An Introduction To Planetary Atmospheres

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Light Scattering in Inhomogeneous Atmospheres Edgard G. Yanovitskij 2012-12-06 This book is aimed at studying the scattering of monochromatic radiation in plane inhomogeneous media. We are dealing with the media whose optical properties depend on a single spatial coordinate, namely of a depth. The most widely known books on radiation transfer, for instance 1. S. Chandrasekhar, Radiative Transfer, Oxford, Clarendon Press, 1950, (RT), 2. V. V. Sobolev, Light Scattering in Planetary Atmospheres, New York, Pergamon Press, 1975, (LSPA), 3. H. C. van de Hulst, Multiple Light Scattering. Tables, Formulas and - plications. Vol. 1,2, New York, Academic Press, 1980, (MLS), treat mainly the homogeneous atmospheres. However, as known, the actual atmospheres of stars and planets, basins of water, and other artificial and nat ural media are not homogeneous. This book deals with the model of vertically inhomogeneous atmosphere, which is closer to reality than the homogeneous models. This book is close to the aforementioned monographs in its scope of prob lems and style. Therefore, I guess that a preliminary knowledge of the con tents of these books, particularly of the book by Sobolev, would facilitate the readers' task substantially. On the other hand, all concepts, problems, and equations used in this book are considered in full in Chap. 1. So, it will be possible for those readers who do not possess the above knowledge to understand this book. A general idea about the content of the book can be gained from both the Introduction and the Table of Contents.

Introduction to Planetary Geomorphology Ronald Greeley 2013-02-21 Featuring hundreds of images, this textbook explores the geological evolution of planets and moons for undergraduate students in planetary science.

An Introduction to Atmospheric Radiation K. N. Liou 2002-05-09 This Second Edition of An Introduction to Atmospheric Radiation has been extensively revised to address the fundamental study and quantitative measurement of the interactions of solar and terrestrial radiation with molecules, aerosols, and cloud particles in planetary atmospheres. It contains 70% new material,

much of it stemming from the investigation of the atmospheric greenhouse effects of external radiative perturbations in climate systems, and the development of methodologies for inferring atmospheric and surface parameters by means of remote sensing. Liou's comprehensive treatment of the fundamentals of atmospheric radiation was developed for students, academics, and researchers in atmospheric sciences, remote sensing, and climate modeling. Balanced treatment of fundamentals and applications Includes over 170 illustrations to complement the concise description of each subject Numerous examples and hands-on exercises at the end of each chapter

Theory of Planetary Atmospheres Joseph Chamberlain 1990

Introduction to Circulating Atmospheres Ian N. James 1994 An advanced undergraduate text on the large scale circulation of the atmosphere.

The Planetary Scientist's Companion Katharina Lodders 1998 Scientists have collected a wealth of physical and chemical data for the Sun, planets, and small bodies in our solar system, but until now this information has been scattered throughout the technical literature. The Planetary Scientist's Companion solves this problem, providing for the first time a single, extensive reference for the interdisciplinary fields of planetary science and cosmochemistry. The book begins with a summary of frequently used physical and chemical constants, unit conversion factors, properties of some compounds and minerals, thermodynamic data, partition coefficients, and useful formulas. This is followed by an overview of the solar system, including comparative data for the planets and their satellites and abundances of the elements. Much of the book is devoted to a series of chapters describing in turn the Sun, each of the planets, and the groups of small bodies (asteroids, comets, meteorites, and Kuiper Belt and Centaur objects). Each chapter includes an introduction, followed by tables of physical and chemical properties compiled from many sources, including data on planetary atmospheres, surfaces, and interiors. The book concludes with data on nearby stars, the interstellar medium, and recently discovered brown dwarfs and possible extrasolar planets, followed by a glossary. A unique and practical resource for anyone interested in contemporary planetary science and cosmochemistry, this volume is likely to be an essential tool in future research.

