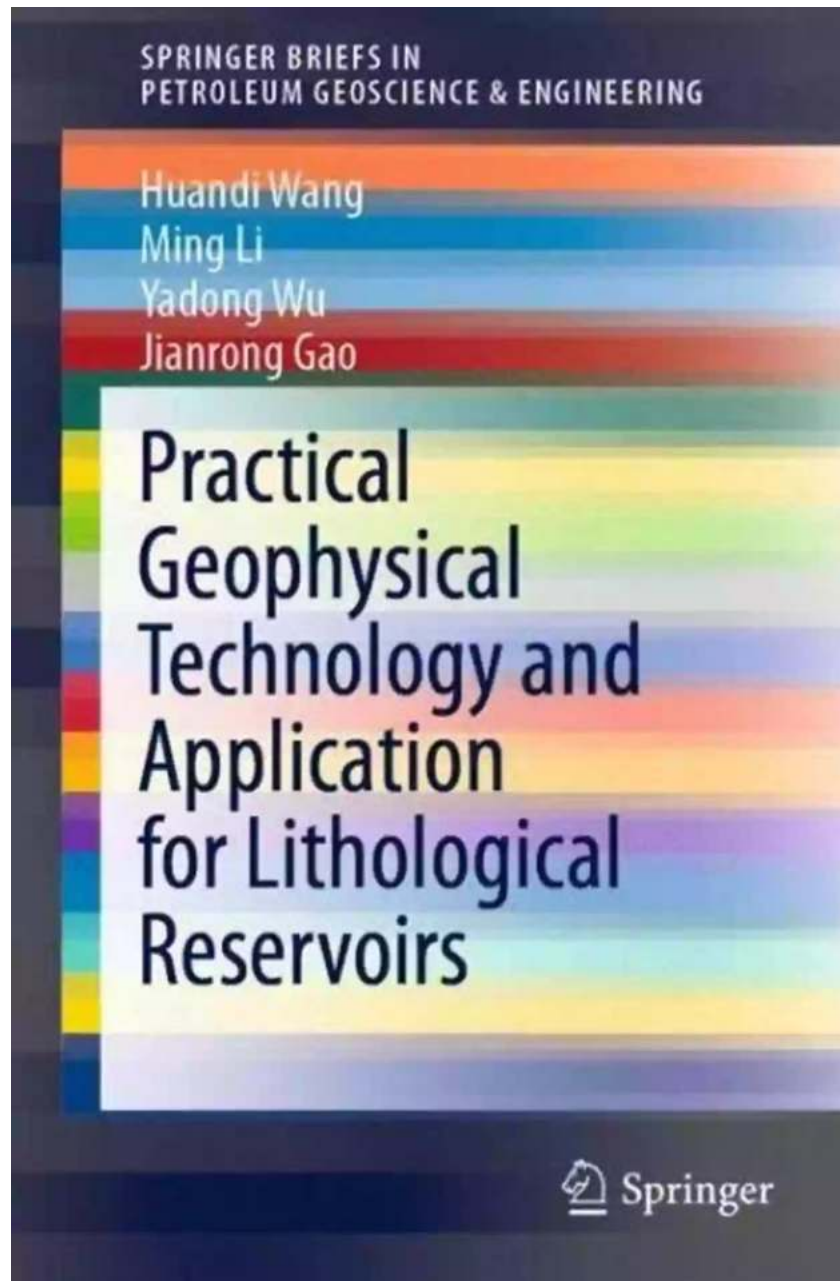


# Unlock the Secrets of Lithological Reservoirs with Practical Geophysical Technology



When it comes to exploring and extracting natural resources, the understanding of lithological reservoirs plays a vital role. These reservoirs are known for their unique geological composition and often prove to be challenging for traditional exploration methods. However, with modern advancements in geophysical

technology and its practical applications, tapping into the potential of lithological reservoirs has become more feasible than ever before.

## The Importance of Geophysical Technology

Geophysical technology utilizes various physical principles to study the Earth's subsurface, providing key insights into its composition and potential reserves of oil, gas, and other natural resources. By combining geophysical techniques with advanced data processing algorithms, scientists and engineers can create accurate models of lithological reservoirs, enabling more informed decision-making during exploration and production phases.



