

Earth Observation For Water Resources Management Current Use And Future Opportunities For The Water Sector

A volume in the three-volume Remote Sensing Handbook series, Land Resources Monitoring, Modeling, and Mapping with Remote Sensing documents the scientific and methodological advances that have taken place during the last 50 years. The other two volumes in the series are Remotely Sensed Data Characterization, Classification, and Accuracies, and Remo

Earth science is evolving into Earth system science, changing from a discipline-specific premise to an interdisciplinary endeavor. Increased awareness of human dependence and impact upon the environment has made global change research one of the most pressing policy issues facing decision makers today.

This book presents an overview of past, present, and future satellite missions and programs and their sensor complements. An effort has been made to show to some extent the scale and nature of existing national and international activities and operations in this context.

Text and illustrations are intended as a guide and roadmap to everyone interested in the wide field of Earth observation. In particular, the book may serve as a reference, or give reasonable inputs, on the following subjects: Programmatic planning on all levels, planning for the required infrastructure, existing and planned operational service provision, data utilization and

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Earth Observation for Flood Applications: Progress and Perspectives describes the latest scientific advances in Earth Observation. With recent floods around the world becoming ever more devastating, there is a need for better science enabling more effective solutions at a fast pace. This book aims at stretching from the current flood mapping to diverse real data so as to estimate the flood risk and damage. Earth Observation for Flood Applications: Progress and Perspectives includes three parts containing each a separate but complementary topic area under floods. Each chapter unfolds various applications, case studies, and illustrative graphics. In terms of flood mapping and monitoring, the usage of multi-sensor satellite data, web-services information, microwave remote sensing methods are discussed in depth. So, this book is a valuable resource for scientists, researchers, and students in the area of earth observation. Focuses in on one specific application field of Earth Observation Brings the latest scientific advances and perspectives from experts around the world Includes extensive figures, tables, and case studies to illustrate real-life applications

Water has always been a source of risks and opportunities in the Middle East and North Africa. Yet rapidly changing socioeconomic, political, and environmental conditions make water security a different, and more urgent, challenge than ever before. This report shows that achieving water security means much more than coping with water scarcity. It means managing water resources in a sustainable, efficient, and equitable

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way. It also involves delivering water services reliably and affordably, to reinforce relationships between service providers and water users and contribute to a renewed social contract. Water security also entails mitigating water-related risks such as floods and droughts. Water security is an urgent target, but it is also a target within reach. A host of potential solutions to the region's water management challenges exist. To make these solutions work, clear incentives are needed to change the way water is managed, conserved, and allocated. To make these solutions work, countries in the region will also need to better engage water users, civil society, and youth. The failure of policies to address water challenges can have severe impacts on people's well-being and political stability. The strategic question for the region is whether countries will act with foresight and resolve to strengthen water security, or whether they will wait to react to the inevitable disruptions of water crises.

A comprehensive guide to managing and mitigating natural disasters Recent years have seen a surge in the number, frequency, and severity of natural disasters, with further increases expected as the climate continues to change. However, advanced computational and geospatial technologies have enabled the development of sophisticated early warning systems and techniques to predict, manage, and mitigate disasters. Techniques for Disaster Risk Management and Mitigation explores different approaches to forecasting disasters and provides guidance on mitigation and adaptation strategies. Volume highlights include: Review of current and emerging technologies for disaster prediction

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Different approaches to risk management and mitigation
Strategies for implementing disaster plans and infrastructure improvements
Guidance on integrating artificial intelligence with GIS and earth observation data
Examination of the regional and global impacts of disasters under climate variability

