An Introduction To Planetary Atmospheres

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Giant Planets of Our Solar System Patrick Irwin 2009-03-27 This book reviews the current state of knowledge of the atmospheres of the giant gaseous planets: Jupiter, Saturn, Uranus, and Neptune. The current theories of their formation are reviewed and their recently observed temperature, composition and cloud structures are contrasted and compared with simple thermodynamic, radiative transfer and dynamical models. The instruments and techniques that have been used to remotely measure their atmospheric properties are also reviewed, and the likely development of outer planet observations over the next two decades is outlined. This second edition has been extensively updated following the Cassini mission results for Jupiter/Saturn and the newest ground-based measurements for Uranus/Neptune as well as on the latest development in the theories on planet formation.
Fundamental Planetary Science Jack J. Lissauer 2013-09-09 A quantitative introduction to the Solar System and planetary systems science for advanced undergraduate students, this engaging new textbook explains the wide variety of physical, chemical and geological processes that govern the motions and properties of planets. The authors provide an overview of our current knowledge and discuss some of the unanswered questions at the forefront of research in planetary science and astrobiology today. They combine knowledge of the Solar System and the properties of extrasolar planets with astrophysical observations of ongoing star and planet formation, offering a comprehensive model for understanding the origin of planetary systems. The book concludes with an introduction to the fundamental properties of living organisms and the relationship that life has to its host planet. With more than 200 exercises to help students learn how to apply the concepts covered, this textbook is ideal for a one-semester or two-quarter course for undergraduate students.
Introduction to the Dynamics of Planetary Atmospheres Georgiĭ Sergeevich Golit͡syn 1973
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 . . . .
Planets Beyond Mark Littmann 2004-01-01 This book serves as a fascinating progress report on the outer solar system, offering a way to better appreciate the newest findings. It unlocks some of the mysteries surrounding Uranus, Neptune, and Pluto — from the drama of their discoveries to the startling results of Voyager 2's historic 1989 encounter with Neptune.
Planetary Atmospheres F.W. Taylor 2010-08-05 This book covers the basic physics of planetary atmospheres, providing an overview, followed by detailed discussion of key topics arranged by physical phenomenon. The emphasis is on acquiring and interpreting measurements, and the basic physics of instruments and models, with key definitions and historical notes given in the footnotes and glossary.
Planetary Sciences Imke de Pater 2010-07-15 An authoritative introduction for graduate students in the physical sciences, this textbook explains the wide variety of physical, chemical, and geological processes that govern the motions and properties of planets. The second edition of this award-winning textbook has been substantially updated and improved. It now contains a reorganized discussion of small bodies, including a detailed description of the Kuiper belt and asteroid belt; a significantly expanded chapter on extrasolar planets and what they tell us about planetary systems; and appendixes providing a glossary of acronyms, tables of key spacecraft, a summary of observing techniques, and a sampling of very recent images. With over 300 exercises to help students apply the concepts covered, this textbook is ideal for courses in astronomy, planetary science and earth science, and well suited as a reference for researchers. Color versions of many figures and movie clips supplementing the text are available at www.cambridge.org/9780521853712.
Atmosphere, Ocean and Climate Dynamics John Marshall 1979-01-01 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.
Aeronomy P. M. Banks 2013-09-24 Aeronomy, Part A is an attempt to make a comprehensive exposition of the processes in aeronomy, the study of composition, movement, and thermal balance of the upper regions of the planetary atmosphere. The text covers topics such as atmospheric regions and atmospheric density, the temperature and molecular mass of the atmosphere; the permanent constituents and the molecular and isotopic composition of the homosphere; and the transition from the homosphere to the heterosphere. Also covered are topics such as the temperature gradient and energies in the thermosphere, conditions at 200km and above 250km, solar radiation and ionization, and aeronomic reactions. The book is recommended for scientists, especially natural physicists, who would like to know more about the field of aeronomy and its advances.
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.
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.
Photochemistry of Planetary Atmospheres Yuk Ling Yung 1999 This valuable reference presents detailed studies of eleven planetary atmospheres at the same time it offers an extensive survey of the principal chemical cycles that control the present composition and past history of these planetary atmospheres.
