

## Remote Sensing Of Impervious Surfaces In Tropical And Subtropical Areas Remote Sensing Applications Series

Sustainable management of natural resources is an urgent need, given the changing climatic conditions of Earth systems. The ability to monitor natural resources precisely and accurately is increasingly important. New and advanced remote sensing tools and techniques are continually being developed to monitor and manage natural resources in an effective way. Remote sensing technology uses electromagnetic sensors to record, measure and monitor even small variations in natural resources. The addition of new remote sensing datasets, processing techniques and software makes remote sensing an exact and cost-effective tool and technology for natural resource monitoring and management. *Advances in Remote Sensing for Natural Resources Monitoring* provides a detailed overview of the potential applications of advanced satellite data in natural resource monitoring. The book determines how environmental and - ecological knowledge and satellite-based information can be effectively combined to address a wide array of current natural resource management needs. Each chapter covers different aspects of remote sensing approach to monitor the natural resources effectively, to provide a platform for decision and policy. This important work: Provides comprehensive coverage of advances and applications of remote sensing in natural resources monitoring Includes new and emerging approaches for resource monitoring with case studies Covers different aspects of forest, water, soil- land resources, and agriculture Provides exemplary illustration of themes such as glaciers, surface runoff, ground water potential and soil moisture content with temporal analysis Covers blue carbon, seawater intrusion, playa wetlands, and wetland inundation with case studies Showcases disaster studies s

An authoritative guide to the essential techniques and most recent advances in urban remote sensing *Techniques and Methods in Urban Remote Sensing* offers a comprehensive guide to the recent theories, methods, techniques, and applications in urban remote sensing. Written by a noted expert on the subject, this book explores the requirements for mapping impervious surfaces and examines the issue of scale. The book covers a range of topics and includes illustrative examples of commonly used methods for estimating and mapping urban impervious surfaces, explains how to determine urban thermal landscape and surface energy balance, and offers information on impacts of urbanization on land surface temperature, water quality, and environmental health. *Techniques and Methods in Urban Remote Sensing* brings together in one volume the latest opportunities for combining ever-increasing computational power, more plentiful and capable data, and more advanced algorithms. This allows the technologies of remote sensing and GIS to become mature and to gain wider and better applications in environments, ecosystems, resources, geosciences, geography and urban studies. This important book: Contains a comprehensive resource to the latest developments in urban remote sensing Explains urban heat islands modeling and analysis Includes information on estimating urban surface energy fluxes Offers a guide to generating data on land surface temperature Written for professionals and students of

environmental, ecological, civic and urban studies, Techniques and Methods in Urban Remote Sensing meets the demand for an updated resource that addresses the recent advances urban remote sensing.

International Journal of Advanced Remote Sensing and GIS (IJARSG, ISSN 2320 – 0243) is an open-access peer-reviewed scholarly journal publishes original research papers, reviews, case study, case reports, and methodology articles in all aspects of Remote Sensing and GIS including associated fields. This Journal commits to working for quality and transparency in its publishing by following standard Publication Ethics and Policies.

This book provides a comprehensive overview of the state of the art in the field of thermal infrared remote sensing. Temperature is one of the most important physical environmental variables monitored by earth observing remote sensing systems. Temperature ranges define the boundaries of habitats on our planet. Thermal hazards endanger our resources and well-being. In this book renowned international experts have contributed chapters on currently available thermal sensors as well as innovative plans for future missions. Further chapters discuss the underlying physics and image processing techniques for analyzing thermal data. Ground-breaking chapters on applications present a wide variety of case studies leading to a deepened understanding of land and sea surface temperature dynamics, urban heat island effects, forest fires, volcanic eruption precursors, underground coal fires, geothermal systems, soil moisture variability, and temperature-based mineral discrimination. 'Thermal Infrared Remote Sensing: Sensors, Methods, Applications' is unique because of the large field it spans, the potentials it reveals, and the detail it provides. This book is an indispensable volume for scientists, lecturers, and decision makers interested in thermal infrared technology, methods, and applications.

