DEDUCTION OF TECTONIC STRUCTURE OF NORTH AND CENTRAL SINAI FROM AEROMAGNETIC AND BOUGUER ANOMALY MAPS

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The aim of the present work is to deduce the tectonic structure of the area and to show the role of the separation methods in the resolution of the multisource of magnetic and gravity implications. The aeromagnetic total intensity map was transformed to the reduced pole aeromagnetic map (RTP). This step was followed by linear wavelength filtering of the RTP aeromagnetic map, and of the Bouguer anomaly map, in order to isolate shallower residual components using different grid intervals. A comparative analysis was carried out for the different filtered RTP aeromagnetic and gravity maps. Statistical trend analysis was applied for the magnetic and gravity data. The study revealed that the area has been affected by three significant tectonic trends, namely: NE-SW, NW-SE and E-W. The RTP aeromagnetic map and Bouguer anomaly maps provided detailed data for 2D modeling of the source. The magnetic and gravity cross section indicates possible sources of the observed anomalies. Only depth of the anomaly sources (mostly in the basement) were determined from magnetic and gravity data to reveal a tectonic zone and structure which leads to a fluid migration. The result of depth estimation to the basement complex revealed that the depth of the basement ranges between 3.2 km and 4.3 km.

Keywords: aeromagnetic survey; Bouguer-anomaly; Sinai tectonics

Introduction

The area selected for the present study lies between latitudes 30°00 – 31°10 N and longitudes 33°00 – 35°00 E as shown in Fig. 1. The aim of this paper is to find out the structures of the basement rock of the earth's crust in the investigated area using the available geophysical and geologic data. The potential field data include the followings:

1. Magnetic data in the form of total intensity aeromagnetic anomaly map, scale 1:700000. The RTP technique was then used on the total aeromagnetic intensity map using the equation of Baranov (1975), and with help of the Geosoft program (1994). The input parameters are: inclination 40°30, declination 2.1°, magnetic field intensity 43000 nT.

2. Gravity data in the form of Bouguer anomaly map, with a scale 1:700000 and contour interval 0.75 milligal.

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Qualitative interpretation deals with description of anomalies especially their symmetry, strike, extensions, width, amplitudes, gradients, filtering technique and trend analysis. The quantitative interpretation in this work is based on the following steps, for both gravity and magnetic data:

1. Application of the two-dimensional modeling technique.

2. Parameter calculation of the buried bodies using Hilbert transform technique.


The results achieved by the analysis of these data is that, different possible solutions exist for one problem. This fact, urges us to find a method leading to a single solution. The geological information and borehole data were used to support the interpretation of the gravity and magnetic data as well as find out the relation between the geology, structure, geophysics and the present tectonic activity.