and oceanic modeling. It was held recently at the Earth Simulator Center in Yokohama, Japan. Rather than producing a standard conference proceedings volume, the editors have decided to compose this volume entirely of papers written by invited speakers at the meeting, who report on their most exciting recent results involving high resolution modeling.
Earth's Early Atmosphere and Oceans, and The Origin of Life-George H. Shaw 2015-10-07 This book provides a comprehensive treatment of the chemical nature of the Earth’s early surface environment and how that led to the origin of life. This includes a detailed discussion of the likely process by which life emerged using as much quantitative information as possible. The emergence of life and the prior surface conditions of the Earth have implications for the evolution of Earth’s surface environment over the following 2-2.5 billion years. The last part of the book discusses how these changes took place and the evidence from the geologic record that supports this particular version of early and evolving conditions.
Energy Transfers in Atmosphere and Ocean-Carsten Eden 2019-01-23 This book describes a recent effort combining interdisciplinary expertise within the Collaborative Research Centre “Energy transfers in atmosphere and ocean” (TRR-181), which was funded by the German Research Foundation (DFG). Energy transfers between the three dynamical regimes – small-scale turbulence, internal gravity waves and geostrophically balanced motion – are fundamental to the energy cycle of both the atmosphere and the ocean. Nonetheless, they remain poorly understood and quantified, and have yet to be adequately represented in today’s climate models. Since interactions between the dynamical regimes ultimately link the smallest scales to the largest ones through a range of complex processes, understanding these interactions is essential to constructing atmosphere and ocean models and to predicting the future climate. To this end, TRR 181 combines expertise in applied mathematics, meteorology, and physical oceanography. This book provides an overview of representative specific topics addressed by TRR 181, ranging from - a review of a coherent hierarchy of models using consistent scaling and approximations, and revealing the underlying Hamiltonian structure - a systematic derivation and implementation of stochastic and backscatter parameterisations - an exploration of the dissipation of large-scale mean or eddying balanced flow and ocean eddy parameterisations; and - a study on gravity wave breaking and mixing, the interaction of waves with the mean flow and stratification, wave-wave interactions and gravity wave parameterisations to topics of a more numerical nature such as the spurious mixing and dissipation of advection schemes, and direct numerical simulations of surface waves at the air-sea interface. In TRR 181, the process-oriented topics presented here are complemented by an operationally oriented synthesis focusing on two climate models currently being developed in Germany. In this way, the goal of TRR 181 is to help reduce the biases in and increase the accuracy of atmosphere and ocean models, and ultimately to improve climate models and climate predictions.
An Ocean of Air-Gabrielle Walker 2007 In 1960 Joe Kittinger fell to earth from the edge of space and lived. Inside a pressure suit, attached to a huge helium balloon, Kittinger freefell from where the earth's atmosphere met space - an appalling, hostile, environment that would freeze us, and burn us and boil us away. It is the air that Kittinger fell through that makes our lives on earth possible - the atmosphere is made up of enfolding layers of air which protect us so completely that we don't even realise the dangers of space lurking just twenty miles above us. We don't just live in the air, we live because of it. Gabrielle Walker's new book illuminates this most extraordinary and yet most underrated substance on earth- air. Thin air miraculously transforms into food; our atmosphere soaks up flares from the sun that are more violent than a nuclear explosion; the air wraps our planet in a blanket of warmth; radio signals bounce off a layer of floating metal in the air. An Ocean of Air reveals the story of how humanity came to understand earth's atmosphere through the stories of the people who discovered the functions of each of its layers- the Italian Renaissance scientist, disciple of Galileo, who discovered that we live at the bottom of a dense ocean of air; an arrogant Frenchman who had only just discovered how air brings us life, when the guillotine brought him death; a hapless 1920s inventor who inadvertently created chemicals that could punch a hole in the sky. After you've read this book, you will never take air for granted again.
