Statistical Downscaling And Bias Correction For

Can we unlock resilience to climate stress by better understanding linkages between the environment and biological systems? Agroclimatology allows us to explore how different processes determine plant response to climate and how climate drives the distribution of crops and their productivity. Editors Jerry L. Hatfield, Mannava V.K. Sivakumar, and John H. Prueger have taken a comprehensive view of agroclimatology to assist and challenge researchers in this important area of study. Major themes include: principles of energy exchange and climatology, understanding climate change and agriculture, linkages of specific biological systems to climatology, the context of pests and diseases, methods of agroclimatology, and the application of agroclimatic principles to problem-solving in agriculture.

A comprehensive and practical guide, providing technical background and user context for researchers, graduate students, practitioners and decision makers. This book presents the main approaches and describes their underlying assumptions, skill and limitations. Guidelines for the application of downscaling and the use of downscaled information in practice complete the volume.

Downscaling is a widely used technique for translating information from large-scale climate models to the spatial and temporal scales needed to assess local and regional climate impacts, vulnerability, risk and resilience. This book is a comprehensive guide to the downscaling techniques used for climate data. A general introduction of the science of climate modeling is followed by a discussion of techniques, models and methodologies used for producing downscaled projections, and the advantages, disadvantages and uncertainties of

each. The book provides detailed information on dynamic and statistical downscaling techniques in non-technical language, as well as recommendations for selecting suitable downscaled datasets for different applications. The use of downscaled climate data in national and international assessments is also discussed using global examples. This is a practical guide for graduate students and researchers working on climate impacts and adaptation, as well as for policy makers and practitioners interested in climate risk and resilience. The Mediterranean region contains a diverse and interesting climate ranging from areas with permanent glaciers to areas of subtropical, semiarid regions. The region is potentially sensitive to climate change and its progress has environmental, social, and economic implications within and beyond the region. Produced by the Mediterranean Climate Variability and Predictability Research Networking Project, this book reviews the evolution of the Mediterranean climate over the past two millennia with projections further into the twenty-first century as well as examining in detail various aspects of the Mediterranean region's climate including evolution, atmospheric variables, and oceanic and land elements. Integrated with this, the book also considers the social and economic problems or vulnerabilities associated with the region. Written and reviewed by multiple researchers to ensure a high level of information presented clearly, Mediterranean Climate Variables will be an invaluable source of information for geologists, oceanographers, and anyone interested in learning more about the Mediterranean climate. Written by leading experts in the field Presents clear, compelling, and concise evidence Includes the latest thinking in Mediterranean climate research Coupled climate system models are of central importance for climate studies. A new model known as FGOALS (the Flexible Global Ocean-Atmosphere-Land System model), has been

developed by the Sate Key Laboratory of Numerical Modeling for Atmospheric Sciences and Geophysical Fluid Dynamics, Institute of Atmospheric Physics, Chinese Academy of Sciences (LASG/IAP, CAS), a first-tier national geophysical laboratory. It serves as a powerful tool, both for deepening our understanding of fundamental mechanisms of the climate system and for making decadal prediction and scenario projections of future climate change. "Flexible Global Ocean-Atmosphere-Land System Model: A Modeling Tool for the Climate Change Research Community" is the first book to offer systematic evaluations of this model's performance. It is comprehensive in scope, covering both developmental and application-oriented aspects of this climate system model. It also provides an outlook of future development of FGOALS and offers an overview of how to employ the model. It represents a valuable reference work for researchers and professionals working within the related areas of climate variability and change. Prof. Tianjun Zhou, Yongqiang Yu, Yimin Liu and Bin Wang work at LASG, the Institute of Atmospheric Physics, Chinese Academy of Sciences, China.

This book provides a unique, in-depth view of past, present and potential future climatic change in mountain regions, and in particular on the mechanisms which are responsible for this change. Other books which focus on environmental change in mountains focus more generally on the impacts of this change on mountain systems, rather than on the regional features of climatic change itself. The book enters into a high level of detail concerning results of international investigations which involve specialists from numerous climate-related disciplines. The book can be used in an academic and research context, for advanced graduate and doctoral students, as well as researchers working in various domains of relevance to climatic change issues. The book also has relevance in the context of future

activities of the Intergovernmental Panel on Climate Change (IPCC), in terms of providing up-to-date knowledge of fundamental mechanisms and consequences of climatic change in mountain regions.