This open access book is a consolidation of lessons learnt and experiences gathered from our efforts to utilise Earth observation (EO) science and applications to address environmental challenges in the Hindu Kush Himalayan region. It includes a complete package of knowledge on service life cycles including multi-disciplinary topics and practically tested applications for the HKH. It comprises 19 chapters drawing from a decade's worth of experience gleaned over the course of our implementation of SERVIR-HKH – a joint initiative of NASA, USAID, and ICIMOD – to build capacity on using EO and geospatial technology for effective decision making in the region. The book highlights SERVIR's approaches to the design and delivery of information services – in agriculture and food security; land cover and land use change, and ecosystems; water resources and hydro-climatic disasters; and weather and climate services. It also touches upon multidisciplinary topics such as service planning; gender integration; user engagement; capacity building; communication; and monitoring, evaluation, and learning. We hope that this book will be a good reference document for professionals and practitioners working in remote sensing, geographic information systems, regional and spatial sciences, climate change, ecosystems, and

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environmental analysis. Furthermore, we are hopeful that policymakers, academics, and other informed audiences working in sustainable development and evaluation – beyond the wider SERVIR network and well as within it – will greatly benefit from what we share here on our applications, case studies, and documentation across cross-cutting topics.

Published by the American Geophysical Union as part of the Water Resources Monograph Series, Volume 11.

This monograph compiles research findings on soil mass movement into a format usable by practitioners and students. Applications are stressed in the areas of extensive and management practices rather than engineering earthworks. Examples are included to illustrate various prediction, avoidance, and control measures used in managing unstable terrain. We use the term soil (i.e., soil mass movement) to mean the mantle of unconsolidated or poorly consolidated material of either residual or transported origin, that overlies bedrock and forms the surface of the land. This usage is consistent with the conventional civil engineering use of the word and is synonymous with the geological term regolith and with soil mantle.

Natural and human-induced changes in Earth's interior, land surface, biosphere, atmosphere, and oceans affect all aspects of life. Understanding these changes requires a range of observations acquired from land-, sea-, air-, and space-based platforms. To assist NASA, NOAA, and USGS in developing these tools, the NRC was asked to carry out a "decadal strategy" survey of Earth science and applications from space that would develop the key

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scientific questions on which to focus Earth and environmental observations in the period 2005-2015 and beyond, and present a prioritized list of space programs, missions, and supporting activities to address these questions. This report presents a vision for the Earth science program; an analysis of the existing Earth Observing System and recommendations to help restore its capabilities; an assessment of and recommendations for new observations and missions for the next decade; an examination of and recommendations for effective application of those observations; and an analysis of how best to sustain that observation and applications system. Earth Observation Science (EOS) is the study of the global Earth land-ocean-atmosphere system through observations. The principal tools for such studies are measurements from space since these provide the coverage of the planet that is necessary to capture the behaviour of the entire coupled system. In addition, surface observations, and measurements from aircraft, balloons and sounding rockets provide valuable contributors to what are now termed "integrated, global observing systems." Coupled with models, the EOS measurement suites provide powerful tools for research into the factors controlling and changing the Earth system in which we live. The objectives of this book are to describe new methods and applications of satellite technology in the fields of land and emergency monitoring. It draws on new research outcomes from the European FP7 project GIONET (European Centre of Excellence in Earth

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Observation Research Training). GIONET combines industrial partners with universities and research institutes, and this book provides a perspective on Earth Observation applications that is motivated by the cross-fertilisation of both sectors. Hence, this book will find readers in both industry and academia. This book highlights a broad range of innovative uses of Earth Observation technology to support environmental management, decision making, crisis management and climate policies. It uses advanced concepts of multi-sensor image integration, multi-temporal analysis and synergies between data and models. This is a truly interdisciplinary subject that encompasses a range of applications in various fields which are discussed in detail throughout the text. If you are interested in remote sensing applications and looking for inspiration, this is the book for you.

The wide range of challenges in studying Earth system dynamics due to uncertainties in climate change and complex interference from human activities is creating difficulties in managing land and water resources and ensuring their sustainable use. Mapping, Monitoring, and Modeling Land and Water Resources brings together real-world case studies accurately surveyed and assessed through spatial modeling. The book focuses on the effectiveness of combining remote sensing, geographic information systems, and R. The use of open source software for

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different spatial modeling cases in various fields, along with the use of remote sensing and geographic information systems, will aid researchers, students, and practitioners to understand better the phenomena and the predictions by future analyses for problem-solving and decision-making.

