The Atmosphere And Ionosphere Dynamics Processes And Monitoring

#atmosphere dynamics #ionosphere processes #geospace monitoring #upper atmosphere research #space weather impact

Explore the intricate dynamics and physical processes occurring within the Earth's atmosphere and ionosphere, detailing advanced methods for their continuous monitoring to better understand phenomena like space weather and its influence on our planet.

The Atmosphere and Ionosphere

From July 7 to 12, 2008 in Zelenogradsk, a cosy resort on the bank of the Baltic Sea near Kaliningrad in Russia, the 1st International Conference “Atmosphere, Ionosphere, Safety (AIS-2008)” has been carried out. The State Russian University of I. Kant, Semenov Institute of chemical physics of the Russian Academy of Sciences, Pushkov Institute of terrestrial magnetism and radio-waves propagation of the Russian Academy of Sciences, and Russian Committee on Ball Lightning (BL) have acted as organizers of the conference. Financial support was made by Russian Fund of Fundamental Research Project N. 08-03-06041 and European Of?ce of Aerospace Research and Development Grant award FA8655-08-1-5052. The International conference “Atmosphere, Ionosphere, Safety” (AIS-2008) was devoted to (i) the analysis of the atmosphere–ionosphere response on natural and man-made processes, the reasons of occurrence of the various accompanying geophysical phenomena, and an estimation of possible consequences of their in?uence on the person and technological systems; (ii) the study of the monitoring possibility and search of the ways for the risk level decrease. Discussion of the physical and chemical processes accompanying the observable geophysical p- nomena was undertaken. One can see from a list of the Conference sections that questions of safety took only rather modest place, so main topics of the Conference became discussion of processes taking place in the atmosphere, ionosphere and methods of monitoring these processes.

The Atmosphere and Ionosphere

This book presents a collection of reviews prepared for the conference “Atmosphere, Ionosphere, Safety,” held in Kaliningrad, Russia, in July 2012. It provides the reader insight into the current developments in the following fields: physics of elementary processes; ionosphere dynamics; ball lightning and aerosol structures; as well as remote detection of the radioactive and highly toxic substances. The diversity of scope presented offers readers an up-to-date overview of trends, questions and their solutions.

The Atmosphere and Ionosphere

The book presents a collection of articles devoted to atmospheric and ionospheric science reported during the Conference “Atmosphere, Ionosphere, Safety” held in Kaliningrad, Russia in July 2010. It consists of reviews devoted to physics of elementary processes, aerosols, ionosphere dynamics, microwave discharges and plasmoids. Such a wide range of topics presents a comprehensive analysis of this atmospheric science including trends and questions which exist to be solved.

The Atmosphere and Ionosphere

The Dynamical Ionosphere: A Systems Approach to Ionospheric Irregularity examines the Earth’s ionosphere as a dynamical system with signatures of complexity. The system is robust in its overall configuration, with smooth space-time patterns of daily, seasonal and Solar Cycle variability, but shows a hierarchy of interactions among its sub-systems, yielding apparent unpredictability, space-time irregularity, and turbulence. This interplay leads to the need for constructing realistic models of the average ionosphere, incorporating the increasing knowledge and predictability of high variability components, and for addressing the difficulty of dealing with the worst cases of ionospheric disturbances, all of which are addressed in this interdisciplinary book. Borrowing tools and techniques from classical and stochastic dynamics, information theory, signal processing, fluid dynamics and turbulence science, The Dynamical Ionosphere presents the state-of-the-art in dealing with irregularity, forecasting ionospheric threats, and theoretical interpretation of various ionospheric configurations. Presents studies addressing Earth’s ionosphere as a complex dynamical system, including irregularities and radio scintillation, ionospheric turbulence, nonlinear time series analysis, space-ionosphere connection, and space-time structures Utilizes interdisciplinary tools and techniques, such as those associated with stochastic dynamics, information theory, signal processing, fluid dynamics and turbulence science Offers new data-driven models for different ionospheric variability phenomena Provides a synoptic view of the state-of-the-art and most updated theoretical interpretation, results and data analysis tools of the "worst case" behavior in ionospheric configurations