## Practical Geophysical Technology and Application for Lithological Reservoirs (SpringerBriefs in Petroleum Geoscience & Engineering)

by Huandi Wang(Kindle Edition)

★★★★☆ 4.2 out of 5

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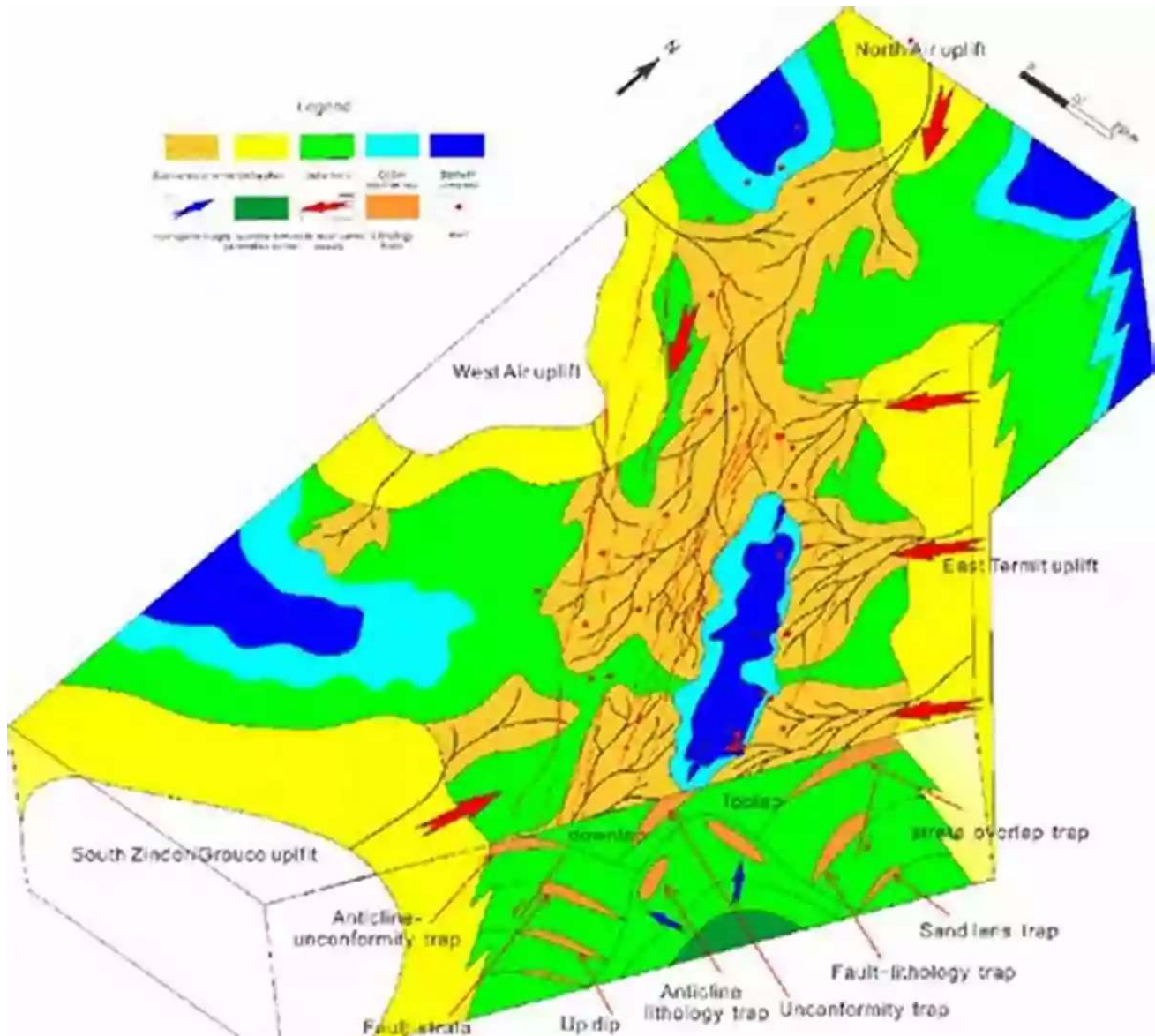
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## Understanding Lithological Reservoirs

Lithological reservoirs are characterized by their specific lithology, which refers to the physical and chemical properties of the rocks constituting the reservoir. These reservoirs often have complex structures and heterogeneous compositions, making their characterization a challenging task. However, with the right

geophysical tools and methodologies, it is possible to gain valuable insights into these reservoirs.



## Geophysical Techniques for Lithological Reservoir Characterization

Below are some notable geophysical techniques that have proven effective for lithological reservoir characterization:

- **Seismic Reflection:** This technique involves generating seismic waves and analyzing the reflected signals to create detailed images of subsurface rock

formations. By analyzing the amplitude, frequency, and polarity of the reflected waves, scientists can determine lithology variations and identify potential hydrocarbon-bearing zones.

- **Electrical Resistivity Tomography (ERT):** ERT measures the electrical resistivity distribution of subsurface materials. It can help identify lithological variations by detecting differences in conductive and resistive rocks.
- **Gravity and Magnetic Surveys:** These surveys measure gravitational and magnetic field anomalies, which can provide valuable information about the distribution of lithological reservoirs.
- **Well Logging:** Well logging involves collecting geophysical data directly from wells drilled into the reservoir. These data help determine lithology, porosity, and fluid saturation, providing crucial information for reservoir evaluation.