This volume reflects the current state of scientific knowledge about natural climate variability on decade-to-century time scales. It covers a wide range of relevant subjects, including the characteristics of the atmosphere and ocean environments as well as the methods used to describe and analyze them, such as proxy data and numerical models. They clearly demonstrate the range, persistence, and magnitude of climate variability as represented by many different indicators. Not only do natural climate variations have important socioeconomic effects, but they must be better understood before possible anthropogenic effects (from greenhouse gas emissions, for instance) can be evaluated. A topical essay introduces each of the disciplines represented, providing the nonscientist with a perspective on the field and linking the papers to the larger issues in climate research. In its conclusions section, the book evaluates progress in the different areas and makes recommendations for the direction and conduct of future climate research. This book, while consisting of technical papers, is also accessible to the interested layperson.

This report focuses on the risks of climate change to development in Sub-Saharan Africa, South East Asia and South Asia. Building on the 2012 report, Turn Down the Heat: Why a 4°C Warmer World Must be Avoided, this new scientific analysis examines the likely impacts of present day, 2°C and 4°C warming on agricultural production, water resources, and coastal vulnerability. It finds many significant climate

and development impacts are already being felt in some regions, and that as warming increases from present day (0.8°C) to 2°C and 4°C, multiple threats of increasing extreme heat waves, sea-level rise, more severe storms, droughts and floods are expected to have further severe negative implications for the poorest and most vulnerable. The report finds that agricultural yields will be affected across the three regions, with repercussions for food security, economic growth, and poverty reduction. In addition, urban areas have been identified as new clusters of vulnerability with urban dwellers, particularly the urban poor, facing significant vulnerability to climate change. In Sub-Saharan Africa, under 3°C global warming, savannas are projected to decrease from their current levels to approximately one-seventh of total land area and threaten pastoral livelihoods. Under 4°C warming, total hyper-arid and arid areas are projected to expand by 10 percent. In South East Asia, under 2°C warming, heat extremes that are virtually absent today would cover nearly 60-70 percent of total land area in northern-hemisphere summer, adversely impacting ecosystems. Under 4°C warming, rural populations would face mounting pressures from sea-level rise, increased tropical cyclone intensity, storm surges, saltwater intrusions, and loss of marine ecosystem services. In South Asia, the potential sudden onset of disturbances to the monsoon system and rising peak temperatures would put water and food resources at severe risk. Well before 2°C warming occurs, substantial reductions in the frequency of low snow years is projected to cause substantial reductions in dry season flow, threatening

agriculture. Many of the worst climate impacts could still be avoided by holding warming below 2°C, but the window for action is closing rapidly. Urgent action is also needed to build resilience to a rapidly warming world that will pose significant risks to agriculture, water resources, coastal infrastructure, and human health.

This book has been published by Allenvi (French National Alliance for Environmental Research) to coincide with the 22nd Conference of Parties to the United Nations Framework Convention on Climate Change (COP22) in Marrakesh. It is the outcome of work by academic researchers on both sides of the Mediterranean and provides a remarkable scientific review of the mechanisms of climate change and its impacts on the environment, the economy, health and Mediterranean societies. It will also be valuable in developing responses that draw on "scientific evidence" to address the issues of adaptation, resource conservation, solutions and risk prevention. Reflecting the full complexity of the Mediterranean environment, the book is a major scientific contribution to the climate issue, where various scientific considerations converge to break down the boundaries between disciplines.

