Modern Geophysical Methods For Subsurface Water Exploration

This research is an integrated project which uses physical (geophysical and hydrologic) and innovative geophysical imaging and microbial characterization methods to identify key scales of physical heterogeneities that affect bioremediation. In the this effort data from controlled laboratory and in situ experiments at the Idaho National Engineering and Environmental (INEEL) Test Area North (TAN) site were used to determine the dominant physical characteristics (lithologic, structural, and hydrologic) that can be imaged in situ and correlated with flow and transport properties. Emphasis was placed on identifying fundamental scales of variation of physical parameters that control transport behavior relative to subsurface microbial dynamics that could be used to develop a predictive model. A key hypothesis of the work was that nutrient flux and transport properties are key factors in controlling microbial dynamics, and that geophysical techniques could be used to identify the critical physical properties and scales controlling transport. This hypothesis was essentially validated. The goal was not only to develop and apply methods to monitor the spatial and temporal distribution of the bioremediation in fractured sites such as TAN, but also to develop methods applicable to a wider range of DOE sites. The outcome has been an improved understanding of the relationship between physical, chemical and microbial processes in heterogeneous environments, thus applicable to the design and monitoring of bioremediation strategies for a variety of environments. In this EMSP work we demonstrated that high resolution geophysical methods have considerable resolving power, especially when linked with modern advanced processing and interpretation. In terms of basic science, in addition to providing innovative methods for monitoring bioremediation, the work also provided a strong motivation for developing and extending high resolution geophysical methods.

Winner of the 2004 Claire P. Holdredge Award of the Association of Engineering Geologists (USA). The only book to concentrate on the relationship between geology and its implications for construction, this book covers the full scope of the subject from site investigation through to the complexities of reservoirs and dam sites. Features include international case studies throughout, and summaries of accepted practice, plus sections on waste disposal, and contaminated land.

Groundwater Resource Development describes the basic steps involved in the development of a groundwater resource in the search for productive aquifers. This book discusses groundwater exploration, construction and testing of water wells, water quality and pollution considerations, and groundwater management. This text is comprised of 10 chapters and begins by presenting the steps in the evaluation, development, and management of an aquifer for water supply. The reader is then introduced to the fundamentals of groundwater, with emphasis on their origin and occurrence as well as the influence of porosity and permeability on groundwater accumulation, migration, and distribution. The chapters that follow focus on groundwater exploration, assessment of aquifer recharge and potential well yield, and factors affecting the quality of groundwater. The issues to be considered in well design and construction are also highlighted, along with aquifer hydraulics and pumping tests, groundwater pollution, and optimum management of groundwater resources. This text concludes with a chapter on techniques used in modeling the response of a

groundwater reservoir. This book will be of value to geologists, civil engineers, environmental scientists, mathematicians, chemists, water well contractors, and others involved in the profession of water engineering.

This ground-breaking work is the first to cover the fundamentals of hydrogeophysics from both the hydrogeological and geophysical perspectives. Authored by leading experts and expert groups, the book starts out by explaining the fundamentals of hydrological characterization, with focus on hydrological data acquisition and measurement analysis as well as geostatistical approaches. The fundamentals of geophysical characterization are then at length, including the geophysical techniques that are often used for hydrogeological characterization. Unlike other books, the geophysical methods and petrophysical discussions presented here emphasize the theory, assumptions, approaches, and interpretations that are particularly important for hydrogeological applications. A series of hydrogeophysical case studies illustrate hydrogeophysical approaches for mapping hydrological units, estimation of hydrogeological parameters, and monitoring of hydrogeological processes. Finally, the book concludes with hydrogeophysical frontiers, i.e. on emerging technologies and stochastic hydrogeophysical inversion approaches.

This edited volume is based on the best papers accepted for presentation during the 1st Springer Conference of the Arabian Journal of Geosciences (CAJG-1), Tunisia 2018. This special volume is of interest to all researchers practicing geosphysicists/seismologists, students of PG and UG in the fields of multifaceted Geoscience. Major applications with relevant illustrations presented in the volume are from Middle East. And therefore, this book no doubt would serve as a reference guide to all geoscientists and students in the broad field of Earth Science. This volume covers significant applications of gravity and magnetic methods, electrical and electromagnetic methods, refraction and reflection seismic methods besides a large number of study on earthquakes, tectonics and geological settings etc. The salient features of this volume are the interpretation and modeling of geophysical data of different nature. Main topics include: 1. Applications of gravity and magnetic methods.2. Electrical and Electromagnetic methods in mineral and groundwater exploration.3. Case studies on refraction and reflection seismic methods.4. Integrated geoscience applications in the exploration of subsurface resources.5. Hydrocarbon and petrophysical studies6. Earthquakes and seismic hazard assessment.7. Tectonics

