

On the Utilization of Physical Science in the Area of Geology

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Abstract: As an old subject, physical science is perceived by people The premise of understanding nature is to uncover and expand the material world Basic creation and essential laws of its development and association Science. As of now, physical science has become quite possibly the main fields in innate science One of the most essential discipline, with numerous other inherent sciences Closely related, like arithmetic, science, science, stargazing, and so forth, Especially math and science. Geography as a designing discipline The discipline is additionally firmly identified with material science Geological examination requires a ton of actual information This paper talks about the utilization of physical science in the area of topography.

Keywords: Topography, Physical science, Marine physics

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1. Geophysics

Geophysics is the use of the concepts and methods of physics Through observation, experiment, theoretical analysis and inversion calculation, Study physical problems related to the earth. Using physics Method to detect the medium structure and attribute of underground resources, earthquake Breeding medium and tectonic environment, and the intersection of material and energy Exchange and sphere coupling, kinematics and dynamics of earth matter Learning, etc.

As a basic quantity in physics, “resistivity” is There are sufficient references in the study of the evolution of continental lithosphere Use. The study of the conductivity of the continental lithosphere shows that Conductivity is not only related to its material composition, but also taken as It depends on many factors, such as the structure and texture of the continental lithosphere Physical state of manufacturing, temperature, pressure and material composition Wait. The measurement of resistivity is based on the theory of physics The realization of electromagnetic measurement is based on Faraday electromagnetic measurement A kind of electrical exploration method based on induction law Electromagnetic field excited in the earth’s interior by artificial or natural magnetic field Induction phenomenon, study the underground from shallow to deep at different

depths The conductive structure of the stratum, so as to infer the electrical conductivity of the earth’s interior Evolution process.

Another example is the different depths, temperatures and chemistry of the earth’s interior Physical properties and changes of material components in environment Cheng has also become the main target of current geophysical research One of the images, which further reveals the material in the deep part of the earth Structural and dynamic processes, genesis and evolution are crucial Yes. With the help of physical means, people have obtained the depth of the earth Various physical parameters of partial matter, which makes geophysics The transformation of data into specific substances and their motion information becomes more and more important More reliable. Using the condition of high temperature and high pressure in Physics The physical properties of minerals are measured according to the environment inside the earth, It can not only obtain the composition and conduction of materials in the earth’s interior Mechanism, movement and change state of matter (phase change, fluid and Melting, etc.), but also to geophysical surveyors Provide favorable support and supplement.

For a long time, due to testing technology and computing technology The relative lag of geological research mainly focuses on chemistry Process, especially in the field

of geophysics. Or focus In the comprehensive observation, reasoning, induction and summary, this Especially in the field of kinematics, or focus on improvement Observation methods, especially in the field of technology. With the development of science and technology With the progress of technology, many jobs that were originally considered impossible are being It is gradually becoming possible. Geoscientists also gradually understand To solve the dynamic relationship between geological events, it is necessary to Good physical foundation. From this point of view, Future geological research must also involve physicists.

2. Marine Physics

The main content of marine physics research is the laws of various movements of sea water and the interaction between ocean, atmosphere and lithosphere, so as to provide basis for the monitoring and prediction of sea state and weather. Study the acoustic, optical and electrical phenomena and processes in the ocean to master their changes and mechanisms, so as to realize the on-site special observation and experiment at sea in a planned way. The application of physics in marine physics can be seen from the research content and development history of marine physics.

(1) Research content of marine physics. Marine acoustics is a discipline that studies the propagation law of sound waves in marine water layer, sedimentary layer and seabed rock layer, and its application in marine exploration and marine development. Its main research contents include sound propagation and sound velocity distribution, sound absorption and sound scattering, natural noise in the ocean, acoustic detection in marine water layer and seabed sound Scientific characteristics and seabed acoustic exploration, etc. Marine electromagnetism mainly studies the electromagnetic characteristics of the ocean, the motion form and propagation law of natural electromagnetic field and electromagnetic wave in the ocean, and the application of electromagnetic in ocean exploration, communication and ocean development. The basic research contents of ocean optics are mainly the study of ocean radiation transfer process, as well as sea surface light radiation, water visibility, sea water optical transfer function, laser and sea water interaction, etc.

Steiner published the theory of deep water surface wave; In 1839, green established the small amplitude wave theory and derived the phase velocity formula expressed in wavelength; In 1847, Stokes established the finite amplitude wave theory and small amplitude internal wave theory, and then put forward the group velocity formula related to the propagation of wave energy in 1876. In 1857, British Thomson (Kelvin) first derived the adiabatic

temperature gradient formula of deep-sea water; In 1898, piekness of Norway popularized the circulation theorem of ideal baroclinic fluid and published the circulation theorem suitable for rotating earth.