With urbanization as a global phenomenon, there is a need for data and information about these terrains. Urban remote sensing techniques provide critical physical input and intelligence for preparing base maps, formulating planning proposals, and monitoring implementations. Likewise these methodologies help with understanding the biophysical properties, patterns, and process of urban landscapes, as well as mapping and monitoring urban land cover and spatial extent. Advanced sensor technologies and image processing methodologies such as deep learning, data mining, etc., facilitate the wide applications of remote sensing technology in urban areas. This book presents advanced image processing methods and algorithms focused on three very important roots of urban remote sensing: 3D urban modelling using different remotely sensed data, urban orthophotomap generation, and urban feature extraction, which are also today's real challenges in high resolution remote sensing. Data generated by remote sensing, with its repetitive and synoptic viewing and multispectral capabilities, constitutes a powerful tool for mapping and monitoring emerging changes in the city's urban core, as well as in peripheral areas. Features: Provides advances in emerging methods and algorithms in image processing and technology Uses algorithms and methodologies for handling high-resolution imagery from a ground sampling distance (GSD) less than 1.0 meter Focuses on 3D urban modelling, orthorectification methodologies, and urban feature extraction algorithms from high-resolution remotely sensed imagery Demonstrates how to apply up-to-date techniques to the problems identified and how to analyze research results Presents methods and algorithms for monitoring, analyzing, and

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modeling urban growth, urban planning, and socio-economic developments In this book, readers are provided with valuable research studies and applications-oriented chapters in areas such as urban trees, soil moisture mapping, city transportation, urban remote sensing big data, etc.

The Clean Water Act (CWA) requires that wetlands be protected from degradation because of their important ecological functions including maintenance of high water quality and provision of fish and wildlife habitat. However, this protection generally does not encompass riparian areas—the lands bordering rivers and lakes—even though they often provide the same functions as wetlands. Growing recognition of the similarities in wetland and riparian area functioning and the differences in their legal protection led the NRC in 1999 to undertake a study of riparian areas, which has culminated in *Riparian Areas: Functioning and Strategies for Management*. The report is intended to heighten awareness of riparian areas commensurate with their ecological and societal values. The primary conclusion is that, because riparian areas perform a disproportionate number of biological and physical functions on a unit area basis, restoration of riparian functions along America's waterbodies should be a national goal. This open access book is the first to systematically introduce the principles of urban informatics and its application to every aspect of the city that involves its functioning, control, management, and future planning. It introduces new models and tools being developed to understand and implement these technologies that enable cities to function more efficiently – to become 'smart' and 'sustainable'. The smart city has quickly emerged as computers have become ever smaller to the point where they can be embedded into the very fabric of the city, as well as being central to new ways in which the population can communicate and act. When cities are wired in this way, they have the potential to become sentient and responsive, generating massive streams of 'big' data in real time as well as providing immense opportunities for extracting new forms of urban data through crowdsourcing. This book offers a comprehensive review of the methods that form the core of urban informatics from various kinds of urban remote sensing to new approaches to machine learning and statistical modelling. It provides a detailed technical introduction to the wide array of tools information scientists need to develop the key urban analytics that are fundamental to learning about the smart city, and it outlines ways in which these tools can be used to inform design and policy so that cities can become more efficient with a greater concern for environment and equity.

*Population, Land Use, and Environment: Research Directions* offers recommendations for future research to improve understanding of how changes in human populations affect the natural environment by means of changes in land use, such as deforestation, urban development, and development of coastal zones. It also features a set of state-of-the-art papers by leading researchers that analyze population-land use-environment relationships in urban and rural settings in developed and underdeveloped countries and that show how remote sensing and other observational methods are being applied to these issues. This book will serve as a resource for researchers, research funders, and students.

Maximize a geographical information tool by incorporating it with up-to-date remotely sensed data GIS is predominantly a

data-handling technology, while remote sensing is a data retrieval and analysis technology. This book addresses the need to combine remotely sensed data with cartographic, socioeconomic, and environmental data and GIS functionalities. Remote Sensing and GIS Integration begins with theoretical discussions, followed by a series of application areas in urban and environmental studies that employ the integration of remote sensing and GIS. Each application area is examined through analysis of state-of-the-art methods and detailed presentations of one or more case studies.

