Mineral Resource Estimation An Introduction

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Introduction to Mineralogy and Petrology Society for Mining Metallurgy & Exploration
Mineral resource estimation has changed considerably in the past 25 years: geostatistical techniques have become commonplace and continue to evolve; computational horsepower has revolutionized all facets of numerical modeling; mining and processing operations are often larger; and uncertainty quantification is becoming standard practice. Recent books focus on historical methods or details of geostatistical theory. So there is a growing need to collect and synthesize the practice of modern mineral resource estimation into a book for undergraduate students, beginning graduate students, and young geologists and engineers. It is especially fruitful that this book is written by authors with years of relevant experience performing mineral resource estimation and with years of relevant teaching experience. This comprehensive textbook and reference fills this need.

Mineral Resource Potential and Geology of the San Juan National Forest, Colorado Springer
This new, up dated edition of Introduction to Mineral Exploration provides a comprehensive overview of all aspects of mineral exploration. Covers not only the nature of mineral exploration but also considers other factors essential to successful exploration, from target evaluation to feasibility studies for extraction and production. Includes six detailed case studies, selected for the range of different problems and considerations they present to the mineral explorationist. Features new chapters on handling mineral exploration data and a new case study on the exploration for diamonds. Essential reading for upper level undergraduates studying ore geology, mineral exploration, mining geology, coal exploration, and industrial minerals, as well as professional geologists. Artwork from the book is available to instructors online at www.blackwellpublishing.com/moon.
Mineral Resource and Ore Reserve Estimation Elsevier
Written by a mining professional with a strong background in technical and financial studies, risk assessment, and statistics, this book provides a detailed suite of tools so you can determine whether investing in a mining project makes sense for you. Jean-Michel Rendu provides a comprehensive guide to determine when to invest, when to demand a plan that reduces the risks, and when to just walk away.
An Introduction to Cut-off Grade Estimation, Second Edition Elsevier
This conference proceedings presents the research papers in the field of mine planning and mining equipment including themes such as mine automation, rock mechanics, drilling, blasting, tunnelling and excavation engineering. The papers presents the recent advancement and the application of a range of technologies in the field of mining industry. It is of interest to the professionals who practice in mineral industry including but not limited to engineers, consultants, managers, academics, scientist, and government staff.
Mine and Mineral Economics Society for Mining, Metallurgy & Exploration
Gold, a chemical element with the symbol Au, is a highly sought-after precious metal, having been used as money, in jewellery, in sculpture, and for ornamentation since the beginning of recorded

history. The metal occurs as nuggets or grains in rocks, in veins and in alluvial deposits. Gold mining consists of the processes and techniques employed in the removal of gold from the ground. There are several techniques by which gold may be extracted from the Earth. Since the 1880s, South Africa has been the source for a large proportion of the world's gold supply, with about 50% of all gold ever produced having come from South Africa. Other major producers are the United States, Australia, China, Russia and Peru. The world's oceans also hold a vast amount of gold, but in very low concentrations. At current consumption rates, the supply of gold is believed to last 45 years. This book will present current research on gold mining including methodologies for discovering new deposits of gold as well as economic and environmental issues.

Mineral Property Evaluation Springer Science & Business Media

This publication includes eight case studies that demonstrate the classification of uranium or thorium resources at different scales, with examples in Argentina, Brazil, China, India, Malawi, Niger and the USA, to test the application of the United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009 (UNFC-2009) to Nuclear Fuel Resources. UNFC-2009, which has been developed by the UNECE Expert Group on Resource Classification, is applicable to all extractive activities worldwide with work underway to broaden application to encompass renewable energy as well as injection projects for the geological storage of carbon dioxide. Guidelines, described here, were prepared for the application of UNFC-2009 to nuclear fuel resources. They will assist those responsible for finding, classifying, quantifying, financing, permitting, mining, and processing these minerals such that they are fit to enter the nuclear fuel cycle. They must be used in conjunction with the most recent release of UNFC-2009. The eight case studies demonstrate that UNFC-2009 can be applied to nuclear fuel resources and that the Bridging Document and Guidelines are both workable documents, providing a practical basis for application.

