

Introduction To Atmospheric Chemistry

Textbook that uniquely integrates physics and chemistry in the study of atmospheric thermodynamics for advanced single-semester courses.

Based on more than 20 years of research and lecturing, Jordi Vil...-Guerau de Arellano and his team's textbook provides an excellent introduction to the interactions between the atmosphere and the land for advanced undergraduate and graduate students and a reference text for researchers in atmospheric physics and chemistry, hydrology, and plant physiology. The combination of the book, which provides the essential theoretical concepts, and the associated interactive Chemistry Land-surface Atmosphere Soil Slab (CLASS) software, which provides hands-on practical exercises and allows students to design their own numerical experiments, will prove invaluable for learning about many aspects of the soil-vegetation-atmosphere system. This book has a modular and flexible structure, allowing instructors to accommodate it to their own learning-outcome needs.

Almost all of the breakthroughs in understanding the atmosphere have been initiated by field observations, using a range of instrumental techniques. Developing or deploying instruments to make further observations demands a thorough understanding of the chemical and spectroscopic principles on which such measurements depend. Written as an authoritative guide to the techniques of instrumental measurement for the atmospheric scientist, research student or undergraduate, *Analytical Techniques for Atmospheric Measurement* focuses on the instruments used to make real time measurements of atmospheric gas and aerosol composition. Topics covered include how they work, their strengths and weaknesses for a particular task, the platforms on which they have been deployed and how they are calibrated. It explains the fundamental principles upon which the instrumental techniques are based (ie what property of a molecule can be exploited to enable its detection), what limits instrumental sensitivity and accuracy, and the information that can be gained from their use.

The atmosphere is the thin, diffuse fluid that envelops the Earth's surface. Despite its apparent fragility, the existence of this fluid is vital for human and other life on Earth. In this *Very Short Introduction* Paul Palmer describes the physical and chemical characteristics of different layers in the atmosphere, and shows how the interactions where the atmosphere is in contact with land, ocean, and ice affect its observed physical and chemical properties. He also looks at how movement in the atmosphere, driven by heat from the sun, transports heat from lower latitudes to higher latitudes, and is a fundamental feature of the general circulation in the atmosphere. Finally, Palmer presents an overview of the types of measurements used to understand different parts of the atmosphere, and identifies the future challenges for atmospheric

scientists. ABOUT THE SERIES: The Very Short Introductions series from Oxford University Press contains hundreds of titles in almost every subject area. These pocket-sized books are the perfect way to get ahead in a new subject quickly. Our expert authors combine facts, analysis, perspective, new ideas, and enthusiasm to make interesting and challenging topics highly readable.

Although the technology of observation and prediction of atmospheric systems draws upon many common fields, until now the interrelatedness and interdisciplinary nature of these research fields have scarcely been discussed in one volume containing fundamental theories, numerical methods, and operational application results. This is a book to provide in-depth explorations of the numerical methods developed to better understand atmospheric systems, which are introduced in eight chapters. Chapter 1 presents an efficient algorithm for tropical cyclone center determination by using satellite imagery. Chapter 2 aims to identify atmospheric systems with a new polarization remote sensing method. Chapters 3-8 place emphasis on enhancing the performance of numerical models in the prediction of atmospheric systems that should be valuable for researchers and forecasters.

Understanding the composition and chemistry of the Earth's atmosphere is essential to global ecological and environmental policy making and research. Atmospheric changes as a result of both natural and anthropogenic activity have affected many of the Earth's natural systems throughout history, some more seriously than others, and such changes are ever more evident with increases in both global warming and extreme weather events. Atmospheric Chemistry considers in detail the physics and chemistry of our atmosphere, that gives rise to our weather systems and climate, soaks up our pollutants and protects us from solar UV radiation. The development of the complex chemistry occurring on Earth can be explained through application of basic principles of physical chemistry, as is discussed in this book. It is therefore accessible to intermediate and advanced undergraduates of chemistry, with an interdisciplinary approach relevant to meteorologists, oceanographers, and climatologists. It also provides an ideal opportunity to bring together many different aspects of physical chemistry and demonstrate their relevance to the world we live in. This book was written in conjunction with *Astrochemistry: From the Big Bang to the Present Day*, Claire Vallance (2017) World Scientific Publishing. Request Inspection Copy