This two volume set (CCIS 398 and 399) constitutes the refereed proceedings of the International Conference on Geo-Informatics in Resource Management and Sustainable Ecosystem, GRMSE 2013, held in Wuhan, China, in November 2013. The 136 papers presented, in addition to 4 keynote speeches and 5 invited sessions, were carefully reviewed and selected from 522 submissions. The papers are divided into 5 sessions: smart city in resource management and sustainable ecosystem, spatial data acquisition through RS and GIS in resource management and sustainable ecosystem, ecological and environmental data processing and management, advanced geospatial model and analysis for understanding ecological and environmental process, applications of geo-informatics in resource management and sustainable ecosystem.

Using a systems analysis approach and extensive case studies, Environmental Remote Sensing and Systems Analysis shows how remote sensing can be used to support environmental decision making. It presents a multidisciplinary framework and the latest remote sensing tools to understand environmental impacts, management complexity, and policy implicatio

One of the key milestones of radar remote sensing for civil applications was the launch of the European Remote Sensing Satellite 1 (ERS 1) in 1991. The platform carried a variety of sensors; the Synthetic Aperture Radar (SAR) is widely considered to be the most important. This active sensing technique provides all-day and all-weather mapping capability of considerably ?ne spatial resolution. ERS 1 and its sister system ERS 2 (launch 1995) were primarily designed for ocean app- cations, but soon the focus of attention turned to onshore mapping. Examples for typical applications are land cover classi?cation also in tropical zones and mo- toring of glaciers or urban growth. In parallel, international Space Shuttle Missions dedicated to radar remote sensing were conducted starting already in the 1980s. The most prominent were the SIR-C/X-SAR mission focussing on the investigation of multi-frequency and multi-polarization SAR data and the famous Shuttle Radar Topography Mission (SRTM). Data acquired during the latter enabled to derive a DEM of almost global coverage by means of SAR Interferometry. It is indispe- ableeventodayandformanyregionsthebestelevationmodelavailable. Differential SAR Interferometry based on time series

of imagery of the ERS satellites and their successor Envisat became an important and unique technique for surface deformation monitoring. The spatial resolution of those devices is in the order of some tens of meters.

Driven by advances in technology and societal needs, the next frontier in remote sensing is urban areas. With the advent of high-resolution imagery and more capable techniques, the question has become "Now that we have the technology, how do we use it?" The need for a definitive resource that explores the technology of remote sensing and the issues it can resolve in an urban setting has never been more acute. Containing contributions from world renowned experts, Urban Remote Sensing provides a review of basic concepts, methodologies, and case studies. Each chapter demonstrates how to apply up-to-date techniques to the problems identified and how to analyze research results.

Organized into five sections, this book: Focuses on data, sensors, and systems considerations as well as algorithms for urban feature extraction Analyzes urban landscapes in terms of composition and structure, especially using sub-pixel analysis techniques Presents methods for monitoring, analyzing, and modeling urban growth Illustrates various approaches to urban planning and socio-economic applications of urban remote sensing Assesses the progress made to date, identifies the existing problems and challenges, and demonstrates new developments and trends in urban remote sensing This book is ideal for upper division undergraduate and graduate students, however it can also serve as a reference for researchers or those individuals interested in the remote sensing of cities in academia, and governmental and commercial sectors. Urban Remote Sensing examines how to apply remote sensing technology to urban and suburban areas.

Provides up-to-date developments in the field of remote sensing by assessing scale issues in land surface, properties, patterns, and processes Scale is a fundamental and crucial issue in remote sensing studies and image analysis. GIS and remote sensing scientists use various scaling techniques depending on the types of remotely sensed images and geospatial data used. Scaling techniques affect image analysis such as object identification and change detection. This book offers up-to-date developments, methods, and techniques in the field of GIS and remote sensing and features articles from internationally renowned authorities on three interrelated perspectives of scaling issues: scale in land surface properties, land surface patterns, and land surface processes. It also visits and reexamines the fundamental theories of scale and scaling by well-known experts who have done substantial research on the topics. Edited by a prominent authority in the geographic information science community, Scale Issues in Remote Sensing: Offers an extensive examination of the fundamental theories of scale issues along with current scaling techniques Studies scale issues from three interrelated perspectives: land surface properties, patterns, and processes Addresses the impact of new frontiers in Earth observation technology (high-resolution, hyperspectral, Lidar sensing, and their synergy with

existing technologies) and advances in remote sensing imaging science (object-oriented image analysis and data fusion) Prospects emerging and future trends in remote sensing and their relationship with scale Scale Issues in Remote Sensing is ideal as a professional reference for practicing geographic information scientists and remote sensing engineers as well as supplemental reading for graduate level students.

