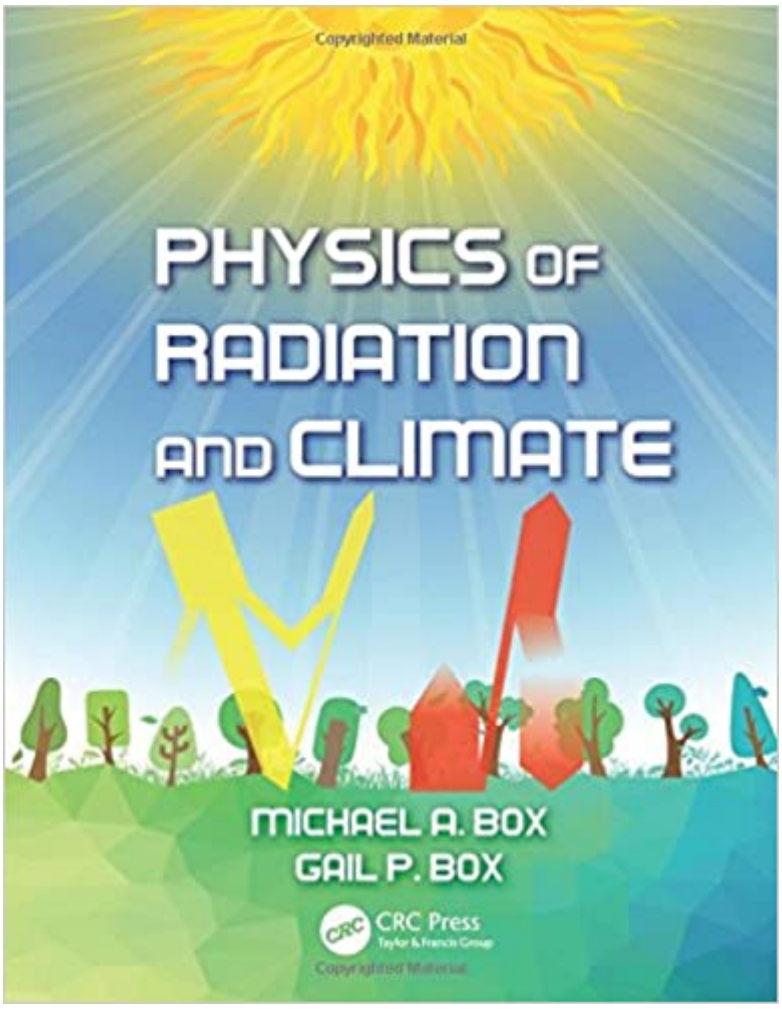
Physics Of Radiation And Climate



Synopsis

Our current climate is strongly influenced by atmospheric composition, and changes in this composition are leading to climate change. Physics of Radiation and Climate takes a look at how the outward flow of longwave or terrestrial radiation is affected by the complexities of the atmosphereÃ¢â ¬â„¢s molecular spectroscopy. This book examines the planet in its current state and considers the radiation fluxes, including multiple scattering, photochemistry, and the ozone layer, and their impact on our climate overall. Starting from the physical fundamentals of how electromagnetic radiation interacts with the various components of the EarthÃ¢â ¬â„¢s atmosphere, the book covers the essential radiation physics leading to the radiative transfer equation. The book then develops the central physics of the interaction between electromagnetic radiation and gases and particles: absorption, emission, and scattering. It examines the physics that describes the absorption and emission of radiation, using quantum mechanics, and scattering, using electromagnetism. It also dedicates a detailed chapter to aerosols, now recognized as a key factor of climate change. Written to be used for a first course in climate physics or a physics elective, the text contains case studies, sample problems, and an extensive reference list as a guide for further research. In addition, the authors: Provide a complete derivation of molecular spectroscopy from quantum mechanical first principles Present a formal derivation of the scattering of radiation by molecules and particles Include the latest results from the Intergovernmental Panel on Climate Change Fifth Assessment Report (IPCC AR5) Physics of Radiation and Climate shows how radiation measurements are used to aid our understanding of weather and climate change and provides an introduction to the atmosphere. This book covers the key branches of physics with a specific focus on thermodynamics, electromagnetism, and quantum mechanics.