Theory of Planetary Atmospheres Joseph Wyan Chamberlain 1978

Planetary Aeronomy Siegfried Bauer 2013-03-09 Planetary Aeronomy is a modern and concise introduction to the underlying physical and chemical processes that govern the formation and evolution of the upper atmospheres of planets. The general approach employed permits consideration of the growing number of extrasolar planets, the detailed observation of which will become possible over the next decades. The book explains the physics behind many atmospheric processes, which are relevant for the evolution of planetary atmospheres and their water inventories, and also contains useful scaling laws and analytical expressions that can be applied to any planet. Readers thus gain insight into the evolution of terrestrial planets and their long-time habitability, atmospheric stability, etc. This volume can be used both as graduate textbook for students wishing to specialize in the field as well as succinct compendium for researchers in the field.

Planets: A Very Short Introduction David A. Rothery 2010-11-25 This Very Short Introduction discusses the

nature of planets and gas giants, and their rings and moons. It also looks beyond Pluto, in the Kuiper Belt, at the knowledge we have about planets around other stars. With many striking photos to illustrate the details, it demonstrates the unique world of every planet.

The Scientific Exploration of Venus Fredric W. Taylor 2014-09-22 Venus is the brightest 'star' in the night sky and it has been observed since ancient times. Often dubbed Earth's 'twin', it is the planet most similar to the Earth in size, mass and composition. There the similarity ends: Venus is shrouded by a dense carbon dioxide atmosphere, its surface is dominated by thousands of volcanoes and it lacks a protective magnetic field to shield it from energetic solar particles. So why isn't Venus more like Earth? In this book, a leading researcher of Venus addresses this question by explaining what we know through our investigations of the planet. Venus presents an intriguing case study for planetary astronomers and atmospheric scientists, especially in light of the current challenges of global warming, which supports, and potentially threatens, life on Earth. Scientifically rigorous, yet written in a friendly non-technical style, this is a broad introduction for students and astronomy and space enthusiasts.

An Introduction to Planetary Physics William M Kaula 1968

Introduction to the Dynamics of Planetary Atmospheres Georgij Sergeevič Golicyn (Atmosphärenphysiker, Klimatologe) 1974

Atmospheric and Space Sciences: Neutral Atmospheres Erdal Yiğit 2015-07-27 The SpringerBriefs on Atmospheric and Space Sciences in two volumes presents a concise and interdisciplinary introduction to the basic theory, observation & modeling of atmospheric and ionospheric coupling processes on Earth. The goal is to contribute toward bridging the gap between meteorology, aeronomy, and planetary science. In addition recent progress in several related research topics, such atmospheric wave coupling and variability, is discussed. Volume 1 will focus on the atmosphere, while Volume 2 will present the ionosphere– the plasma environment. Volume 1 is aimed primarily at (research) students and researchers that would like to gain quick insight in atmospheric sciences and current research. It also is a useful tool for professors who would like to develop a course in atmospheric physics.

Planets and Their Atmospheres John S. Lewis 2013-10-22 This work is addressed to advanced undergraduate and graduate students in astronomy, geology, chemistry, meteorology, and the planetary sciences as well as to researchers with pertinent areas of specialization who desire an introduction to the literature across the broad interdisciplinary range of this important topic. Extensive references to the pre-spacecraft literature will be particularly useful to readers interested in the historical development of the field during this century.

An Introduction to Astrobiology David A. Rothery 2018-03-01 How did life on Earth begin? How common is it elsewhere in the Universe? Written and edited by planetary scientists and astrobiologists, this undergraduate-level textbook provides an introduction to the origin and nature of life, the habitable environments in our solar system and the techniques most successfully used for discovery and characterisation of exoplanets. This third edition has been thoroughly revised to embrace the latest developments in this

field. Updated topics include the origins of water on Earth, the exploration of habitable environments on Mars, Europa and Enceladus, and the burgeoning discoveries in exoplanetary systems. Ideal for introductory courses on the subject, the textbook is also well-suited for self-study. It highlights important concepts and techniques in boxed summaries, with questions and exercises throughout the text, with full solutions provided. Online resources, hosted at www.cambridge.org/features/planets, include selected figures from the book, self-assessment questions and sample tutor assignments.

Theory of Planetary Atmospheres John Marshall 2013-10-22 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.