Atmospheric chemistry is central to understanding global changes ? ozone depletion, appearance of the polar ozone holes, and compositional changes which worsen the greenhouse effect. Because of its importance, work is progressing on many fronts. This volume emphasizes the troposphere and stratosphere and has chapters on gas phase, condensed phase, and heterogeneous chemistry. Present progress is emphasized, and important future directions are also described. This book fills a need not satisfied by any others and will be popular for some years to come. It informs

students and newcomers to the field of the many facets of atmospheric chemistry and can be used as a text for advanced students. It is also a valuable desk reference summarizing activities by quite a number of the most active research groups. Chapter 18 by Kolb et al. on heterogeneous chemistry is especially noteworthy because it represents a unique joint effort by several groups working on a very timely subject; they describe a conceptual framework and establish conventions which will be standard in future papers on this subject.

This comprehensive introduction to the physics and chemistry of Earth's atmosphere explains the science behind some of the most critical and intensely debated environmental controversies of our day. In it, one of the world's leading experts on planetary environments presents the background necessary to assess the complex effects of human activity on our atmosphere and climate. Unique in its breadth and depth of coverage, *The Atmospheric Environment* includes a survey of Earth's climatic history to provide a context for assessing the changes underway today. It is written for--and will be of lasting value to--a varied audience, including not only students but also professional scientists and others seeking a sophisticated but readable introduction to the frontiers of contemporary research on biogeochemistry, depletion of stratospheric ozone, tropospheric air pollution, and climatology. The book covers both the chemistry and physics of the atmosphere with an account of relevant aspects of ocean science, treats atmospheric science and the climate as an integrated whole, and makes explicit the policy implications of what is known. Its critical account of steps taken by the international community to address the issue of climatic change highlights the challenge of dealing with a global issue for which the political and economic stakes are high, where uncertainties are common, and where there is an urgent need for clear thinking and informed policy. The book also sketches key gaps in our knowledge, outlining where we need to go to fully understand the impact of our actions on the climate. Thorough, timely, and authoritative, this is the book to consult for answers about some of the thorniest and most pressing environmental questions that we face.

Atmospheric chemistry is one of the fastest growing fields in the earth sciences. Until now, however, there has been no book designed to help students capture the essence of the subject in a brief course of study. Daniel Jacob, a leading researcher and teacher in the field, addresses that problem by presenting the first textbook on atmospheric chemistry for a one-semester course. Based on the approach he developed in his class at Harvard, Jacob introduces students in clear and concise chapters to the fundamentals as well as the latest ideas and findings in the field. Jacob's aim is to show students how to use basic principles of physics and chemistry to describe a complex system such as the atmosphere. He also seeks to give students an overview of the current state of research and the work that led to this point. Jacob begins with atmospheric structure, design of simple models, atmospheric transport, and the continuity equation, and continues with geochemical cycles, the greenhouse effect, aerosols, stratospheric ozone, the oxidizing power of the atmosphere, smog, and acid rain. Each chapter concludes with a problem set based on recent scientific literature. This is a novel approach to problem-set writing, and one that successfully introduces students to the prevailing issues. This is a major contribution to a growing area of study and will be welcomed enthusiastically by students

and teachers alike.

Aerosols and Atmospheric Chemistry is a collection of papers presented at the American Chemical Society Kendall Award Symposium honoring Professor Milton Kerker, held in Los Angeles, California, on March 28-April 2, 1971. Contributors focus on the physical chemistry of aerosols and their relationship to atmospheric chemistry. Topics covered range from the optical and dynamical properties of aerosols to the kinetics of growth of an aerosol in a flow reactor. The formation and chemical reactions of atmospheric particles are also discussed. This book is comprised of 30 chapters and begins with an overview of some of the optical and dynamical properties of aerosols, along with the preparation of submicron aerosols by condensation. The discussion then turns to the formation and properties of neutral ultrafine particles and small ions conditioned by gaseous impurities of the air; preparation of ultrafine metal oxide particles in a hydrogen-oxygen flame; production of aerosols by X-rays; and condensational growth of atmospheric aerosols. A comparison of synthetic and smog aerosols is also presented. The final section is devoted to the Los Angeles (Pasadena) Smog Project—its genesis, objectives, and scope—and provides a detailed description of the Minnesota Aerosol Analyzing System used in the project. This monograph will be a useful resource for chemists as well as students and researchers interested in aerosol and atmospheric chemistry.

