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STRUCTURAL ANALYSIS OF THE BASEMENT ROCKS BETWEEN LATITUDES 28°00′ & 28°30′ N, AND ITS RELATION TO RADIOACTIVITY, NORTH EASTRERN DESERT, EGYPT.

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ABSTRACT

The area bounded by latitudes 28° 00′ - 28° 30′ N, north Eastern Desert, comprises a part of the Egyptian orogenic belt. It is essentially formed of igneous and metamorphic rocks predominantly of late Precambrian age. These rocks were subjected to various tectonic cycles since their formation. Joints and faults are the most pronounced prints of these tectonics. The attitudes of 9680 joints and 320 fault lines affecting the area have been measured, statistically treated and structurally analysed in the light of regional tectonics of the besement of Egypt. Their relation to radioactivity has been studied.

The study shows that joints are numerous with great variations in their attitudes, density, frequency distribution and directions depending on the different lithological and chemical characters of the rocks. However, three prevailing joint sets following NNE-SSW, NE-SW and NNW-SSE can be distinguished, which the NNW-SSE joint set is the oldest. On the other hand, the NE-SW, NNW-SSE and NW-SE directions are the most common fault trends which the NE-SW fault set is the youngest.

Stress analysis study revealed that the area was subjected to various regional palaeo-stresses which the latest one was generally directed N-S with an average angle of plunge of 30° mainly to the south.

Radiometrically, the normal gamma radioactivity range of each rock type has a mutual relationship to its lithological and mineralogical characters, while the distribution of abnormal values as well as presence of radioactive anomalies and occurrences are essentially controlled by NNW-SSE, NW-SE and N-S major tectonic fractures.

INTRODUCTION

The study area is about 3978 Km^2 located in the northern part of the Eastern Desert of Egypt. It is bounded by latitudes 28°00′-28°30′N and longitudes 32°25′-33°00′E (Fig. 1) The area is mainly formed of igneous and metamorphic rocks of late Proterozoic age. The main rock units exposed in this area, from old to young, are metavolcanics, quartz - diorites, pinkish grey granites, Dokhan Volcanics, younger granites and post granite dykes (Ghanem, 1972, Shalaby, 1981, Nossarr, 1981. and 1987, Salman, et al, 1989, Salman and Nossair, 1988, and Takla, et al 1991).

In this paper some 9680 joint and 320 fault measurements in the various rock exposures are measured in the field. They are geometrically described, statistically treated and structurally analysed, In addition, a comparative study on the preferred orientations of joint sets, fault trends, wadi lines and dyke swarms has been performed to restore the regional palaeo-stress fileds controlling the geometry of the study area. Moreover, the specific gamma radioactivity rage of each rock exposure is measured and compared with that recorded along the fracture systems to throw light on the main factors controlling the distribution and presence of the radioactive anomalies and occurrences.

JOINT DESCRIPTION

The joints recorded in the various rock exposures are numerous with great variations in their attitudes, density, frequency distribution, directions, joint spacing, type of fillers and the effect of weathering on their joint surfaces.

In older rocks, metavolcanics - Dokhan Volcanics, joints are mainly of large scales with long extension in a fairly straight form. The joint spacing is widely ranging from a few cm to about 25 cm and sometimes reaches up to 50 cm at the top most parts of the Dokhan volcanics. The wide spacing joints are occasionally intruded with thin basic dykes (Fig 2) and sometimes filled with secondary quartz, pale green epidote and / or carbonate materials. Closed joints are less common the majority of joints recorded in pinkish grey granites are strongly affected by weathering from which their joint surfaces are deeply eroded and more crushed. The intersection of the nearly perpendicular and predominant N-S and E-W joint sets caused with ersion the rounded to subrounded bouldary appearance of the pinksh grey granites (Fig. 3). Coloumanr joints are well developed and more pronounced in Dokhan Volcanics representing the prevailing tension joints in these rocks (Fig . 4).

