

Application of Geophysical Technology in Engineering Investigation

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Abstract. With the development of science and technology and the progress of society, various high and new technologies have increasingly shown their respective advantages. Among them, geophysical prospecting technology is a typical representative. Because it can greatly improve the speed and efficiency of engineering, and at the same time, it also plays an important role in engineering safety and prevention. Therefore, it is widely promoted and applied, especially in engineering survey work. This article studies the importance of geophysical prospecting in engineering exploration, the methods of geophysical prospecting technology, the application of geophysical prospecting technology, and the development trend of geophysical prospecting technology. How to better understand the application of geophysical prospecting technology and rationally choose working methods and methods, so as to serve the geological exploration work to the utmost extent, is an important topic that needs to be solved and studied urgently.

1. Introduction

At this stage, relying on the development of science and technology and economic and social progress, my country's geological prospecting work has achieved unprecedented rapid development, and various high and new technologies represented by geophysical technology have been promoted and applied in this field. As we all know, as a basic project for work construction, geological survey work plays an irreplaceable role in the quality, safety and overall benefits of the entire project. Compared with traditional drilling and exploratory well technologies, geophysical prospecting technology has more advantages in the role and function of engineering construction, its application field and scope are wider, the restrictions are less, and the effect is more obvious. But it is undeniable that there are also problems and defects of this kind and that need to be further studied and solved in order to be able to play the greatest role and utility in the engineering geological survey and improve the overall quality and level of engineering construction.

2. Significance of geophysical methods in engineering investigation

At this stage, with the development and progress of basic technology and the continuous purchase of goods in society, geophysical prospecting technology is becoming more and more mature, and it has been widely promoted and applied in many fields and industries, and has received good economic and social Effect. Especially in the field of geological exploration, it has played an irreplaceable role. For example, in hydrogeological

exploration and material disaster investigation and design, its role is unattainable by other technologies. In the work and construction, geophysical prospecting technology can not only greatly improve the construction progress and speed of project construction, but also provide an important guarantee for the quality and safety of the project. At the same time, it has also played a great guiding and key role in the prediction, prevention, and prevention of geological disasters. It can be seen that the role of geophysical prospecting technology for geological exploration is very obvious and important, and it has an important position and irreplaceable significance for establishing a public safety guarantee system and maintaining social security and stability. It should be noted that if we want to give full play to the role of geophysical technology, we must further strengthen research, earnestly delve into it, and play a better role.

3. Geophysical methods

Geophysical exploration technology is abbreviated as geophysical exploration technology. It is an exploration technology that uses the principles and methods of geophysics to observe the distribution and changes of various physical fields through the density difference, radioactivity, and magnetism of rocks, strata and surrounding rocks.

Geophysical prospecting technology can not only provide technologies and methods for detecting the internal structure of the earth, searching for energy, and monitoring the environment, but also for disaster forecasting.

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Geological engineering prospecting is the investigation work carried out to find the geological factors that affect the construction of the project. The prospecting factors mainly include geological structure, hydrology, geomorphology, rock and soil and other physical properties and natural geological phenomena.

At present, geophysical prospecting technology is not only applied in geological engineering exploration of groundwater resources and mineral resources, but also used in geological disasters and archaeological surveys. The main exploration methods include gravity prospecting, electrical prospecting, seismic prospecting, magnetic prospecting, radiological prospecting, etc. See Figure 1. Brief description of the technical route of geophysical prospecting technology.

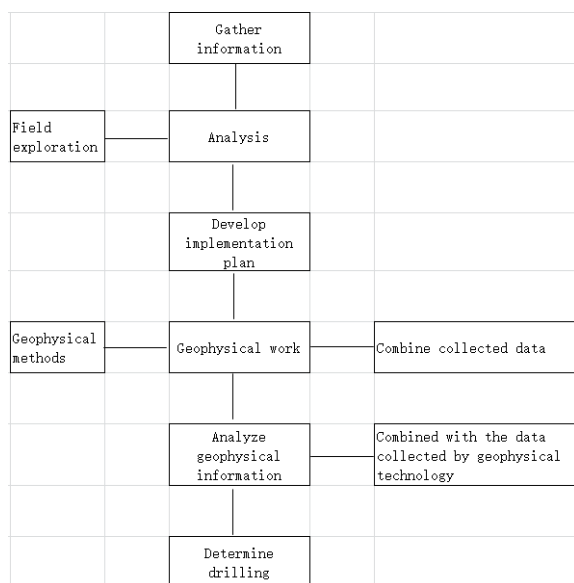


Figure 1. Brief description of the technical route of geophysical prospecting technology

3.1 Ground penetrating radar

The working principle of ground penetrating radar is similar to that of optics, mainly by launching high-frequency electromagnetic waves to the target medium, screening and analyzing the reflected electromagnetic wave frequency to conduct detailed survey and analysis of relevant geological conditions. Especially for metal minerals, it can carry out more in-depth detection and screening, so as to draw analysis conclusions and provide a basis for further work. It should be noted that in order to more accurately understand and grasp the characteristics of geology, it is necessary to strictly follow the principle of electromagnetic wave work, comprehensively analyze the topography and geology of the target site for comprehensive analysis and research, and in similar or identical geological conditions Below, the frequency obtained is also similar, which requires that the ground penetrating radar must have a higher resolution and recognition rate.

3.2 Magnetic method

The natural magnetic field method is mainly based on the full utilization of the natural underground electric field resources. The distribution and storage of groundwater and minerals can be judged by measuring the changes in the geoelectric field on the ground. It can exert a good effect on certain occasions. However, the limitation of this method is also obvious. At present, it only plays a good role in the target ground with obvious hydraulic slope and not deeply buried.