The Dynamical Ionosphere

The monograph is devoted to ball lightning (BL) observed in natural conditions in the air and artificial BL, long-lived luminous formations (LLF), usually obtained in laboratories experimentally. Joint consideration of artificial and natural BL emphasizes the need for a comprehensive analysis of such complex objects. It is the description of the study of the properties of artificial BL and LLF in the end of 20th and 21st centuries that allows the reader to better understand what and how can be experimentally simulated.

Natural and Artificial Ball Lightning in the Earth’s Atmosphere

Launches of several major magnetospheric research satellites (i.e., Polar, Wind, and Interball) set the scene for extensive multi-platform investigations of the Earth's plasma environment in the era of the International Solar-Terrestrial Physics Program. Exciting new results from this Program and the ongoing innovative advances to scientific instrumentation and spacecraft technology are vitally important for the international space community in preparing for future plans in the upcoming new millenium. This volume is a product of the COSPAR Colloquium held in Beijing on April 15-19, 1996 aimed to consolidate these achievements. It contains state-of-the-art articles in the four areas of modern magnetospheric techniques, namely, (1) active experiment in space, (2) innovative measurement technique, (3) multi-point observation, and (4) numerical simulation and theoretical analysis. Researchers in the space community, both novices and experts, are expected to benefit from this collection of articles.

Toward Global Monitoring of the Ionosphere in Real Time by a Modern Ionosonde Network

A recommendation of the NRC's decadal survey in solar and space physics, published in 2002, was the Small Instrument Distributed Ground-Based Network, which would provide global-scale ionospheric and upper atmospheric measurements crucial to understanding the atmosphere-ionosphere-magnetosphere system. To explore the scientific rationale for this distributed array of small instruments (known as DASI), the infrastructure needed to support and make use of such arrays, and proposals for a deployment implementation plan, the NRC held a workshop of interested parties at the request of the National Science Foundation. This report presents a summary of that workshop focusing on the science and instruments, and on infrastructure issues. It describes the themes emerging from the workshop: the need to address the magnetosphere-ionosphere-magnetosphere ensemble as a system; the need for real-time observations; and the insufficiency of current observations.

Magnetospheric Research with Advanced Techniques

This report describes a radio investigation of traveling ionospheric disturbances carried out near Boulder, Colorado, over a 1-year period from June 1967 to June 1968. The three-dimensional motions of F2 layer disturbances were measured by the high frequency Doppler technique with spaced transmitters and at several probing frequencies. Horizontal motions were determined by cross-correlating three signals on frequencies near 5 MHz, whose reflection points were approximately at the corners of a horizontal equilateral triangle with 40-km sides. Vertical motions were determined from cross-correlation of signals on frequencies of 3.3, 4.0, and 5.1 MHz, whose reflection points were aligned vertically.

Distributed Arrays of Small Instruments for Solar-Terrestrial Research

This book contains the papers selected by the Scientific Committee and represented at the XIII International Conference "Solar-Terrestrial Relations and Physics of Earthquake Precursors\

Observation of Traveling Ionospheric Disturbances by the Doppler Technique with Spaced Transmitters

