3D Geological Modeling in Northern Dandong, Liaoning Province, China

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Abstract: With the resources and environmental problem, population problem, the whole society of energy and mineral resources demand more and more high, but with the resource of the earth's surface over the years of mining, the reserves has far lower. On the surface of the earth to find ore has become more and more difficult, the deep underground to find ore more and more and more attention by domestic and foreign researchers. During the recent years, in the aspects of 3D geological modeling research results more and more, geological information expression and record gradually by 2D conversion for 3D, so reliable and effective 3D geological modeling method research become an important trend. Liaodong region is China's important metallogenic belt in the study area at the mouth of the grass - Tongyuan synclinorium famous Maoling gold, lead and zinc ore and coal. The research of deep geological structure in this area is good for studying the spatial distribution of underground deep geological body, and puts forward the corresponding deep metallogenic regularity. Through using the gravity and magnetic inversion method to the study area underground deep geological structure of understanding, on the basis of this, using block modeling method, a 3D geological model is established, finally in multiple aspects of structure, rock and the formation of underground deep metallogenic regularity were analyzed.

1 INTRODUCTION

Dandong City, Liaoning Province, east and Democratic People's Republic of Sinuiju across the river, the geographical coordinates of longitude 124 ° 23 ', latitude 40 ° 07'. Maximum horizontal distance of 96 km, maximum longitudinal distance of 160 km, 120 km long coastline. Ideally, the annual average temperature of 9 ℃, is one of the livable city. Area high-speed railway, airport, port is developed, which also makes it the Northeast region and an important logistics hub in Northeast Asia. Extensive forest cover in the region, rich in resources, has an important ridge of gold mining and boron cat. The area is located in one of the 12 significant mineralized zones, is one of the key areas of mineral research, after years of research which is located on the surface or the surface of shallow mineral has been fundamental discoveries, but in the area of minerals deep underground the occurrence of still has great potential. So the study area deep underground has been paid more and more attentions.

2 DANDONG INCREASE REGIONAL GEOLOGICAL MAPPING THREE-DIMENSIONAL MAPS AND MAPPING PROCESS

2.1 The Study Area Tectonic Position

Liaoji rift mainly in eastern and southern Jilin Province, Liaoning Province, located in Longgang rangrim block and between blocks (Figure 2.2). Liaoji rift within the development of a thick Proterozoic volcanic - sedimentary rocks, in this study area is mainly Liaohe Group, formed cap era 1700Ma, the lower limit is 2200-2500Ma. Mainly grass estuary - Tongyuanpu into south and north Liaohe Group Liaohe Group, North Liaohe Group mainly develops and nappe tectonic lineament, South Liaohe Group fold structures are developed.

A large area of the study area exposed Paleoproterozoic Liaohe Group in the study area north east Neoproterozoic unconformably overlies

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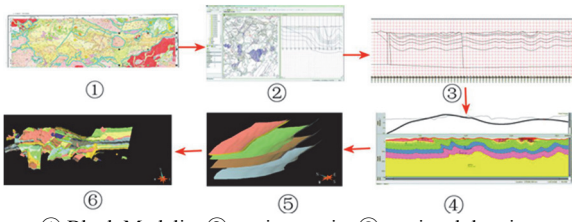
the Liaohe Group. Liaoyang web junction with Cambrian small area distribution and Ordovician, research and development area in the northeast corner area of Jurassic, near the eastern Mesozoic Komine Caohekou distribution group.

2.2 Three-dimensional Modeling Process



① Block Modeling② cutting section③ sectional drawing
④ inversion profiles⑤ block modeling⑥ block integration

Figure 1: Three-dimensional geological modeling process.

(1) Building Blocks Divided.
Divide principles: 1. if the block by the unconformity traps can be divided directly; 2. if the block is large or unconformity trap does not completely block is not conducive to the 3D modeling, can be assisted by adding reasonable line to complete; 3. If the presence of the smaller rock invasion may temporarily without treatment, in the post-processing (gravity and magnetic inversion) in adding.

Object of study: 1. strata blocks, it is the focus of research, including analysis of a variety of different geological formations; 2. rock blocks, including primary and secondary and eruption of magma body is different; 3. fracture, including production faults. like many other relations between geological factors and fracture.

(2) Block Cutting Section.
Profile types: 1. a trunk inversion profile, characterized by: setting can be cross-sectional unlimited, cross-block research, geophysical and other data needed to control the accuracy of the entire area of study, the control link between blocks; 2. Block control inversion profile, characterized in that: setting can be cross-sectional analysis of unlimited, geophysical and other information required in a single block, three-dimensional modeling of the control and finesse; 3. geologic modeling profile characterized. 4. Set the cross section does not cross, to be the main reference inversion sectional profile, forming a three-dimensional model.

(3) Synthesis Constraints Subsurface Geological Inference and Interpretation.
Various studies show that existing single technology is difficult to directly understand the deep underground, the joint inversion using gravity and magnetic profiles implementation constraints deep geological situation in the present study. Concrete action is in reference rock samples on the basis of physical properties (density and magnetic susceptibility), complete inversion of the trunk section in Geosoft software, determine the accurate formation, rock, faults, folds spatial distribution situation.

(4) Three-dimensional Geological Modeling.
The realization of three-dimensional geological model adopted in GOCAD eventually generate, with the gradual improvement IGeoMod software, which sought to develop a three-dimensional function also has tended to improve, and then in IGeoMod achieve three-dimensional visualization can between.

(5) The model's Modification and Integration.
By completing the trunk inversion profile can well understand the deep geological structure of the entire area through which to understand and realize the connection between the block integration.

3 CONCLUSIONS

Based on the northern Dandong city's very important tectonic TongYuanPu - CaoHeKou Synclinorium region, the deep geological structure, geological modeling and deep metallogenic regularity region have a preliminary understanding. Final Thoughts by block modeling complete geological modeling of the area.

(1) Liaohe Group in the region exposed a major stratigraphic units on which the development of a large number of folds, the lower boundary of Liaohe Group recognize the basic geological its deepest estuary should be on grass - tongyuanpu Complex Syncline, a depth of about 5900m By region of the gravity and magnetic data analysis and inversion, it confirms the group's bottom boundary Liaohe basic core of the syncline, depth of about 6000m, in line with the basic geological facts. It can also reflect the gravity and magnetic inversion can accurately reflect the deep underground geological structure, gravity and magnetic inversion provides an important tool for the analysis of deep underground geological formation.

(2) In the course of the three-dimensional modeling of the region, for the special geological structure (folding and fault development) in the region, using block modeling. Model was done well in the area of

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three-dimensional geological modeling, the ways to simplify the modeling process, to achieve a geological - geophysical data management, block (unit) management, cutting section, section management, 3D geological object generation, export geophysical models.

(3) On the basis of the geological structure in the area of deep analysis, the deep mineralization area got a better understanding. First, the structure ore control factors play a crucial role in the mineralization process, the general area of mineralization in the region are located in anticline core unit, part of the ore deposits in cracks in the fault zone, in such a configuration environment with conducive to migration and enrichment of ore-forming elements. Second, it features more magmatism presence around the amount of deposit, to deposit the necessary heat in the formation process. Finally, rock ore-controlling role in the region is also obvious a lot of gold deposit and other types of Pb-Zn occur in the bed and cover Dashiqiao county groups.

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