This book presents select peer-reviewed papers presented at the International Conference on Numerical Optimization in Engineering and Sciences (NOIEAS) 2019. The book covers a wide variety of numerical optimization techniques across all major engineering disciplines like mechanical, manufacturing, civil, electrical, chemical, computer, and electronics engineering. The major focus is on innovative ideas, current

methods and latest results involving advanced optimization techniques. The contents provide a good balance between numerical models and analytical results obtained for different engineering problems and challenges. This book will be useful for students, researchers, and professionals interested in engineering optimization techniques. This publication reviews the economics of climate change in Southeast Asia, with a particular focus on Indonesia, Philippines, Singapore, Thailand, and Viet Nam. It confirms that the region is highly vulnerable to climate change, demonstrates that a wide range of adaptation measures are already being applied, and that it has great potential to contribute to the reduction of greenhouse gas emissions globally. It shows that the cost to the region and globally of taking no early action against climate change far outweighs the cost of action. The publication urges Southeast Asia to play an important part in working toward a global solution to climate change, and to apply all feasible and economically viable adaptation and mitigation measures as key elements of poverty reduction and sustainable development strategies. It also argues that the current global economic crisis offers Southeast Asia an opportunity to start a transition towards a climate-resilient and low-carbon economy by introducing green stimulus programs that can simultaneously shore up economies, create jobs, reduce poverty, lower carbon emissions, and prepare for the worst effects of climate change. This book gives an overview of various aspects of climate change by integrating global climate models, downscaling approaches, and hydrological models. It also covers

themes that help in understanding climate change in a holistic manner. The book includes worked-out examples, revision questions, exercise problems, and case studies, making it relevant for use as a textbook in graduate courses and professional development programs. The book will serve well researchers, students, as well as professionals working in the area of hydroclimatology. Empirical-statistical downscaling (ESD) is a method for estimating how local climatic variables are affected by large-scale climatic conditions. ESD has been applied to local climate/weather studies for years, but there are few — if any — textbooks on the subject. It is also anticipated that ESD will become more important and commonplace in the future, as anthropogenic global warming proceeds. Thus, a textbook on ESD will be important for next-generation climate scientists. This book presents innovative work in Climate Informatics, a new field that reflects the application of data mining methods to climate science, and shows where this new and fast growing field is headed. Given its interdisciplinary nature, Climate Informatics offers insights, tools and methods that are increasingly needed in order to understand the climate system, an aspect which in turn has become crucial because of the threat of climate change. There has been a veritable explosion in the amount of data produced by satellites, environmental sensors and climate models that monitor, measure and forecast the earth system. In order to meaningfully pursue knowledge discovery on the basis of such voluminous and diverse datasets, it is necessary to apply machine

learning methods, and Climate Informatics lies at the intersection of machine learning and climate science. This book grew out of the fourth workshop on Climate Informatics held in Boulder, Colorado in Sep. 2014.

The manual describes procedure for estimating the maximum probable precipitation and the maximum probable flood. This is the third revised version. The first and second editions of this manual were published in 1973 and 1986, respectively. The current edition keeps a majority of the content from the second edition. Newly added content in this third edition primarily results from experiences, since 1986, in directly estimating PMP for the requirements of a given project in a design watershed on probable maximum flood (PMF) in China, the United States of America, Australia and India.--Publisher's description.

First published in 1992. Routledge is an imprint of Taylor & Francis, an informa company.

Climatology is, to a large degree, the study of the statistics of our climate. The powerful tools of mathematical statistics therefore find wide application in climatological research. The purpose of this book is to help the climatologist understand the basic precepts of the statistician's art and to provide some of the background needed to apply statistical methodology correctly and usefully. The book is self contained: introductory material, standard advanced techniques, and the specialised techniques used specifically by climatologists are all contained within this one source. There are a wealth of real-world examples drawn from the climate literature to demonstrate the need, power and pitfalls of statistical analysis in climate research. Suitable for graduate courses on statistics for climatic, atmospheric and oceanic science, this book will also be valuable as a reference source for researchers in climatology, meteorology, atmospheric science, and oceanography.

The Fifth Assessment Report of the IPCC is the standard scientific reference on climate change for students, researchers and policy makers.

This book presents best selected research papers presented at the International Conference on Recent Trends in Communication and Intelligent Systems (ICRTCIS 2020), organized by Arya College of Engineering and IT, Jaipur, on 20-21 November 2020. It discusses the latest technologies in communication and intelligent systems, covering various areas of communication engineering, such as signal processing, VLSI design, embedded systems, wireless communications, and electronics and communications in general. Featuring work by leading researchers and technocrats, the book serves as a valuable reference resource for young researchers and academics as well as practitioners in industry.