This book provides a unique insight into the research and recent developments undertaken among the African Remote Sensing community in regard to the environment. It includes reports of the latest research outcomes in the field of remote sensing and geospatial information technologies, analyses discussions around operational topics such as capacity building, Spatial Data Infrastructure (SDI), applications of advanced remote sensing technologies (LiDAR , Hyperspectral) in Africa, big data, space policy, and topics of high actually in the field of climate changes, ocean and coastal zone management, early warning systems, natural resources management or geospatial science for sustainable development goals. The book comprises the contributions of the AARSE (African Association of Remote Sensing of the Environment) international conference which is conducted biennially across Africa, alternately with the AfricaGIS conference. It is the premier forum in Africa for research on remote sensing technologies and geospatial information science, gathering leading scholars from the remote sensing and related communities. The conference is

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co-organised by the Arab Academy of Science and Technology, in partnership with the National Authority for Remote Sensing & Space Sciences (NARSS) of Egypt, and continues a long series of successful AARSE conferences which started in 1996, in Harare (Zimbabwe) and has been held in Abidjan (Cote D'Ivoire) in 1998, Cape Town (South Africa) in 2000, Abuja (Nigeria) in 2002, Nairobi (Kenya) in 2004, Cairo (Egypt) in 2006, Accra (Ghana) in 2008, Addis Abeba (Ethiopia) in 2010, El Jadida (Morocco) in 2012, Johannesburg (South Africa) in 2014, and in Kampala (Ouganda) in 2016. The book is mainly addressed to practitioners and experts from academia, politics and industry. Water systems are building blocks for poverty alleviation, shared growth, sustainable development, and green growth strategies. They require data from in-situ observation networks. Budgetary and other constraints have taken a toll on their operation and there are many regions in the world where the data are scarce or unreliable. Increasingly, remote sensing satellite-based earth observation is becoming an alternative. This book briefly describes some key global water challenges, perspectives for remote sensing approaches, and their importance for water resources-related activities. It describes eight key types of water resources management variables, a list of sensors that can produce such information, and a description of existing data products with

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examples. Earth Observation for Water Resources Management provides a series of practical guidelines that can be used by project leaders to decide whether remote sensing may be useful for the problem at hand and suitable data sources to consider if so. The book concludes with a review of the literature on reliability statistics of remote-sensed estimations.

An examination of environmental satellite data sharing policies, offering a model of data-sharing policy development, case and practical recommendations for increasing global data sharing. Key to understanding and addressing climate change is continuous and precise monitoring of environmental conditions. Satellites play an important role in collecting climate data, offering comprehensive global coverage that can't be matched by in situ observation. And yet, as Mariel Borowitz shows in this book, much satellite data is not freely available but restricted; this remains true despite the data-sharing advocacy of international organizations and a global open data movement. Borowitz examines policies governing the sharing of environmental satellite data, offering a model of data-sharing policy development and applying it in case studies from the United States, Europe, and Japan—countries responsible for nearly half of the unclassified government Earth observation satellites. Borowitz develops a model that centers on the

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government agency as the primary actor while taking into account the roles of such outside actors as other government officials and non-governmental actors, as well as the economic, security, and normative attributes of the data itself. The case studies include the U.S. National Aeronautics and Space Administration (NASA) and the U.S. National Oceanographic and Atmospheric Association (NOAA), and the United States Geological Survey (USGS); the European Space Agency (ESA) and the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT); and the Japanese Aerospace Exploration Agency (JAXA) and the Japanese Meteorological Agency (JMA). Finally, she considers the policy implications of her findings for the future and provides recommendations on how to increase global sharing of satellite data.

