



Application of Aeromagnetic System of Power Glider in Typical Exploration Areas

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Abstract: Currently, aeromagnetic system of power glider is one of the more advanced and convenient aerogeophysical methods (Xiong et al., 2009). It can be carried out the high-precision magnetic survey in ultra-low altitude (0-100m). Compared with ground survey and other aeromagnetic surveys, it improves work efficiency, reduces disturbance of ecology, and obtains shallower information, improves the resolution of anomalies (Cui et al., 2009). Moreover, it can be applied to forests and hills. The power delta glider is used as the flight carrier, with high precision RS-GB10 helium optical pump magnetic measurement system and three-component automatic magnetic compensation system, a set of the aeromagnetic measurement system with simple structure, safety has been formed. Through carrying out low-flying aeromagnetic work at Zhuxi hilly area in Jiangxi Province, three aeromagnetic anomalies are delineated, the possible positions of intrusive rock masses are predicted, and six geological structural lines are inferred by means of oblique derivative and total gradient modulus, which can be used to guide the research of the prospecting and prediction in the area. It will be valuable experience for promoting the popularization and application of this technology in geological survey.

The power glider aeromagnetic system is composed of a powered delta wing glider, high-precision RS-GB10 helium optical pump magnetic measurement system, three-component automatic magnetic compensation system, OmniSTAR high-precision differential GPS augmentation system and Acuity-AR3000 laser altimeter, which enables high-precision magnetic measurements in the ultra-low altitude (0-100 m) range. The powered delta wing glider is an aviation sports equipment with simple structure, light weight (300kg), low speed flight (80-100km/h), low flight altitude (20-500m) and strong endurance (500km), suitable as a larger scale work carrier. The high-precision RS-GB10 helium optical pump magnetic measuring system have large measuring range (20000nT-100000nT), high sensitivity (0.0002nT/S), high sampling rate (10/s~2/s) and high precision (± 0.01 nT). The three-component automatic magnetic compensation system can compensate and record the total magnetic field strength value in real time, which is an ideal compensator for small fixed-wing aircraft. The OmniSTAR high-precision differential GPS augmentation system uses the world's advanced differential GPS positioning technology and

monitoring design to improve 24-hour high-reliability positioning services. The Acuity-AR3000 laser altimeter measures the height from the ground in real time and performs elevation monitoring and control. In combination with the performance of each device, the aeromagnetic system of the power glider is characterized by high resolution (close to the ground sampling point distance of 2m), simple take-off and landing (no formal runway required), efficiency (200Km/day), low cost and applicable to various landscape areas.

Jiangxi Zhuxi area is located at the southeastern part of the Yangtze block, Jiangnan ancient island, and the middle section of the Taqian-Fuchun metallogenic belt with an area of about 36km². The exposed stratum include Neoproterozoic metamorphic sandstone, sandy phyllite, Paleozoic clastic rocks, carbonate rocks, Mesozoic sandstones, and shale. The types of exposed magmatic rocks in the area are completely developed, and it is mainly in the Yanshanian period medium-acid rocks with the form of veins. Intrusive rocks include diorite, porphyry, and granodiorite porphyry. The survey area is affected by the Taqian-Fuchun nappe structure belt. The folds and faults are intensively developed, and the faults are northeastward and northwestward.

The ΔT anomaly of Zhuxi area shows that there is the obvious magnetic difference between the abnormal area and the stationary area, and the positive and negative anomalies appear in pairs. The magnetic isomorphism is mostly long-axis or planar, with different amplitudes. The anomalous overall distribution is northeastward, consistent with the Carboniferous-Permian-Triassic sedimentary rock caprocks in the area. In order to eliminate the influence of oblique magnetization, the ΔT anomaly is treated with polarization. After the treatment, the overall anomaly shifts to the north. The positive anomaly amplitude increases, the range becomes wider, the overall display is north high and south low trend, local anomalies are more prominent.

