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3D Geological Model of Nihe ore deposit Constrained by Gravity and Magnetic Modeling

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We present a case study on using integrated geologic model in mineral exploration at depth. Nihe ore deposit in Anhui Province, is deep hidden ore deposit which was discovered in recent years, this finding is the major driving force of deep mineral exploration work in Luzong. Building 3D elaborate geological model has the important significance for prospecting to deep or surround in this area, and can help us better understand the metallogenic law and ore-controlling regularity. A 3D geological model, extending a depth from +200m to -1500m in Nihe ore deposit, has been compiled from surface geological map, cross-section, borehole logs and amounts of geological inference. And then the 3D geological models have been given physical property parameter for calculating the potential field. Modelling the potential response is proposed as means of evaluating the viability of the 3D geological models, and the evidence of making small changes to the uncertain parts of the original 3D geological models. It is expected that the final models not only reproduce supplied prior geological knowledge, but also explain the observed geophysical data. The workflow used to develop the 3D geologic model in this study includes the three major steps, as follows:
(1) Determine the basic information of Model: Defining the 3D limits of the model area, the basic geological and structural unit, and the tectonic contact relations and the sedimentary sequences between these units.
(2) 3D model construction: Firstly, a series of 2D geological cross sections over the model area are built by using all kinds of prior information, including surface geology, borehole data, seismic sections, and local geologists' knowledge and intuition. Lastly, we put these sections into a 3D environment according to their profile locations to build a 3D model by using geostatistics method.
(3) 3D gravity and magnetic modeling: we calculate the potential field responses of the 3D model, and compare the predicted and observed data, and then adjust the model until a satisfactory accuracy of errors is achieved.
It is hope that this work can provide reference for similar work in other areas. this study shows that the research of geologic constrained 3D gravity and magnetic modeling has potential value in the aspects of deep mineral exploration and mineral reserves estimation.