The world's first nuclear bomb was a developed in 1954 at a site near the town of Los Alamos, New Mexico. Designated as the Los Alamos National Laboratory (LANL) in 1981, the 40-square-mile site is today operated by Log Alamos National Security LLC under contract to the National Nuclear Security Administration (NNSA) of the U.S. Department of Energy (DOE). Like other sites in the nation's nuclear weapons complex, the LANL site harbors a legacy of radioactive waste and environmental contamination. Radioactive materials and chemical contaminants have been detected in some portions of the groundwater beneath the site. Under authority of the U.S. Environmental Protection Agency, the State of New Mexico regulates protection of its water resources through the New Mexico Environment Department (NMED). In 1995 NMED found LANL's groundwater monitoring program to be inadequate. Consequently LANL conducted a detailed workplan to characterize the site's hydrogeology in order to develop an effective monitoring program. The study described in Plans and Practices for Groundwater Protection at the Los Alamos National Laboratory: Final Report was initially requested by NNSA, which turned to the National Academies for technical advice and recommendations regarding several aspects of LANL's groundwater protection program. The DOE Office of Environmental Management funded the study. The study came approximately at the juncture between completion of LANL's hydrogeologic workplan and initial development of a sitewide monitoring plan.

This contributed volume encompasses contributions by eminent researchers in the field of geotechnical engineering. The chapters of this book are based on the keynote and sub-theme lectures delivered at the Indian Geotechnical Conference 2017. The book provides a comprehensive overview of the current state-of-the-art research and practices in different domains of geotechnical engineering in the areas of soil dynamics, earth retaining structures, ground improvement, and geotechnical and geophysical investigations. It will serve as an ideal resource for academics, researchers, practicing professionals, and students alike.

Geotechnical Risk and Safety V contains contributions presented at the 5th International Symposium on Geotechnical Safety and Risk (5th ISGSR, Rotterdam, 13-16 October 2015) which was organized under the auspices of the Geotechnical Safety Network (GEOSNet) and the following technical committees of the of the International Society of Soil Mechanics and Geotechnical Engineering (ISSGME): • TC304 Engineering Practice of Risk Assessment & Management • TC205 Safety and Serviceability in Geotechnical Design • TC212 Deep Foundations • TC302 Forensic Geotechnical Engineering Geotechnical Risk and Safety V covers seven themes: 1. Geotechnical Risk Management and Risk Communication 2. Variability in Ground Conditions and Site Investigation 3. Reliability and Risk Analysis of Geotechnical Structures 4. Limit-state design in Geotechnical Engineering 5. Assessment and Management of Natural Hazards 6. Contractual and Legal Issues of Foundation and (Under)Ground Works 7. Case Studies, Monitoring and Observational Method The 5th ISGSR is the continuation of a series of symposiums and workshops on geotechnical risk and reliability, starting with LSD2000 (Melbourne, Australia), IWS2002 (Tokyo and Kamakura, Japan), LSD2003 (Cambridge, USA), Georisk2004 (Bangalore, India), Taipei2006 (Taipei, Taiwan), the 1st ISGSR (Shanghai, China, 2007), the 2nd ISGSR (Gifu, Japan, 2009), the 3rd ISGSR (Munich, Germany, 2011) and the 4th ISGSR (Hong Kong, 2013).

An Introduction to Applied and Environmental Geophysics, 2nd Edition, describes the rapidly developing field of near-surface geophysics. The book covers a range of applications including mineral, hydrocarbon and groundwater exploration, and emphasises the use of geophysics in civil engineering and in environmental investigations. Following on from the international popularity of the first edition, this new, revised, and much expanded edition contains additional case histories, and descriptions of geophysical techniques not previously included in such textbooks. The level of mathematics and physics is deliberately kept to a minimum but is described qualitatively within the text. Relevant mathematical expressions are separated into boxes to supplement the text. The book is profusely illustrated with many figures, photographs and line drawings, many never previously published. Key source literature is provided in an extensive reference section; a list of web addresses for key organisations is also given in an appendix as a valuable additional resource. Covers new techniques such as Magnetic Resonance Sounding, Controlled- Source EM, shear-wave seismic refraction, and airborne gravity and EM techniques Now includes radioactivity surveying and more discussions of down-hole geophysical methods; hydrographic and Sub-Bottom Profiling surveying; and UneXploded Ordnance detection Expanded to include more forensic, archaeological, glaciological, agricultural and bio-geophysical applications Includes more information on physio-chemical properties of geological, engineering and environmental materials Takes a fully global approach Companion website with additional resources available at www.wiley.com/go/reynolds/introduction2e Accessible core textbook for undergraduates as well as an ideal reference for industry professionals The second edition is ideal for students