The study of exoplanetary atmospheres—that is, of planets orbiting stars beyond our solar system—may be our best hope for discovering life elsewhere in the universe. This dynamic, interdisciplinary field requires practitioners to apply knowledge from atmospheric and climate science, astronomy and astrophysics, chemistry, geology and geophysics, planetary science, and even biology. Exoplanetary Atmospheres provides an essential introduction to the theoretical foundations of this cutting-edge new science. Exoplanetary Atmospheres covers the physics of radiation, fluid dynamics, atmospheric chemistry, and atmospheric escape. It draws on simple analytical models to aid learning, and features a wealth of problem sets, some of which are open-ended. This authoritative and accessible graduate textbook uses a coherent and self-consistent set of notation and definitions throughout, and also includes appendixes containing useful formulae in thermodynamics and vector calculus as well as selected Python scripts. Exoplanetary Atmospheres prepares PhD students for research careers in the field, and is ideal for self-study as well as for use in a course setting. The first graduate textbook on the theory of exoplanetary atmospheres Unifies knowledge from atmospheric and climate science, astronomy and astrophysics, chemistry, planetary science, and more Covers radiative transfer, fluid dynamics, atmospheric chemistry, and atmospheric escape Provides simple analytical models and a wealth of problem sets Includes appendixes on thermodynamics, vector calculus, tabulated Gibbs free energies, and Python scripts Solutions manual (available only to professors)

A multitude of processes that operate in the upper atmosphere are revealed by detailed physical and mathematical descriptions of the interactions of particles and radiation, temperatures, spectroscopy and dynamics.

Atmospheric Chemistry and Global Change presents an integrated examination of chemical processes in the atmosphere, focusing on global-scale problems and their role in the evolution of the Earth system. Taking a largely interdisciplinary approach, it features the collective efforts of a group of scientists at the National Center for Atmospheric Research (NCAR), as well as other experts from several universities and national laboratories. Topics discussed include the fundamental physical, chemical, and biological processes that affect the atmospheric composition; the chemical mechanisms that affect the production and the fate of important chemical compounds; and the techniques used to investigate the chemical processes in the atmosphere. The book concludes with discussions on global problems related to the atmosphere (stratospheric ozone depletion, changes in greenhouse gases, and global chemical pollution), the relationship between the atmosphere and

the global climate, and the long-term chemical evolution of the atmosphere. Each chapter features a brief essay by a leader in the field and includes a large number of current references. Ideal for graduate courses in atmospheric chemistry and atmospheric science, Atmospheric Chemistry and Global Change also serves as an authoritative and practical reference for scientists studying the Earth's atmosphere. Support materials for the book are available via the website <http://acd.ucar.edu/textbook>

Here is the most comprehensive and up-to-date treatment of one of the hottest areas of chemical research. The treatment of fundamental kinetics and photochemistry will be highly useful to chemistry students and their instructors at the graduate level, as well as postdoctoral fellows entering this new, exciting, and well-funded field with a Ph.D. in a related discipline (e.g., analytical, organic, or physical chemistry, chemical physics, etc.). Chemistry of the Upper and Lower Atmosphere provides postgraduate researchers and teachers with a uniquely detailed, comprehensive, and authoritative resource. The text bridges the "gap" between the fundamental chemistry of the earth's atmosphere and "real world" examples of its application to the development of sound scientific risk assessments and associated risk management control strategies for both tropospheric and stratospheric pollutants. Serves as a graduate textbook and "must have" reference for all atmospheric scientists Provides more than 5000 references to the literature through the end of 1998 Presents tables of new actinic flux data for the troposphere and stratosphere (0-40km) Summarizes kinetic and photochemical data for the troposphere and stratosphere Features problems at the end of most chapters to enhance the book's use in teaching Includes applications of the OZIPR box model with comprehensive chemistry for student use

This introduction to the principles of atmospheric physics and chemistry has been designed for physics or chemistry undergraduates with no prior knowledge of the subject. All aspects of the lower and middle atmospheres are treated as ultimate consequences