This book describes essential concepts of, and the status quo in, the field of ionospheric space weather. It explains why our society on planet Earth and moving outwards into space cannot work safely, function efficiently, or progress steadily without committed and comprehensive research initiatives addressing space weather. These initiatives must provide space environment specifications, warnings, and forecasts, all of which need to be timely, accurate and reliable. Cause and effect models of the Earth's ionosphere are discussed in terms of the spatial and temporal dimensions of background variability, storms, gradients, irregularities, and waves in both current and long-term research activities. Starting from dynamic processes on the Sun, in the interplanetary medium, and in the Earth's magnetosphere, ionosphere, and atmosphere, the text focuses on the dominant features of the plasma medium under normal and extreme conditions over the European zone during the last few Solar Cycles. One of the book's most unique features is a series of fundamental examples that offer profound insights into ionospheric climate and weather. Various approaches for acquiring and disseminating the necessary data and forecasting analyses are discussed, and interesting analogies are observed between terrestrial and space weather - both of which could produce lasting social consequences, with not only academic but also concrete economic implications. The book's primary goal is to foster the development of ionospheric space weather products and services that are capable of satisfying the ever-growing demand for space-based technology, and are ready for the society of the not-so-distant future.

Ionospheric Electron Concentration Measurements at the Magnetic Equator, 1964-1966

Pre-Earthquake signals are advanced warnings of a larger seismic event. A better understanding of these processes can help to predict the characteristics of the subsequent mainshock. Pre-Earthquake Processes: A Multidisciplinary Approach to Earthquake Prediction Studies presents the latest research on earthquake forecasting and prediction based on observations and physical modeling in China, Greece, Italy, France, Japan, Russia, Taiwan, and the United States. Volume highlights include: Describes the earthquake processes and the observed physical signals that precede them Explores the relationship between pre-earthquake activity and the characteristics of subsequent seismic events Encompasses physical, atmospheric, geochemical, and historical characteristics of pre-earthquakes

Illustrates thermal infrared, seismo–ionospheric, and other satellite and ground-based pre-earthquake anomalies Applies these multidisciplinary data to earthquake forecasting and prediction Written for seismologists, geophysicists, geochemists, physical scientists, students and others, Pre-Earthquake Processes: A Multidisciplinary Approach to Earthquake Prediction Studies offers an essential resource for understanding the dynamics of pre-earthquake phenomena from an international and multidisciplinary perspective.

Solar-Terrestrial Relations and Physics of Earthquake Precursors

Turbulence due to vertical wind shear at the tropopause temperature inversion produces small-scale temperature irregularities which cause echoes on sensitive microwave radars and allow monitoring of the tropopause level and study of the progression of dynamic instability and turbulence generation in the clear atmosphere. For tropopause temperatures below about -45 to -50°C, the structure constant C2T, a characteristic measure of temperature variability within the inertial subrange, may be determined from radar reflectivity with an error less than 3 dB by neglecting water vapor contributions to refractive-index variability.

Ionospheric Space Weather

Earthquakes are some of the most dynamic features of the Earth. This multidisciplinary volume presents an overview of earthquake processes and properties including the physics of dynamic faulting, fault fabric and mechanics, physical and chemical properties of fault zones, dynamic rupture processes, and numerical modeling of fault zones during seismic rupture. This volume examines questions such as: • What are the dynamic processes recorded in fault gouge? • What can we learn about rupture dynamics from laboratory experiments? • How do on-fault and off-fault properties affect seismic ruptures? • How do fault zones evolve over time? Fault Zone Dynamic Processes: Evolution of Fault Properties During Seismic Rupture is a valuable resource for scientists, researchers and students from across the geosciences interested in the earthquakes processes.

Pre-Earthquake Processes

This open access book provides a comprehensive toolbox of analysis techniques for ionospheric multi-satellite missions. The immediate need for this volume was motivated by the ongoing ESA Swarm satellite mission, but the tools that are described are general and can be used for any future ionospheric multi-satellite mission with comparable instrumentation. In addition to researching the immediate plasma environment and its coupling to other regions, such a mission aims to study the Earth’s main magnetic field and its anomalies caused by core, mantle, or crustal sources. The parameters for carrying out this kind of work are examined in these chapters. Besides currents, electric fields, and plasma convection, these parameters include ionospheric conductance, Joule heating, neutral gas densities, and neutral winds.