Based on the polar ΔT anomaly, by analyzing the total gradient mode characteristics (Fig. 1), a number of local high magnetic anomaly boundaries are identified, which considered being magnetically concealed or semi-concealed rock mass or vein. The main three magnetic anomalies are M1-M3: M1 is the main anomaly of Zhuxigong area, and its distribution range is completely corresponding to Zhuxi copper-tungsten mine. It is similar to the exposed position of granite rock mass, which may

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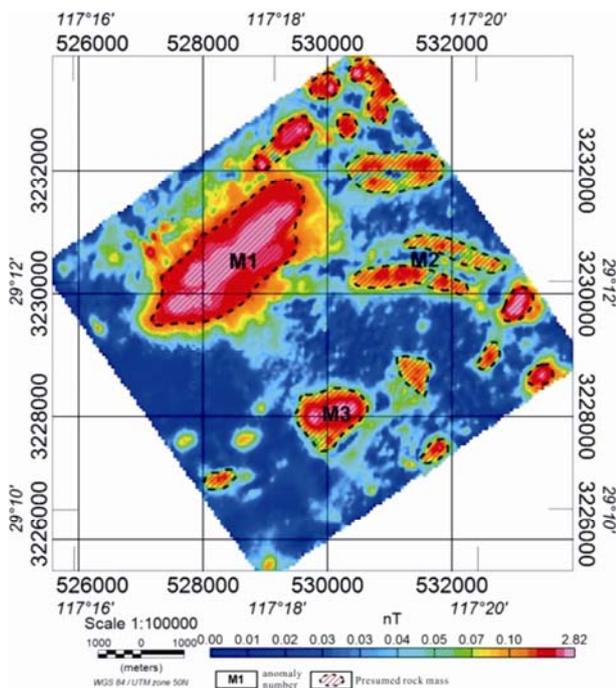


Fig. 1. Characteristics of total gradient mode and inferred rock mass distribution in Zhuxi area

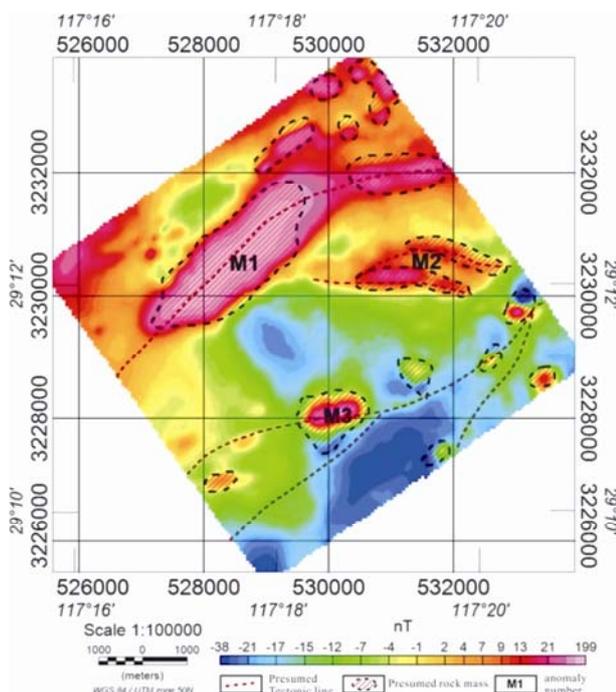


Fig. 2. The Characteristics of the Oblique Derivatives of Zhuxi Area and Its Inferred Structure

be caused by semi-hidden granite rock; M2 is similar to the M1 anomaly, it is presumed to be a reflection of the rock mass or vein of the same or homologous intrusion activity with M1, but

the anomaly center is scattered and the amplitude is small. No geological body is found in the area, presumably the hidden magnetic rock mass; M3 is a large-scale magnetic anomaly in the southern of the work area, close to the known regional fault and there is obvious mineralization nearby. It is speculated that the fracture control related to mineralization granite rock or diorite. From the oblique derivative characteristics of polar ΔT anomaly (Fig. 2), the structural direction of the work area is mainly north-eastward, extending longer, consistent with the tectonic direction of the Taqian-Fuchun area, with less north-westward structure and little extension. In addition, there are many small-scale, short-length structural lines locally, mostly orderless structures, which may be part of the structural features of the area. Overall, the rock mass and structure estimated by aeromagnetic anomalies are in line with regional geological understanding, and provide an important reference for the next prospecting prediction work in this region.

Through the application in the typical exploration areas-Zhuxi hilly area of Jiangxi, the efficiency of the system collection and the practicability to complex terrain are verified. A number of concealed and semi-concealed rock masses are circled by aeromagnetic anomalies and total gradient modulus, three local anomalies that may be related to mineralization are analyzed. Using the data processing method such as oblique derivative to effectively identify the distribution characteristics of the structure in the region, which is consistent with the regional geological understanding, indicating that the method can play an important role in the prospecting prediction work.

Keywords: power glider, aeromagnetic system, Zhuxi, Jiangxi Province, aeromagnetic anomaly, prospecting prediction

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