Mathematical modeling of atmospheric composition is a formidable scientific and computational challenge. This comprehensive presentation of the modeling methods used in atmospheric chemistry focuses on both theory and practice, from the fundamental principles behind models, through to their applications in interpreting observations. An encyclopaedic coverage of methods used in atmospheric modeling, including their advantages and disadvantages, makes this a one-stop resource with a large scope. Particular emphasis is given to the mathematical formulation of chemical, radiative, and aerosol processes; advection and turbulent transport; emission and deposition processes; as well as major chapters on model evaluation and inverse modeling. The modeling of atmospheric chemistry is an intrinsically interdisciplinary endeavour, bringing together meteorology, radiative transfer, physical chemistry and biogeochemistry, making the book of value to a broad readership. Introductory chapters and a review of the relevant mathematics make this book instantly accessible to graduate students and researchers in the atmospheric sciences.

Introduction to Atmospheric Chemistry is a concise, clear review of the fundamental aspects of atmospheric chemistry. In ten succinct chapters, it reviews our basic understanding of the chemistry of the Earth's atmosphere and discusses current environmental issues, including air pollution, acid rain, the ozone hole, and global change. Written by a well-known atmospheric science teacher, researcher, and author of several established textbooks, this book is an introductory textbook for beginning university courses in atmospheric chemistry. Also suitable for self instruction, numerous exercises and solutions make this textbook accessible to students covering atmospheric chemistry as a part of courses in

atmospheric science, meteorology, environmental science, geophysics and chemistry. Together with its companion volume, *Basic Physical Chemistry for the Atmospheric Sciences* (second edition 2000; Cambridge University Press), *Introduction to Atmospheric Chemistry* provides a solid introduction to atmospheric chemistry.

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

New edition of introductory textbook, ideal for students taking a course on air pollution and global warming, whatever their background. Comprehensive introduction to the history and science of the major air pollution and climate problems facing the world today, as well as energy and policy solutions to those problems.

Atmospheric Chemistry provides readers with a basic knowledge of the chemistry of Earth's atmosphere, and an understanding of the role that chemical transformations play in this vital part of our environment. The composition of the 'natural' atmosphere (troposphere, stratosphere and mesosphere) is described in terms of the physical and chemical cycles that govern the behaviour of the major and the many minor species present, and of the atmospheric lifetimes of those species. An extension of these ideas leads to a discussion of the impacts of Man's activities on the atmosphere, and to an understanding of some of the most important environmental issues of our time. One thread of the book explains how living organisms alter the composition and pressures in the atmosphere, modify temperatures, and change the intensity and wavelength-distribution of light arriving from the Sun. Meanwhile, the living organisms on Earth have depended on these very same environmental conditions being satisfactory for the maintenance and evolution of life. There thus appear to be two-way interactions between life and the atmosphere. Man, just one species of living organism, has developed an unfortunate ability to interfere with the feedbacks that seem to have maintained the atmosphere to be supportive of surface life for more than 3.5 billion years. This book will help chemists to understand the background to the problems that arise from such interference. The structure of the book and the development of the subject deviate somewhat from those usually encountered. Important and recurring concepts are presented in outline first, before more detailed discussions of the atmospheric behaviour of specific chemical species. Examples of such themes are the sources and sinks of trace gases, and their budgets and lifetimes. That is, the emphasis is initially on the principles of the subject, with the finer points emerging at later points in the book, sometimes in several successive chapters. In this way, some of the core material gets repeated exposure, but in new ways and in new contexts. The book is written at a level that makes it accessible to undergraduate chemists, and in a manner that should make it interesting to them. However, the material presented forms a solid base for those who are extending their studies to a higher level, and it will also provide non-specialists with the background to an understanding of Man's several and varied threats to the atmosphere.

Well-informed citizens can then better assess measures proposed to prevent or alleviate the potential damage, and policy makers more realistically formulate the necessary controls on a sound scientific foundation.

An Introduction to Air Chemistry serves as a textbook on air chemistry and covers topics such as chemical principles, sampling and collection, treatment of data, and special methods of analysis. The atmospheric chemistry of sulfur compounds is also discussed, together with nitrogen compounds and ozone, aerosols, and carbon compounds. This book is comprised of nine chapters and begins with a review of the relevant chemical and meteorological principles. The general methods for obtaining and handling air chemical data are then described, followed by a discussion on three classes of chemical compounds that are important in any consideration of trace constituents of the atmosphere, namely, sulfur compounds, carbon compounds, and nitrogen compounds and ozone. Significant atmospheric reactions, the global budgets, and selected methods of analysis for these compounds are considered. The final chapter examines some of the physical characteristics of aerosols. This monograph will be a valuable resource for upper-level undergraduate and graduate-level students of analytical chemistry, meteorology, oceanography, and civil engineering, as well as for laboratory chemists, meteorologists, physical scientists, and technicians.

