Atmosphere Ocean And Climate Dynamics An Introductory Text International Geophysics 1st Edition By Marshall John Plumb R Alan 2007 Hardcover

Climate DynamicsCoupled Ocean-Atmosphere ModelsMiddle Atmosphere DynamicsElementary Climate PhysicsAtmosphere, Ocean and Climate DynamicsThe El Niño-Southern Oscillation PhenomenonOcean Atmosphere Interaction and Climate ModelingAtmospheric and Oceanic Fluid DynamicsFundamentals of Tropical Climate DynamicsComputational Methods for the Atmosphere and the OceansAtmosphere-Ocean InteractionOcean Circulation and ClimateClimate and the OceansAtmosphere, Ocean and Climate DynamicsNatural Climate Variability on Decade-to-Century Time ScalesAn Introduction to Atmospheric PhysicsPaleoclimate, Global Change and the FutureAn Introduction to Dynamic MeteorologyOur Warming Planet: Topics In Climate DynamicsAtmosphere-Ocean DynamicsA Mathematical Theory of Large-Scale Atmosphere/Ocean FlowIntraseasonal Variability in the Atmosphere-Ocean Climate SystemIntroductory Dynamical OceanographyPrinciples of Planetary ClimateAtmosphere, Ocean and Climate DynamicsAtmosphere-ocean InteractionsGlobal Physical ClimatologyEssentials of Atmospheric and Oceanic DynamicsPhysical Oceanography and ClimateOcean Dynamics and the Carbon CycleThe Oceans and ClimateDynamics in Atmospheric PhysicsThermodynamics of Atmospheres and OceansFlexible Global Ocean-Atmosphere-Land System ModelClimate System Dynamics and ModellingPhysics of the Atmosphere and ClimateOcean BiogeochemistryClimate Dynamics of the TropicsThe Atmosphere and OceanDynamics of The Tropical Atmosphere and Oceans

Climate Dynamics

This volume reflects the current state of scientific knowledge about natural climate variability on decade-to-century time scales. It covers a wide range of relevant subjects, including the characteristics of the atmosphere and ocean environments as well as the methods used to describe and analyze them, such as proxy data and numerical models. They clearly demonstrate the range, persistence, and magnitude of climate variability as represented by many different indicators. Not only do natural climate variations have important socioeconomic effects, but they must be better understood before possible anthropogenic effects (from greenhouse gas emissions, for instance) can be evaluated. A topical essay introduces each of the disciplines represented, providing the nonscientist with a perspective on the field and linking the papers to the larger issues in climate research. In its conclusions section, the book evaluates progress in the different areas and makes recommendations for the direction and conduct of future climate research. This book, while consisting of technical papers, is also accessible to the interested layperson.

Coupled Ocean-Atmosphere Models

Oceans account for 50% of the anthropogenic CO2 released into the atmosphere. During the past 15 years an international programme, the Joint Global Ocean Flux Study (JGOFS), has been studying the ocean carbon cycle to quantify and model the biological and physical processes whereby CO2 is pumped from the ocean's surface to the depths of the ocean, where it can remain for hundreds of years. This project is one of the largest multi-disciplinary studies of the oceans ever carried out and this book synthesises the results. It covers all aspects of the topic ranging from air-sea exchange with CO2, the role of physical mixing, the uptake of CO2 by marine algae, the fluxes of carbon and nitrogen through the marine food chain to the subsequent export of carbon to the depths of the ocean. Special emphasis is laid on predicting future climatic change.

Middle Atmosphere Dynamics

The first edition of my book "Climate and Circulation of the Tropics" was reasonably up to date to the middle of 1985. In a second printing in 1988 it was possible to complete a few literature references and to correct some misprints. However, vigorous research has taken place over the past five years in various areas of tropical climate dynamics, especially in the atmosphere-ocean mechanisms of climate anomalies, climate prediction, ocean circulation, and paleoclimates. Promising progress has also been made in the application of general circulation modelling to tropical climate problems. In the present second edition, named "Climate Dynamics of the Tropics", I have attempted to incorporate much of the recent work to late 1990. Chapters 8 and 9 have been essentially re-written, and major additions have been made to Chapters 4 and 12 in particular. I would like to acknowledge the continued support by the U.S. National Science Foundation over the past five years. B. Parthasarathy, Poona, and H. Lessmann, San Salvador, sent me updates of data series not easily accessible. I have benefitted from discussions with numerous colleagues in the United States and overseas. In the preparation of this second edition, Marilyn Wolff patiently transferred my illegible hand-written drafts onto word processor. Dierk Polzin and Dan Skemp assisted me with the creation of the page masters and the subject index and Christopher Collimore with the author index.

Elementary Climate Physics

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.