Theory of Planetary Atmospheres Joseph Wyan Chamberlain 1987

Space Physics C. T. Russell 2016-07-07 This textbook, derived from courses given by three leading researchers, provides advanced undergraduates and graduates with up-to-date coverage of space physics, from the Sun to the interstellar medium. Clear explanations of the underlying physical processes are presented alongside major new discoveries and knowledge gained from space missions, ground-based observations, theory, and modelling to inspire students. Building from the basics to more complex ideas, the book contains enough material for a two-semester course but the authors also provide suggestions for how the material can be tailored to fit a single semester. End-of-chapter problems reinforce concepts and include computer-based exercises especially developed for this textbook package. Free access to the software is available via the book's website and enables students to model the behavior of magnetospheric and solar plasma. An extensive glossary recaps new terms and carefully selected further reading sections encourage students to explore advanced topics of interest.

Exoplanet Atmospheres Sara Seager 2010-08-02 Over the past twenty years, astronomers have identified hundreds of extrasolar planets--planets orbiting stars other than the sun. Recent research in this burgeoning field has made it possible to observe and measure the atmospheres of these exoplanets. This is the first textbook to describe the basic physical processes--including radiative transfer, molecular absorption, and chemical processes--common to all planetary atmospheres, as well as the transit, eclipse, and thermal phase variation observations that are unique to exoplanets. In each chapter, Sara Seager offers a conceptual introduction,

examples that combine the relevant physics equations with real data, and exercises. Topics range from foundational knowledge, such as the origin of atmospheric composition and planetary spectra, to more advanced concepts, such as solutions to the radiative transfer equation, polarization, and molecular and condensate opacities. Since planets vary widely in their atmospheric properties, Seager emphasizes the major physical processes that govern all planetary atmospheres. Moving from first principles to cutting-edge research, Exoplanet Atmospheres is an ideal resource for students and researchers in astronomy and earth sciences, one that will help prepare them for the next generation of planetary science. The first textbook to describe exoplanet atmospheres Illustrates concepts using examples grounded in real data Provides a step-by-step guide to understanding the structure and emergent spectrum of a planetary atmosphere Includes exercises for students

Introduction to the Dynamics of Planetary Atmospheres Georgiĭ Sergeevich Golit□s□yn 1973

Izvestiya 2004

Solar System Astrophysics Eugene F. Milone 2008-08-27 The book covers the field of solar system astrophysics beginning with basic tools of spherical astronomy and coordinate frames and celestial mechanics. It therefore presents equations and derivations starting from a level that permits one to see the underlying physical ideas. An up-to-date overview on all essential topics is presented, but is concise where possible. The text is based on extensive experience in the classroom and its contents have been field-tested by students for years. The material has been updated in the last few months to take advantage of the newer discoveries of the Mars Rover and the Saturn Cassini missions.

An Introduction to Planetary Atmospheres Agustin Sanchez-Lavega 2011-06-27 Planetary atmospheres is a relatively new, interdisciplinary subject that incorporates various areas of the physical and chemical sciences, including geophysics, geophysical fluid dynamics, atmospheric science, astronomy, and astrophysics. Providing a much-needed resource for this cross-disciplinary field, An Introduction to Planetary Atmospheres presents current knowledge on atmospheres and the fundamental mechanisms operating on them. The author treats the topics in a comparative manner among the different solar system bodies—what is known as comparative planetology. Based on an established course, this comprehensive text covers a panorama of solar system bodies and their relevant general properties. It explores the origin and evolution of atmospheres, along with their chemical composition and thermal structure. It also describes cloud formation and properties, mechanisms in thin and upper atmospheres, and meteorology and dynamics. Each chapter focuses on these atmospheric topics in the way classically done for the Earth’s atmosphere and summarizes the most important aspects in the field. The study of planetary atmospheres is fundamental to understanding the origin of the solar system, the formation mechanisms of planets and satellites, and the day-to-day behavior and evolution of Earth’s atmosphere. With many interesting real-world examples, this book offers a unified vision of the chemical and physical processes occurring in planetary atmospheres. Ancillaries are available at www.ajax.ehu.es/planetary_atmospheres/