This evaluation of the potential of remote sensing of urban areas helps to close a gap between the research-focused results offered by the "urban remote sensing" community, and the application of these data and products by the governing bodies of cities and urban regions. The authors present data from six urban regions worldwide. They explain what the important questions are, and how data and scientific skills can help answer them.

Urban Remote Sensing is designed for upper level undergraduates, graduates, researchers and practitioners, and has a clear focus on the development of remote sensing technology for monitoring, synthesis and modeling in the urban environment. It covers four major areas: the use of high-resolution satellite imagery or alternative sources of image data (such as high-resolution SAR and LIDAR) for urban feature extraction; the development of improved image processing algorithms and techniques for deriving accurate and consistent information on urban attributes from remote sensor data; the development of analytical techniques and methods for deriving indicators of socioeconomic and environmental conditions that prevail within urban landscape; and the development of remote sensing and spatial analytical techniques for urban growth simulation and predictive modeling.

Urban Remote Sensing, Second Edition assembles a team of professional experts to provide a much-needed update on the applications of remote sensing technology to urban and suburban areas. This book reflects new developments in spaceborne and airborne sensors, image processing methods and techniques, and wider applications of urban remote sensing to meet societal and economic challenges. In various sections of the book the authors address methods for upscaling urban feature extraction to the global scale, new methods in mapping and detecting urban landscape features and structures, and mapping and monitoring urbanization in developing countries. Additionally, readers are provided with valuable case studies such as the HEAT (Heat Energy Assessment Technologies) project in Calgary, Canada and the use of VHR (very high resolution) satellite monitoring in Salzburg, Austria to tackle challenges of urban green planning. Features Explores the most up-to-date developments in the field of urban remote sensing Integrates both technical and practical aspects covering all different topics of global urban growth issues Provides new and updated contributions addressing data mining of remotely sensed big data, recent urban studies on a global scale, accuracy assessment and validation, and new technical challenges Examines various applications of urban remote sensing in support of urban planning, environmental management, and sustainable urban development Authors are renowned figures in the field of remote sensing

This book expands the current frame of reference of remote sensing and geographic information specialists to include an array of socio-economic and related planning issues. Using remotely sensed data, the project explores the efficacy and policy implications of new approaches toward analyzing data, integrates approaches from human geography and explores the utility of employing geo-technologies to further the politics of local growth and smart growth coalitions, as in green space programs.

Water quality and nonpoint source (NPS) pollution are important issues in many areas of the world, including the Greater Toronto Area where urban development is changing formerly rural watersheds into impervious surfaces. Impervious surfaces (i.e. roads, sidewalks, parking lots,

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strip malls, building rooftops, etc.) made out of impenetrable materials directly impact hydrological attributes of a watershed. Therefore, understanding the degree and spatial distribution of impervious surfaces in a watershed is an important component of overall watershed management. According to Environment Canada's estimates, road salts, also considered nonpoint source pollutants, represent the largest chemical loading to Canadian surface waters. The main objective of this study is to verify the often assumed correlation between impervious surfaces and chlorides that result from the application of road salts, focusing on a case study in the selected six major watersheds within the Greater Toronto Area. In this study, Landsat-5 TM images from 1990, 1995, 2000, and 2005 were used in mapping urban impervious surface changes within the study area. Pixel-based unsupervised classification technique was utilized in estimation of percentage impervious surface coverage for each watershed. Chloride concentrations collected at Water Quality Monitoring Stations within the watersheds were then mapped against impervious surface estimates and their spatiotemporal distribution was assessed. In a GIS environment, remotely sensed impervious surface maps and chloride maps were overlaid for the investigation of their potential correlation. The main findings of this research demonstrate an average of 12.9% increase in impervious surface areas as well as a three-fold increase in chloride concentrations between 1990 and 2005. Water quality monitoring stations exhibiting the highest amounts of chloride concentrations correspond with the most impervious parts of the watersheds. The results also show a correlation (coefficient of determination of 0.82) between impervious surfaces and chloride concentrations. The findings demonstrate that the increase in imperviousness do generate higher chloride concentrations. Correspondingly, the higher levels of chloride can potentially degrade quality of surface waters in the region. Through an innovative integrated remote sensing approach, the study was successful in identifying areas most vulnerable to surface water quality degradation by road salts.