Atmosphere, Ocean and Climate Dynamics

Murry Salby's new book provides an integrated treatment of the processes controlling the Earth-atmosphere system, developed from first principles through a balance of theory and applications. This book builds on Salby's previous book, Fundamentals of Atmospheric Physics. The scope has been expanded into climate, with the presentation streamlined for undergraduates in science, mathematics and engineering. Advanced material, suitable for graduate students and as a resource for researchers, has been retained but distinguished from the basic development. The book provides a conceptual yet quantitative understanding of the controlling influences, integrated through theory and major applications. It leads readers through a methodical development of the diverse physical processes that shape weather, global energetics and climate. End-of-chapter problems of varying difficulty develop student knowledge and its quantitative application, supported by answers and detailed solutions online for instructors.

The El Niño-Southern Oscillation Phenomenon

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

Ocean Atmosphere Interaction and Climate Modeling

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

Atmospheric and Oceanic Fluid Dynamics

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.

Fundamentals of Tropical Climate Dynamics

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.

Computational Methods for the Atmosphere and the Oceans

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.

Atmosphere-Ocean Interaction

A systematic, unifying approach to the dynamics of the ocean and atmosphere is given in this book, with emphasis on the larger-scale motions (from a few kilometers to global scale). The foundations of the subject (the equations of state and dynamical equations) are covered in some detail, so that students with training in mathematics should find it a self-contained text. Knowledge of fluid mechanics is helpful but not essential. Simple mathematical models are used to demonstrate the fundamental dynamical principles with plentiful illustrations from field and laboratory.

Ocean Circulation and Climate

New edition of successful textbook that introduces the multi-disciplinary controls on air-sea interaction.

Climate and the Oceans

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.

Atmosphere, Ocean and Climate Dynamics

An engaging and accessible textbook focusing on climate dynamics from the perspective of the ocean, specifically interactions between the atmosphere and ocean. It describes the fundamental physics and dynamics governing the behaviour of the ocean, and provides numerous end-of-chapter questions and access to online data sets.

Natural Climate Variability on Decade-to-Century Time Scales

A comprehensive 1995 treatment of all aspects of ocean-atmosphere interactions, for advanced students and professional researchers.

An Introduction to Atmospheric Physics

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 MATLABÂ® 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 MATLABÂ® exercises and demonstrations * Updated treatments on climate dynamics, tropical meteorology, middle atmosphere dynamics, and numerical prediction

Paleoclimate, Global Change and the Future

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.

An Introduction to Dynamic Meteorology

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

Our Warming Planet: Topics In Climate Dynamics

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.

Atmosphere-Ocean Dynamics

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.

A Mathematical Theory of Large-Scale Atmosphere/Ocean Flow

A concise introduction to climate system dynamics Climate Dynamics is an advanced undergraduate-level textbook that provides an essential foundation in the physical understanding of the earth's climate system. The book assumes no background in atmospheric or ocean sciences and is appropriate for any science or engineering student who has completed two semesters of calculus and one semester of calculus-based physics. Describing the climate system based on observations of the mean climate state and its variability, the first section of the book introduces the vocabulary of the field, the dependent variables that characterize the climate system, and the typical approaches taken to display these variables. The second section of the book gives a quantitative understanding of the processes that determine the climate state—radiation, heat balances, and the basics of fluid dynamics. Applications for the atmosphere, ocean, and hydrological cycle are developed in the next section, and the last three chapters of the book directly address global climate change. Throughout, the textbook makes connections between mathematics and physics in order to illustrate the usefulness of mathematics, particularly first-year calculus, for predicting changes in the physical world. Climate change will impact every aspect of life in the coming decades. This book supports and broadens understanding of the dynamics of the climate system by offering a much-needed introduction that is accessible to any science, math, or engineering student. Makes a physically based, quantitative understanding of climate change accessible to all science, engineering, and mathematics undergraduates Explains how the climate system works and why the climate is changing Reinforces, applies, and connects

the basic ideas of calculus and physics Emphasizes fundamental observations and understanding An online illustration package and solutions manual for professors is available

Intraseasonal Variability in the Atmosphere-Ocean Climate System

This book introduces the reader to all the basic physical building blocks of climate needed to understand the present and past climate of Earth, the climates of Solar System planets, and the climates of extrasolar planets. These building blocks include thermodynamics, infrared radiative transfer, scattering, surface heat transfer and various processes governing the evolution of atmospheric composition. Nearly four hundred problems are supplied to help consolidate the reader's understanding, and to lead the reader towards original research on planetary climate. This textbook is invaluable for advanced undergraduate or beginning graduate students in atmospheric science, Earth and planetary science, astrobiology, and physics. It also provides a superb reference text for researchers in these subjects, and is very suitable for academic researchers trained in physics or chemistry who wish to rapidly gain enough background to participate in the excitement of the new research opportunities opening in planetary climate.