This practical reference examines the structure and properties of the atmosphere, including listings of compounds in clouds, fog, rain, snow, and ice; a listing of compounds detected in the stratosphere; and a compendium of compounds in indoor air. An introduction to carcinogenicity and bioassay of atmospheric compounds is also presented. Readers will find the extensive cross-referencing especially useful--compounds can be located by chemical type, name, CAS registry number, or source.

Thoroughly restructured and updated with new findings and new features The Second Edition of this internationally acclaimed text presents the latest developments in atmospheric science. It continues to be the premier text for both a rigorous and a complete treatment of the chemistry of the atmosphere, covering such pivotal topics as: * Chemistry of the stratosphere and troposphere * Formation, growth, dynamics, and properties of aerosols * Meteorology of air pollution * Transport, diffusion, and removal of species in the atmosphere * Formation and chemistry of clouds * Interaction of atmospheric chemistry and climate * Radiative and climatic effects of gases and particles * Formulation of mathematical chemical/transport models of the atmosphere All chapters develop results based on fundamental principles, enabling the reader to build a solid understanding of the science underlying atmospheric processes. Among the new material are three new chapters: Atmospheric Radiation and Photochemistry, General Circulation of the Atmosphere, and Global Cycles. In addition, the chapters Stratospheric Chemistry, Tropospheric Chemistry, and Organic Atmospheric Aerosols have been rewritten to reflect the latest findings. Readers familiar with the First Edition will discover a text with new

structures and new features that greatly aid learning. Many examples are set off in the text to help readers work through the application of concepts. Advanced material has been moved to appendices. Finally, many new problems, coded by degree of difficulty, have been added. A solutions manual is available. Thoroughly updated and restructured, the Second Edition of Atmospheric Chemistry and Physics is an ideal textbook for upper-level undergraduate and graduate students, as well as a reference for researchers in environmental engineering, meteorology, chemistry, and the atmospheric sciences. Click here to Download the Solutions Manual for Academic Adopters:

<http://www.wiley.com/WileyCDA/Section/id-292291.html>

Clouds affect our daily weather and play key roles in the global climate. Through their ability to precipitate, clouds provide virtually all of the fresh water on Earth and are a crucial link in the hydrologic cycle. With ever-increasing importance being placed on quantifiable predictions – from forecasting the local weather to anticipating climate change – we must understand how clouds operate in the real atmosphere, where interactions with natural and anthropogenic pollutants are common. This textbook provides students – whether seasoned or new to the atmospheric sciences – with a quantitative yet approachable path to learning the inner workings of clouds. Developed over many years of the authors' teaching at Pennsylvania State University, *Physics and Chemistry of Clouds* is an invaluable textbook for advanced students in atmospheric science, meteorology, environmental sciences/engineering and atmospheric chemistry. It is also a very useful reference text for researchers and professionals.

This revised and updated study is about the atmosphere and humanity's influence on it. Following an analysis of the natural environment, it re-examines the sources of air pollution and its effects, including decline in health, damage to plants and animals, indoor pollution, and acid rain. *Advances in Fluorine Science* presents critical multidisciplinary overviews for areas in which fluorine and fluoride compounds have a decisive impact. The individual volumes of *Advances in Fluorine Science* are thematic, addressing comprehensively both the science and applications on topics including the Environment, Green chemistry, Medicine, Health & Life Sciences, New Technologies & Materials Science, Energy and the Earth Sciences. For each subject the contributors will clearly inform the reader on the nature of the problem (if any) and on the solutions, combining knowledge from different scientific disciplines, that have been proposed to solve each issue. This volume covers a wide scope of important issues about our atmospheric environment and contains contributions from both chemists and environmental scientists. Articles review the origin of fluorine-emissions either from natural or anthropogenic origin; the chemistry of fluorine- and halogen-based species in the atmosphere; the monitoring and characterization of atmospheric pollutants; new generations of halocarbons and improved destruction procedures of banned CFCs; the role of fluorides within both our geosphere: volcanic magmas and natural fluorine emissions, and effects on our biosphere: life cycle, plants and animals. * Examines the role of fluorine and fluoride products in our environment: from the geosphere to the atmosphere through the biosphere * Discusses the efforts of scientists and industry groups towards the improvement of environmental and sustainability issues * Multidisciplinary contributions from chemists, geologists, biologists, environmentalists and industry staffs