Remote sensing of impervious surfaces has matured using advances in geospatial technology so recent that its applications have received only sporadic coverage in remote sensing literature. Remote Sensing of Impervious Surfaces is the first to focus entirely on this developing field. It provides detailed coverage of mapping, data extraction, and modeling techniques specific to analyzing impervious surfaces, such as roads and buildings. Written by renowned experts in the field, this book reviews the major approaches that apply to this emerging field as well as current challenges, developments, and trends. The authors introduce remote sensing digital image processing techniques for estimating and mapping impervious surfaces in urban and rural areas. Presenting the latest modeling tools and algorithms for data extraction and analysis, the book explains how to differentiate roads, roofs, and other manmade structures from remotely sensed images for individual analysis. The final chapters examine how to use impervious surface data for predicting the flow of storm- or floodwater and studying trends in population, land use, resource distribution, and other real-world applications in environmental, urban, and regional planning. Each chapter offers a consistent format including a concise review of basic concepts and methodologies, timely case studies, and guidance for solving problems and analyzing data using the techniques presented.

Land use and land cover changes associated with increased urbanization have led to landscape and environmental changes throughout the world. Remote Sensing Applications for the Urban Environment places emphasis on the rapid development of worldwide urbanization and its impact on the environment, and reviews the assessment of urban land cover conditions.

This book describes the algorithms, validation and preliminary analysis of the Global Land Surface Satellite (GLASS) products, a long-term, high-quality dataset that is now freely available worldwide to government organizations and

agencies, scientific research institutions, students and members of the general public. The GLASS products include leaf area index, broadband albedo, broadband emissivity, downward shortwave radiation and photosynthetically active radiation. The first three GLASS products cover 1981 to 2012 with 1km and 5km spatial resolutions and 8-day temporal resolution, and the last two GLASS products span 2008 to 2010 with 3-hour temporal resolution and 5km spatial resolution. These GLASS products are unique. The first three are spatially continuous and cover the longest period of time among all current similar satellite products. The other two products are the highest spatial-resolution global radiation products from satellite observations that are currently available. These products can be downloaded from Beijing Normal University at <http://glass-product.bnu.edu.cn/> and the University of Maryland Global Land Cover Facility at <http://www.glcfc.umd.edu/> The GLASS products are the outcome of a key research project entitled “Generation & Applications of Global Products of Essential Land Variables”, supported by funding from the High-Tech Research and Development Program of China and involving dozens of institutions and nearly one hundred scientists and researchers. Following an introduction, the book contains five chapters corresponding to these five GLASS products: background, algorithm, quality control and validation, preliminary analysis and applications. It discusses the long-term environmental changes detected from the GLASS products and other data sources at both global and local scales and also provides detailed analysis of regional hotspots where environmental changes are mainly associated with climate change, drought, land-atmosphere interactions, and human activities. The book is based primarily on a set of published journal papers about these five GLASS products and includes updated information. Since these products have now begun to be widely used, this book is an essential reference document. It is also a very helpful resource to anyone interested in satellite remote sensing and its applications.