Radar Monitoring of Turbulence at the Tropopause Level

Published by the American Geophysical Union as part of theGeophysical Monograph Series, Volume 201. Modeling the Ionosphere-Thermosphere System bringstogether for the first time a detailed description of the physicsof the IT system in conjunction with numerical techniques to solvethe complex system of equations that describe the system, as wellas issues of current interest. Volume highlights includediscussions of: Physics of the ionosphere and thermosphere IT system, and thenumerical methods to solve the basic equations of the ITsystem The physics and numerical methods to determine the globalelectrodynamics of the IT system The response of the IT system to forcings from below (i.e., thelower atmosphere) and from above (i.e., the magnetosphere) The physics and numerical methods to model ionosphericirregularities Data assimilation techniques, comparison of model results todata, climate variability studies, and applications to spaceweather Providing a clear description of the physics of this system inseveral tutorial-like articles, Modeling theIonosphere-Thermosphere System is of value to the upperatmosphere science community in general. Chapters describingdetails of the numerical methods used to solve the equations thatdescribe the IT system make the volume useful to both activeresearchers in the field and students.

Fault Zone Dynamic Processes

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.

FM/CW Radar Signals and Digital Processing

Meteorology. A comprehensive handbook on upper atmospheric processes and research principles is given. The emphasis is placed upon particle-particle and particle-field relationships which enter into the determination of the macroscopic dynamics of the upper atmosphere. Some fundamental theory and data are presented from which development of comparatively undeveloped topics is made. The topics discussed are: (1) the upper atmosphere, (2) the solar spectrum and cross-sections for photoionization and absorption, (3) reaction rates, (4) atomic transition probabilities, (5) molecular diffusion, (6) atmospheric turbulence, (7) solutions of the continuity equation, (8) energy loss processes of solar corpuscles, (9) generation of electromagnetic waves, (10) transmission of electromagnetic waves, (11) cosmic rays, (12) geomagnetism, and (13) plasma dynamics. Numerous tables and a set of appendices on geophysical constants, general physical relations, and units are listed.

Ionospheric Multi-Spacecraft Analysis Tools

The Hidden Link Between Earth’s Magnetic Field and Climate offers a new framework of understanding and interpretation for both well-known and less known relations between different geophysical and meteorological variables which can improve the quality of climate modeling. The book reviews the most current research on both current and paleo data to introduce a causal chain of interactions between the geomagnetic field, energetic particles which bombard the Earth’s atmosphere, ozone and humidity near the tropopause, and surface temperature. The impacts of these complicated interactions is not uniformly distributed over the globe, thus contributing to our understanding of regional differences in climatic changes and the asymmetrical ozone distribution over the globe. Covers the newly discovered autocatalytic cycle for ozone production in the lower stratosphere, providing a better understanding of the heterogeneous distribution of ozone globally Outlines a mechanism for the lower stratospheric ozone influence on the temperature and humidity of the upper troposphere Provides a single resource on research in energetic particles’ modulation by heterogeneous geomagnetic fields, mechanisms of the influence of particles on the atmospheric ozone, and the influence of ozone on climate

Geospace Observation of Natural Hazards

Published by the American Geophysical Union as part of the Geophysical Monograph Series, Volume 181. Filling the need for a 20-year lag in substantial consideration of the midlatitude ionosphere, this volume focuses on work that takes advantage of GPS and UV imaging from satellites over the past decade, two methods that have profoundly transformed our understanding of this stratum of the atmosphere. Its interdisciplinary content brings together researchers of the solar wind, magnetosphere, ionosphere, thermosphere, polar and equatorial ionospheres, and space weather. Modeling and assimilative imaging of the ionosphere and thermosphere show for the first time the complex and global impact of midlatitude ionospheric storms. The editors invited the leading experts in the following areas to contribute the chapters herein: Characterization of Midlatitude Storms Electric Field Coupling From the Heliosphere and Inner Magnetosphere Thermospheric Control of the Midlatitude Ionosphere Ionospheric Irregularities Experimental Methods and New Techniques These themes were chosen to create a path for understanding the midlatitude ionosphere. They continue to be largely valid and represent a coherent division of the subject matter. They will be critical for understanding space weather during the upcoming solar maximum. This book was inspired by the Chapman Conference of the same name held January 2007.

