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What magnetic maps and images should be used for magnetic interpretation: example from Heired gold exploration, Khorasan jnoobi

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چکیده

نمایش دادن موثر داده های مغناطیسی برای تفسیر کامل داده حیاتی است. انتخاب غالب و طرح نمایشها (رابطه نمایش داده شده، چه به صورت منحنی میزان، تصویر، نیمرخ، مقیاس ارائه، و استفاده از رنگ) بستگی به امکانات موجود واین مشخصات ژئوفیزیکی ـ هدف از تفسیر، مشخصات مغناطیسی وزمین شناسی منطقه، و مشخصات بر داشت دارد. با امکانات خیلی محدود موجود برای نویسنده، از اندازه گیریهای مغناطیس زمینی در کانی سازی طلای هیرد در خراسان جنوبی به منظور نشان دادن بر خورد سیستماتیک در انتخاب نمایشها برای تفسیر مغناطیسی استفاده شده است.

Abstract

The effective display of magnetic data is crucial to the efficient interpretation of the data set. Selection of the format and design of the displays (function displayed, whether as profiles, contour maps, images, scale of presentation and use of color) is dependent of the facilities available and on these geophysical criteria – aims of interpretation, magnetic characteristics and geology of the area, and the survey specification. With very limited facilities available to the author ground magnetic measurements at Hired gold mineralization in Khorasan Jnoobi is used to demonstrate a systematic approach to the selection of displays for magnetic interpretation.

Introduction

The information available in magnetic data is generally underutilized and this is in part due to poor display of the data. Most of this data will be either on tape as digital data (airborne data) or xyz format (ground data) and cannot be interpreted until it is displayed. To maximize the amount of information extracted from the data set and overcome the limitations imposed by using only one kind of display format, several displays should be used to provide different perspectives. A wide range of presentations and enhancements are possible for magnetic data. Many examples can be found in the Geophysical literature particularly in ASEG, SEG and CSEG. Broom, 1990; Isles et al, 1991; Teskey and Hood, 1993; Milligan and Gunn, 1997; Liu and Mackay, 1998 have all discussed the presentation and interpretation of magnetic data. Considering limited available facilities in educational institutions in Iran particularly at the geology department of Ferdowsi university of Mashhad, a systematic approach leading to the selection of the most effective displays is presented here, and demonstrated using ground magnetic survey for gold exploration in Khorasan Jnoobi, Iran as a case study.

Hired magnetic survey

Ground magnetic measurements were collected with ENVI magnetometer at Hired gold mineralization area, 160 km. to the sought of Birjand and 80 km. to the north of Nehbandan (figure1). Three exploration target area (exploration target 1 east and west and exploration target 3) were selected for magnetic measurement (figure 2). This work will present only the data from exploration target1 east area. At this location survey lines were oriented NE-SW and spaced 10 and 15 meter with sample spacing of 2 meter. Mineralogical studies and susceptibility measurements on drilled core indicated the presence of pyrrhotite associated with sulfide mineralization including gold only at the target1 east (Karimpoor et.al. 2007). There is a good correlation between susceptibility and gold grade on the bases of susceptibility measurements and geochemical analysis on drilled core. The host rocks for sulfide mineralization which are shale and ilmenite type granitoide intrusion are not magnetic (Karimpoor et al, 2007). Small scale image (1:50000) of high resolution aeromagnetic data from Geological Survey of Iran (GSI) was available for the regional area (figure 2). This image shows the magnetic responses of Granitoide intrusion with magnetic highs corresponding to magnetite type granitoide and lows to ilmenite type. Despite the high density (19.3 g/cm^3) and electrical conductivity (5×10^7 S/m) of gold it is almost impossible to get a direct geophysical response for it (Doyle, 1990).The small direct responses are a result of the low grades involved today (usually only a few grams per ton) because of the high value of gold. The magnetic contrast between sulfide mineralization associated with gold and host rock at exploration target1 east on Hired mineralization made the magnetic method suitable for direct identification of sulfide and indirect detection of gold.