In younger granitoid rocks, joints are well developed and more pronounced to a great depth in the mass. They occur in all scales and usually extend in a straight form. Curved joints are less common, essentially restricted to local tectonic fractures. Horizontal joints are well developed, usually confined to the foot hills of some granite masses forming sheet-like structures (Fig. 5). The prevailing joints in some rock exposures are sometimes following their general topography, as observed in the porphyritic pink granites. Open joints with spacing not exceed 10 cm and mostly of smooth surfaces are the dominant ones. Closed joints, occasionally injected with Fe-oxides or filled with secondary quartz veinlets and red-potash feldspars, are essentially associated with some major tectonic fractures and shear zones. Peripheral joints filled with thin aplite dykes and pegmatites are common in some red-granite margins.

JOINT ANALYSIS

The joint measurements recorded in each rock exposure have been classified, statistically treated and structurally analysed. Their poles are plotted on a lower hemisphere of an equal area net following phillips, 1960. Nine contour diagrams showing a certain pattern of direction in each rock type are obtained (Fig. 8). The interpretation of these diagrams shows that:

-In metavolcanis (Fig. 8 a), 1478 joints are recorded. Four predominant joint sets following NE-SW, NNE-SSW, NNW-SSE and E-W are distinguished. They are of steep to very steep angles of dips (68°-80°)mainly to NW,ESE, WSW and S respectively. They cover 17.28%, 14. 12%, 13.32% and 12.58% of the total joints respectively

- In quartz-diorites (Fig. 8b), 740 joints are recorded. The NNW-SSE, NNE-SSW, N-S and E-W joint sets are the prevailing ones. They are steeply to very steeply inclined (72° - 80°) mainly to ENE, ESE, E and S respectively. They form 18.51%, 15.00%, 14.87% and 12.16% of the total joints respectively.

- In pinkish grey granites (Fig.8c), 528 joints are recorded. The master joint sets are directed NNW-SSE (17.23%), N-S (15.72%), NW-SE (14.96%) and E-W (13.26%). Their angles of dips vary greatly from 62° to 82° mainly to ENE, W, SW and S respectively.

- In Dokhan Volcanics (Fig. 8d), 1110 joints are measured. The NNE- SSW, ENE-WSW, E-W and NE-SW directions are the predominant joints sets with steep to vertical inclinations (68° - 90°) mainly to ESE, NNW, N and SE respectively. Their densities are 20.90%, 14.23%, 12.97% and 12.43% respectively.

In porphyritic pink granites (Fig.8e), 1140 joints are measured. Two prevailing joint sets striking NNW-SSE and NNE-SSW are distinguished forming 15.96% and 14.91% of the total joints respectively. They are essentially inclined to ENE and WSW respectively with 68° - 82° angles of dips.

In pink granites (Fig. 8f), 2590 joints are recorded. The NE-SW,NNW-SSE and NW-SE joint sets are the most common ones. They are dipping with steep to very steep angles (72° - 80°) mainly to NW, WSW and SW respectively. They constitute 15.52%, 14.13% and 13.67% of the total joints respectively.

- In red-pink granites (Fig. 8g), 585 joints are recorded. Two master joint sets following N-S and NW-SE are distinguished forming 19.32% and 15.39% of the total joints respectively. They are essentially inclined with 62°-82° angles of dips to W and SW respectively.

- In red granites (Fig. 8h), 660 joints are recorded showing a predomination in

NNW-SSW (17.88%), NW-SE (16.36%) NNW-SSE (14.85%) directions. They are of steep to vertical inclinations (62°-90°) mainly to WNW, SW and ENE respectively.

- Finally, and in alkaline granites (Fig. 8i), 840 joints are recorded. Three joint sets prevailing in NW-SE, NE-SE and NNE-SSW directions are distinguished with steep to very steep angles of dips (64° - 80°) mainly to SW, SE and ESE respectively. They include 16.13%, 15.60% and 14.41% of the total joints respectively.

Table (1) summarizes the frequency distributron of the prevailing joint sets in the various rock exposures in the study area.

JOINTS AND STRESS:

The shear joints are those, regionally or locally, form two complementary conjugate sets (Billings, 1979). Shear fractures could form at less than 45° to the principal stress axis while the extension joints are developed at right angles to the least stress axis under several conditions.