Application of the United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009 to Nuclear Fuel Resources - Selected Case Studies Scientific Publishers

Presents an applied approach to the estimation of mineral resources/reserves. It is suitable for any university or mining school that offers courses on mineral resource/reserve estimation. It will also be valuable for professional mining and geological engineers and geologists working with mineral exploration companies.

Mineral Policy Mining Law and Development 2nd Ed Wiley-Blackwell

"Geostatistics, mining resource estimation, spatial statistics in mining industry."--Provided by publisher.

Quantitative Mineral Resource Assessments Springer Nature

Critiquing approaches to estimating mineral resources for the mining industry by comparing methods, parameters and strategies.

An Introduction to Cut-Off Grade Estimation Springer Science & Business Media

An Introduction to Cut-off Grade Estimation examines one of the most important calculations in the mining industry. Cut-off grades are essential to determining the economic feasibility and mine life of a project. Profitability and socioeconomic impact of mining operations are influenced by the choice of cut-off grades. Cut-off grades play a key role in estimating mineral reserves that can be publicly reported. This new edition is easier to read and of greater practical interest to practitioners. The relationship between optimization of net present value, capacity constraints, and opportunity cost is explained in greater detail. A new section discusses blending strategies, which play a critical role in an increasing number of mining operations. Author Jean-Michel Rendu, an internationally recognized expert in the management, estimation, and public reporting of mineral resources, provides practical insights. As a manager in major mining companies, a consultant, and an educator, Rendu has acquired considerable experience in all aspects of mining engineering, experience that was incorporated into this publication.

Hearings, Reports and Prints of the Senate Committee on Interior and Insular Affairs Society for Mining, Metallurgy, and Exploration

Policy makers, mineral exploration experts, and regional planners decide how public lands, which may contain undiscovered resources, should be used or whether to invest in exploration for minerals on a regular basis. Decisions are also made concerning mineral resource adequacy, national policy, and regional development. This book makes explicit the factors that can affect a mineral-related decision so that decision-makers can clearly see the possible consequences of their decisions. Based on work done at the US Geological Survey, the authors address the question of the kinds of issues decision-makers are trying to resolve and what forms of information would aid in resolving these issues. The goal of the process discussed is to offer unbiased quantitative assessments in a format needed in decision-support systems so that consequences of alternative courses of action can be examined with respect to land use or mineral-resource development. An integrated approach focuses on three assessment parts and the models that support them. Although the concepts presented are straightforward and understandable, in assessments, carefully listening to the experts in other disciplines leads to better products. Navigating through and making sense of QRA requires not just learning rules and equations, but life experiences and common sense. The judgment required to understand which tools to apply are best learned by example and experience. This will be useful to governmental or industrial policy makers, managers of explorations, planners of regional development, and similar decision-makers.

Applied Mineral Inventory Estimation United Nations

The Business of Mining complete set of three Focus books provides readers with a holistic all-embracing appraisal of the analytical tools available for assessing the economic viability of prospective mines. Each volume has a discrete focus. This third volume commences with "Our Earth, its Minerals and Ore Bodies", followed by a review of mineral exploration and sampling of mineral deposits. It continues with detailed sections covering the reporting of mineral resources and reserves in Australia, and concludes with the basic principles and application of the various methods of estimating the in-situ mineral resources and ore reserves. The books were written primarily for undergraduate applied geologists, mining engineers and extractive metallurgists and those pursuing course-based postgraduate programs in mineral economics. However, the complete series will also be an extremely useful reference text for practicing mining professionals as well as for consultant geologists, mining engineers or primary metallurgists.

Mineral Resources Society for Mining, Metallurgy, and Exploration, Incorporated

This comprehensive textbook covers all major topics related to the utilization of mineral resources for human activities. It begins with general concepts like definitions of mineral resources, mineral resources and humans, recycling mineral resources, distribution of minerals resources across Earth, and international standards in mining, among others. Then it turns to a classification of mineral resources, covering the main types from a geological standpoint. The exploration of mineral resources is also treated, including geophysical methods of exploration, borehole geophysical logging, geochemical methods, drilling methods, and mineral deposit models in exploration. Further, the book addresses the evaluation of mineral resources, from sampling techniques to the economic evaluation of mining projects (i.e. types and density of sampling, mean grade definition and calculation, Sichel’s estimator, evaluation methods – classical and geostatistical, economic evaluation – NPV, IRR, and PP, estimation of risk, and software for evaluating mineral resources). It subsequently describes key mineral resource exploitation methods (open pit and underground mining) and the mineral processing required to obtain saleable products (crushing, grinding, sizing, ore separation, and concentrate dewatering, also with some text devoted to tailings dams). Lastly, the book discusses the environmental impact of mining, covering all the aspects of this very important topic, from the description of diverse impacts to the environmental impact assessment (EIA), which is essential in modern mining projects.