## **Practical Applications of Geophysical Technology**

## Application of geophysical technology in prevention of mining geological disasters

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**Keywords:** disaster prevention; geophysical technology; 3-D seismic exploration

**Abstract:** The prevention of geological disasters in the coal mine, integrated geophysical technology was used to avoid geological disasters in coal mine, build a harmonious society and improve economic efficiency is of great significance. In this paper the development of geophysical technology was analyzed, the correct use of geophysical technology and geological disaster prevention are described. It briefly introduced seismic exploration, electrical geophysical technology such as the basic concepts and exploration results and looked forward to the prospect of integrated geophysical technology. By exploration cases it described geophysical exploration methods in the prevention of geological disasters in the coal mine practicality and effectiveness.

### 1 Introduction

Geophysical exploration is an important tool of survey and exploration of minerals, which uses special instruments to detect the natural or artificial changes in the geophysical field, eliminate the value of interference factors, correct the measured data, then use the corrected value to plot planar graph and profile graph. According to the unusual features which were reflected by the map, and comprehensive consideration of working area integrated geological data, then determine the cause of the abnormal. Make qualitative or quantitative explanation to the shape, occurrence, and spatial location of geological bodies, then analyze geological structure and delineate geological seam distribution, and solve various geological problems encountered in production and safety<sup>[1]</sup>.

### 2 The application of geophysical technology

#### 2.1 Magnetic exploration

Main method: (1) The acoustic monitoring technology (2) Surface wave exploration technology (3) Geological radar technology (4) The reflected wave measured pile technology (5) Microtremor observation techniques (6) Transient Rayleigh wave exploration technology

Applications and geological problems that can be solved: (1) Direct detection and the search for magnetic or geological deposits (2) Used to determine the rock, the formation of faults, and the delineation of rock (3) Indirect prospecting, such as asbestos stone (4) Geological mapping

#### 2.2 Electrical prospecting

Main method: (1) The resistivity method (2) Natural electric field method (3) The induced polarization method (4) Alternating current method

The practical application of geophysical technology in lithological reservoirs is extensive and offers numerous benefits:

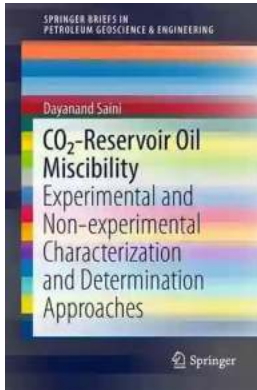
1. **Identifying Optimal Drilling Locations:** Geophysical surveys help determine areas with the highest potential, minimizing the risk of unsuccessful drilling and increasing the success rate.

2. **Characterizing Reservoir Properties:** Geophysical techniques aid in understanding the lithology variations and predicting the presence of hydrocarbon-bearing zones, porosity, permeability, and fluid saturation.
3. **Monitoring Reservoir Performance:** Continuous geophysical monitoring helps track changes in reservoir properties over time, enabling efficient reservoir management and production optimization.
4. **Improving Enhanced Oil Recovery (EOR) Techniques:** Geophysical data and models assist in evaluating and optimizing different EOR methods, enhancing oil and gas recovery from lithological reservoirs.
5. **Preventing Environmental Impacts:** Geophysical methods can also be used to detect and mitigate potential environmental risks associated with lithological reservoir exploration and production activities.

Practical geophysical technology has revolutionized the exploration and production of natural resources from lithological reservoirs. By using advanced geophysical techniques, scientists and engineers can gain a comprehensive understanding of the reservoir's composition and properties. This knowledge enables targeted exploration, informed decision-making, and efficient production strategies, ultimately leading to better resource utilization and minimizing environmental impacts.

As technology continues to evolve, the practical application of geophysical techniques will undoubtedly play a crucial role in unlocking the mysteries of lithological reservoirs, providing a sustainable and efficient approach towards resource exploitation.

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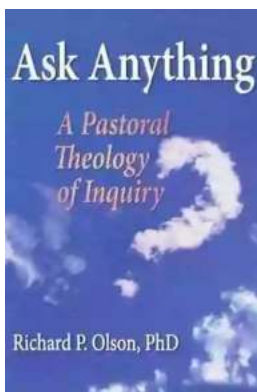
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This book introduces new geological analysis and geophysical methods and techniques for lithological reservoir exploration. It puts forward a set of practical geophysical methods and techniques aimed at lithological reservoirs in China. From a practical point of view, the book systematically analyses geophysical methods and technique principles, applied steps, key problems and caution notes in lithological exploration. The lessons of the book are demonstrated with a case study of the Songliao Basin, which has a large area with a low density of lithological reservoirs, indicating the methods and techniques that can identify lithological reservoirs. It is unique in its fusion of theory, method and technology and practice.



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