Modeling the Ionosphere-Thermosphere

A Complete Reference for the 21st Century Until recently, much of the communications technology in the former Eastern bloc countries was largely unknown. Due to the historically competitive nature of East/West relations, scientific groups operated independently, without the benefit of open communication on theoretical frameworks and experimental technologies. As these countries have begun to bridge the gap and work in a more cooperative environment, the need has grown for a comprehensive guide which assimilates all the information in this vast knowledge bank. Ionosphere and Applied Aspects of Radio Communication and Radar meets the demand for an updated reference on this continually evolving global technology. This book examines the changes that have occurred in the past two or three decades. It thoroughly reviews ionospheric radio propagation, over-horizon and above-horizon radars, and miniature ionospheric stations used for investigating nonregular phenomena occurring in the ionosphere. In addition, it also comprehensively discusses land-satellite and satellite-satellite communications. This volume also reviews an area that has been all but ignored in previous works: the effects of plasma irregularities on radio waves propagation through the inhomogeneous ionosphere. Here, a heavy focus is placed on the effects of these irregular phenomena. And due to the recent wireless revolution, more attention than ever has been aimed on improving the efficiency of land-satellite and satellite-satellite communication networks, which are fully addressed. Included are— Transport processes and photochemistry reactions occurring in the regular homogeneous ionosphere Nonlinear phenomena occurring in the irregular ionosphere Instabilities in the inhomogeneous disturbed ionosphere Various ambient natural and artificial sources and corresponding plasma irregularities Written by two leading scientists, this book will be an invaluable guide to anyone working in this ever-changing field.

The Earth's Ionosphere

From the interior of the Sun, to the upper atmosphere and near-space environment of Earth, and outward to a region far beyond Pluto where the Sun's influence wanes, advances during the past decade in space physics and solar physics-the disciplines NASA refers to as heliophysics-have yielded spectacular insights into the phenomena that affect our home in space. Solar and Space Physics, from the National Research Council's (NRC's) Committee for a Decadal Strategy in Solar and Space Physics, is the second NRC decadal survey in heliophysics. Building on the research accomplishments realized during the past decade, the report presents a program of basic and applied research for the period 2013-2022 that will improve scientific understanding of the mechanisms that drive the Sun's activity and the fundamental physical processes underlying near-Earth plasma dynamics, determine the physical interactions of Earth's atmospheric layers in the context of the connected Sun-Earth system, and enhance greatly the capability to provide realistic and specific forecasts of Earth's space environment that will better serve the needs of society. Although the recommended program is directed primarily at NASA and the National Science Foundation for action, the report also recommends actions by other federal agencies, especially the parts of the National Oceanic and Atmospheric Administration charged with the day-to-day (operational) forecast of space weather. In addition to the recommendations included in this summary, related recommendations are presented in this report.

Atmospheric Processes

A world-wide model of ionospheric irregularities giving rise to scintillations was developed by Fremouw and Rino of Stanford Research Institute. This model takes into consideration diurnal, seasonal, and solar variations. Also considered is the dependence on geomagnetic latitude, frequency, and the geometry between the transmitter and the receiver. This model was used to make computations appropriate for the GOES system, assuming the satellite to be parked on 100°W longitude. Calculations were made at 400 MHz for sunspot numbers 30, 100, and 200, coo responding to low, medium, and high solar activity; for solstice and equinoctial periods; and for several times of the day. The results are presented as contour maps of the earth as viewed from GOES. The results show that for low solar activity periods serious scintillations will occur only within about ± 10 degrees of the geomagnetic equator. During moderately active periods stations located in the vicinity of the auroral zones will also be affected. The worst case condition occurs for sunspot number 200, during the equinox, and at midnight , on the longitude of the geostationary satellite. In general, the mid-latitude regions are relatively free from scintillations. These results should be useful in determining the positioning and programming of the data readout of the numerous surface-based stations to be used in connection with the data collection and relay subsystem.

