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IDENTIFICATION OF TECTONIC LINEATION USING AIRBORNE MAGNETIC DATA IN ALBORZ, IRAN

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Regarding the hypocenter of instrumental and historical earthquakes in southern Caspian basin, it is very important to recognize surface and deep faults to examine the risks and natural hazards. We decided to study the exact location of the tectonic lineation by interpreting the airborne magnetometer data in this region. Today airborne data play a unique role in tracking and studying processes occurring on earth due to appearance of magnetic field changes due to geological facies. This role is particularly pronounced in densely covered with alluvial and massive vegetation. The criterion for detecting magnetic lineation is the magnetic contrast in different images to define tectonic lineation as faults and shear zones. By applying different filters tectonic lineation are extracted the use of common filters provides the necessary information for the region's qualitative interpretation of the data. The final aim and lineation extraction to interpret tectonism of the region is done by using two important filters named reduction to pole (RTP) and first vertical derivative (FVD) [1].

INTRODUCTION

The origin of the magnetic anomalies is the difference in spatial resolution of the rock mass magnetism adjacent to each other or it is due to the topography and structure of basement [1]. Available magnetic data is derived from Aerodata Corporation USA, in collaboration with the Geological Survey of Iran from 1975 to 1977. The distance between of flight lines is 7.5 km and flight height is 250 m and the azimuth is 0°. Also the type of magnetometer sensor used was Cesium Vapor magnetometer. All required filters are applied on the total magnetic field intensity to identify the surface and deep lineation. In this regard, the map is the base map of the magnetic data, which shows the total intensity of the magnetic field in the measuring points. The total magnetic field intensity is influenced by the material and magnetic structures present at that point. The IGRF value of the land previously measured must be removed from the recorded data values displays the remaining amount of the anomalies in the area according to the angle of magnetic inclination and declination [2].

MATERIALS AND METHODS

We used GeoSoft Oasis Montaj, to apply corrections were made, including daily, IGRF, leveling, and so on, and then these data were tied together to obtain a single grid from the entire area and got the total magnetic field intensity map. As the image of the total magnetic field intensity field appears, several distinct regions can be identified in the map. Regions of varying area and expansion, with a very high magnitude intensity with a low frequency starting from the northeast, extending to the southwest, representing a large magnetic anomaly in the region that lies at high depths (Figure 1).

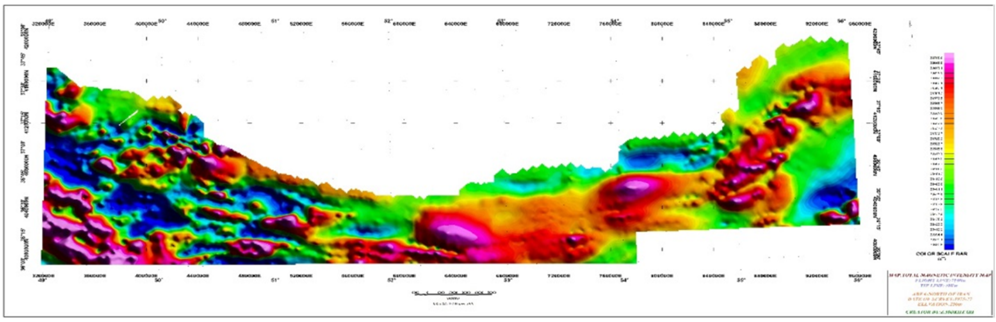

Figure 1. The total magnetic field intensity in study area.

After applying the reduction to pole filter, the anomalies of the total magnetic field intensity are positioned on their exact location, so it is easier to detect the location of the masses in this case. The application of this filter is done using angle of magnetic inclination 5 and declination 6. The value of these angles in the study area was 55.3 and 4.94, respectively, and the mean IGRF was 48707 nT. By applying this filter, the total magnetic field intensity changes slightly and these anomalies move slightly to the north of the region and the intension of some of them changes.

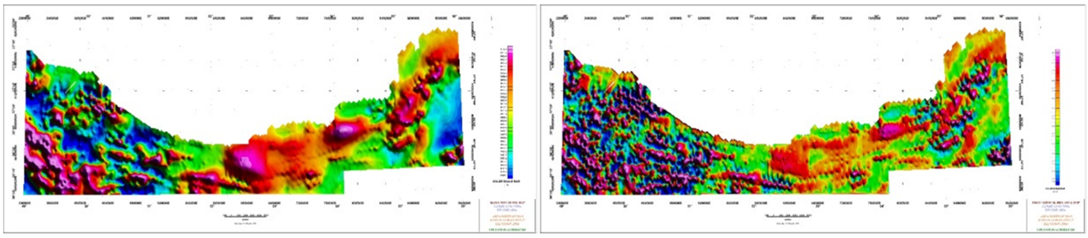

Figure 2. The magnetic field intensity map after applying the reduction to pole (right) and first vertical derivation (left).

Also, by using of first vertical derivative filter, it is possible to look even more surface anomalies. The first vertical derivative filter is a high-pass filter, which increases the effect of high frequencies towards low frequencies. This filter has the effect of large anomalies, which have long wavelengths and low frequencies, and are related to deep and regional resources, that eliminates small anomalies and causes weak anomalies to appear well [3]. Accordingly, after doing both of filters, they exhibit anomalies with their linear trend, which indicate the existence of a linearity in that direction. In general, these two maps are very useful in tectonic analysis and finding of the lineation, since with the separation and decomposition of anomalies, it can be largely attributed to the function of the fault. Finally, based on the principles mentioned above, it was attempted to identify and distinguish magnetic lines and tectonic lineation that are presented in Figure 3.

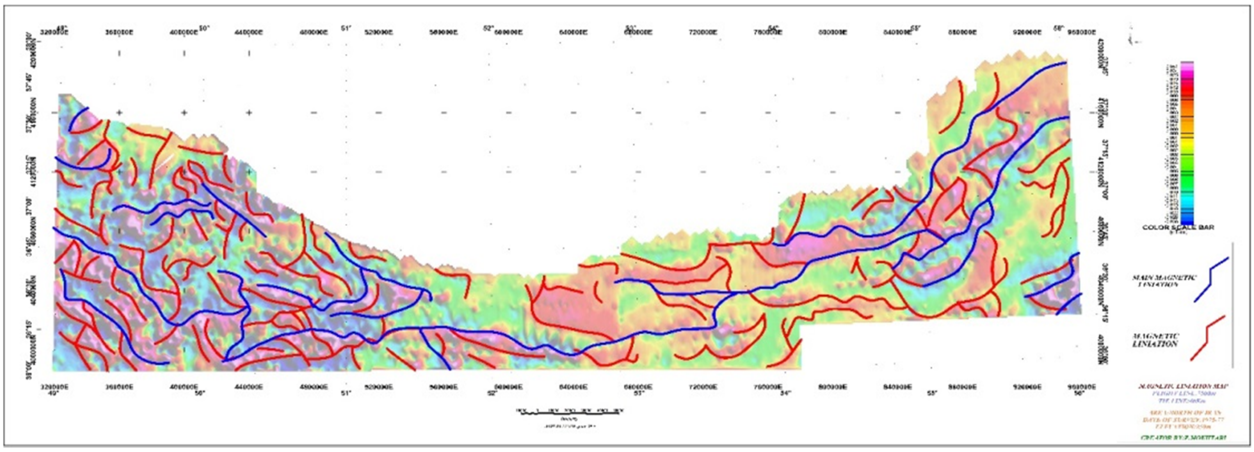

Figure 3. Final extraction of tectonic lineation.

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