With the ever-increasing developmental activities as diverse as the construction of dams, roads, tunnels, underground powerhouses and storage facilities, petroleum exploration and nuclear repositories, a more comprehensive and updated understanding of rock mass is essential for civil engineers, engineering geologists, geophysicists, and petroleum and mining engineers. Though some contents of this vast subject are included in undergraduate curriculum, there are full-fledged courses on Rock Mechanics/Rock Engineering in postgraduate programmes in civil engineering and mining engineering. Much of the material presented in this book is also taught to...
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Climate Change in Water Resources

InCIEC 2014

There are several books on broad aspects of hydrogeology, groundwater hydrology and geohydrology, which do not discuss in detail on the intrigues of hydraulic conductivity elaborately. However, this book on Hydraulic Conductivity presents comprehensive reviews of new measurements and numerical techniques for estimating hydraulic conductivity. This is achieved by the chapters written by various experts in this field of research into a number of clustered themes covering different aspects of hydraulic conductivity. The sections in the book are: Hydraulic conductivity and its importance, Hydraulic conductivity and plant systems, Determination by mathematical and laboratory methods, Determination by field techniques and Modelling and hydraulic conductivity. Each of these sections of the book includes chapters highlighting the salient aspects and most of these chapters explain the facts with the help of some case studies. Thus this book has a good mix of chapters dealing with various and vital aspects of hydraulic conductivity from various authors of different countries.
Climate change and global warming is one of the burning issues, which need more attention, awareness and understanding. It refers to change in average weather pattern for an extended period of time in terms of decades or millions of years. Climate change is caused by several factors like variation in solar radiation, plate movements and volcanic activities. In addition, human intervention plays a major role in ongoing climate change. The continuous rise in global temperature affecting the hydrological cycle has substantial impact on surface
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The Inter-governmental Panel on Climate Change (IPCC, 2000) reports that the surging population, increasing industrialization and associated demands for freshwater, food and energy would be major areas of concern in the climate change aspect. Increase of temperature increases evaporation, resulting in droughts. Under warmer environment, more precipitation will occur as rainfall rather than snow. The changes in monsoon rainfall may be considered as measure to examine climate variability in the context of global warming. Glaciers are an important source for fresh water and considered among the most sensitive indicators of climate change. People living in the catchment areas of the Himalayas face increased risk of floods as glaciers retreat followed by drought and water scarcity. In the coming decades, it is predicted that billions of people in developing countries face shortages of water and food as a result of climate change. Rigorous action has to be taken to enable developing countries to adapt to the effects of climate change. Hence, it is an urgent need for assessing impact and vulnerabilities of climate change, as well as considering possible adaptation options. The deliberations in the conference may be useful in understanding the impact of climate change on water resource, create awareness, learning process for planning and implementing adaptation options.
By definition, it is obviously arbitrary which of the two problems we call the direct and which we call the inverse problem. But usually, one of the problems has been studied earlier and, perhaps, in more detail. This one is usually called the direct problem, whereas the other is the inverse problem. However, there is often another, more important difference between these two problems.

Hadamard (see [91]) introduced the concept of a well-posed problem, originating from the philosophy that the mathematical model of a physical problem has to have the properties of uniqueness, existence, and stability of the solution. If one of the properties fails to hold, he called the problem ill-posed. It turns out that many interesting and important inverse problems lead to ill-posed problems, while the corresponding direct problems are well-posed. Often, existence and uniqueness can be forced by enlarging or reducing the solution space (the space of “models”). For restoring stability, however, one has to change the topology of the spaces, which is in many cases impossible because of the presence of measurement errors. At first glance, it seems to be impossible to compute the solution of a problem numerically if the solution of the problem does not depend continuously on the data, i.e., for the case of ill-posed problems.
Geophysical Abstracts, 144 January-March 1951

Seismic Data Analysis

For a number of years geophysical methods of subsurface surveys have been employed in geology, locating of petroleum and ore bodies, ground water studies, foundation studies for many types of structures, and other fields. These methods have utilized field apparatus, such as seismic and electrical resistivity, to locate or plot these unknown subsurface formations. These two methods are probably the most commonly used. Many public and private agencies, as well as individuals, have adopted the electrical resistivity apparatus as standard equipment, among them many state highway departments, consulting geologists, governmental engineering agencies such as the Bureau of Reclamation, water districts, soil engineers, and oil companies. Highlights in the usefulness of this tool as reported by these agencies, include the economical determination of borrow pit sources, ground water, soundness and faulting of rock formations, depths of bed rock, and oil well logging. The electrical device utilizes the principle that soil and rock of different character offer varying resistances to the flow of electrical current, whereas other methods employ basic principles such as the passage of sound vibration, etc.

Comparative Study Between Seismic Refraction and Electrical Resistivity Method for Subsurface Investigation

This is a collection of conference papers which discuss construction methods in tunnelling. Subjects studied include; engineering classification and characterization of rock mass; planning, investigation and analysis of tunnels; shafts and inclined tunnels; and tunnelling equipment.