Fundamentals of Atmospheric Radiation Craig F. Bohren 2006-08-21 Meeting the need for teaching material

suitable for students of atmospheric science and courses on atmospheric radiation, this textbook covers the fundamentals of emission, absorption, and scattering of electromagnetic radiation from ultraviolet to infrared and beyond. Much of the contents applies to planetary atmosphere, with graded discussions providing a thorough treatment of subjects, including single scattering by particles at different levels of complexity. The discussion of the simple multiple scattering theory introduces concepts in more advanced theories, such that the more complicated two-stream theory allows readers to progress beyond the pile-of-plates theory. The authors are physicists teaching at the largest meteorology department in the US at Penn State. The problems given in the text come from students, colleagues, and correspondents, and the figures designed especially for this book facilitate comprehension. Ideal for advanced undergraduate and graduate students of atmospheric science. * Free solutions manual available for lecturers at www.wiley-vch.de/supplements/

Atmospheric and Space Sciences: Ionospheres and Plasma Environments Erdal Yiğit 2017-07-07 The SpringerBriefs on Atmospheric and Space Sciences in two volumes presents a concise and interdisciplinary introduction to the basic theory, observation & modeling of atmospheric and ionospheric coupling processes on Earth. The goal is to contribute toward bridging the gap between meteorology, aeronomy, and planetary science. In addition recent progress in several related research topics, such atmospheric wave coupling and variability, is discussed. Volume 1 will focus on the atmosphere, while Volume 2 will present the ionospheres and the plasma environments. Volume 2 is aimed primarily at (research) students and young researchers that would like to gain quick insight into the basics of space sciences and current research. In combination with the first volume, it also is a useful tool for professors who would like to develop a course in atmospheric and space physics.

Giant Planets of Our Solar System Patrick Irwin 2006-08-29 This book reviews the current state of knowledge of the atmospheres of the four giant gaseous planets. It is the first book to contain all the latest data and background information on these planets in one handy volume. Current theories of their formation are reviewed. The book clearly explains all specialist terms, and it discusses the pros and cons of ground versus space-based observations of giant planets.

Planetary Atmospheres 1965

Non-LTE Radiative Transfer in the Atmosphere Manuel López-Puertas 2001 Ch. 1. Introduction and overview. 1.1. General introduction. 1.2. Basic properties of the Earth's atmosphere. 1.3. What is LTE? 1.4. Non-LTE situations. 1.5. The importance of non-LTE. 1.6. Some historical background. 1.7. Non-LTE models. 1.8. Experimental studies of non-LTE. 1.9. Non-LTE in planetary atmospheres. 1.10. References and further reading -- ch. 2. Molecular spectra. 2.1. Introduction. 2.2. Energy levels in diatomic molecules. 2.3. Energy levels in polyatomic molecules. 2.4. Transitions and spectral bands. 2.5. Properties of individual vibration-rotation lines. 2.6. Interactions between energy levels. 2.7. References and further reading -- ch. 3. Basic atmospheric radiative transfer. 3.1. Introduction. 3.2. Properties of radiation. 3.3. The radiative transfer equation. 3.4. The formal solution of the radiative transfer equation. 3.5. Thermodynamic equilibrium and local thermodynamic equilibrium. 3.6. The source