Introductory Dynamical Oceanography

This textbook introduces fundamental dynamics of tropical atmosphere and ocean useful for advanced graduate courses in atmospheric and climate sciences. It presents an overview of simple atmospheric and oceanic models, as well as the observed phenomena associated with major climate modes in the tropics. It provides students with an up-to-date understanding of the dynamics of tropical climate and weather phenomena. A particular focus is given to scale interactions and atmosphere-ocean interactions associated with tropical mean climate (such as ITCZ asymmetry and annual cycles), synoptic-scale variability (such as synoptic wave trains, easterly waves and tropical cyclones), intraseasonal oscillations (such as Madden-Julian Oscillation and boreal summer intraseasonal oscillation), and interannual variability (such as El Niño-Southern Oscillation and Indian Ocean Dipole). Theoretical and conceptual models are presented for better understanding of physical mechanisms behind the observational phenomena. This book aims to motivate graduate students in atmospheric sciences and oceanography by providing them with the key methods and tools necessary to conduct research.

Principles of Planetary Climate

This book provides a synthesis of the past decade of research into global changes that occurred in the earth system in the past. Focus is achieved by concentrating on those changes in the Earth's past environment that best inform our evaluation of current and future global changes and their consequences for human populations. The book stands as a ten year

milestone in the operation of the Past Global Changes (PAGES) Project of the International Geosphere-Biosphere Programme (IGBP). It seeks to provide a quantitative understanding of the Earth's environment in the geologically recent past and to define the envelope of natural environmental variability against which anthropogenic impacts on the Earth System may be assessed. A set of color overhead transparencies based on the figures in the book is available free on the PAGES website (www.pages-igbp.org) for use in teaching and lecturing.

Atmosphere, Ocean and Climate Dynamics

The book represents all the knowledge we currently have on ocean circulation. It presents an up-to-date summary of the state of the science relating to the role of the oceans in the physical climate system. The book is structured to guide the reader through the wide range of world ocean circulation experiment (WOCE) science in a consistent way. Cross-references between contributors have been added, and the book has a comprehensive index and unified reference list. The book is simple to read, at the undergraduate level. It was written by the best scientists in the world who have collaborated to carry out years of experiments to better understand ocean circulation. Presents in situ and remote observations with worldwide coverage Provides theoretical understanding of processes within the ocean and at its boundaries to other Earth System components Allows for simulating ocean and climate processes in the past, present and future using a hierarchy of physical-biogeochemical models

Atmosphere-ocean Interactions

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.

Global Physical Climatology

The exchange of momentum, heat, moisture, gases (such as CO2 and O2) and salt between the atmosphere and the ocean is a phenomenon of paramount importance for the dynamics of the atmosphere and the ocean. With the pressing need for reliable climate forecast (e.g. to deal with severe food and energy problems) interactive ocean-atmosphere models have become one of the main objectives of geophysical fluid dynamics. This volume provides the first state-of-the-art review of interactive ocean-atmosphere modelling and its application to climates. The papers are by active and eminent scientists from different countries and different disciplines. They provide a up-to-date survey of major recent discoveries and valuable

recommendations for future research.

Essentials of Atmospheric and Oceanic Dynamics

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.

Physical Oceanography and Climate

Global Physical Climatology is an introductory text devoted to the fundamental physical principles and problems of climate sensitivity and change. Addressing some of the most critical issues in climatology, this text features incisive coverage of topics that are central to understanding orbital parameter theory for past climate changes, and for anthropogenic and natural causes of near-future changes-- Key Features * Covers the physics of climate change * Examines the nature of the current climate and its previous changes * Explores the sensitivity of climate and the mechanisms by which humans are likely to produce near-future climate changes * Provides instructive end-of-chapter exercises and appendices

Ocean Dynamics and the Carbon Cycle

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

This work offers a broad coverage of atmospheric physics, including atmospheric thermodynamics, radiative transfer, atmospheric fluid dynamics and elementary atmospheric chemistry.

Dynamics in Atmospheric Physics

Coupled climate system models are of central importance for climate studies. A new model known as FGOALS (the Flexible Global Ocean-Atmosphere-Land System model), has been developed by the Sate Key Laboratory of Numerical Modeling for Atmospheric Sciences and Geophysical Fluid Dynamics, Institute of Atmospheric Physics, Chinese Academy of Sciences (LASG/IAP, CAS), a first-tier national geophysical laboratory. It serves as a powerful tool, both for deepening our understanding of fundamental mechanisms of the climate system and for making decadal prediction and scenario projections of future climate change. "Flexible Global Ocean-Atmosphere-Land System Model: A Modeling Tool for the Climate Change Research Community" is the first book to offer systematic evaluations of this model's performance. It is comprehensive in scope, covering both developmental and application-oriented aspects of this climate system model. It also provides an outlook of future development of FGOALS and offers an overview of how to employ the model. It represents a valuable reference work for researchers and professionals working within the related areas of climate variability and change. Prof. Tianjun Zhou, Yongqiang Yu, Yimin Liu and Bin Wang work at LASG, the Institute of Atmospheric Physics, Chinese Academy of Sciences, China.

