Pure and Applied Geophysics

Book Review

Gravity and Magnetic Exploration: Principles, Practices, and Applications by William J. Hinze, Ralph R. B. von Frese and Afif H. Saad, Cambridge University Press, 2013; ISBN: 978-0-521-87101-3, (hardback), £45, USD 80.00

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This well-written, comprehensive textbook and reference source will provide readers with a comprehensive account of the geophysical methods of gravity and magnetics, including data acquisition, processing, modeling, and practical interpretation. The book explains how surface, subsurface, marine, airborne and satellite gravity and magnetic measurements are used for exploring the subsurface structure. A full range of potential fields-exploration topics are described, including high-resolution magnetic studies, time-variation gravity analysis from surface and satellite gravity measurements, absolute and gradient gravimetry, and the role of the Global Positioning System (GPS) in mapping gravity and magnetic fields. The book also recapitulates the physical properties of rocks and other Earth materials that are important to the successful design, implementation, and interpretation of surveys, and presents an outline of digital data analysis methods used to process and interpret gravity and magnetic anomalies for subsurface information.

The book is organized in three parts—gravity exploration, magnetic exploration and applications with focus on the former two sections. The authors begin each chapter with a general overview and conclude with a summary of key concepts that will help readers review essential aspects of each chapter. The figures and tables are an added value as they help illustrate key points. An appendix provides guidance for basic data analysis using accessible mathematical notation. Study questions and problem sets are available online, together with computer-based exercises. Getting access to an accompanying website sometimes requires some patience and persistence. However, while access is successful, a reader can get hold of practical experience in processing, modeling, and interpreting gravity and magnetic anomaly data. The user is urged to study the relevant segments of the book and cited references in the book prior to performing the exercises. The appropriate book segments are referenced with each set of exercises. A suite of computational exercises with instructions and software for performing them on the book's website illustrates the practical utility of modern gravity and magnetic surveys in various fields of exploration and research, as well as their potential limitations.

This book is suitable for advanced undergraduate and graduate courses, but also serves as a reference for research academics, professional geophysicists, and all explorationists using gravity and magnetic methods. Much of the included mathematics will be familiar to students in the geosciences, but knowledge of advanced mathematics will be helpful and enhance understanding of topics presented. For the most chapters, however, the mathematics is limited to an absolute minimum. This valuable resource will be beneficial to all those interested in petroleum, engineering, mineral, environmental, geological, and archaeological exploration and willing to extent and consolidate their knowledge. It will help students to

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efficiently gain understanding and appreciation for the gravity and magnetic methods, and it will provide experienced earth scientists with a valuable addition to their exploration libraries.