ICAR publication

Global Climate Models (GCMs) are the typical sources of future climate data required for impact assessments of climate change. However, GCM outputs are related to model-related uncertainties and involve a great deal of biases. Bias correction of model outputs is, therefore, necessary before their use in impact studies. The coarse resolution of GCM simulations is another hindrance to their direct use in fine-scale impact analysis of climate change. Although downscaling of GCM outputs can be performed by dynamical downscaling using Regional Climate Models (RCMs), it requires large computational capacity. When daily climate data from multiple GCMs are required to be downscaled, dynamical downscaling may not be a feasible option. Statistical downscaling, in contrast, can be efficiently used to downscale a large number of GCM outputs at a fine temporal and spatial scale. This study performs the bias correction and statistical downscaling of daily maximum and minimum temperature and daily

precipitation data from six GCM and four RCM simulations for the northeast United Stated (US). The spatial resolution of the data set is 1/8°x 1/8° and it spans from 2046 to 2065. This fine-scale daily climate data set, which has been created using Bias Correction and Spatial Downscaling (BCSD) approach, can be directly used in regional impact studies for the northeast US. Using both raw and bias corrected daily precipitation data from two GCMs and two RCMs, one extreme precipitation index has been analyzed for the observed climate. The comparison between the results demonstrates that bias correction is important not only for GCM outputs, but also for RCM outputs. When the same analysis has been performed for future climate, bias correction has led to a larger level of agreements among the models in predicting the magnitude and capturing the spatial trend for the extreme precipitation index. Moreover, five extreme climate indices have been analyzed at 1/8° spatial resolution for future climate using the bias corrected and statically downscaled data from multiple GCMs and RCMs. The incorporation of dynamical downscaling as an intermediate step has not led to any considerable changes from the results of statistical downscaling. Statistical downscaling with bias correction has been sufficient to create a fine-scale daily climate data set to be directly used in impact studies. The future means of five extreme climate indices, which have been calculated from GCM and RCM ensembles, have been compared to their observed means. The decrease in total number of frost days because of the future warming will be similar over the entire northeast region. The earlier arrival of spring will lead to an extended growing season and the magnitude of the changes will be larger in the coastal area. The comparison of precipitation extreme indices indicates an increase in the heavy precipitation events in future climate for most of the region.

Statistical Methods in the Atmospheric Sciences, Third Edition, explains the latest statistical methods used to describe, analyze, test, and forecast atmospheric data. This revised and expanded text is intended to help students understand and communicate what their data sets have to say, or to make sense of the scientific literature in meteorology, climatology, and related disciplines. In this new edition, what was a single chapter on multivariate statistics has been expanded to a full six chapters on this important topic. Other chapters have also been revised and cover exploratory data analysis, probability distributions, hypothesis testing, statistical weather forecasting, forecast verification, and time series analysis. There is now an expanded treatment of resampling tests and key analysis techniques, an updated discussion on ensemble forecasting, and a detailed chapter on forecast verification. In addition, the book includes new sections on maximum likelihood and on statistical simulation and contains current references to original research. Students will benefit from pedagogical features including worked examples, end-of-chapter exercises with separate solutions, and numerous illustrations and equations. This book will be of interest to researchers and students in the atmospheric sciences, including meteorology, climatology, and other geophysical disciplines. Accessible presentation and explanation of techniques for atmospheric data summarization, analysis, testing and forecasting Many worked examples End-of-chapter exercises, with answers provided

The quantitative revolution in geography has passed. The spirited debates of the past decades have, in one sense, been resolved by the inclusion of quantitative techniques into the typical geographer's set of methodological tools. A new decade is upon us. Throughout the quantitative revolution, geographers ransacked related disciplines and mathematics in order to

find tools which might be applicable to problems of a spatial nature. The early success of Berry and Marble's Spatial Analysis and Garrison and Marble's volumes on Quantitative Geog raphy is testimony to their accomplished search. New developments often depend heavily on borrowed ideas. It is only after these developments have been established that the necessary groundwork for true innovation ob tains. In the last decade, geographers significantly -augmented their methodologi cal base by developing quantitative techniques which are specifically directed towards analysis of explicitly spatial problems. It should be pointed out, however, that the explicit incorporation of space into quantitative techniques has not been the sole domain of geographers. Mathematicians, geologists, meteorologists, economists, and regional scientists have shared the geo grapher's interest in the spatial component of their analytical tools.