The Color of the Atmosphere with the Ocean Below-James G. Acker 2015-05-01 (Full Color) The Color of the Atmosphere with the Ocean Below is a comprehensive history of NASA's "ocean color" missions. Written by James Acker with funding from the NASA Science and History Divisions, this book covers the science, technology, and diverse scientific personalities that allowed NASA to successfully extract measurements of light from the ocean surface using satellite instruments. These data allowed observation and determination of the complex patterns of biological activity in the oceans, which are directly related to mankind's understanding and utilization of the oceans. This research has also helped define the role that oceans play in local and regional ecosystems, as well in the changing global climate system. The history is extensively footnoted and referenced, providing unique documentation of this successful sector of NASA's Earth science missions. It covers a broad range of oceanographic research to which these vital data have been applied, and explains many scientific aspects. The history was augmented by individual and group interviews of scientists and engineers involved in NASA's three primary ocean color missions. The interviews and documents describe how diligent efforts and collaborations of oceanographers, physicists, satellite and sensor technicians, computer programmers, government agencies, and private companies combined to surmount remarkable challenges both at sea and in space to make this critical oceanographic data accurate and useful. Augmented with anecdotal insights into the missions - what made them work, and the different pitfalls and surprises frequently imperiling their eventual success - the book presents a detailed history of NASA's leading contribution to the observations of ocean color from space. It will both inform and entertain readers interested in science, oceanography, and remote sensing of the Earth.
Surface Ocean-Corinne Le Quéré 2013-05-02 Published by the American Geophysical Union as part of the Geophysical Monograph Series, Volume 187. The focus of Surface Ocean: Lower Atmosphere Processes is biogeochemical interactions between the surface ocean and the lower atmosphere. This volume is an outgrowth of the Surface Ocean-Lower Atmosphere Study (SOLAS) Summer School. The volume is designed to provide graduate students, postdoctoral fellows, and researchers from a wide range of academic backgrounds with a basis for understanding the nature of ocean-atmosphere interactions and the current research issues in this area. The volume highlights include the following: Background material on ocean and atmosphere structure, circulation, and chemistry and on marine ecosystems Integrative chapters on the global carbon cycle and ocean biogeochemistry Issue-oriented chapters on the iron cycle and dimethylsulfide Tool-oriented chapters on biogeochemical modeling and remote sensing A framework of underlying physical/chemical/biological principles, as well as perspectives on current research issues in the field. The readership for this book will include graduate students and/or advanced undergraduate students, postdoctoral researchers, and researchers in the fields of oceanography and atmospheric science. It will also be useful for experienced researchers in specific other disciplines who wish to broaden their perspectives on the complex biogeochemical coupling between ocean and atmosphere and the importance of this coupling to understanding global change.
Atmosphere, Ocean and Climate Dynamics-John Marshall 2014-05-14 For advanced undergraduate and beginning graduate students in atmospheric, oceanic, and climate science, Atmosphere, Ocean and Climate Dynamics is an introductory textbook on the circulations of the atmosphere and ocean and their interaction, with an emphasis on global scales. It will give students a good grasp of what the atmosphere and oceans look like on the large-scale and why they look that way. The role of the oceans in climate and paleoclimate is also discussed. The combination of observations, theory and accompanying illustrative laboratory experiments sets this text apart by making it accessible to students with no prior training in meteorology or oceanography. * Written at a mathematical level that is appealing for undergraduates and beginning graduate students * Provides a useful educational tool through a combination of observations and laboratory demonstrations which can be viewed over the web * Contains instructions on how to reproduce the simple but informative laboratory experiments * Includes copious problems (with sample answers) to help students learn the material.
Polar Remote Sensing-Dan Lubin 2006-08-31 The polar regions, perhaps more than any other places on Earth, give the geophysical scientist a sense of exploration. This sensibility is genuine, for not only is high-latitude ?eldwork arduous with many locations seldom or never visited, but there remains much fundamental knowledge yet to be discovered about how the polar regions interact with the global climate system. The range of opportunities for new discovery becomes strikingly clear when we realize that the high latitudes are not one region but are really two vastly di?erent worlds. The high Arctic is a frozen ocean surrounded by land, and is home to fragile ecosystems and unique modes of human habitation. The Antarctic is a frozen continent without regular human habitation, covered by ice sheets taller than many mountain ranges and surrounded by the Earth’s most forbidding ocean. When we consider global change as applied to the Arctic, we discuss impacts to a region whose surface and lower atmospheric temperatures are near the triple point of water throughout much of the year. The most consistent signatures of climate warming have occurred at northern high latitudes (IPCC, 2001), and the potential impacts of a few degrees increase in surface temperature include a reduction in sea ice extent, a positive feedback to climate warming due to lowering of surface albedo, and changes to surface runo? that might a?ect the Arctic Ocean’s salinity and circulation.