Cities and towns are the original producers of many of the global environmental problems related to waste disposal, and air and water pollution. There is a rapidly growing need for technologies that will enable monitoring of the world's natural resources and urban assets, and managing exposure to natural and man-made risks. The Group on Earth Observation (GEO) calls for strengthening the cooperation and coordination among global observing systems and research programs. Global Urban Monitoring and Assessment through Earth

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Observation introduces this important international collaborative effort, reviews the current state of global urban remote sensing, and expands on future directions in the field. The book reviews the current state of global urban monitoring, assessment, modeling, and prediction through Earth observation and related technologies. It then introduces GEO's important international collaborative effort—Global Urban Observation and Information Task—and the current state of global urban remote sensing and future directions. It explores groundbreaking work in urban remote sensing and examines how it could contribute to the development of innovative concepts and techniques for sustainable urban development. Despite significant progress in recent years, there remain substantial gaps in ongoing national, regional, and global efforts to address environmental challenges. Edited by a well-known expert in the field of remote sensing, GIS, and other geospatial technologies, this book addresses the gaps in an effective and long-term manner, highlighting the importance of increased coordination and networking among major stakeholders and of working together with other key international mechanisms. Drawing on the expertise of pioneers in the field from across the globe, the book details emerging research in the theory, methods, and techniques of urban remote sensing that provide insight into how to solve the major issues of sustainable development—one of the

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most important issues facing society in the future.

Hyperspectral Remote Sensing: Theory and Applications offers the latest information on the techniques, advances and wide-ranging applications of hyperspectral remote sensing, such as forestry, agriculture, water resources, soil and geology, among others. The book also presents hyperspectral data integration with other sources, such as LiDAR, Multi-spectral data, and other remote sensing techniques. Researchers who use this resource will be able to understand and implement the technology and data in their respective fields. As such, it is a valuable reference for researchers and data analysts in remote sensing and Earth Observation fields and those in ecology, agriculture, hydrology and geology. Includes the theory of hyperspectral remote sensing, along with techniques and applications across a variety of disciplines Presents the processing, methods and techniques utilized for hyperspectral remote sensing and in-situ data collection Provides an overview of the state-of-the-art, including algorithms, techniques and case studies

We live on a dynamic Earth shaped by both natural processes and the impacts of humans on their environment. It is in our collective interest to observe and understand our planet, and to predict future behavior to the extent possible, in order to effectively manage resources, successfully respond to threats from natural and human-induced environmental

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change, and capitalize on the opportunities " social, economic, security, and more " that such knowledge can bring. By continuously monitoring and exploring Earth, developing a deep understanding of its evolving behavior, and characterizing the processes that shape and reshape the environment in which we live, we not only advance knowledge and basic discovery about our planet, but we further develop the foundation upon which benefits to society are built. Thriving on Our Changing Planet presents prioritized science, applications, and observations, along with related strategic and programmatic guidance, to support the U.S. civil space Earth observation program over the coming decade.

This book presents relevant and contemporary research on the remote sensing of landscapes, agriculture & forestry, geomorphology, coasts & oceans, natural hazards and wild habitats. It highlights the application of remote sensing in understanding natural processes and oceanic features, as well as in creating mapping inventories of water resources across different spatial and temporal scales. Recent advances in hyperspectral imaging and high spatial resolution offer promising techniques for exploring various aspects related to the fruitful and cost-effective monitoring of large-scale environments. In the field of forestry and agriculture, the book addresses topics such as terrain analysis, forest management, updating current forest inventories, and vegetation cover type discrimination. It also elaborates

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delineation of various geo-morphological features of the earth's surface and natural disasters, and includes a special section on the remote sensing of wild habitats. Readers working in interdisciplinary sectors engaged in remote-sensing-based research benefit from the techniques presented.

This book advances the scientific understanding, development, and application of geospatial technologies related to water resource management. It presents recent developments and applications specifically by utilizing new earth observation datasets such as TRMM/GPM, AMSR E/2, SMOS, SMAP and GCOM in combination with GIS, artificial intelligence, and hybrid techniques. By linking geospatial techniques with new satellite missions for earth and environmental science, the book promotes the synergistic and multidisciplinary activities of scientists and users working in the field of hydrological sciences.

