Discovery of the causeway and the mortuary temple of the Pyramid of Amenemhat II using near-surface magnetic investigation, Dahshour, Giza, Egypt

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Abstract:

The main outbuildings of the Amenemhat II pyramid complex in Dahsour were yet to be discovered due to a very long subjection of the area to the military authorities and also the demolition of the pyramid itself. We describe the discovery of some of these outbuildings using near-surface magnetic investigations. A gradiometer survey was conducted in the area east of the pyramid to measure the vertical magnetic gradient with a high resolution instrument at 0.5 m sampling interval. The data showed some undesirable field effects such as grid discontinuities, grid slope, traverse stripe effects, spikes and high frequencies originating from recent ferrous contamination. These undesirable effects were addressed to produce an enhanced display. We have successfully detected four main structures in the area east of the pyramid; the causeway that connected the mortuary temple with the valley temple during the Middle Kingdom of the 12th Dynasty, the mortuary temple and its associated rooms, ruins of an ancient working area and an Egyptian-style tomb structure called a Mastaba. An improved recognition for these structures was accomplished by using the analytic signal and Euler deconvolution techniques. Excavation of a small part within the study area has proven the reliability of magnetic discoveries and the shallowness and composition of the detected features.

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STRUCTURAL INTERPRETATION OF THE BOUGUER AND AEROMAGNETIC ANOMALIES IN CENTRAL SINAI

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Abstract:

A large part of the central Sinai peninsula, covering mainly the El-Tih and Egma plateaux, was evaluated using geophysical data. The Bouguer and aeromagnetic anomaly maps were critically analyzed and correlated to investigate regional tectonism, structural elements and major sedimentary basins characterizing this region. The regional Bouguer anomalies reflect density variations at great depth as well as crustal thickening towards the Gulf of Aqaba. Parameters of the interpreted major and minor faults, which are oriented mainly NNE, NE and NW, were calculated. The boundary faults along the Gulf of Aqaba downthrow by about 6 km to the east, with some of these faults showing surface expression.

Residual gravity and magnetic maps reflect a central high anomaly zone trending NE, but its northern part deviates E-W suggesting either a shallow and wide basic/ultrabasic dyke or uplifted basement Depth calculations of the magnetic and gravity anomaly profiles indicate that the shallow sources have depths down to 1.0 km, however, the depth to the basement surface is similar to 3.5 km. Significantly low Bouguer and magnetic anomalies reflect a major sedimentary basin containing a thick layer of elastic Palaeozoic-Mesozoic sediments, which overlie basement rocks, and are topped by subhorizontal non-clastic Tertiary sediments. The results of this paper should be of considerable help in delineating some exploration concepts of hydrocarbon and groundwater resources for developing this part of Sinai.

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GEOLOGICAL AND STRUCTURAL INTERPRETATION OF AIRBORNE SURVEYS AND ITS SIGNIFICANCE FOR MINERALIZATION, SOUTH EASTERN DESERT, EGYPT

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Abstract:

Interpretation of aeromagnetic and radiometric geophysical data is carried out in an area of the Precambrian basement rocks of the south Eastern Desert of Egypt. The area is delimited by lat. 24-degrees-00' and 25-degrees-00'N and long. 34-degrees-00' and 35-degrees-00'E.

Aeromagnetic anomalies in the area reflect important features on basement tectonics, on deep-seated structures and on detailed geological mapping. Major faults and shear zones, which play an important role in the emplacement of mineralized bodies, have been interpreted and two tectonic blocks are suggested. The statistical analysis of the basement fractures and aeromagnetic lineaments shows major NNW, NW and ENE trends with intersections indicating locations of magmatic intrusions and alkaline ring complexes. The depth computations indicate shallow to near surface magnetic sources as well as deeper ones. The constructed residual, second- derivative, upward-downward continuations and regional maps respectively emphasize these features. The surface rocks of basic-ultrabasic affinity are reflected on the magnetic map. Other rock units give low magnetic effects that indicate variations in lithological composition and/or the degree of metamorphism.

The total count-radiometric map shows a close relationship between the alkaline rocks (e.g. ring complexes) and younger granites as well as strong radioactive indications of uranium and/or thorium mineralization (e.g. G. Abu Khurq and G. Kahfa). The linear radiometric anomalies indicate locations of fault lines which are mineralized with radioactive minerals, such as at G. Hafafit area. These faults are also interpreted from the magnetic map. Additional locations are recommended for further ground geophysical and geological explorations.

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Tracing of the defunct Canopic Nile branch using geoelectrical resistivity data around Itay El-Baroud area, Nile Delta, Egypt

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Abstract:

Around the Nile Delta Branches, ancient settlements had been created and left their remains to be good witness for the paleoenvironment during the Holocene time. Therefore, tracing of the defunct Canopic branch and its distributaries as well as associated environments are of great importance. Using a Schlumberger electrode configuration, well-distributed 44 vertical electrical resistivity soundings were acquired. The 1D modelling technique was applied to estimate the depth and the apparent resistivity of the interpreted geoelectrical units. Then 2D inversion was applied for the same data set using the ABIC least-squares inversion scheme. The geoelectrical cross-sections and slice maps discriminate the Upper Quaternary sequence into three geoelectrical units. The Holocene Nile mud is represented by two units: the agricultural root zone (unit 1) that is underlain by relatively thick water-saturated mud (unit 2). The Upper Pleistocene sandy aquifer is represented by irregular surface (unit 3). Two generations of defunct channels were traced out. The older channels are characterized by low sinuosity compared with younger channels. This is probably attributed to river activity due to relatively low sea level and much higher Nile discharge. The system of younger channels is characterized by broad meanders, probably as a consequence of sea-level rise and decreased gradient since the Middle Holocene.

KeyWords Plus: LATE QUATERNARY EVOLUTION; INVERSION

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