In the study area, joints commonly occur as tension and shear fracrures. Two conjugate shear joints were depicted from the equal area diagram for stress analysis. They are stereographically represented following Buchers method, (Phillips, 1960). Nine stereograms are obtained (Fig. 9) where the attitude of the principal stress axis (A), intermediate stress axis (B) and least stress axis (Á) are determined. Table (2) shows the attitudes of the determined three principal stress axes in the various rock exposures in the study area.

DESCRIPTION AND ANALYSIS OF FAULTS:

The basement rock exposures in the study area are highly influenced by several faults and numerous fracture systems. Most of the recorded faults are easily recogized in the field by the obvious separation of different dyke swarms and linear contacts as well as by the various associated wall rock alterations and slickensides (Fig. 10 & 11).

The attitudes of 320 fault lines affecting the surface of the area can be measured, statistically treeated and structually analysed. Two rose diagrams based on length and number proportions, have been constructed (Fig. 12). The obtained results show that : 1) the total number of the recorded fault lines is 320 in an area of 3978 Km with an average. frequency of 0.08 fault/Km,2) the total length of the all measured fault lines attains 1800 Km ranging from several tens of meters to more than 30 Km for individuals and 3) the NE- SW, NNW-SSE and NW-SE major directional trends are the most common fault sets either in number or in lenghth proportions. They cover 35.90%, 23.40% and 12.50% of the total number and 40.09%, 28.03% and 15.03% of the total length respectively .

Two major conjugate shear planes of two predominant fault lines striking N40°E, 64° NW and N25° W, 73°NE are chosen as two major conjugate shear fractures for stress analysis (Fig. 13) The determined three principal stress axes aquire the following attitudes : Á-axis strikes N9°E and plunges 34°SSW.B- axis strikes N5° W and plunges 54° NNW and A-axis strikes N81°W and plunges 7° ESE.

DESCRIPTION AND ANALYSIS OF WADI LINES:

The study area is traversed by 6 famous wadis connected with several branches and tributaries. They are, from north to south, Wadi Umm Tenasseib, Wadi Hawashiya, Wadi Abu Had, Wadi El Kherim., Wadi Khurm El Uyun and Wadi Khurm El Ghuwarib (Fig. 1). These wadis are of a significant geomorphological feature reflecting the effect of lithology and structures. They are generally following NE-SW and drained by their eastern parts to the Gulf of Suez and by western parts to Wadi Qena. They are geometrically controlled by major faults in the area from which they may be called fault line wadis.

In the study area, all the major wadis and their connected branches are delineated where their individal lengths and directions have been measured. The collected data are statistically treated and graphically, represented in a rose diagram based on length proportion (Fig . 14). The obtained results show that : 1) the total length of the measured wadi lines is 420.5Km ranging from several meters to more than 40 Km for individuals with an average density of 0.11Km/Km and 2) the NE-SW (24.5%), NNE-SSW (22.5%) and NNW-SSE (19.5%) are the most common trends of the wadi lines in the area.

DESCRIPTION AND TRENDS OF DYKE SWARMS :

Igneous materials may be emplaced as a dyke either 1) by flowing relatively passively into a pre-existig open fissure or 2) by forceful injection (Price and Cosgrove, 1990). In the study area, the various rock exposures are traversed by several late fairly straight and long dykes. They emplaced either cutting through the hard rock or intruded the major fault zones (Figs. 15 & 16). Acidic, intermediate, alkaline and basic varieties are the main dyke groups distinguished. The former is much more resisstant to erosion than the invaded rocks, whereby the dykes stand up in relief to form conspicuous rides and spines (Fig. 15).

The attitudes of 1484 dykes 495 acidic , 285 intermediate, 218 alkaline and 486 basic, are recorded statisttially treated and graphically repesented in five rose digrams based on number proportion (Fig. 17). The obtained results show that :1) the total number of the recorded dykes is 1484 with an averge density of 0.37 dyke / Km and 2) the NNE-SSW, NE-SW and NNW-SSE directions are the most common trends of the dyke emplacement.

RELATION OF RADIOACTIVITY TO FRACTURE SYSTEMS:

The radioactivity of igneous rocks shows considerable variation and many variations are systematic, relatable to chemical, mineralogical, petrographic and sructural features of the rocks, some variations are apparently nonsystematic (Heinrich, 1958 and Gazzaz, et al, 1989).