Thermodynamics of Atmospheres and Oceans

A text for first year graduate students in atmospheric sciences.

Flexible Global Ocean-Atmosphere-Land System Model

'Introductory Dynamical Oceanography' 2nd ed provides an introduction to Dynamical Physical Oceanography at a level suitable for senior year undergraduate students in the sciences and for graduate students entering oceanography. It aims to present the basic objectives, procedures and successes and to state some of the present limitations of dynamical oceanography and its relations to descriptive physical oceanography. The first edition has been thoroughly revised and updated and the new work includes reference to the Practical Salinity Scale 1978, the International Equation of State 1980 and the beta-spiral technique for calculating absolute currents from the density distribution. In addition the description of mixed-layer models has been updated and the chapters on Waves and on Tides have been substantially revised and

enlarged, with emphasis on internal waves in the Waves chapter. While the text is self-contained readers are recommended to acquaint themselves with the general aspects of descriptive (synoptic) oceanography in order to be aware of the character of the ocean which the dynamical oceanographer is attempting to explain by referring to Pickard and Emery's 'Descriptive Physical Oceanography' 4th edition.

Climate System Dynamics and Modelling

The processes and consequences of climate change are extremely heterogeneous, encompassing many different fields of study. Dr David Rind in his career at the NASA Goddard Institute for Space Studies and as a professor at Columbia University has had the opportunity to explore many of these subjects with colleagues from these diverse disciplines. It was therefore natural for the Lectures in Climate Change series to begin with his colleagues contributing lectures on their specific areas of expertise.This first volume, entitled Our Warming Planet: Topics in Climate Dynamics, encompasses topics such as natural and anthropogenic climate forcing, climate modeling, radiation, clouds, atmospheric dynamics/storms, hydrology, clouds, the cryosphere, paleoclimate, sea level rise, agriculture, atmospheric chemistry, and climate change education. Included with this publication are downloadable PowerPoint slides of each lecture for students and teachers around the world to be better able to understand various aspects of climate change.The lectures on climate change processes and consequences provide snapshots of the cutting-edge work being done to understand what may well be the greatest challenge of our time, in a form suitable for classroom presentation.

Physics of the Atmosphere and Climate

Climate Physics is a modern subject based on a space-era understanding of the physical properties of the atmosphere and ocean, their planetary-scale history and evolution, new global measurement systems and sophisticated computer models, which collectively make quantitative studies and predictions possible. At the same time, interest in understanding the climate has received an enormous boost from the concern generated by the realization that rapid climate change, much of it forced by the relentless increase in population and industrialization, is potentially a serious threat to the quality of life on Earth. Our ability to resist and overcome any such threat depends directly on our ability to understand what physical effects are involved and to predict how trends may develop. In an introductory course like that presented here, we want to clarify the basics, topic by topic, and see how far we can get by applying relatively simple Physics to the climate problem. This provides a foundation for more advanced work, which we can identify and appreciate at this level although of course a full treatment requires more advanced books, of which there are many.

Ocean Biogeochemistry

This textbook presents all aspects of climate system dynamics, on all timescales from the Earth's formation to modern human-induced climate change. It discusses the dominant feedbacks and interactions between all the components of the climate system: atmosphere, ocean, land surface and ice sheets. It addresses one of the key challenges for a course on the climate system: students can come from a range of backgrounds. A glossary of key terms is provided for students with little background in the climate sciences, whilst instructors and students with more expertise will appreciate the book's modular nature. Exercises are provided at the end of each chapter for readers to test their understanding. This textbook will be invaluable for any course on climate system dynamics and modeling, and will also be useful for scientists and professionals from other disciplines who want a clear introduction to the topic.

Climate Dynamics of the Tropics

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.

The Atmosphere and Ocean

Many climatic extremes around the globe, such as severe droughts and floods, can be attributed to the periodic warming of the equatorial Pacific sea surface, termed the El Niño or Southern Oscillation (ENSO). Advances in our understanding of ENSO, in which Edward Sarachik and Mark Cane have been key participants, have led to marked improvements in our ability to predict its development months or seasons, allowing adaptation to global impacts. The book introduces basic concepts and builds to more detailed theoretical treatments. Chapters on the structure and dynamics of the tropical ocean and atmosphere place ENSO in a broader observational and theoretical context. Chapters on ENSO prediction, past and future, and impacts introduce broader implications of the phenomenon. This book provides an introduction to all aspects of this most important mode of global climate variability, for research workers and students of all levels in climate science, oceanography and related fields.

Dynamics of The Tropical Atmosphere and Oceans

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.