function in non-LTE. 3.7. Non-LTE situations. 3.8. References and further reading -- ch. 4. Solutions to the radiative transfer equation in LTE. 4.1. Introduction. 4.2. Integration of the radiative transfer equation over height. 4.3. Integration of the radiative transfer equation over frequency. 4.4. Integration of the radiative transfer equation over solid angle. 4.5. References and further reading -- ch. 5. Solutions to the radiative transfer equation in non-LTE. 5.1. Introduction. 5.2. Simple solutions for radiative transfer under non-LTE. 5.3. The full solution of the radiative transfer equation in non-LTE. 5.4. Integration of the RTE in non-LTE. 5.5. Intercomparison of non-LTE codes. 5.6. Parameterizations of the non-LTE cooling rate. 5.7. The Curtis matrix method. 5.8. References and further reading -- ch. 6. Non-LTE modelling of the Earth's atmosphere I: CO2. 6.1. Introduction. 6.2. Useful approximations. 6.3. Carbon dioxide, CO2. 6.4. References and further reading -- ch. 7. Non-LTE modelling of the Earth's atmosphere II: Other infrared emitters. 7.1. Introduction. 7.2. Carbon monoxide, CO. 7.3. Ozone, O3. 7.4. Water vapour, H2O. 7.5. Methane, CH4. 7.6. Nitric oxide, NO. 7.7. Nitrogen dioxide, NO2. 7.8. Nitrous oxide, N2O. 7.9. Nitric acid, HNO3. 7.10. Hydroxyl radical, OH. 7.11. Molecular oxygen atmospheric infrared bands. 7.12. Hydrogen chloride, HC1, and hydrogen fluoride, HF. 7.13. NO+. 7.14. Atomic Oxygen, O (3P), at 63[symbol]m. 7.15. References and further reading -- ch. 8. Remote sensing of the non-LTE atmosphere. 8.1. Introduction. 8.2. The analysis of emission measurements. 8.3. Observations of carbon dioxide in emission. 8.4. Observations of ozone in emission. 8.5. Observations of water vapour in emission. 8.6. Observations of carbon monoxide in emission. 8.7. Observations of nitric oxide in emission. 8.8. Observations of other infrared emissions. 8.9. Rotational non-LTE. 8.10. Absorption measurements. 8.11. Simulated limb emission spectra at high resolution. 8.12. Simulated Nadir emission spectra at high resolution. 8.13. Non-LTE retrieval schemes. 8.14. References and further reading -- ch. 9. Cooling and heating rates. 9.1. Introduction. 9.2. CO2 15 f[symbol]m cooling. 9.3. O3 9.6[symbol]xm cooling. 9.4. H2O 6.3[symbol]m cooling. 9.5. NO 5.3[symbol]m cooling. 9.6. O(3Pi) 63[symbol]m cooling. 9.7. Summary of cooling rates. 9.8. CO2 solar heating. 9.9. References and further reading -- ch. 10. Non-LTE in planetary atmospheres. 10.1. Introduction. 10.2. The terrestrial planets: Mars and Venus. 10.3. A non-LTE model for the Martian and Venusian atmospheres. 10.4. Mars. 10.5. Venus. 10.6. Outer planets. 10.7. Titan. 10.8. Comets. 10.9. References and further reading.

An Introduction to Atmospheric Physics Robert G. Fleagle 1981-01-09 This book is addressed to those who wish to understand the relationship between atmospheric phenomena and the nature of matter as expressed in the principles of physics. The interesting atmospheric phenomena are more than applications of gravitation, of thermodynamics, of hydrodynamics, or of electrodynamics; and mastery of the results of controlled experiment and of the related theory alone does not imply an understanding of atmospheric phenomena. This distinction arises because the extent and the complexity of the atmosphere permit effects and interactions that are entirely negligible in the laboratory or are deliberately excluded from it. the objective of laboratory physics is, by isolating the relevant variables, to reveal the fundamental properties of

matter; whereas the objective of atmospheric physics, or of any observational science, is to understand those phenomena that are characteristic of the whole system. For these reasons the exposition of atmospheric physics requires substantial extensions of classical physics. It also requires that understanding be based on a coherent "way of seeing" the ensemble of atmospheric phenomena. Only then is understanding likely to stimulate still more general insights.

Vortex Dynamics, Statistical Mechanics, and Planetary Atmospheres

Mars Nadine G. Barlow 2008 Textbook on Mars for graduate students and researchers, in geology, chemistry, atmospheric sciences, and astronomy.