This book is a printed edition of the Special Issue "Earth Observation for Water Resource Management in Africa" that was published in Remote Sensing

We live on a dynamic Earth shaped by both natural processes and the impacts of humans on their environment. It is in our collective interest to observe and understand our planet, and to predict future behavior to the extent possible, in order to effectively manage resources, successfully respond to threats from natural and human-induced environmental change, and capitalize on the opportunities " social, economic, security, and more " that such knowledge can bring. By continuously monitoring and exploring Earth,

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developing a deep understanding of its evolving behavior, and characterizing the processes that shape and reshape the environment in which we live, we not only advance knowledge and basic discovery about our planet, but we further develop the foundation upon which benefits to society are built. Thriving on Our Changing Planet: A Decadal Strategy for Earth Observation from Space (National Academies Press, 2018) provides detailed guidance on how relevant federal agencies can ensure that the United States receives the maximum benefit from its investments in Earth observations from space, while operating within realistic cost constraints. This short booklet, designed to be accessible to the general public, provides a summary of the key ideas and recommendations from the full decadal survey report. Remote Sensing of the Terrestrial Water Cycle is an outcome of the AGU Chapman Conference held in February 2012. This is a comprehensive volume that examines the use of available remote sensing satellite data as well as data from future missions that can be used to expand our knowledge in quantifying the spatial and temporal variations in the terrestrial water cycle. Volume highlights include: - An in-depth discussion of the global water cycle - Approaches to various problems in climate, weather, hydrology, and agriculture - Applications of satellite remote sensing in measuring precipitation, surface water, snow, soil moisture, groundwater, modeling, and data assimilation - A description of the use of satellite data for accurately estimating and monitoring the components of the hydrological cycle - Discussion of the

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measurement of multiple geophysical variables and properties over different landscapes on a temporal and aregional scale Remote Sensing of the Terrestrial Water Cycle is a valuable resource for students and research professionals in the hydrology, ecology, atmospheric sciences, geography, and geological sciences communities.

This open access book offers a summary of the development of Digital Earth over the past twenty years. By reviewing the initial vision of Digital Earth, the evolution of that vision, the relevant key technologies, and the role of Digital Earth in helping people respond to global challenges, this publication reveals how and why Digital Earth is becoming vital for acquiring, processing, analysing and mining the rapidly growing volume of global data sets about the Earth. The main aspects of Digital Earth covered here include: Digital Earth platforms, remote sensing and navigation satellites, processing and visualizing geospatial information, geospatial information infrastructures, big data and cloud computing, transformation and zooming, artificial intelligence, Internet of Things, and social media. Moreover, the book covers in detail the multi-layered/multi-faceted roles of Digital Earth in response to sustainable development goals, climate changes, and mitigating disasters, the applications of Digital Earth (such as digital city and digital heritage), the citizen science in support of Digital Earth, the economic value of Digital Earth, and so on. This book also reviews the regional and national development of Digital Earth around the world, and discusses the role and effect of

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education and ethics. Lastly, it concludes with a summary of the challenges and forecasts the future trends of Digital Earth. By sharing case studies and a broad range of general and scientific insights into the science and technology of Digital Earth, this book offers an essential introduction for an ever-growing international audience.

This book contains papers on the state-of-the-art of the application of satellite observations in the fields of irrigation, water management, and vegetation monitoring. The role of remote sensing from space and its usefulness in the analysis of important processes related to the hydrological cycle are presented with reference to real-world applications and ready-to-transfer operability. Satellite Earth observation (EO) data have already exceeded the petabyte scale and are increasingly freely and openly available from different data providers. This poses a number of issues in terms of volume (e.g., data volumes have increased 10x in the last 5 years); velocity (e.g., Sentinel-2 is capturing a new image of any given place every 5 days); and variety (e.g., different types of sensors, spatial/spectral resolutions). Traditional approaches to the acquisition, management, distribution, and analysis of EO data have limitations (e.g., data size, heterogeneity, and complexity) that impede their true information potential to be realized. Addressing these big data challenges requires a change of paradigm and a move away from local processing and data distribution methods to lower the barriers caused by data size and related complications in data management. To tackle these issues, EO data cubes (EODC) are a new