Planetary Climates Andrew Ingersoll 2013-08-25 This concise, sophisticated introduction to planetary climates explains the global physical and chemical processes that determine climate on any planet or major planetary satellite--from Mercury to Neptune and even large moons such as Saturn's Titan. Although the climates of other worlds are extremely diverse, the chemical and physical processes that shape their dynamics are the same. As this book makes clear, the better we can understand how various planetary climates formed and evolved, the better we can understand Earth's climate history and future.
An Introduction to the Solar System David A. Rothery 2018-01-11 Updated third edition introduces undergraduates to the Solar System's bodies, the processes upon and within them, and their origins and evolution.
Planetary Aeronomy Siegfried Bauer 2004-07-05 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.
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.
Atmospheric Evolution on Inhabited and Lifeless Worlds David C. Catling 2017-03-31 A comprehensive and authoritative text on the formation and evolution of planetary atmospheres, for graduate-level students and researchers.
Theory of Planetary Atmospheres Joseph Chamberlain 1990
Atmospheric Science John M. Wallace 2006-03-24 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
An Introduction to Atmospheric Radiation Liou 1981-01-12 An Introduction to Atmospheric Radiation
An Introduction to Atmospheric Physics David G. Andrews 2010-04-29 This work offers a broad coverage of atmospheric physics, including atmospheric thermodynamics, radiative transfer, atmospheric fluid dynamics and elementary atmospheric chemistry.
Principles of Planetary Climate Raymond T. Pierrehumbert 2010-12-02 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.
Planets: Ours and Others ThÃ©rÃ¨se Encrenaz 2013-09-26 What is a planet? The answer may seem obvious; still, the definition of a planet has continuously evolved over the centuries, and their number has changed following successive discoveries. In 2006, the decision endorsed by the International Astronomical Union to remove Pluto from the list of planets has well illustrated the difficulty associated with their definition. The recent discovery of hundreds of exoplanets around nearby stars of our Galaxy opens a new and spectacular dimension to astrophysics. We presently know very little about the physical nature of exoplanets. In contrast, our knowledge on solar system planets has made huge progress over the past decades, thanks, especially, to space planetary exploration. The purpose of this book is first to characterize what planets are, in their global properties and in their diversity. Then, this knowledge is used to try to imagine the physical nature of exoplanets, starting from the few parameters we know about them. Throughout, we keep in mind the ultimate question of the search for possible extraterrestrial life: Could life exist or have existed in the solar system and beyond? Thérèse Encrenaz is Emeritus Senior Scientist at the Centre National de la Recherche Scientifique. She works at the Observatoire de Paris, at the Laboratoire d'Etudes Spatiales et d'Instrumentation en Astrophysique (LESIA). She is a specialist of the study of planetary atmospheres, and has been involved in several space missions.
Introductory Notes on Planetary Science Colette Salyk 2020 Planets come in many different sizes, and with many different compositions, orbiting our Sun and countless other stars. Understanding their properties and interactions requires an understanding of a diverse set of sub-fields, including orbital and atmospheric dynamics, geology, geophysics, and chemistry. This textbook provides a physics-based tour of introductory planetary science concepts for undergraduate students majoring in astronomy, planetary science, or related fields. It shows how principles and equations learned in introductory physics classes can be applied to study many aspects of planets, including dynamics, surfaces, interiors, and atmospheres. It also includes chapters on the discovery and characterization of extrasolar planets, and the physics of planet formation.
An Introduction to Atmospheric Radiation K. N. Liou 2002-05-13 Fundamentals of radiation for atmospheric applications -- Solar radiation at the top of the atmosphere -- Absorption and scattering of solar radiation in the atmosphere -- Thermal infrared radiation transfer in the atmosphere -- Light scattering by atmospheric particulates -- Principles of radiative transfer in planetary atmospheres -- Application of radiative transfer principles to remote sensing -- Radiation and climate.
Theory of Planetary Atmospheres Joseph Wyan Chamberlain 1978
Exoplanet Atmospheres Sara Seager 2010-08-22 Describes 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.