Ore Reserve Estimation and Strategic Mine Planning Springer

“Everything” sums up what must be considered for a properly documented property evaluation. Less than 30% of the projects that are developed in the minerals industry yield the return on investment that was projected from the project feasibility studies. The tools described in this handbook will greatly improve the probability of meeting your projections and minimizing project execution capital cost blowout that has become so prevalent in this industry in recent years. Mineral Property Evaluation provides guidelines to follow in performing mineral property feasibility and evaluation studies and due diligence, and in preparing proper documents for bankable presentations. It highlights the need for a consistent, systematic methodology in performing evaluation and feasibility work. The objective of a feasibility and evaluation study should be to assess the value of the undeveloped or developed mineral property and to convey these findings to the company that is considering applying technical and physical changes to bring the property into production of a mineral product. The analysis needs to determine the net present worth returned to the company for investing in these changes and to reach that decision point as early as possible and with the least amount of money spent on the evaluation study. All resources are not reserves, nor are all minerals an ore. The successful conclusion of any property evaluation depends on the development, work, and conclusions of the project team. The handbook has a diverse audience: • Professionals in the minerals industry that perform mineral property evaluations. • Companies that have mineral properties and perform mineral property feasibility studies and evaluations or are buying properties based on property evaluation. • Financial institutions, both domestic and overseas, that finance or raise capital for the minerals industry. • Consulting firms and architectural and engineering contractors that utilize mineral property feasibility studies and need standards to follow. • And probably the most important, the mining and geological engineering students and geology and economic geology students that need to learn the standards that they should follow throughout their careers.

The Estimation of Mineral Resources by the Computer Program "Iris" Oxford University Press

Introduction to Mineralogy and Petrology, second edition, presents the essentials of both disciplines through an approach accessible to industry professionals, academic researchers, and students alike. This new edition emphasizes the relationship between rocks and minerals, right from the structures created during rock formation through the economics of mineral deposits. While petrology is classified on the lines of geological evolution and rock formation, mineralogy speaks to the physical and chemical properties, uses, and global occurrences for each mineral, emphasizing the need for the growth of human development. The primary goal is for the reader to identify minerals in all respects, including host-rocks, and mineral deposits, with additional knowledge of mineral-exploration, resource, extraction, process, and ultimate use. To help provide a comprehensive analysis across ethical and socio-economic dimensions, a separate chapter describes the hazards associated with minerals, rocks, and mineral industries, and the consequences to humanity along with remedies and case studies. New to the second edition: includes coverage of minerals and petrology in extra-terrestrial environments as well as case studies on the hazards of the mining industry. Addresses the full scope of core concepts of mineralogy and petrology, including crystal structure, formation and grouping of minerals and soils, definition, origin, structure and classification of igneous, sedimentary and metamorphic rocks Features more than 250 figures, illustrations and color photographs to vividly explore the fundamental principles of mineralogy and petrology Offers a holistic approach to both subjects, beginning with the formation of geologic structures that is followed by the hosting of mineral deposits and the exploration and extraction of lucrative, usable products that improve the health of global economies Includes new content on minerals and petrology in extraterrestrial environments and case studies on hazards in the mining industry

The Art and Science of Resource Estimation Cambridge University Press

"Informed decisions concerning undiscovered mineral resources cannot be made without an understanding of the technological, environmental, or economic difficulties that might be encountered. Quantitative Mineral Resource Assessments: An Integrated Approach offers a modern quantitative assessment that explicates the diverse factors that affect mineral-related decisions, so that potential consequences can be more easily assessed, uncertainty and risk reduced, and courses of action determined without bias. The integrated approach focuses on three assessment parts and the models that support them and is designed so that consequences of alternative courses of action can be examined with respect to land use, exploration, or mineral-resource development. Drawing upon newly developed deposit density models, frequency distributions, and previously unpublished experiments, the book provides an essential and practical approach for making critical decisions." "Written for governmental and industrial policy makers, managers of exploration, planners of regional development, and similar decision makers, the book brings together for the first time the widely scattered literature on the subject. It also captures the necessary ingredients of the diverse disciplines of economic geology, statistics, mineral economics, and geology that are an integral part of quantitative mineral resource assessments. With this wealth of information, the book will serve not only as a guide for professionals but also as a comprehensive reference for those studying or researching mineral resources."--BOOK JACKET.