The quantitative assessment of the impact of climate change on water availability and water resources management requires knowledge of climate, hydro(geo)logical and water resources models, and particularly the relationships between each of them. This book brings together world experts on each of these aspects, distilling each complex topic into concise and easy to understand chapters, in which both the uses and limitations of modelling are explored. The book concludes with a set of case studies using real-life examples to illustrate the steps required and the problems that can be faced in assessing the potential impacts of climate change on water resource systems. For students, scientists, engineers and decision-makers alike, this book provides an invaluable and critical look at the information that is provided by climate models, and the ways it is used in modelling water systems. A key focus is the exploration of how uncertainties may accrue at each stage of an impacts assessment, and the

reliability of the resulting information. The book is a practical guide to understanding the opportunities and pitfalls in the quantitative assessment of climate change impacts and adaptation in the water resource sector.

Empirical-statistical downscaling (ESD) is a method for estimating how local climatic variables are affected by large-scale climatic conditions. ESD has been applied to local climate/weather studies for years, but there are few ? if any ? textbooks on the subject. It is also anticipated that ESD will become more important and commonplace in the future, as anthropogenic global warming proceeds. Thus, a textbook on ESD will be important for next-generation climate scientists.

This book presents selected articles from the International Conference on Asian and Pacific Coasts (APAC 2019), an event intended to promote academic and technical exchange on coastal related studies, including coastal engineering and coastal environmental problems, among Asian and Pacific countries/regions. APAC is jointly supported by the Chinese Ocean Engineering Society (COES), the Coastal Engineering Committee of the Japan Society of Civil Engineers (JSCE), and the Korean Society of Coastal and Ocean Engineers (KSCOE). APAC is jointly supported by the Chinese Ocean Engineering Society (COES), the Coastal Engineering Committee of the Japan Society of Civil Engineers (JSCE), and the Korean Society of Coastal and Ocean Engineers (KSCOE).

Statistical Postprocessing of Ensemble Forecasts brings together chapters contributed by international subject-matter experts describing the current state of the art in the statistical postprocessing of ensemble forecasts. The book illustrates the use of these methods in several important applications including weather, hydrological and climate forecasts, and

renewable energy forecasting. After an introductory section on ensemble forecasts and prediction systems, the second section of the book is devoted to exposition of the methods available for statistical postprocessing of ensemble forecasts: univariate and multivariate ensemble postprocessing are first reviewed by Wilks (Chapters 3), then Schefzik and Möller (Chapter 4), and the more specialized perspective necessary for postprocessing forecasts for extremes is presented by Friederichs, Wahl, and Buschow (Chapter 5). The second section concludes with a discussion of forecast verification methods devised specifically for evaluation of ensemble forecasts (Chapter 6 by Thorarinsdottir and Schuhen). The third section of this book is devoted to applications of ensemble postprocessing. Practical aspects of ensemble postprocessing are first detailed in Chapter 7 (Hamill), including an extended and illustrative case study. Chapters 8 (Hemri), 9 (Pinson and Messner), and 10 (Van Schaeybroeck and Vannitsem) discuss ensemble postprocessing specifically for hydrological applications, postprocessing in support of renewable energy applications, and postprocessing of long-range forecasts from months to decades. Finally, Chapter 11 (Messner) provides a guide to the ensemble-postprocessing software available in the R programming language, which should greatly help readers implement many of the ideas presented in this book. Edited by three experts with strong and complementary expertise in statistical postprocessing of ensemble forecasts, this book assesses the new and rapidly developing field of ensemble forecast postprocessing as an extension of the use of statistical corrections to traditional deterministic forecasts. Statistical Postprocessing of Ensemble Forecasts is an essential resource for researchers, operational practitioners, and students in weather, seasonal, and climate forecasting, as well as users of such forecasts in fields involving renewable energy,

conventional energy, hydrology, environmental engineering, and agriculture. Consolidates, for the first time, the methodologies and applications of ensemble forecasts in one succinct place Provides real-world examples of methods used to formulate forecasts Presents the tools needed to make the best use of multiple model forecasts in a timely and efficient manner This book offers a collection of high-quality peer-reviewed research papers presented at the Second International Conference on Communication and Computational Technologies (ICCCT 2019), held at Rajasthan Institute of Engineering and Technology, Jaipur, Rajasthan, India, on 30–31 August 2019. In contributions prepared by researchers from academia and industry alike, the book discusses a wide variety of industrial, engineering and scientific applications of emerging techniques.