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paradigm revolutionizing the way users can store, organize, manage, and analyze EO data. This Special Issue is consequently aiming to cover the most recent advances in EODC developments and implementations to broaden the use of EO data to larger communities of users, support decision-makers with timely and actionable information converted into meaningful geophysical variables, and ultimately unlock the information power of EO data.

Contains ten state-of-the-art review articles on selected topics in hydraulics/fluid mechanics and water resources engineering.

In the Mediterranean islands, limited water supplies combined with highly developed tourism and irrigation agriculture lead to extreme pressures on water resources. ISLA project has produced an application to support water managers in their decision-making activities, providing them with specific and up to date information obtained from Earth Observation data. Resulting of this project, water managers will be able to address their most typical and urgent problems in land and water management; to plan viable solutions for water use reduction; to know how much water is potentially available; to exploit alternative sources of water; and to have an overview of the total water supply. ISLA project is geographically focused on the islands of Mallorca (Spain) and Crete (Greece), and the target users of ISLA system are river basin organisms, regional authorities, local development agencies and hydroelectric companies.

This book is published open access under a CC BY 4.0 license. Over the past decades, rapid developments in digital and sensing technologies, such as the Cloud, Web and Internet of Things, have dramatically changed the way we live and work. The digital transformation is revolutionizing our

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ability to monitor our planet and transforming the way we access, process and exploit Earth Observation data from satellites. This book reviews these megatrends and their implications for the Earth Observation community as well as the wider data economy. It provides insight into new paradigms of Open Science and Innovation applied to space data, which are characterized by openness, access to large volume of complex data, wide availability of new community tools, new techniques for big data analytics such as Artificial Intelligence, unprecedented level of computing power, and new types of collaboration among researchers, innovators, entrepreneurs and citizen scientists. In addition, this book aims to provide readers with some reflections on the future of Earth Observation, highlighting through a series of use cases not just the new opportunities created by the New Space revolution, but also the new challenges that must be addressed in order to make the most of the large volume of complex and diverse data delivered by the new generation of satellites.

Water Resources in the Mediterranean Region summarizes and collates scientific developments around water resources in the Mediterranean socio-economic environment through a multidisciplinary framework synthesizing hydrology, hydrogeology, climate, bioclimatology, economics, and geography. As such, it provides essential information for any reader looking to learn more about the Mediterranean which is experiencing the impact of climate change and concurrent complex issues of anthropogenic effects, especially in agriculture and other resource uses. Water Resources in the Mediterranean Region covers different challenges in the issue of the evolution of water resources in the Mediterranean. It is intended for PhD students, research scientists, and managers interested in new solutions and approaches for water management and in the forecast of future water dynamics.

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Offers multidisciplinary content providing global visions of the challenges faced in the Mediterranean region Presents fundamental and operational studies, providing the reader with information on how to implement these actions and results themselves Written in a pedagogical manner, allowing for ease of reading for both researchers and water managers Learn basic Python programming to create functional and effective visualizations from earth observation satellite data sets Thousands of satellite datasets are freely available online, but scientists need the right tools to efficiently analyze data and share results. Python has easy-to-learn syntax and thousands of libraries to perform common Earth science programming tasks. Earth Observation Using Python: A Practical Programming Guide presents an example-driven collection of basic methods, applications, and visualizations to process satellite data sets for Earth science research. Gain Python fluency using real data and case studies Read and write common scientific data formats, like netCDF, HDF, and GRIB2 Create 3-dimensional maps of dust, fire, vegetation indices and more Learn to adjust satellite imagery resolution, apply quality control, and handle big files Develop useful workflows and learn to share code using version control Acquire skills using online interactive code available for all examples in the book 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. Find out more about this book from this Q&A with the Author