Atmospheric Science, Second Edition, is the long-awaited update of the classic atmospheric science text, which helped define the field nearly

30 years ago and has served as the cornerstone for most university curricula. Now students and professionals alike can use this updated classic to understand atmospheric phenomena in the context of the latest discoveries, and prepare themselves for more advanced study and real-life problem solving. This latest edition of Atmospheric Science, has been revamped in terms of content and appearance. It contains new chapters on atmospheric chemistry, the Earth system, the atmospheric boundary layer, and climate, as well as enhanced treatment of atmospheric dynamics, radiative transfer, severe storms, and global warming. The authors illustrate concepts with full-color, state-of-the-art imagery and cover a vast amount of new information in the field. Extensive numerical and qualitative exercises help students apply basic physical principles to atmospheric problems. There are also biographical footnotes summarizing the work of key scientists, along with a student companion website that hosts climate data; answers to quantitative exercises; full solutions to selected exercises; skew-T log p chart; related links, appendices; and more. The instructor website features: instructor's guide; solutions to quantitative exercises; electronic figures from the book; plus supplementary images for use in classroom presentations. Meteorology students at both advanced undergraduate and graduate levels will find this book extremely useful. Full-color satellite imagery and cloud photographs illustrate principles throughout. Extensive numerical and qualitative exercises emphasize the application of basic physical principles to problems in the atmospheric sciences. Biographical footnotes summarize the lives and work of scientists mentioned in the text, and provide students with a sense of the long history of meteorology. Companion website encourages more advanced exploration of text topics: supplementary information, images, and bonus exercises.

This book contains texts by the Nobel laureate Paul J. Crutzen who is best known for his research on ozone depletion. It comprises Crutzen's autobiography, several pictures documenting important stages of his life, and his most important scientific publications. The Dutch atmospheric chemist is one of the world's most cited scientists in geosciences. His political engagement makes him a tireless ambassador for environmental issues such as climate change. He popularized the term 'Anthropocene' for the current geological era acknowledging the enduring influence of humankind on planet Earth. This concept conceives humans to be a geologic factor, influencing the evolution of our globe and the living beings populating it. The selection of texts is representing Paul Crutzen's scientific oeuvre as his research interests span from ozone depletion to the climatic impacts of biomass burning, the consequences of a worldwide atomic war – the Nuclear Winter - to geoengineering and the Anthropocene.

Introduction to Atmospheric Chemistry Princeton University Press

Introduction to Atmospheric Chemistry reviews in ten concise chapters the chemistry of the Earth's atmosphere and some outstanding environmental issues, including air pollution, acid rain, the ozone hole, and global change. Peter Hobbs is an eminent atmospheric science teacher, researcher, and author of several well-known textbooks. This text and his other book Basic Physical Chemistry for the Atmospheric Sciences (Second Edition, Cambridge University Press 2000) form companion volumes. The book, designed to be a primary textbook for a first university course--undergraduate or graduate--in atmospheric chemistry, will find a place in atmospheric science, meteorology, environmental science, geophysics and chemistry curricula. Special features include worked exercises and end-of-chapter student exercises with model solutions in an appendix.

Consisting mainly of hands-on experiments, this work is designed specifically to give students of diverse academic backgrounds an opportunity to explore and understand the underlying physical principles of meteorology.

This book is aimed at graduate students and research scientists interested in gaining a deeper understanding of atmospheric chemistry,

fundamental photochemistry, and gas phase and heterogeneous reaction kinetics. It also provides all necessary spectroscopic and kinetic data, which should be useful as reference sources for research scientists in atmospheric chemistry. As an application of reaction chemistry, it provides chapters on tropospheric and stratospheric reaction chemistry, covering tropospheric ozone and photochemical oxidant formation, stratospheric ozone depletion and sulfur chemistry related to acid deposition and the stratospheric aerosol layer. This book is intended not only for students of chemistry but also particularly for non-chemistry students who are studying meteorology, radiation physics, engineering, and ecology/biology and who wish to find a useful source on reaction chemistry.

