Aeromagnetic Characteristics and Exploration Prospects of Jining Super-large Iron Ore Deposit

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1 Introduction

In recent years, with the benefit of high accuracy geophysical data and advanced drilling technology, deep ore deposits (Jining iron ore and Shanxian iron ore) have been found in the west of Shandong. Jining iron ore deposit has the largest reserves of iron ore in Shandong Province and is also one of the deposits with the greatest depth of burial. Based on the Jining iron ore geology, drilling and the latest high accuracy aeromagnetic data, this article analyzes the geological and the aeromagnetic anomaly characteristics of the deposit, then carry out 2.5D forward modeling, and combining with regional geological data and modeling result determines that the deep part and periphery of the known deposit has great prospecting potential.

2 Geological Characteristics

Jining aeromagnetic anomaly was found by Aerial Survey Group of the Ministry of Geology in 1958, and concluded it is caused by a deep iron ore deposit. In 2006 deep drilling was carried out (ZK8 1804.78 m) based on in-depth study of this magnetic anomaly. Drill hole ZK8 intersected 85.53m of magnetite from 1612.89 m to 1796.54 m and verified that the Jining aeromagnetic anomaly is caused by deep super-large metamorphosed sedimentary iron ore which related to phyllite, intermediate - felsic volcanic rocks and marble. The ore types include calcite-magnetite-quartzite and magnetite-quartz marble, both with obvious banded structure. Mineralogy consists of quartz, calcite, magnetite, magnemite and siderite. Magnetite is often in banded aggregates, separated by quartz - calcite bands while single magnetite crystals in quartz - calcite bands are relatively highly idiomorphic.

3 Magnetic Susceptibility

Magnetic susceptibility of ZK8 drill core shows the different types of rocks have obvious magnetic differences. Magnetic susceptibility measurements show three zones. (1) The Quaternary, Ordovician and Cambrian sedimentary stratigraphy are non-magnetic; (2) Jining Rock Group have average magnetic susceptibility of 230×10⁻⁵SI, and range from 156 to 410×10⁻⁵SI; (3) Iron ore and banded magnetite-quartzite have an average value of magnetic susceptibility 65721×10⁻⁵SI, and range from 31,270 to 150,260×10⁻⁵SI.

4 Aeromagnetic Anomaly

In 2010, Chinese Aero Geophysical Survey and Remote Sensing Center (AGRS) carried out a large-scale high-precision aeromagnetic survey in Western Shandong Province. This aeromagnetic data over Jining iron ore deposit is shown in Figure 1. The magnetic anomaly has a regular shape with smooth curves and NNE trend. The positive magnetic anomaly clearly shows two
superimposed magnetic anomaly. The north peak is 2269 nT and the south peak is 2174 nT. There is an obvious negative magnetic anomaly at the northern side of the positive anomaly. The minimum value of the negative anomaly is –774 nT. The amplitude ratio of positive and negative magnetic anomaly is relatively small, and the horizontal gradient between positive and negative magnetic anomaly is relatively gentle, reflecting the great burial depth of the ore body. The south magnetic anomaly is wide and gentle and the gradient in the northern is relatively steep. The most likely reason for this phenomenon is the burial depth of the north ore body is shallower than the south ore body.

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References