wanting a broad introduction to the subject and is also designed for practising civil and geotechnical engineers, geologists, archaeologists and environmental scientists who need an overview of modern geophysical methods relevant to their discipline. While the first edition was the first textbook to provide such a comprehensive coverage of environmental geophysics, the second edition is even more far ranging in terms of techniques, applications and case histories.

Roots represent half of the plant body – and arguably the more interesting half. Despite its obvious importance for the whole plant, until recently our knowledge of the root apparatus was very limited, mostly due to the inadequacy of the techniques available. Recent advances in the visualization and measurement of roots have resulted in significant progress in our understanding of root architecture, growth and behaviour. In this book international experts highlight the most advanced techniques, both lab and field methods, and discuss them in detail. Measuring Roots combines academic and practical aspects of this topic, making it a universal handbook for all researchers and others interested in root-measuring methods.

New Achievements in Geoscience is a comprehensive, up-to-date resource for academic researchers in geophysics, environmental science, earth science, natural resource managements and their related support fields. This book attempts to highlight issues dealing with geophysical and earth sciences. It describes the research carried out by world-class scientists in the fields of geoscience. The content of the book includes selected chapters covering seismic interpretation, potential field data interpretation and also several chapters on earth science.

This book is focused on different aspects of geophysical research, particularly on modern approach in subsurface imaging, tectonics, geohazard, seismicity, and Earth planetary system. Syntheses of results from regional and local studies combined with new techniques of geophysical data acquisition and interpretation from diverse geological provinces are presented. Some of the chapter explained clearly the geophysical technic that can image local sources in urban and rural settings in Israel. An example of studies on basement tectonics and fault reactivation in North America using integrated geophysical methods is also presented. Two modes of seismicity, one involving rotational seismology and another based on seismic response in Mexico using Hilbert-Huang transform (HHT) as an alternative technique for extracting data that will be useful for the assessment of potential earthquake, are discussed in other sets of chapters. The integration of geoelectric methods in another chapter demonstrated delimitation of the resistivity anomalies caused by different types of hydrocarbon contaminants and rocks in rural, industrial, and urban sites. The results of electrical resistivity method to define 1D and 2D electrical models from two datasets acquired in dry and rainy seasons in Panama (Central America) were used to show the relationship between electrical resistivity and volumetric water content. Petrophysical analyses show good fits between resistivity and volumetric water content and known parameters for rocks and soils. The study on Earth planetary system noted that at all stages of the Earth?s formation, convective heat and mass transfer are the most important factors in the dynamics of the planet. The chapter on magnetics shows how remanent magnetization and self-demagnetization complicate the inversion and interpretation of magnetic anomaly with examples from iron deposit in South Australia.

The interest in seismic stratigraphic techniques to interpret reflection datasets is well established. The advent of sophisticated subsurface reservoir studies and 4D monitoring, for optimising the hydrocarbon production in existing fields, does demonstrate the importance of the 3D seismic methodology. The added value of reflection seismics to the petroleum industry has clearly been proven over the last decades. Seismic profiles and 3D cubes form a vast and robust data source to unravel the structure of the subsurface. It gets nowadays exploited in ever greater detail. Larger offsets and velocity anisotropy effects give for instance access to more details on reservoir flow properties like fracture density, porosity and permeability distribution, Elastic inversion and modelling may tell something about the change in petrophysical parameters. Seismic investigations provide a vital tool for the delineation of subtle hydrocarbon traps. They are the basis for understanding the regional basin framework and the stratigraphic subdivision. Seismic stratigraphy combines two very different scales of observation: the seismic and well-control. The systematic approach applied in seismic stratigraphy explains why many workers are using the principles to evaluate their seismic observations. The here presented modern geophysical techniques allow more accurate prediction of the changes in subsurface geology. Dynamics of sedimentary environments are discussed with its relation to global controling factors and a link is made to high-resolution sequence stratigraphy. ‘Seismic Stratigraphy Basin Analysis and Reservoir Characterisation’ summarizes basic seismic interpretation techniques and demonstrates the benefits of intergrated reservoir studies for hydrocarbon exploration. Topics are presented from a practical point of view and are supported by well-illustrated case histories. The reader (student as well as professional geophysicists, geologists and reservoir engineers) is taken from a basic level to more advanced study techniques. * Overview reflection seismic methods and its limitations. * Link between basic seismic stratigraphic principles and high resolution sequence stratigraphy. * Description of various techniques for seismic reservoir characterization and synthetic modelling. * Overview nversion techniques, AVO and seismic attributes analysis.