NASA Technical Memorandum

The Earth's Ionosphere: Plasma Physics and Electrodynamics emphasizes the study of plasma physics and electrodynamics of the ionosphere, including many aeronomical influences. The ionosphere is somewhat of a battleground between the earth's neutral atmosphere and the sun's fully ionized atmosphere, in which the earth is embedded. One of the challenges of ionosphere research is to know enough about these two vast fields of research to make sense out of ionospheric phenomena. This book provides insights into how these competing sources of mass, momentum, and energy compete for control of the ionosphere. Some of the topics discussed include the fundamentals of ionospheric plasma dynamics; equatorial plasma instabilities; high-latitude electrodynamics; and instabilities and structure in the high-latitude ionosphere. Throughout this text only the region above 90 km are discussed, ignoring the D region entirely. This publication is a good source of information for students and individuals conducting research on earth’s ionosphere.

The Anchorage, Alaska, Real-time Auroral Radar Monitor

This volume of proceedings is a collection of refereed papers resulting from the VI Hotine-Marussi Symposium on Theoretical and Computational Geodesy. The papers cover almost every topic of geodesy, including satellite gravity modeling, geodynamics, GPS data processing, statistical estimation and prediction theory, and geodetic inverse problem theory. In addition, particular attention is paid to topics of fundamental importance in the next one or two decades in Earth Science.

The Hidden Link Between Earth’s Magnetic Field and Climate

Thought provoking treatise that aims to answer questions about Earth’s environment based on research done through remote sensing techniques In Extraterrestrial Remote Sensing and Climate Change, the author addresses longstanding questions about a possible correlation between fluctuations in solar activity and changes in the Earth’s atmosphere and geosphere that have been observed during periods of extraterrestrial changes such as solar eclipses or solar storms. The author goes on to suggest possible mechanisms for anomalies seen in climate change and other environmental effects through a deep examination of interdisciplinary research. Core topics covered in the work include: Data from ground- based detectors and from the Solar and Heliospheric Observatory (SOHO) satellite, which monitor solar activity Key variables associated with sunspot eruption, such as Electron flux, Proton flux, X-ray flux, and Planetary indices Observable changes in other planets and their moons, as well as in cosmic radiation from beyond the sun Extraterrestrial effects on the Earth’s magnetic field and on seismic activity With its fresh and multidisciplinary approach, Extraterrestrial Remote Sensing and Climate Change is a thought-provoking treatise for students, researchers, and professionals in the fields of environmental science and climate science.

Midlatitude Ionospheric Dynamics and Disturbances

Using isotopes as a tool for understanding Earth processes From establishing the absolute age of the Earth to providing a stronger understanding of the nexus between geology and life, the careful

measurement and quantitative interpretation of minor variations in the isotopic composition of Earth's materials has provided profound insight into the origins and workings of our planet. Isotopic Constraints on Earth System Processes presents examples of the application of numerous different isotope systems to address a wide range of topical problems in Earth system science. Volume highlights include: examination of the natural fractionation of non-traditional stable isotopes utilizing isotopes to understand the origin of magmas and evolution of volcanic systems application of isotopes to interrogate and understand Earth's Carbon and Oxygen cycles examination of the geochemical and hydrologic processes that lead to isotopic fractionation application of isotopic reactive transport models to decipher hydrologic and biogeochemical processes The American Geophysical Union promotes discovery in Earth and space science for the benefit of humanity. Its publications disseminate scientific knowledge and provide resources for researchers, students, and professionals.