The result of a workshop bringing together an international advisory board of experts in science, satellite technologies, industry innovations, and public policy, this book addresses the current and future roles of satellite Earth observations in solving large-scale environmental problems. The book

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showcases the results of engaging distinct communities to enhance our ability to identify emerging problems and to administer international regimes created to solve them. It also reviews the work of the Policy and Earth Observation Innovation Cycle (PEOIC) project, an effort aimed at assessing the impact of satellite observations on environmental policy and to propose a mission going forward that would launch an “innovation cycle”. The achievements of such a mission would feed back to innovations in next-generation observation technology, thus contributing to global policy demand for policy-relevant information. This book is open access under a CC BY license.

A balanced review of differing approaches based on remote sensing tools and methods to assess and monitor biodiversity, carbon and water cycles, and the energy balance of terrestrial ecosystem. Earth Observation of Ecosystem Services highlights the advantages Earth observation technologies offer for quantifying and monitoring multiple ecosystem functions and services. It provides a multidisciplinary reference that expressly covers the use of remote sensing for quantifying and monitoring multiple ecosystem services. Rather than exhaustively cover all possible ecosystem services, this book takes a global look at the most relevant remote sensing approaches to estimate key ecosystem services from satellite data. Structured in four main sections, it covers carbon cycle, biodiversity, water cycle, and energy balance. Each section contains a review of conceptual and empirical methods, techniques, and case studies linking remotely sensed data to the biophysical variables and ecosystem functions associated with key ecosystem services. The book identifies relevant issues and challenges of assessment, presents cutting-edge sensing techniques, uses globally implemented tools to quantify ecosystem functions, and presents examples of successful

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monitoring programs. Covering recent developments undertaken on the global and national stage from Earth observation satellite data, it includes valuable lessons and recommendations and novel ways to improve current global monitoring systems. The book delineates the use of Earth observation data so that it can be used to quantify, map, value, and manage the valuable goods and services that ecosystems provide to societies around the world.

Recent advances in the modeling and remote sensing of droughts and floods Droughts and floods are causing increasing damage worldwide, often with devastating short- and long-term impacts on human society. Forecasting when they will occur, monitoring them as they develop, and learning from the past to improve disaster management is vital. *Global Drought and Flood: Observation, Modeling, and Prediction* presents recent advances in the modeling and remote sensing of droughts and floods. It also describes the techniques and products currently available and how they are being used in practice. Volume highlights include: Remote sensing approaches for mapping droughts and floods Physical and statistical models for monitoring and forecasting hydrologic hazards Features of various drought and flood systems and products Use by governments, humanitarian, and development stakeholders in recent disaster cases Improving the collaboration between hazard information provision and end users 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.

Global Change is increasingly considered a critical topic in environmental research. Remote sensing methods provide a useful tool to monitor global variables, since they provide a systematic coverage of the Earth's surface, at different

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spatial, spectral and temporal resolutions. This book offers an analysis of the leading missions in global Earth observation, and reviews the main fields in which remote sensing methods are providing vital data for global change studies.

In a rapidly changing world, there is an ever-increasing need to monitor the Earth's resources and manage it sustainably for future generations. Earth observation from satellites is critical to provide information required for informed and timely decision making in this regard. Satellite-based earth observation has advanced rapidly over the last 50 years, and there is a plethora of satellite sensors imaging the Earth at finer spatial and spectral resolutions as well as high temporal resolutions. The amount of data available for any single location on the Earth is now at the petabyte-scale. An ever-increasing capacity and computing power is needed to handle such large datasets. The Google Earth Engine (GEE) is a cloud-based computing platform that was established by Google to support such data processing. This facility allows for the storage, processing and analysis of spatial data using centralized high-power computing resources, allowing scientists, researchers, hobbyists and anyone else interested in such fields to mine this data and understand the changes occurring on the Earth's surface. This book presents research that applies the Google Earth Engine in mining, storing, retrieving and processing spatial data for a variety of applications that include vegetation monitoring, cropland mapping, ecosystem assessment, and gross primary productivity, among others. Datasets used range from coarse spatial resolution data, such as MODIS, to medium resolution datasets (Worldview -2), and the studies cover the entire globe at varying spatial and temporal scales.