In the study area, as it was covered by various rock types greatly different in their lithlogical characters and mineralogical composition , each rock type has a distinctive range of radioactivity known as normal or background radioactivity. Table (3) shows the normal gamma radioactivity range of the various rock exposures in the area. It is measured in the field using a portable Gamma Ray-Seintillometer model GR-101 A (manufactured by Geometrics, U.S.A.) It is expressed as a total count per second (cps).

On the other hand, the distribution of the abnormal radioactivity values and presence of most radioactive anomalies and occurrences are found to be controlled by certain fractural trends (Fig. 1). The NNW-SSE, NW-SE, and N-S directions are the most significant radioactive trends in the area. The gamma radioactivity measured along these fractures ranges from 400 to 600 cps and sometimes reaches up to 700 cps.

DISCUSSION AND CONCLUSION :

The rock exposures in the study area were deformed by several stages of tectonic movements. Since these rocks are of diverse lithological characters and mineralogical composition, they yielded differently to these tectonics. Joints and faults are the most pronounced structural prints of these movements.

Joints are greatly different in their attitudes directions, density, gapping, type of fillers and in the effect of erosion on their surfaces. Some of the prevailing joint sets (E-W) in the older rocks (metavolcanics- Dokhan volcanics) are not recorded in the younger granitoids. On the other hand, the NNE-SSW and NNW-SSE joint sets are generally predominant in nearly all the rock exposures. In addition, some local intersections between the NNE-SSW and NNW-SSE joint sets show a relative younger age for the former. These indicate that the study area was subjected to sveral tectonic cycles with differnt sense of movements.

As for faults, it is observed that the most common NE-SW faults are mainly fault zones generally running through the main wadis, whereas the majority of the NNW-SSE and NW-SE faults are clear-cut fractures passing through the hard and resistant rocks. These faults play an important role in controlling the geometry of the study area. Field observations show that the NE-SW faults with left lateral separations are relatively younger than the NNW-SSE and NW-SE faults with right lateral separations.

By comparing the preferred orientations of joint sets, fault trends, wadi lines and dyke swarms, it is found that they can becorrelated and statistically show a good degree of match. In addition, the determined principal stress axis (A) in nearly all the rock unit is striking N (0° - 19°)W and plunges (25° - 50°)SSE. This means that the study area was subjected to regional palaeo-stresses from which the latest one is generally directed N-S to NNW with an average angle of plunge of 35° southwardly.

On correlating the obtained results in the study area with the regional structural trends in the northern Eastern Desert, it is clear that there is a close relationship. The common NE-SW fault trend of a relative younger age is approximatly parrallel to the Gulf of Aqaba and the other NNW-SSE and NW-SE fault sets are parallel to the Gulf of Suez and Red Sea. The Gulfs of Suez and Aqaba fractures and their related faults produced by a N-S compressive stress (Youssef, 1968). They had been either simaltenous or developed during different phases. In the latter case, the fractures of the Suez Gulf and Red Sea would be older than those of Aqaba Gulf. Regionally, El Shazly (1966) and Youssef (1968) postulated that Egypt was subjected to a compressive force or stress generally directed north-westerly.

It is noteworthy to mention that the NE-SW and NW-SE major fault sets are also predominant in several other areas in the Eastern Desert of Egypt (Salman, et al., 1985 and El Kassas and Bakhit, 1990). The development of these prevailing fault sets has been interpreted by some authors. Meshref (1971) considered the NE-SW fault set as tension type developed parallel to the short diagonal of the block which was subjected to a force of couple. Garson (1976) mentioned that the NE-SW fractures and faults in the Eastern Desert of Egypt may be partly due to vertical and partly to the transcurrent movements. On the other hand, the presence of almost parallel shears striking NW-SE in the northern Egypt is probably owing to the interaction of the Europian and African plates (Raid, 1977). A comparative study, carried out by Meshref, et al, (1980) on both sides of the Red Sea coasts (NW-SE trend) showed that the basement rocks along the Arabian coast are much more affected by this trend than the corresponding rocks on the Nubian coast.