3.3 Transient electromagnetic method

This method is mainly based on the change of electromagnetic waves at different times to detect and survey the target surface. It is mainly based on the different conductivity of different minerals, which induces different signals, and analyzes the law of electromagnetic field and time changes, so as to Detect and analyze the storage location and depth of minerals.

3.4 Seismic exploration method

The working principle of this method is to analyze the rock structure and structure of the crust by analyzing the propagation law of artificially excited elastic waves in different crusts. And this elastic wave is what we call seismic wave. In this process, if explosives are used as the seismic source, the surface is excited by the action at the bottom layer, which will affect the changes in the surrounding environment and topography.

In this way, the rock at a certain distance from the earthquake source will produce a certain elastic change, which will trigger the resistance of the rock itself, and this resistance will form a structural deformation. However, once this elastic change disappears, the rock will return to its original condition. In this process, the seismic point changes of the seismic source are constantly changing with different deformations, so that by analyzing the position of each deformation, the necessary basis and original materials can be provided for subsequent analysis and detection.

4. Application of geophysical prospecting technology

4.1 Application in Geological Engineering Investigation of Groundwater Resources

In order to ensure the accuracy of geological engineering survey of groundwater resources, before conducting geophysical exploration, technicians need to collect the topographic and geomorphic features, climatic features, human environment, traffic conditions and other data of the exploration area, and make appropriate surveys based on the above data. Plan, select the appropriate geophysical exploration technology, method and survey instrument. Among them, the induced polarization method has a small impact on the hydrological environment and landform

characteristics, and can measure multiple parameters at the same time. It is the most commonly used geophysical prospecting technology in the exploration of groundwater resources.

The operation of the induced polarization method in the geological engineering survey of groundwater resources is as follows:

- (1) Choose to place an average of 3 detectors at 3 locations in the exploration area for IP detection, and collect the measured parameters such as polarizability, deviation, and resistivity.
- (2) The parameter information collected by the three detectors is analyzed and processed through the terminal computer to obtain the geophysical prospecting results; in order to lose the parameter information during the data processing, the original data needs to be backed up.
- (3) Combine the geophysical prospecting results with the exploration experience of the technicians, and finally get the location of the groundwater boreholes in the exploration area.

4.2 Application in geological engineering prospecting of mineral resources

Similarly, in order to ensure the accuracy of the geological engineering exploration of mineral resources, it is necessary to collect data before proceeding with geophysical exploration technology, and determine the exploration plan based on the collected data, and select the appropriate geophysical exploration technology, method and exploration instrument.

The operations of using geophysical prospecting technology to explore mineral resources are as follows:

- (1) Choose measuring instrument: The audio geoelectric field instrument has become the most commonly used geological exploration instrument for mineral resources due to its compact equipment, little influence by topographic features, simple operation, and large amount of mineral resources exploration information obtained.
- (2) Scan and probe the stratum in the exploration area: select a location with a relatively stable potential difference to place the detector; at the same time, at least 3 scan measurements are required to ensure accuracy.
- (3) Draw a report on the results of geophysical prospecting: scan and detect through the terminal computer, the obtained stratum images, charts and data information are analyzed and integrated, and finally a report of the geophysical prospecting results is obtained.
- (4) Determine the location of the borehole: Combine the geophysical prospecting results with the exploration experience of the technicians, and finally get the location of the mineral resources in the exploration area.

With the application of geophysical prospecting technology in geological engineering exploration, not only has it greatly reduced the difficulty of geological engineering exploration, improved work efficiency, but also effectively increased the accuracy and scientificity of the exploration results, providing a basis for the development and utilization of geological resources And security.

5. Development trend of geophysical technology

5.1 Innovation in detection technology

With the development of science and technology and the progress of society, people are becoming more and more important and necessary for geological exploration. Under such circumstances, the research and exploration of geophysical prospecting technology also appears more urgent and imperative. In this situation, the introduction of high-tech and advanced equipment has even more advantages and markets. For example, it is possible to make full use of wavelet analysis theory, give full play to the advantages and characteristics of this theory, carry out data collection and screening, analysis and induction, so as to maximize the depth, precision and accuracy of exploration to adapt to modern society and engineering quality requirements for geophysical prospecting technology.

5.2 Treatment of geophysical engineering technology

In the specific construction process, collecting and translating engineering geophysical data is an indispensable link and procedure. On the one hand, keen observation and data capture capabilities are required. This is the basis and prerequisite for geological survey work. If there is no accurate and timely original data, geological survey and analysis work is like a source of no root. And if there are loopholes and mistakes in this link, it will inevitably affect the entire investigation work. This is called data collection. On the other hand, since the collected data are all primitive, some of them may even have a strong professional and theoretical nature. For the subsequent survey work, detailed analysis and translation must be carried out by engineers. This is very necessary and important to ensure the accuracy and applicability of the data. Only through translation and conversion can the next step of the survey and translation Analyze and test work to provide compliance and provide a basis for the next decision. Through the above analysis, we can see that the practitioners of geophysical prospecting technology must have deep professional technical knowledge and comprehensive ability and quality to meet the needs of this task, and to deal with the various problems encountered in geological exploration, and complete them well. work tasks.

6. Conclusion

All in all, with the development of modern science and technology and the progress of society, geophysical prospecting technology has also shown a good momentum of development, and has played an increasingly important role in geological exploration. In this large category, various professional technical means, such as gravity, electromagnetic, seismic wave and other specialized technologies, have also shown their own

characteristics and functions. However, it cannot be ignored that our mastery of geophysical prospecting technology is far from adapting to the application of current geological exploration work, and it is far from meeting actual needs. Therefore, we must attach great importance to further strengthen research, improve the professional level and comprehensive ability of practitioners, and provide an inexhaustible source of power for the development of geophysical prospecting technology and even basic geological technology.

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