Extreme Hydroclimatic Events and Multivariate Hazards in a Changing Environment: A Remote Sensing Approach reviews multivariate hazards in a non-stationary environment,

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covering both short and long-term predictions from earth observations, along with long-term climate dynamics and models. The book provides a detailed overview of remotely sensed observations, current and future satellite missions useful for hydrologic studies and water resources engineering, and a review of hydroclimatic hazards. Given these tools, readers can improve their abilities to monitor, model and predict these extremes with remote sensing. In addition, the book covers multivariate hazards, like landslides, in case studies that analyze the combination of natural hazards and their impact on the natural and built environment. Finally, it ties hydroclimatic hazards into the Sendai Framework, providing another set of tools for reducing disaster impacts. Emphasizes recent and future satellite missions to study, monitor and forecast hydroclimatic hazards Provides a complete overview and differentiation of remotely sensed products that are useful for monitoring extreme hydroclimatic and related events Covers real-life examples and applications of integrating remote sensing products to study complex multi-hydroclimatic hazards Earth Observation interacts with space, remote sensing, communication, and information technologies, and plays an increasingly significant role in Earth related scientific studies, resource management, homeland security, topographic mapping, and development of a healthy, sustainable environment and community. Geospatial Technology for Earth Observation provides an in-depth and broad collection of recent progress in Earth observation. Contributed by leading experts in this field, the book covers satellite, airborne and ground remote sensing systems and system integration, sensor orientation, remote sensing physics, image classification and analysis, information extraction, geospatial service, and various application topics, including cadastral mapping, land use change evaluation, water environment

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monitoring, flood mapping, and decision making support. Geospatial Technology for Earth Observation serves as a valuable training source for researchers, developers, and practitioners in geospatial science and technology industry. It is also suitable as a reference book for upper level college students and graduate students in geospatial technology, geosciences, resource management, and informatics. Accompanying CD-ROM ... "contains spreadsheets used in many of the example calculations, color versions of some of the illustrations, and movies illustrating the NAPL migration."-- p. vi.

Declining coastal, estuarine and inland water quality has become a global issue of significant concern as anthropogenic activities expand and climate change threatens to cause major alterations to the hydrological cycle. The measurement of water quality variables via radiometric measurements of the water's optical properties has grown rapidly over recent years. Improvements in algorithms and product development, sensor technology and maturity, and data accessibility and provision have led to demonstrated confidence in remotely-sensed data with potential applications to water resources management. Management agencies, however, have been slow to embrace satellite-derived measurements to date even though important parameters such as chlorophyll-a, c-phyco cyanin, suspended solids, coloured dissolved organic matter (CDOM), light attenuation, Secchi Disk transparency and turbidity have been quantified with required accuracies using remotely sensed data. An IOCCG working group was formed in 2014 to support the implementation of a global water quality monitoring service that contributes to the broader implementation of the Global Earth Observation System of Systems (GEOSS) under the auspices of the Group of Earth Observations (GEO). The goal of the working group was to

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provide a strategic plan that incorporates current and future Earth Observations (EO) information into national and international near-coastal and inland quality monitoring efforts. --

The combined observational power of the multiple earth observing satellites is currently not being harnessed holistically to produce more durable societal benefits. We are not able to take complete advantage of the prolific amount of scientific output and remote sensing data that are emerging rapidly from satellite missions and convert them quickly into decision-making products for users. The current application framework we have appears to be an analog one lacking the absorption bandwidth required to handle scientific research and the voluminous (petabyte-scale) satellite data. This book will tackle this question: "How do we change this course and take full advantage of satellite observational capability for a more sustainable, happier and safer future in the coming decades?"

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