The Encyclopedia of Caves and Karst Science contains 350 alphabetically arranged entries. The topics include cave and karst geoscience, cave archaeology and human use of caves, art in caves, hydrology and groundwater, cave and karst history, and conservation and management. The Encyclopedia is extensively illustrated with photographs, maps, diagrams, and tables, and has thematic content lists and a comprehensive index to facilitate searching and browsing.

Borehole imaging is one of the fastest and most precise methods for collecting subsurface data that provides high resolution information on layering, texture and dips, permitting a core-like description of the subsurface. Although the range of information recoverable from this technology is widely acknowledged, image logs are still used in a strictly qualitative manner. Interpreting image logs manually is cumbersome, time consuming and is subjective based on the experience of the interpreter. This thesis outlines new methods that automate image log interpretation and extract subsurface lithofacies information in a quantitative manner. We developed two methodologies based on advanced image analysis techniques successfully employed in remote sensing and medical imaging. The first one is a pixelbased pattern recognition technique applying textural analysis to quantify image textural properties. These properties together with standard logs and core-derived lithofacies information are used to train a

back propagation Neural Network. In principle the trained and tested Neural Network is applicable for automated borehole image interpretation from similar geological settings. However, this pixel-based approach fails to make use explicitly of the spatial characteristics of a high resolution image. TAT second methodology is introduced which groups identical neighbouring pixels into objects. The resultant spectrally and spatially consistent objects are then related to geologically meaningful groups such as lithofacies by employing fuzzy classifiers. This method showed better results and is applied to outcrop photos, core photos and image logs, including a 'difficult' data set from a deviated well. The latter image log did not distinguish some of the conductive and resistive regions, as observed from standard logs and core photos. This is overcome by marking bed boundaries using standard logs. Bed orientations were estimated using an automated sinusoid fitting algorithm within a formal uncertainty framework in order to distinguish dipping beds and horizontal stratification. Integration of these derived logs in the methodology yields a complete automated lithofacies identification, even from the difficult dataset. The results were validated through the interpretation of cored intervals by a geologist. This is a supervised classification method which incorporates the expertise of one or several geologists, and hence includes human logic, reasoning, and current knowledge of the field heterogeneity. By including multiple geologists in the training, the results become less dependent on each individual's subjectivity and prior experience. The method is also easily adaptable to other geological settings. In addition, it is applicable to several kinds of borehole images, for example wireline electrical borehole wall images, core photographs, and logging-while-drilling (LWD) images. Thus, the theme of this dissertation is the development of methodologies which makes image log interpretation simpler, faster, less subjective, and efficient such that it can be applied to large quantities of data.

All the traces of historic heritage are a fundamental part of our environment and reward us in the form of cultural enrichment, with the ability to have a positive effect both on our lifestyle and economy. Therefore, the preservation of ancient monuments, historic towns and sites has increasingly drawn the attention of public opinion, governmental

Lunar environment, bases, exploration, and extraterrestrial resources.

This book provides readers with a solid understanding of the capabilities and limitations of the techniques used for buried object detection. Presenting theory along with applications and the existing technology, it covers the most recent developments in hardware and software technologies of sensor systems with a focus on primary sensors such as Ground Penetrating Radar (GPR) and auxiliary sensors such as Nuclear Quadruple Resonance (NQR). It is essential reading for students, practitioners, specialists, and academicians involved in the design and implementation of buried object detection sensors.

The purpose of this manuel is to provide guidelines for geophysical surveying at archaeological sites, acquaint those responsible for site investigations with applicable surveying techniques and equipment and present information in relationship to interpretational procedures, quality assurances and reference materials.