Mineral Resource Estimation PHI Learning Pvt. Ltd.

An Introduction to Cut-off Grade Estimation examines one of the most important calculations in the mining industry. Cut-off grades are essential to determining the economic feasibility and mine life of a project. Increased cut-off grades can reduce political risks by ensuring higher financial returns over a shorter period of time. Conversely, lower cut-off grades may increase project life with longer economic benefits to shareowners, employees, and local communities. Cut-off grades also impact reported reserves, which are closely monitored by stock exchanges and regulatory agencies. Author Dr. Jean-Michel Rendu, an internationally recognized expert in the management,

estimation, audit, and public reporting of mineral resources, provides practical insights into this critical variable. YouOCOll learn about minimum cut-off grades, as well as those for deposits containing multiple valuable minerals. Dr. Rendu explains which costs should be included in cut-off grade calculations and considerations when planning open pit, underground, and block and panel caving operations. He shows how to optimize a copper mining project by changing grind size, and demonstrates the relationship between deposit modeling, ore control, and cut-off grades.

Geomathematics: Theoretical Foundations, Applications and Future Developments Springer

The mining business faces continual risks in producing metals and raw materials under fluctuating market demand. At the same time, the greatest uncertainty driving the risk and profitability of mining investments is the geological variability of mineral deposits. This supply uncertainty affects the prediction of economic value from the initial valuation of a mining project through mine planning, design and production scheduling. This book is the first of its kind, presenting state-of-the-art stochastic simulation and optimization techniques and step-by-step case studies. Quantification of geological uncertainty through new efficient conditional simulation techniques for large deposits, integration of uncertainty to stochastic optimization formulations for design and production scheduling and the concurrent management of risk are shown to create flexibility, options and oportunities, increase asset value, cashflows and return on investment. New approaches introduced include resource/reserve risk quantification, cost-effective drilling programs, pit design and long-term production scheduling optimization with simulated orebodies, ore reserve classification, geologic risk discounting, waste managing and demand driven scheduling, risk assessment in meeting project production schedules ahead of mining, risk based optimal stope design, options valuation when mining. Applications include commodities such as gold, copper, nickel, iron ore, coal and diamonds.

Mineral Resources Off the Northeastern Coast of the United States CRC Press

This book contains selected contributions presented at the 10th International Geostatistics Congress held in Valencia from 5 to 9 September, 2016. This is a quadrennial congress that serves as the meeting point for any engineer, professional, practitioner or scientist working in geostatistics. The book contains carefully reviewed papers on geostatistical theory and applications in fields such as mining engineering, petroleum engineering, environmental science, hydrology, ecology, and other fields.

An Introduction to Mineral Economics Springer

For any country’s economy, mineral resources form an important part in generating revenue and increasing its GDP. Therefore, learning the economics behind mines and minerals becomes mandatory and logical. This book investigates and promotes understanding of economic and policy issues, programmes and strategies for exploration, mining, beneficiation and marketing activities. Divided into ten chapters, the book puts emphasis on elaborating the principles of mine and mineral economics. The introductory chapter discusses the scope of the subject and the issues addressed by it. Outline of reserve-resource dynamics and the recent approaches towards estimating ore-reserves are then elaborated, followed by a discussion on mineral availability. Focus is then shifted to more technical and quantitative aspects of mineral sampling. Issues relating to mineral property evaluation and project feasibility assessment are then taken up. Both quantitative and logical aspects of mine finance and accounting have been discussed. Nitty-gritties of mine taxation are further outlined and the reader is introduced to aspects relating to marketing and trading of minerals. Distinctive features of the mineral policies of a few countries are highlighted while discussing the characteristic features of a national mineral policy. The last chapter of this book is on mineral industry and the environment.