In marine electromagnetic theory. In 1831, Faraday discovered the phenomenon of electromagnetic induction and pointed out in 1832 that the seawater flowing in the geomagnetic field, like the metal conductor moving in the magnetic field, will also produce induced electromotive force; In 1851, Wollaston, England, detected the same potential change as the tidal cycle on the submarine cable crossing the English channel, which confirmed Faraday's prediction.

3. Petroleum Physics

In petroleum exploration, for areas covered by topsoil, desert and seawater without direct exposure of rock strata, we mainly rely on physical detection methods to indirectly understand the geological structure and rock stratum properties. For example, according to the differences of physical properties of underground rock strata, we study the geological structure or rock stratum properties through physical quantity measurement to find oil and natural gas. This method is abbreviated as petroleum geophysical prospecting in petroleum physics. At present, petroleum geophysical exploration has become an indispensable means of oil exploration in covered areas, and the specific methods used are also several physical methods, such as gravity method, magnetic method, electrical method and so on.

Gravity exploration. It is used to understand the deep structure of the crust and the fluctuation of the basement surface, and divide regional tectonic units; Under favorable conditions, it can also be used to understand the internal structure of sedimentary strata and look for possible oil and gas bearing structures. Gravity exploration is to measure the relative change of the earth's gravity field according to the difference of underground rock stratum density, so as to understand the underground geological structure. Gravity exploration is relatively simple and low cost, but the exploration accuracy is poor and has multiple solutions.

Magnetic exploration. It is used to understand the fluctuation of basement surface, estimate the thickness of sedimentary strata and divide regional tectonic units. Magnetic exploration is to measure the relative change of geomagnetic field and understand the geological structure according to the magnetic difference of underground rocks. According to the burial depth of magnetic body calculated by magnetic anomaly, it can Understand the fluctuation of the substrate surface and the internal structure of the substrate It reflects the intrusion or eruption of igneous rocks in sedimentary rocks. Magnetic exploration

is similar to the gravity exploration mentioned above. The exploration operation is simple, the cost is low, but the exploration accuracy is low.

Electrical exploration. It is used to understand the fluctuation of the substrate surface and scratch Subregional tectonic units; In areas with favorable conditions, it can also Understand the internal structure of sedimentary strata; Under appropriate conditions, also It can be used to find oil and gas. Electrical exploration is According to the electrical properties such as resistivity and electrification of underground rock stratum To understand the geological structure and search for oil and gas Hide. In petroleum exploration, electric sounding method and earth current method And magnetotelluric method and induced polarization method are widely used, Its equipment is more complex and expensive than gravity method and magnetic method, But the detection accuracy is better than gravity method and magnetic method.

In addition, physical simulation is also used in petroleum geology Very important applications, such as the simulation of petroleum geology Oil and gas migration process in. Since the 1990s, The migration behavior of oil and gas in the transport layer has been more widely studied This is because it determines the connection between oil and gas and rock formation Contact volume and migration path of oil and gas. This is the realization of oil and gas It is the basis of migration channel prediction and reservoir location. domestic Foreign scholars have used a large number of physical simulation experiments to study the secondary characteristics of oil and gas The secondary migration process was studied.

4. Mineral Physics

An important branch of geology is minerals Learn. The application of physics in minerals constitutes minerals Physics is based on solid-state physics and quantum chemistry The structure, composition and properties of minerals are studied theoretically and experimentally The discipline of energy, causes and interrelations. it Make mineral research into the category of quantum mechanics and study minerals The phase between electrons in an atom and its nucleus Interaction to explain minerals, rocks, all the way to the earth And the geological problems of the universe. For physics in mineral physics The application in the research can be seen from its basic content. (1) Mineral spectroscopy. Interaction between minerals and incident electromagnetic waves Produce absorption, emission and resonance spectra of minerals. Use various The spectroscopic method can determine the valence, bond and Coordination, local symmetry, ordering, chemical shifts and phase states, Explain mineral physical properties, identify

minerals and study mineral typomorphic characteristics Sign. (2) Study on physical and chemical properties of minerals. Light, electricity, magnetism, sound, heat, force and dissolution of minerals The study of adsorption and other properties is related to the genetic characteristics of minerals and minerals It is related to the development of materials. (3) High pressure mineral physics research. Through high-pressure phase state and physical properties (such as elastic wave velocity and electricity Conductivity (etc.) measurement, which is consistent with the data measured by geophysical methods To infer the material composition and its variation in the deep underground Change. Mineral physics is in a period of development. with meter. The expansion of computer capacity, spectral method and high voltage technology The improvement will form Mineral chemical bonds and energy, structure and structure Defects, physicochemical properties and genetic characteristics Connected and unified mineral physics theory, and make quantum The theory has gradually entered the whole field of Geoscience. The above is only a few examples of physics in the field of geology by bit application in three disciplines. In addition to geophysics ocean. In addition to physics, petroleum physics and mineral physics, physics is in treasure Stone, rock, new materials, engineering and other disciplines There are many applications. With the increase of interdisciplinary degree Plus, as well as the development of marginal disciplines, physics in various disciplines It will be more widely used in science and technology.

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