Magnetic Apex Coordinates

This book is the result of collaboration within the frames of the 5th International Conference "Trigger Effects in Geosystems" held in the Institute of Geosphere Dynamics of Russian Academy of Sciences, June 2019. This book aims to raise awareness about different triggering aspects in the geosphere and its effects.The conference provided a multidisciplinary platform with a focus on (i) the influence of natural and anthropogenic factors on the geosphere, geomechanical systems and anthropogenic objects found in a subcritical state and (ii) the influence of these factors on the system "atmosphere - ionosphere". The problems considered in the book may be interesting for a wide audience including students, professionals, researches, and for the industry.

Air Force Research Resumés

Over a half century of exploration of the Earth's space environment, it has become evident that the interaction between the ionosphere and the magnetosphere plays a dominant role in the evolution and dynamics of magnetospheric plasmas and fields. Interestingly, it was recently discovered that this same interaction is of fundamental importance at other planets and moons throughout the solar system. Based on papers presented at an interdisciplinary AGU Chapman Conference at Yosemite National Park in February 2014, this volume provides an intellectual and visual journey through our exploration and discovery of the paradigm-changing role that the ionosphere plays in determining the filling and dynamics of Earth and planetary environments. The 2014 Chapman conference marks the 40th anniversary of the initial magnetosphere-ionosphere coupling conference at Yosemite in 1974, and thus gives a four decade perspective of the progress of space science research in understanding these fundamental coupling processes. Digital video links to an online archive containing both the 1974 and 2014 meetings are presented throughout this volume for use as an historical resource by the international heliophysics and planetary science communities. Topics covered in this volume include: Ionosphere as a source of magnetospheric plasma Effects of the low energy ionospheric plasma on the stability and creation of the more energetic plasmas The unified global modeling of the ionosphere and magnetosphere at the Earth and other planets New knowledge of these coupled interactions for heliophysicists and planetary scientists, with a cross-disciplinary approach involving advanced measurement and modeling techniques Magnetosphere-Ionosphere Coupling in the Solar System is a valuable resource for researchers in the fields of space and planetary science, atmospheric science, space physics, astronomy, and geophysics. Read an interview with the editors to find out more: https://eos.org/editors-vox/filling-earths-space-environment-from-the-sun-or-the-earth

Ionosphere and Applied Aspects of Radio Communication and Radar

This monograph is the outcome of an American Geophysical Union Chapman Conference on longitude and hemispheric dependence of ionospheric space weather, including the impact of waves propagating from the lower atmosphere. The Chapman Conference was held in Africa as a means of focusing attention on an extensive geographic region where observations are critically needed to address some of the fundamental questions of the physical processes driving the ionosphere locally and globally. The compilation of papers from the conference describes the physics of this system and the mechanisms that control ionospheric space weather in a combination of tutorial-like and focused articles that will be of value to the upper atmosphere scientific community in general and to ongoing global magnetosphere-ionosphere-thermosphere (MIT) modeling efforts in particular. A number of articles from each science theme describe details of the physics behind each phenomenon that help to solve the complexity of the MIT system. Because this volume is an outcome of the research presented

at this first space science Chapman Conference held in Africa, it has further provided an opportunity for African scientists to communicate their research results with the international community. In addition, the meeting and this conference volume will greatly enhance the space science education and research interest in the African continent and around the world. Ionospheric Space Weather includes articles from six science themes that were discussed at the Chapman Conference in 2012. These include: Hemispherical dependence of magnetospheric energy injection and the thermosphere-ionosphere response Longitude and hemispheric dependence of storm-enhanced densities (SED) Response of the thermosphere and ionosphere to variability in solar radiation Longitude spatial structure in total electron content and electrodynamics Temporal response to lower-atmosphere disturbances Ionospheric irregularities and scintillation Ionospheric Space Weather: Longitude Dependence and Lower Atmosphere Forcing will be useful to both active researchers and advanced graduate students in the field of physics, geophysics, and engineering, especially those who are keen to acquire a global understanding of ionospheric phenomena, including observational information from all longitude sectors across the globe.

Solar and Space Physics

Ionospheric Scintillation Predictions for GOES