Special Procedures for Testing Soil and Rock for Engineering Purposes

Covers the basic ideas and methods used in seismic processing, concentrating on the fundamentals of seismic imaging and deconvolution. Many of the seismic methods in popular use today go back to the work of some of the great scientists of past centuries.
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The book covers such basic topics as wave motion; digital imaging; digital filtering; various visualization aspects of the seismic reflection method; sampling theory; the frequency spectrum; synthetic seismograms; wavelets and wavelet processing; deconvolution; the need for continuing interaction between the seismic interpreter and the computer; seismic attributes; phase rotation; and seismic attenuation. The last of the 15 chapters gives a detailed mathematical overview. Digital Imaging and Deconvolution, nominated for the Association of Earth Science Editors award for the best geoscience publication of 2008-2009, will be of interest to professional geophysicists as well as graduate students and upper-level undergraduates in geophysics. The book also will be helpful to scientists and engineers in other disciplines who use digital signal processing to analyze and image wave-motion data in remote-detection applications. In particular, the methods described in this book are important in optical imaging, video imaging, medical and biological imaging, acoustical analysis, radar, and sonar.

Subsurface Surveying in Road Engineering Using the Electrical Resistivity Method

This book provides a general introduction to the most important methods of applied geophysics with a variety of case studies. These methods represent a primary tool for investigation of the subsurface and are applicable to a very wide range of problems. Applied geophysics is based on physics principles that collect and interpret data on subsurface conditions for practical purposes, including oil and gas exploration, mineral prospecting, geothermal exploration, groundwater exploration, engineering applications, archeological interests, and environmental concerns. The depth of investigation into applied geophysics is shallow, typically from the ground surface to several kilometers deep, where economic, cultural, engineering, or environmental concerns often arise. Applied geophysics uses almost all of the current geophysical methods, including electrical, magnetic, electromagnetic, gravimetric, geothermal, seismic, seismoelectric, magnetotelluric, nuclear, and radioactive methods. In applied geophysics, geophysicists are usually required to have a good understanding of math and physics principles, knowledge of geology and computer skills, and hands-on experience of electronic instruments. A geophysicist's routine job includes survey designs, data acquisition, data processing, and data interpretation with detailed explanation of the study. Applied geophysics consists of three main subject and interest areas, which are exploration geophysics, engineering geophysics, and environmental geophysics.
This book describes the application of non-destructive geophysical methods in subsurface archaeological features. Such non-destructive methods are magnetometry, electrical resistance, electromagnetic conductivity, magnetic susceptibility and ground penetrating radar. This book also includes the latest improvements in instrumentation, data processing, and interpretations of the collected data sets leading to the rapid progress in geophysical applications in the field of archaeological investigations. The book also provides complete case-studies and archaeological interpretations of results carried out in different localities around the world.

An Introduction to the Mathematical Theory of Inverse Problems

Time domain electrometry (TDE) is a general term which includes time domain reflectrometry and time domain transmissometry. It is a commercially-viable technique for leak detection, contaminant monitoring, and moisture content determination in contaminant transport modeling. Under demographic pressure, contaminated sites are increasingly being re-developed for domestic and industrial use; and this presents an urgent need for reliable, non-intrusive and integrated methods of subsurface characterization, detection and monitoring of organic and inorganic pollutants, soil moisture content and salinity. This book provides an overview of the potential application of TDE in geoenvironmental engineering and describes the geophysical methods used.

Construction Guide for Soils and Foundations

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.
The Electrical Resistivity Method of Subsurface Exploration

Resistivity and Induced Polarization

The electrical resistivity method constitutes a procedure for obtaining subsurface information from surface measurements. The goal is to determine the structure of the subsurface layers of soil and rock, or the location of water table, or the location of sand or gravel deposits, or the location of fault zones. This method works upon the known fact that electrical resistivity of earth materials will decrease with increasing values of (a) moisture content and/or (b) salinity or free ion content of the connate moisture. The method is capable of yielding the sequence or relative positions with depth of the various subsurface layers, plus an estimate of depths to the layers. An improved estimate of depth can be obtained if calibration readings can be taken at locations with known depth structure.

Mapping and Monitoring of Electrical Resistivity with Subsurface Arrays

This handbook is primarily a description of the methodology of using earth resistivity techniques for locating cavities. Only a small portion of the handbook will be devoted to the theoretical considerations behind these techniques. However, the annotated bibliography cites ample literature to satisfy the needs of the theoretician. Along with earth resistivity techniques, several geophysical techniques will be examined in lesser detail with respect to cavity location. Micro-gravity, high-resolution seismic reflection profiling, and ground probing radar were selected because they show good success rates in cavity detection. High-resolution seismic profiling shows particularly good promise as an effective tool in cavity location. Techniques in photo interpretation will also be discussed with regard to possible cavity location.
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Ground-water Contamination

This illustrated handbook describes a broad spectrum of methods in the fields of remote sensing, geophysics, geology, hydrogeology, geochemistry, and microbiology designed to investigate landfill, mining and industrial sites. The descriptions provide information about the principle of the methods, applications and fundamentals. This handbook also deals with the stepwise procedure for investigating sites and common problems faced in efficient implementation of field operations.

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