Remote Sensing of Impervious Surfaces in Tropical and Subtropical Areas offers a complete and thorough system for using optical and synthetic aperture radar (SAR) remote sensing data for improving impervious surface estimation (ISE). Highlighting tropical and subtropical areas where there is significant cloud occurrence and varying phenology, the book addresses the challenges impacting impervious surfaces in tropical and subtropical zones. It examines the potential for estimating urban impervious surfaces in a rainy and cloudy environment, considers the difficulties encountered when using optical remote sensing in this type of climate, and assesses existing methods employing remote sensing data for accurate ISE in tropical and subtropical regions. Using the results of comparative studies conducted during the four seasons and in six different cities (Guangzhou, Shenzhen, Hong Kong, Mumbai, Sao Paulo, and Cape Town), the authors develop a framework for ISE using optical and SAR image data. They address the advantages and disadvantages of optical and SAR data, consider fusion strategies for combining optical and SAR data, and examine

different feature extractions for optical and SAR data. They also detail the limitations of the research, suggest possible topics for future analysis, and cover previous findings on the synergistic use of optical and SAR data. Concentrates on the effect a tropical and subtropical urban climate can have on impervious surface estimation (ISE) Reviews literature on the significance of ISE and the phonological and climatic characteristics of tropical and subtropical regions Describes datasets including satellite data, digital orthophoto data, in situ data, and more Remote Sensing of Impervious Surfaces in Tropical and Subtropical Areas investigates the state of the art in creating new algorithms for digital images processing and remotely sensed images classification, as well as in developing the meteorological modeling of urban heat islands, and the hydrological modeling of surface run-off and urban floods.

This book brings together a collection of invited interdisciplinary perspectives on the recent topic of Object-based Image Analysis (OBIA). Its content is based on select papers from the 1<sup>st</sup> OBIA International Conference held in Salzburg in July 2006, and is enriched by several invited chapters. All submissions have passed through a blind peer-review process resulting in what we believe is a timely volume of the highest scientific, theoretical and technical standards. The concept of OBIA first gained widespread interest within the GIScience (Geographic Information Science) community circa 2000, with the advent of the first commercial software for what was then termed 'object-oriented image analysis'. However, it is widely agreed that OBIA builds on older segmentation, edge-detection and classification concepts that have been used in remote sensing image analysis for several decades. Nevertheless, its emergence has provided a new critical bridge to spatial concepts applied in multiscale landscape analysis, Geographic Information Systems (GIS) and the synergy between image-objects and their radiometric characteristics and analyses in Earth Observation data (EO).

This book constitutes the refereed proceedings of the 10th International Conference on Advances in Brain Inspired Cognitive Systems, BICS 2019, held in Guangzhou, China, in July 2019. The 57 papers presented in this volume were carefully reviewed and selected from 129 submissions. The papers are organized in topical sections named: neural computation; biologically inspired systems; image recognition: detection, tracking and classification; and data analysis and natural language processing.

This 1179-page book assembles the complete contributions to the International Conference on Intelligent Computing, ICIC 2006: one volume of Lecture Notes in Computer Science (LNCS); one of Lecture Notes in Artificial Intelligence (LNAI); one of Lecture Notes in Bioinformatics (LNBI); and two volumes of Lecture Notes in Control and Information Sciences (LNCIS). Include are 149 revised full papers, and a Special Session on Computing for Searching Strategies to Control Dynamic Processes.

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Today, remote sensing technology is an essential tool for understanding the Earth and managing human-Earth interactions. There is a rapidly growing need for remote sensing and Earth observation technology that enables monitoring of world's natural resources and environments, managing exposure to natural and man-made risks and more frequently occurring disasters, and helping the sustainability and productivity of natural and human ecosystems. The improvement in temporal resolution/revisit allows for the large accumulation of images for a specific location, creating a possibility for time series image analysis and eventual real-time assessments of scene dynamics. As an authoritative text, *Remote Sensing Time Series Image Processing* brings together active and recognized authors in the field of time series image analysis and presents to the readers the current state of knowledge and its future directions. Divided into three parts, the first addresses methods and techniques for generating time series image datasets. In particular, it provides guidance on the selection of cloud and cloud shadow detection algorithms for various applications. Part II examines feature development and information extraction methods for time series imagery. It presents some key remote sensing-based metrics, and their major applications in ecosystems and climate change studies. Part III illustrates various applications of time series image processing in land cover change, disturbance attribution, vegetation dynamics, and urbanization. This book is intended for researchers, practitioners, and students in both remote sensing and imaging science. It can be used as a textbook by undergraduate and graduate students majoring in remote sensing, imaging science, civil and electrical engineering, geography, geosciences, planning, environmental science, land use, energy, and GIS, and as a reference book by practitioners and professionals in the government, commercial, and industrial sectors.