Exoplanetary Atmospheres Kevin Heng 2017-01-10 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)
Introduction to Planetary Science Gunter Faure 2007-05-04 This textbook details basic principles of planetary science that help to unify the study of the solar system. It is organized in a hierarchical manner so that every chapter builds upon preceding ones. Starting with historical perspectives on space exploration and the development of the scientific method, the book leads the reader through the solar system. Coverage explains that the origin and subsequent evolution of planets and their satellites can be explained by applications of certain basic principles of physics, chemistry, and celestial mechanics and that surface features of the solid bodies can be interpreted by principles of geology.
Planetary Aeronomy Siegfried Bauer 2010-12-15 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.
Planetary Atmospheric Electricity François Leblanc 2008-10-01 This book is a comprehensive discussion of all issues related to atmospheric electricity in our solar system. It details atmospheric electricity on Earth and other planets and discusses the development of instruments used for observation.
Introduction to Earth and Planetary System Science Naotatsu Shikazono 2012-03-22 This book presents basic information on material science (geochemistry, geophysics, geology, mineralogy, etc.), interaction between subsystem consisting earth system (atmosphere, hydrosphere, litho (geo) sphere, biosphere, humans) and in earth-planet system and evolution of earth-planetary system. The nature-humans interactions are described and new view on earth, planets and humans (integration of anthropocentrism and naturecentrism) are presented.
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.
The Atmosphere and Climate of Mars Robert M. Haberle 2017-06-29 Humanity has long been fascinated by the planet Mars. Was its climate ever conducive to life? What is the atmosphere like today and why did it change so dramatically over time? Eleven spacecraft have successfully flown to Mars since the Viking mission of the 1970s and early 1980s. These orbiters, landers and rovers have generated vast amounts of data that now span a Martian decade (roughly eighteen years). This new volume brings together the many new ideas about the atmosphere and climate system that have emerged, including the complex interplay of the volatile and dust cycles, the atmosphere-surface interactions that connect them over time, and the diversity of the planet's environment and its complex history. Including tutorials and explanations of complicated ideas, students, researchers and non-specialists alike are able to use this resource to gain a thorough and up-to-date understanding of this most Earth-like of planetary neighbours.
Theory of Planetary Atmospheres Joseph Wyan Chamberlain 1987
Introduction to the Dynamics of Planetary Atmospheres Georgij Sergeevič Golicyn (Atmosphärenphysiker, Klimatologe) 1974
Alien Skies Frédéric J. Pont 2014-04-23 Planetary atmospheres are complex and evolving entities, as mankind is rapidly coming to realise whilst attempting to understand, forecast and mitigate human-induced climate change. In the Solar System, our neighbours Venus and Mars provide striking examples of two endpoints of planetary evolution, runaway greenhouse and loss of atmosphere to space. The variety of extra-solar planets brings a wider angle to the issue: from scorching "hot jupiters'' to ocean worlds, exo-atmospheres explore many configurations unknown in the Solar System, such as iron clouds, silicate rains, extreme plate tectonics, and steam volcanoes. Exoplanetary atmospheres have recently become accessible to observations. This book puts our own climate in the wider context of the trials and tribulations of planetary atmospheres. Based on cutting-edge research, it uses a grand tour of the atmospheres of other planets to shine a new light on our own atmosphere, and its relation with life.
Introduction to Circulating Atmospheres I. N. James 1995-10-19 An advanced undergraduate text on the large scale circulation of the atmosphere.
Electrostatic Phenomena on Planetary Surfaces Carlos I Calle 2017-03-15 The diverse planetary environments in the solar system react in somewhat different ways to the encompassing influence of the Sun. These different interactions define the electrostatic phenomena that take place on and near planetary surfaces. The desire to understand the electrostatic environments of planetary surfaces goes beyond scientific inquiry. These environments have enormous implications for both human and robotic exploration of the solar system. This book describes in some detail what is known about the electrostatic environment of the solar system from early and current experiments on Earth as well as what is being learned from the instrumentation on the space exploration missions (NASA, European Space Agency, and the Japanese Space Agency) of the last few decades. It begins with a brief review of the basic principles of electrostatics.
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/