Publisher Description

Newly revised and updated, *Basic Physical Chemistry for the Atmospheric Sciences* provides a clear, concise grounding in the basic chemical principles required for modern studies of atmospheres, oceans, and earth and planetary systems. Undergraduate and graduate students with little formal training in chemistry can work through the chapters and the numerous exercises within this book before accessing the standard texts in the atmospheric chemistry, geochemistry, and the environmental sciences. The book covers the fundamental concepts of chemical equilibria, chemical thermodynamics, chemical kinetics, solution chemistry, acid and base chemistry, oxidation-reduction reactions, and photochemistry. In a companion volume entitled *Introduction to Atmospheric Chemistry* (2000, Cambridge University Press) Peter Hobbs provides an introduction to atmospheric chemistry itself, including its applications to air pollution, acid rain, the ozone hole, and climate change. Together these two books provide an ideal introduction to atmospheric chemistry for a variety of disciplines.

Gravity waves exist in all types of geophysical fluids, such as lakes, oceans, and atmospheres. They play an important role in redistributing energy at disturbances, such as mountains or seamounts and they are routinely studied in meteorology and oceanography, particularly simulation models, atmospheric weather models, turbulence, air pollution, and climate research. An *Introduction to Atmospheric Gravity Waves* provides readers with a working background of the fundamental physics and mathematics of gravity waves, and introduces a wide variety of applications and numerous recent advances. Nappo provides a concise volume on gravity waves with a lucid discussion of current observational techniques and instrumentation. Foreword is written by Prof. George Chimonas, a renowned expert on the interactions of gravity waves with turbulence. CD containing real data, computer codes for data analysis and linear gravity wave models included with the text

Technology has propelled the atmospheric sciences from a fledgling discipline to a global enterprise. Findings in this field shape a broad spectrum of decisions--what to wear outdoors, whether aircraft should fly, how to deal with the issue of climate change, and more. This book presents a comprehensive assessment of the atmospheric sciences and offers a vision for the future and a range of recommendations for federal authorities, the scientific community, and education administrators. How does atmospheric science contribute to national well-being? In the context of this question, the panel identifies imperatives in scientific observation, recommends directions for modeling and forecasting research, and examines management issues, including the growing problem of weather data availability. Five subdisciplines--physics, chemistry, dynamics and weather forecasting, upper atmosphere and

near-earth space physics, climate and climate change--and their status as the science enters the twenty-first century are examined in detail, including recommendations for research. This readable book will be of interest to public-sector policy framers and private-sector decisionmakers as well as researchers, educators, and students in the atmospheric sciences.

Providing a comprehensive introduction to atmospheric science, the author identifies the fundamental concepts and principles related to atmospheric science.

Asian Atmospheric Pollution: Sources, Characteristics and Impacts provides a concise yet comprehensive treatment of all aspects of pollution and air quality monitoring, across all of Asia. It focuses on key regions of the world and details a variety of sources, their transport mechanism, long term variability and impacts on climate at local and regional scales. It also discusses the feedback on pollutants, on different meteorological parameters like radiative forcing, fog formations, precipitation, cloud characteristics and more. Drawing upon the expertise of multiple well-known authors from different countries to underline some of these key issues, it includes sections dedicated to treatment of pollutant sources, studying of pollutants and trace gases using satellite/station based observations and models, transport mechanisms, seasonal and inter-annual variability and impact on climate, health and biosphere in general. Asian Atmospheric Pollution: Sources, Characteristics and Impacts is a useful resource for scientists and students to understand the sources and dynamics of atmospheric pollution as well as their transport from one continent to other continents, helping the atmospheric modelling community to model different scenarios of the pollution, gauge its short term and long term impacts across regional to global scales and better understand the ramifications of episodic events. Covers all of Asia in detail in terms of pollution Focuses not only on local pollution, but on long-term transport of these pollutants and their impacts on other regions as well as the globe Includes discussion of both particulate matter and greenhouse gases Serves as a single resource on Asian air pollution and Impacts from the most current research across the globe including the US, Asia, Africa and Europe

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