This handy reference introduces the subject of forecast verification and provides a review of the basic concepts, discussing different types of data that may be forecast. Each chapter covers a different type of predicted quantity (predictand), then looks at some of the relationships between economic value and skill scores, before moving on to review the key concepts and summarise aspects of forecast verification that receive the most attention in other disciplines. The book concludes with a discussion on the most important topics in the field that are the subject of current research or that would benefit from future research. An easy to read guide of current techniques with real life case studies An up-to-date and practical introduction to the different techniques and an examination of their strengths and weaknesses Practical advice given by some of the world?s leading forecasting experts Case studies and illustrations of actual verification

and its interpretation Comprehensive glossary and consistent statistical and mathematical definition of commonly used terms

Winner of the 2013 DeGroot Prize. A state-of-the-art presentation of spatio-temporal processes, bridging classic ideas with modern hierarchical statistical modeling concepts and the latest computational methods Noel Cressie and Christopher K. Wikle, are also winners of the 2011 PROSE Award in the Mathematics category, for the book "Statistics for Spatio-Temporal Data" (2011), published by John Wiley and Sons. (The PROSE awards, for Professional and Scholarly Excellence, are given by the Association of American Publishers, the national trade association of the US book publishing industry.) Statistics for Spatio-Temporal Data has now been reprinted with small corrections to the text and the bibliography. The overall content and pagination of the new printing remains the same; the difference comes in the form of corrections to typographical errors, editing of incomplete and missing references, and some updated spatio-temporal interpretations. From understanding environmental processes and climate trends to developing new technologies for mapping public-health data and the spread of invasive-species, there is a high demand for statistical analyses of data that take spatial, temporal, and spatio-temporal information into account. Statistics for Spatio-Temporal Data presents a systematic approach to key quantitative techniques that incorporate the latest advances in statistical computing as well as hierarchical, particularly Bayesian, statistical modeling, with an emphasis on dynamical spatio-

temporal models. Cressie and Wikle supply a unique presentation that incorporates ideas from the areas of time series and spatial statistics as well as stochastic processes. Beginning with separate treatments of temporal data and spatial data, the book combines these concepts to discuss spatio-temporal statistical methods for understanding complex processes. Topics of coverage include: Exploratory methods for spatio-temporal data, including visualization, spectral analysis, empirical orthogonal function analysis, and LISAs Spatio-temporal covariance functions, spatio-temporal kriging, and time series of spatial processes Development of hierarchical dynamical spatio-temporal models (DSTMs), with discussion of linear and nonlinear DSTMs and computational algorithms for their implementation Quantifying and exploring spatio-temporal variability in scientific applications, including case studies based on real-world environmental data Throughout the book, interesting applications demonstrate the relevance of the presented concepts. Vivid, full-color graphics emphasize the visual nature of the topic, and a related FTP site contains supplementary material. Statistics for Spatio-Temporal Data is an excellent book for a graduate-level course on spatio-temporal statistics. It is also a valuable reference for researchers and practitioners in the fields of applied mathematics, engineering, and the environmental and health sciences.