Driven by the societal needs and improvement in sensor technology and image processing techniques, remote sensing has become an essential geospatial tool for understanding the Earth and managing Human-Earth interactions. *Remote Sensing for Sustainability* introduces the current state of the art remote sensing knowledge integral for monitoring the world's natural resources and environments, managing exposure to natural disasters and man-made risks, and helping understand the sustainability and productivity of natural ecosystems. Bridging the gap between remote sensing and sustainability science this book examines theories and methods as well as practical applications of sustainable development for cities using remote sensing; focuses on remote sensing methods and techniques for sustainable natural resources with emphasize on forests; answers questions on how and what the remote sensing methods and techniques can do for the sustainability of environmental systems; and examines the issues of energy use and sustainable energy sources using remote sensing technology in countries such as Germany, China, the U.S, drawing on case studies to demonstrate the applicability of remote sensing techniques. This comprehensive guide, which can serve to professors, researchers, and students alike, takes in consideration the United Nations set of sustainable development goals and intends to contribute to the GEO's Strategic Plan by addressing and exemplifying a number of societal benefit areas of remote sensing data sets, methods, and techniques for sustainable development.

Albedo is a known and documented phenomenon, defined as the reflectivity of a surface, i.e., the ratio of reflected light energy to incident

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light energy. It is a dimensionless quantity, used in particular in agro-forestry, urban environment, cryosphere and geology. It is an Essential Climate Variable (ECV), deemed extremely meaningful to compute the earth heat balance. The albedo of natural surfaces varies largely, especially in the visible, with the lowest values found for water bodies and dense vegetation canopies and the highest values for desert and snow. It also changes with the angular distribution and spectral composition of the incident radiation and with the surface moisture. Satellite observations allow consistent measuring of the surface albedo at continental scale over a short period of time. Long-term series of surface albedo are good indicators of climate change, especially over glaciers and polar caps. On the other hand, the albedo of bare soil provides a good diagnostic of their degradation. The reliability of satellite albedo is verified against ground-based radiometers and UAV, which also serves to calibrate the instruments embarked on space-borne observing systems and check the quality of the atmospheric correction.

This book provides scientific research into Cognitive Internet of Things for Smart Society, with papers presented at the 2nd EAI International Conference on Robotic Sensor Networks. The conference explores the integration of networks and robotic technologies, which has become a topic of increasing interest for both researchers and developers from academic fields and industries worldwide. The authors posit that big networks will be the main approach to the next generation of robotic research, with the explosive number of networks models and increasing computational power of computers significantly extending the number of potential applications for robotic technologies while also bringing new challenges to the network's community. The 2nd EAI International Conference on Robotic Sensor Networks was held 25-26 August 2018 at the Kitakyushu International Conference Center (MICE), Kitakyushu, Japan.

Generating a satisfactory classification image from remote sensing data is not a straightforward task. Many factors contribute to this difficulty including the characteristics of a study area, availability of suitable remote sensing data, ancillary and ground reference data, proper use of variables and classification algorithms, and the analyst's e

According to the United Nations, three out of five people will be living in cities worldwide by the year 2030. The United States continues to experience urbanization with its vast urban corridors on the east and west coasts. Although urban weather is driven by large synoptic and meso-scale features, weather events unique to the urban environment arise from the characteristics of the typical urban setting, such as large areas covered by buildings of a variety of heights; paved streets and parking areas; means to supply electricity, natural gas, water, and raw materials; and generation of waste heat and materials. Urban Meteorology: Forecasting, Monitoring, and Meeting Users' Needs is based largely on the information provided at a Board on Atmospheric Sciences and Climate community workshop. This book describes the needs for end user communities, focusing in particular on needs that are not being met by current urban-level forecasting and monitoring. Urban Meteorology also describes current and emerging meteorological forecasting and monitoring capabilities that have had and will likely have the most impact on urban areas, some of which are not being utilized by the relevant end user communities. Urban Meteorology explains that users of urban meteorological information need high-quality information available in a wide variety of formats that foster its use and within time constraints set by users' decision processes. By advancing the science and technology related to urban meteorology with input from key end user communities, urban meteorologists can better meet the needs of diverse end users. To continue the advancement within the field of urban meteorology, there are both short-term needs-which might be addressed with small investments but promise large, quick returns-as well as future challenges that could require significant efforts and investments.