Photochemistry of the Atmospheres of Mars and Venus Vladimir A. Krasnopolsky 2013-03-07 Spacecraft study of the Solar system is one of humanity's most outstanding achievements. Thanks to this study, our present knowledge of properties of and conditions on the planets exceeds many-fold that of 20 years ago: planets have been rediscovered. This is especially the case for planetary atmospheres, whose properties were for the most part either not at all or only erroneously known. Much research has been invested in the study of the atmospheres of Mars and Venus, and their chemical composition and photochemistry are basic problems in these studies. In the present publication I have tried to summarize all findings in this field. The English version of the book includes new data in the field from the last 3 years since the book was published in Russian. I wish to thank U. von Zahn, who initiated my talks with Springer-Verlag and acted as technical editor. December 2, 1985 V. A. KRASNOPOLSKY Contents Introduction . . . . . 1 1 Chemical Composition and Structure of the Martian Atmosphere 4 1. 1 Carbon Dioxide and Atmospheric Pressure . . . . . 4 1. 2 CO and O Mixing Ratios . . . . . 8 2 1. 3 Ozone. . . . . 10 1. 4 Water Vapor . . . . . 18 1. 5 Composition of the Upper Atmosphere as Determined from Airglow Spectroscopy . . . . . 23 1. 6 Mass Spectrometric Measurements of the Atmospheric Composition . . . . . 31 1. 7 Ionospheric Composition . . . . . 34 1. 8 Temperature Profile of the Lower Atmosphere. . . . . 36 1. 9 Temperature of the Upper Atmosphere . . . . . 40 1. 10 Eddy Diffusion Coefficient . . . . . 42 2 Photochemistry of the Martian Atmosphere . . . . . .

Atmospheric Evolution on Inhabited and Lifeless Worlds David C. Catling 2017-04-13 As the search for Earth-like exoplanets gathers pace, in order to understand them, we need comprehensive theories for how planetary atmospheres form and evolve. Written by two well-known planetary scientists, this text explains the physical and chemical principles of atmospheric evolution and planetary atmospheres, in the context of how atmospheric composition and climate determine a planet's habitability. The authors survey our current

understanding of the atmospheric evolution and climate on Earth, on other rocky planets within our Solar System, and on planets far beyond. Incorporating a rigorous mathematical treatment, they cover the concepts and equations governing a range of topics, including atmospheric chemistry, thermodynamics, radiative transfer, and atmospheric dynamics, and provide an integrated view of planetary atmospheres and their evolution. This interdisciplinary text is an invaluable one-stop resource for graduate-level students and researchers working across the fields of atmospheric science, geochemistry, planetary science, astrobiology, and astronomy.

The Cambridge Photographic Guide to the Planets Halley Professor of Physics Fredric W Taylor 2001-11-15 Provides a comprehensive introduction to our planetary system, devoting chapters to a different planet or solar system body, in a volume complemented by a selection of the latest images of planets, moons, comets, and asteroids.

Photochemistry of the Atmospheres of Mars and Venus Vladimir A. Krasnopolsky 1986-02-01 Spacecraft study of the Solar system is one of humanity's most outstanding achievements. Thanks to this study, our present knowledge of properties of and conditions on the planets exceeds many-fold that of 20 years ago: planets have been rediscovered. This is especially the case for planetary atmospheres, whose properties were for the most part either not at all or only erroneously known. Much research has been invested in the study of the atmospheres of Mars and Venus, and their chemical composition and photochemistry are basic problems in these studies. In the present publication I have tried to summarize all findings in this field. The English version of the book includes new data in the field from the last 3 years since the book was published in Russian. I wish to thank U. von Zahn, who initiated my talks with Springer-Verlag and acted as technical editor. December 2, 1985 V. A. KRASNOPOLSKY Contents Introduction . . . . . 1 1 Chemical Composition and Structure of the Martian Atmosphere 4 1. 1 Carbon Dioxide and Atmospheric Pressure . . . . . 4 1. 2 CO and O Mixing Ratios . . . . . 8 2 1. 3 Ozone. . . . . 10 1. 4 Water Vapor . . . . . 18 1. 5 Composition of the Upper Atmosphere as Determined from Airglow Spectroscopy . . . . . 23 1. 6 Mass Spectrometric Measurements of the Atmospheric Composition . . . . . 31 1. 7 Ionospheric Composition . . . . . 34 1. 8 Temperature Profile of the Lower Atmosphere. . . . . 36 1. 9 Temperature of the Upper Atmosphere . . . . . 40 1. 10 Eddy Diffusion Coefficient . . . . . 42 2 Photochemistry of the Martian Atmosphere . . . . . .