Climate extremes often imply significant impacts on human and natural systems, and these extreme events are anticipated to be among the potentially most harmful

consequences of a changing climate. However, while extreme event impacts are increasingly recognized, methodologies to address such impacts and the degree of our understanding and prediction capabilities vary widely among different sectors and disciplines. Moreover, traditional climate extreme indices and large-scale multi-model intercomparisons that are used for future projections of extreme events and associated impacts often fall short in capturing the full complexity of impact systems. Climate Extremes and Their Implications for Impact and Risk Assessment describes challenges, opportunities and methodologies for the analysis of the impacts of climate extremes across various sectors to support their impact and risk assessment. It thereby also facilitates cross-sectoral and cross-disciplinary discussions and exchange among climate and impact scientists. The sectors covered include agriculture, terrestrial ecosystems, human health, transport, conflict, and more broadly covering the human-environment nexus. The book concludes with an outlook on the need for more transdisciplinary work and international collaboration between scientists and practitioners to address emergent risks and extreme events towards risk reduction and strengthened societal resilience. Provides an overview about past, present and future changes in climate and weather extremes and how to connect that knowledge to impact and risk assessment under global warming Presents different approaches to assess societal-relevant impacts and risk of climate and weather extremes, including compound events, and the complexity of risk cascades and the interconnectedness of

societal risk Features applications across a diversity of sectors, including agriculture, health, ecosystem services and urban transport

This book focuses on the application of statistical methods in the field of hydrology and hydroclimatology. Among the latest theories being used in these fields, the book introduces the theory of copulas and its applications in this context. The purpose is to develop an understanding and illustrate the usefulness of the statistical techniques with detailed theory and numerous worked out examples. Apart from this, MATLAB-based codes and solutions of some worked out examples are also provided to assist the readers to handle real life data. This book presents a comprehensive knowledge of statistical techniques combining the basics of probability and the current advances in stochastic hydrology. Besides serving as a textbook for graduate courses on stochastic modeling in hydrology and related disciplines, the book offers valuable resources for researchers and professionals involved in the field of hydrology and climatology.

This proceedings volume, with more than 30 chapters, is based on the presentations given at the National Conference on Water Resources and Hydropower (WRHP-2016) and represents the state-of-the-art in water resources in India. It includes experimental investigations, field studies, theoretical developments, numerical methods, as well as engineering achievements in water resources. The contributions are organised under four main topics: • Water Resources and Management: covers the issues related to water resources planning and management, water conservation, flood mitigation,

policies and governance, conflict over rivers and planning of groundwater evolution, Assessment of Sedimentation, Surface water quality, Rainfall assessment, • Climate Change and Global Warming: includes chapters on the impact of climate on water resources and groundwater, hydrological impacts of climate change, Ground Water Contaminants, Assessment of Evaporation and evapotranspiration effects on global warming • Hydraulic Structures: presents contributions on fluvial hydraulics,flow through Weirs, Open Channel flow, river flood control, scour and erosion, dam and dowstream block failures and protection, Losses in pipes By combining these topics, the book provides a valuable resource for practitioners and researchers, including field engineers, academicians, planners, health specialists, disaster managers, decision makers and policy makers engaged in various aspects of water resources and hydropower. The WRHP-2016 was organised in association with the Indian Institute of Technology, Roorkee, Uttrakhand Jal Vidyut Nigam Limited and the Indian Society for Hydraulics, Pune and was held in University of Petroleum and Energy Studies, Dehradun, India from June 17-18, 2016.

Global climate change is typically understood and modeled using global climate models (GCMs), but the outputs of these models in terms of hydrological variables are only available on coarse or large spatial and time scales, while finer spatial and temporal resolutions are needed to reliably assess the hydro-environmental impacts of climate change. To reliably obtain the required resolutions of hydrological variables, statistical

downscaling is typically employed. Statistical Downscaling for Hydrological and Environmental Applications presents statistical downscaling techniques in a practical manner so that both students and practitioners can readily utilize them. Numerous methods are presented, and all are illustrated with practical examples. The book is written so that no prior background in statistics is needed, and it will be useful to graduate students, college faculty, and researchers in hydrology, hydroclimatology, agricultural and environmental sciences, and watershed management. It will also be of interest to environmental policymakers at the local, state, and national levels, as well as readers interested in climate change and its related hydrologic impacts. Features: Examines how to model hydrological events such as extreme rainfall, floods, and droughts at the local, watershed level. Explains how to properly correct for significant biases with the observational data normally found in current Global Climate Models (GCMs). Presents temporal downscaling from daily to hourly with a nonparametric approach. Discusses the myriad effects of climate change on hydrological processes. Copyright: a531d332bdc3fd6c7a20983970ef697b