Master's Thesis from the year 2013 in the subject Geography / Earth Science - Cartography, Geographic Information Science and Geodesy, Sheffield Hallam University, language: English, abstract: This research examines the changes in land use/land cover in the city of

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Sulaymaniyah north of Iraq and identifies land surface temperature variations among the land cover types. The primary aim of this study is to use Landsat-5 TM imagery with GIS techniques to study and investigate the impact of urban expansion on land surface temperature (LST) for three year periods. Three Landsat 5 TM images were obtained in July 1984, August 2000 and October 2010. Land use categories were derived through the use of supervised classification techniques and the land surface temperature was obtained by computing the brightness temperature from the satellite sensor. The result showed that between 1984 and 2010, there was a mild decrease in open and barren lands from 69.3% in 1984 to 57.2% in 2010 while the built-up areas increased from 11.5% in 1984 to 15.5% in 2000 and reached 25.5% by 2010. The political and economic changes in the study area are the main factors behind the recent urban expansion. The lowest LST readings were taken from the vegetation lands with values of 28oC in 1984, 29oC in 2000 and 34oC in 2010. The barren lands recorded the highest temperature of 38oC, 38oC and 34oC for the years 1984, 2000 and 2010 respectively. An interesting observation in this study is the fact that the urban areas were found to be cooler than its surroundings zones. This is revealed by the LST analysis conducted, with the recent increase in green spaces in the city playing a major role in cooling the temperature there. In relating NDVI to LST, the study found a strong negative correlation between them having derived correlation values of the values of (-0.70), (-0.69) and (-0.73) for 1984, 2000 and 2010 respectively. Conclusively, remote sensing and GIS proved to be very effective in studying and monitoring the relationship between urban growth and surface temperature. Recommendations were made to encourage the expansion of urban surfaces into the surrounding areas, especially barren lands, in order to cool those areas.

Fundamentals of Satellite Remote Sensing: An Environmental Approach, Third Edition, is a definitive guide to remote sensing systems that focuses on satellite-based remote sensing tools and methods for space-based Earth observation (EO). It presents the advantages of using remote sensing data for studying and monitoring the planet, and emphasizes concepts that make the best use of satellite data. The book begins with an introduction to the basic processes that ensure the acquisition of space-borne imagery, and provides an overview of the main satellite observation systems. It then describes visual and digital image analysis, highlights various interpretation techniques, and outlines their applications to science and management. The latter part of the book covers the integration of remote sensing with Geographic Information System (GIS) for environmental analysis. This latest edition has been written to reflect a global audience and covers the most recent advances incorporated since the publication of the previous book, relating to the acquisition and interpretation of remotely sensed data. New in the Third Edition: Includes additional illustrations in full color. Uses sample images acquired from different ecosystems at different spatial resolutions to illustrate different interpretation techniques. Includes updated EO missions, such as the third generations of geostationary meteorological satellites, the new polar orbiting platforms (Suomi), the ESA Sentinels program, and high-resolution commercial systems. Includes extended coverage of radar and LIDAR processing methods. Includes all new information on near-ground missions, including unmanned aerial vehicles (UAVs). Covers new ground sensors, as well as machine-learning approaches to classification. Adds more focus on land surface characterization, time series, change detection, and ecosystem processes. Extends the interactions of EO data and GIS that cover different environmental problems, with particular relevance to global observation. Fundamentals of Satellite Remote Sensing: An Environmental Approach, Third Edition, details the tools that provide global, recurrent, and comprehensive views of the processes affecting the Earth. As one of CRC's Essential titles, this book stands out as one of the best in its field and is a must-have for researchers, academics, students, and professionals involved in the field of environmental science, as well as for libraries developing collections on the forefront of this industry.

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