Essentials of Atmospheric and Oceanic Dynamics-Geoffrey K. Vallis 2019-01-24 This is a modern, introductory textbook on the dynamics of the atmosphere and ocean, with a healthy dose of geophysical fluid dynamics. It will be invaluable for intermediate to advanced undergraduate and graduate students in meteorology, oceanography, mathematics, and physics. It is unique in taking the reader from very basic concepts to the forefront of research. It also forms an excellent refresher for researchers in atmospheric science and oceanography. It differs from other books at this level in both style and content: as well as very basic material it includes some elementary introductions to more advanced topics. The advanced sections can easily be omitted for a more introductory course, as they are clearly marked in the text. Readers who wish to explore these topics in more detail can refer to this book's parent, Atmospheric and Oceanic Fluid Dynamics: Fundamentals and Large-Scale Circulation, now in its second edition.
Electronic Distance Measurement-Jean M. Rüeger 2012-12-06 The book has evolved from the author's continuing teaching of the subject and from two editions of a text of the same title. The first edition was published in 1978 by the School of Surveying, Universi ty of New South Wales, Sydney, Australia. Like its predecessors, this totally revised third edition is designed to make the subject matter more readily available to students proceeding to degrees in Survey ing and related fields. At the same time, it is a comprehensive refer ence book for all surveyors as well as for other professionals and scientists who use electronic distance measurement as a measuring tool. Great emphasis is placed on the understanding of measure ment principles and on proper reduction and calibration pro cedures. It comprises an extensive collection of essential formulae, useful tables and numerous literature references. After a review of the history of EDM instruments in Chapter 1, some fundamental laws of physics and units relevant to EDM are revised in Chapter 2. Chapter 3 discusses the principles and applica tions of the pulse method, the phase difference method, the Doppler technique and includes an expanded section on interferometers. The basic working principles of electro-optical and microwave distance meters are presented in Chapter 4, with special emphasis on modu lation/demodulation techniques and phase measurement systems. Important properties of infrared emitting and lasing diodes are discussed.
Atmosphere-Ocean Interaction-Eric B. Kraus 1994-11-10 With both the growing importance of integrating studies of air-sea interaction and the interest in the general problem of global warming, the appearance of the second edition of this popular text is especially welcome. Thoroughly updated and revised, the authors have retained the accessible, comprehensive expository style that distinguished the earlier edition. Topics include the state of matter near the interface, radiation, surface wind waves, turbulent transfer near the interface, the planetary boundary layer, atmospherically-forced perturbations in the oceans, and large-scale forcing by sea surface buoyancy fluxes. This book will be welcomed by students and professionals in meteorology, physical oceanography, physics and ocean engineering.
The Oceans and Climate-Grant R Bigg 2003-12-11 New edition of successful textbook that introduces the multi-disciplinary controls on air-sea interaction.
Ocean in the Earth System-Patrick Prouzet 2014-12-15 Complexity is an intrinsic property of natural systems. In the oceanic system, it is linked to many interactions with the atmosphere, geosphere and biosphere with which it exchanges energy and matter. Complexity of the ocean system has, at different spatial and temporal scales, hydrodynamic mechanisms of these exchanges and dynamics of elements and compounds, they are involved in biogeochemical cycles or used as tracers. By its pedagogical approach, it defines the terms, methods, techniques and analytical tools used. Then, it analyzes the consequences of climate change, future projections, human impact and the concept introduced with planktonic pelagic ecosystem component.
Earth's Climate-Varios Autores 2004-01-09 Published by the American Geophysical Union as part of the Geophysical Monograph Series, Volume 147. It is more than 30 years since the publication of Jacob Bjerknes' groundbreaking ideas made clear the importance of ocean-atmosphere interaction in the tropics. It is now more than 20 years since the arrival of a massive El Niño in the fall of 1982 set off a cascade of observational and theoretical studies. During the following decades, the climate research community has made exceptional progress in refining our capacity to observe earth's climate and theorize about it, including new satellite-based and in situ monitoring systems and coupled ocean-atmosphere predictive numerical models. Of equal importance. is the expanding scope ofresearch, which now reaches far beyond the Pacific El Niño and includes climate phenomena in other ocean basins. In order to cover the now global context of ocean-atmosphere interaction we have organized this monograph around five principal themes, each introduced by one or more broad overview papers. Theme I covers interaction and climate variability in the Pacific sector, with extensive discussion of El Niño-Southern Oscillation, and with the possible causes and consequences of variability on both shorter and longer timescales. Theme II is devoted to interaction in the Atlantic sector. This basin exhibits complex behavior, reflecting its geographic location between two major zones of convection as well as neighboring the tropical Pacific. Theme III reviews the recent, exciting progress in our understanding of climate variability in the Indian sector. Theme IV addresses the interaction between the tropics and the extratropics, which are linked through the presence of shallow meridional overturning cells in the ocean. Finally, Theme V discusses overarching issues of cross-basin interaction.