Book Information

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Customer Reviews

"Box and Box take the reader on a journey, a progression through interwoven topics that build on those that precede them. And regarding the range of styles exhibited in other texts, Physics of Radiation and Climate strikes a nice balance between physical insight and mathematical formalismÃ¢â ¬Â¦. The breadth of topics is astoundingÃ¢â ¬Â¦. the Boxes have achieved their stated goal: they have managed to make radiation the focus of a climate-centric text directed to the senior undergraduate or entry-level graduate student." Ã¢â ¬â ¢American Journal of Physics (review by Prof Peter Pilewskie, University of Colorado at Boulder), Jul 2016 "This is an outstanding textbook striking a perfect balance between physics, chemistry, modeling, and observation of the global climate. The choice and organization of topics are excellent. The book is extremely well written; contains a wealth of valuable material, especially on atmospheric radiation and remote sensing; and will serve as an excellent introductory text for senior undergraduate students. The informal narrative style makes the book a pleasure to read."Ã¢â ¬â ¢Michael I. Mishchenko, NASA Goddard Institute for Space Studies "The authors are eminently qualified to provide a clear, in-depth discussion of the physical basis for how the climate system works and why global climate is changing. This is a very readable yet thorough textbook covering the key climate system processes and issues ranging from environmental implications to the underlying physics."Ã¢â ¬â ¢Andrew Lacis, NASA Climatologist, Goddard Institute for Space Studies, New York "Ã¢â ¬Â¦ a valuable pedagogical addition to atmospheric and climate physics Ã¢â ¬Â¦ The authors apply their vast experiences as researchers and teachers to explain the physical basis of our climate system with a fresh and current perspective. IÃ¢â ¬â„¢m looking forward to using their text in my own courses."Ã¢â ¬â ¢Roger Davies, Buckley-Glavish Professor of Climate Physics, The University of Auckland "Ã¢â ¬Â¦ an outstanding source of information in the field of atmospheric science. Although written in a very concise manner, the book not only provides all the important relations in the fields of physics and chemistry of our EarthÃ¢â ¬â„¢s atmosphere but also outlines how to derive them. I highly recommend it as a treasure of knowledge for an associated lecture course and as a fundamental source for advanced undergraduate and graduate students."Ã¢â ¬â ¢Thomas Trautmann, Head of Atmospheric Processors Department, Deutsches Zentrum fÃƒÂ r Luft- und Raumfahrt e.V. (DLR) "Ã¢â ¬Â¦ an excellent textbook that introduces the reader to EarthÃ¢â ¬â„¢s

climatic system and provides a thorough grounding in the science underlying issues of climate change. The clear physics emphasis sets this book apart from other introductory texts on meteorology and atmospheric science. The combination of basic physics and policy aspects will equip the reader to make informed contributions to the topical debate on climate change and its mitigation Ã¢â ¬Â|"Ã¢â ¬â ¢David Leadley, Professor, Department of Physics, University of Warwick "I think this is an excellent book for undergraduate and beginning graduate students."Ã¢â ¬â ¢Donald J. Wuebbles, The Harry E. Preble Professor of Atmospheric Sciences, University of Illinois "Students will greatly benefit from learning the physics of solar and thermal radiation from these two experts in the field."Ã¢â ¬â ¢Sundar A. Christopher, Professor of Atmospheric Science and Dean of the College of Science, The University of Alabama in Huntsville

Michael A. Box earned his undergraduate degree in physics at Monash University in 1969, before moving to the University of Sydney to complete a Ph.D in nuclear physics. He has worked in the field of atmospheric physics for more than 35 years, and is well known for his contributions in radiative transfer, atmospheric aerosols, and remote sensing inversion theory. Michael Box is a Fellow of the Australian Meteorological and Oceanographic Society (AMOS) and a member of the American Geophysical Union (AGU). He has also served two terms as an associate editor of the Journal of Quantitative Spectroscopy and Radiative Transfer. Gail P. Box completed both her B.Sc and Ph.D in physics at Newcastle University. Her research has covered many aspects of aerosols, including air quality and radiative forcing. She established the Australian Aerosol Workshop, now expanded as the Australian and New Zealand Aerosol Assembly, to bring together workers in this field. Gail Box is also a member of AMOS, AGU, and the Clean Air Society of Australia and New Zealand.

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