Radiative Transfer Hélène Frisch 2022-05-05 This book discusses analytic and asymptotic methods relevant to radiative transfer in dilute media, such as stellar and planetary atmospheres. Several methods, providing exact

expressions for the radiation field in a semi-infinite atmosphere, are described in detail and applied to unpolarized and polarized continuous spectra and spectral lines. Among these methods, the Wiener–Hopf method, introduced in 1931 for a stellar atmospheric problem, is used today in fields such as solid mechanics, diffraction theory, or mathematical finance. Asymptotic analyses are carried out on unpolarized and polarized radiative transfer equations and on a discrete time random walk. Applicable when photons undergo a large number of scatterings, they provide criteria to distinguish between large-scale diffusive and non-diffusive behaviors, typical scales of variation of the radiation field, such as the thermalization length, and specific descriptions for regions close and far from boundaries. Its well organized synthetic view of exact and asymptotic methods of radiative transfer makes this book a valuable resource for both graduate students and professional scientists in astrophysics and beyond.
Planetary Geology National Aeronautics And Administration 2013-12
Physics of the Solar System Nasa 2005 CONTENTS Foreword Introduction to Solar Physics Internal Rotation of the Sun A History of Solar Rotation Dynamics of the Outer Solar Atmosphere The Interplanetary Plasma Lower Atmospheres of the Planets The Composition of Planetary Atmospheres Interior Structure of Giant Planets Radar and Radio Exploration of the Planets Nature and Interpretation of the Apollo 11 Lunar Samples Origin of the Solar System Evolution of Planetary Atmospheres History of the Lunar Orbit
Introduction to the Physics and Techniques of Remote Sensing Charles Elachi 2021-04-20 Discover cutting edge theory and applications of modern remote sensing in geology, oceanography, atmospheric science, ionospheric studies, and more The thoroughly revised third edition of the Introduction to the Physics and Techniques of Remote Sensing delivers a comprehensive update to the authoritative textbook, offering readers new sections on radar interferometry, radar stereo, and planetary radar. It explores new techniques in imaging spectroscopy and large optics used in Earth orbiting, planetary, and astrophysics missions. It also describes remote sensing instruments on, as well as data acquired with, the most recent Earth and space missions. Readers will benefit from the brand new and up-to-date concept examples and full-color photography, 50% of which is new to the series. You'll learn about the basic physics of wave/matter interactions, techniques of remote sensing across the electromagnetic spectrum (from ultraviolet to microwave), and the concepts behind the remote sensing techniques used today and those planned for the future. The book also discusses the applications of remote sensing for a wide variety of earth and planetary atmosphere and surface sciences, like geology, oceanography, resource observation, atmospheric sciences, and ionospheric studies. This new edition also incorporates: A fulsome introduction to the nature and properties of electromagnetic waves An exploration of sensing solid surfaces in the visible and near infrared spectrums, as well as thermal infrared, microwave, and radio frequencies A treatment of ocean surface sensing, including ocean surface imaging and the mapping of ocean topography A discussion of the basic principles of atmospheric sensing and radiative transfer, including the radiative transfer equation Perfect for senior undergraduate and graduate students in the field of remote sensing instrument development, data analysis,

and data utilization, Introduction to the Physics and Techniques of Remote Sensing will also earn a place in the libraries of students, faculty, researchers, engineers, and practitioners in fields like aerospace, electrical engineering, and astronomy.

Introduction to Planetary Volcanism Gregory Mursky 1996 This text explores, from a geological perspective, the volcanic processes on the planets and moons of our solar system. Its comprehensive coverage probes the nature of volcanic activity among the planets and their satellites. The work is designed as an introduction to volcanic phenomena in departments of geology, geophysics and earth science, and is intended primarily for beginning students with no previous geological experience.