One Earth, One Future-National Academy of Sciences 1992-02-01 Written for nonscientists, One Earth, One Future can help individuals understand the basic science behind changes in the global environment and the resulting policy implications that the population of the entire planet must face. The volume describes the earth as a unified system--exploring the interactions between the atmosphere, land, and water and the snowballing impact that human activity is having on the system--and presents perspectives on policies and programs that can both develop and protect our natural resources. One Earth, One Future discusses why such seemingly diverse issues as historical climate change, species diversity, and sea-level rise are part of a single picture--and how human activity is the critical element in that picture. The book concludes with practical examinations of economic, security, and development questions, with a view toward achieving improvements in quality of life without further environmental degradation. One Earth, One Future is must reading for anyone interested in the interrelationship of environmental matters and public policy issues.
IUTAM Symposium on Advances in Mathematical Modelling of Atmosphere and Ocean Dynamics-P.F. Hodnett 2001-08-31 The goals ofthe Symposium were to highlight advances in modelling ofatmosphere and ocean dynamics, to provide a forum where atmosphere and ocean scientists could present their latest research results and learn ofprogress and promising ideas in these allied disciplines; to facilitate interaction between theory and applications in atmosphere/ocean dynamics. These goals were seen to be especially important in view ofcurrent efforts to model climate requiring models which include interaction between atmosphere, ocean and land influences. Participants were delighted with the diversity ofthe scientific programme; the opportunity to meet fellow scientists from the other discipline (either atmosphere or ocean) with whom they do not normally interact through their own discipline; the opportunity to meet scientists from many countries other than their own; the opportunity to hear significant presentations (50 minutes) from the keynote speakers on a range ofrelevant topics. Certainly the goal ofcreating a forum for exchange between atmosphere and ocean scientists who need to input to create realistic models for climate prediction was achieved by the Symposium and this goal will hopefully be further advanced by the publication ofthese Proceedings.
Atmospheric and Oceanic Fluid Dynamics-Geoffrey K. Vallis 2006-11-06 Fluid dynamics is fundamental to our understanding of the atmosphere and oceans. Although many of the same principles of fluid dynamics apply to both the atmosphere and oceans, textbooks tend to concentrate on the atmosphere, the ocean, or the theory of geophysical fluid dynamics (GFD). This textbook provides a comprehensive unified treatment of atmospheric and oceanic fluid dynamics. The book introduces the fundamentals of geophysical fluid dynamics, including rotation and stratification, vorticity and potential vorticity, and scaling and approximations. It discusses baroclinic and barotropic instabilities, wave-mean flow interactions and turbulence, and the general circulation of the atmosphere and ocean. Student problems and exercises are included at the end of each chapter. Atmospheric and Oceanic Fluid Dynamics: Fundamentals and Large-Scale Circulation will be an invaluable graduate textbook on advanced courses in GFD, meteorology, atmospheric science and oceanography, and an excellent review volume for researchers. Additional resources are available at www.cambridge.org/9780521849692.

Atmospheres and Oceans on Computers-Lars Petter Røed 2018-09-04 This textbook introduces step by step the basic numerical methods to solve the equations governing the motion of the atmosphere and ocean, and describes how to develop a set of corresponding instructions for the computer as part of a code. Today's computers are powerful enough to allow 7-day forecasts within hours, and modern teaching of the subject requires a combination of theoretical and computational approaches. The presentation is aimed at beginning graduate students intending to become forecasters or researchers, that is, users of existing models or model developers. However, model developers must be well versed in the underlying physics as well as in numerical methods. Thus, while some of the topics discussed in the modeling of the atmosphere and ocean are more advanced, the book ensures that the gap between those scientists who analyze results from model simulations and observations and those who work with the inner works of the model does not widen further. In this spirit, the course presents methods whereby important balance equations in oceanography and meteorology, namely the advection-diffusion equation and the shallow water equations on a rotating Earth, can be solved by numerical means with little prior knowledge. The numerical focus is on the finite-difference (FD) methods, and although more powerful methods exist, the simplicity of FD makes it ideal as a pedagogical introduction to the subject. The book also includes suitable exercises and computer problems.
Climate and the Oceans-Geoffrey K. Vallis 2012 Explores climate and oceans, providing a look at the basics of climate, a descriptive overview of the oceans, a brief introduction to dynamics, and coverage of other related topics.

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