The study of the relation between radioactivity and fracture systems revealed that the NNW-SSE, NW-SE and N-S fractures, either joints or faults, are the main trends controlling most of the recorded radioactive anomalies and occurrences. The anomalous joints are occasionally injected with iron oxides or filled with red-potash feldspars (Fig. 6). The former has an ability for capturing U-minerals from its bearing solution and the latter contains the radioactive K^{40} (Heinrich, 1958 and Hussein, et al, 1965). On the other hand, the radioactive NNW-SSE and NW-SE fault trends are found to be clear cut fractures rather than fault zones. They were deep enough to permit U-bearing hydrothermal solutions for ascending through their fault planes.

It is noteworthy to mention that the NNW-SSE, NW-SE and N-S major tectonic fractures are considered the most significant radioactive trends in the Red Sea hills (Shalaby, 1985, Salman and Nossair, 1988 and Salman, et al, 1990). These trends are also characteristics of some economic mineral deposits in the northern part of the Eastern Desert of Egypt (Mussa and Abu El Leil, 1983). The NW-SE trend is characteristic of Au, W, Mo and rare earths, while the N-S trend is characteristic of Cu and Fe mineralization.

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Table (1) : Frequency distribution of the prevailing joint sets in the various rock exposures .

Rock unit	Total joints	Joint set	No.	%	Direction of dip / density
Metavolcanics	**1487**	NE - SW	257	17.28	60 % NW & 30 % SE
		NNE - SSW	210	14.12	65 % ESE & 25 % WNW
		NNW - SSE	198	13.32	62 % WSW & 18 % ENE
		E - W	187	12.58	60 % [illegible] & 20 % N
Quartz - diorites	740	NNW - SSE	137	18.51	55 % ENE & 25 %WSW
		NNE - SSW	111	15.00	69 % ESE & 2[illegible] % WNW
		N - S	110	14.87	55 % E & 3[illegible] % W
		E - W	90	12.16	68 % S & 12 % N
Pink-grey granites	528	NNW - SSE	91	17.23	62 % ENE & 28 % WSW
		N - S	83	15.72	53 % W & 27 % E
		NW - SE	79	14.96	58 % SW & 30 % NE
		E - W	70	13.26	66 % S & 20 % N
Dokhan volcanics	1110	NNE - SSW	232	20.90	72 % ESE & 10 % WNW
		ENE - WSW	158	14.23	78 % NNW & 20 % SSE
		E - W	144	12.97	58 % N & 41 % S
		NE - SW	138	12.43	50 % SE & 34 % NW
Porphyritic pink granites	1140	NNW - SSE	182	15.96	70 % ENE & 20 % WSW
		NNW - SSW	170	14.91	80 % WSW & 10 % ENE
Pink granites	2590	NE - SW	402	15.52	61 % NW & 31 % SE
		NNW - SSE	366	14.13	62 % WSW & 29 % ENE
		NW -SE	354	13.67	74 % SW & 12 % NE
Red - pink granites	585	N - S	113	19.32	70 % W & 12 % E
		NW -SE	90	15.39	77 % SW & 11 % NE
Red - granites	660	NNE - SSW	118	17.88	60 % WNW & 32 % ESE
		NW - SE	108	16.36	70 % SW & 23 % NE
		NNW -SSE	98	14.85	63 % ENE & 35 % WSW
Alkaline granites	840	NW -SE	137	16.31	67 % SW & 31 % NE
		NE - SE	131	15.60	72 % SE & 18 % NW
		NNE - SSE	121	14.41	51 % ESE & 39 % WNW

Table (2) : Principal stress axes of two major shear joints in different rock units

Rock unit	Shear joints	Principal stress axes (A , B and A`)
Metavolcanics	a - N 45° E , 75 ° NW b - N18 ° W, 76 ° ENE	A - strikes N10° E, plunges 27° SSE B - " N12° E, " 63° NNE A`- " N80° E, " 3° ENE
Quartz-diorites	a - N15° W, 80 ° NE b - N32° E ,75 °WNW	A - strikes N 7° E , plunges 38° SSW B - " N 12°E , " 53° NNE A`- " N 83°E , " 2° WNW
Pinkish grey granites	a - N 8° E , 66 °WNW b -N 50° W, 72 °NW	A - strikes N19°W , plunges 38° SSW B - " N24°W, " 51° NNW A`- " N71° E , " 5° ENE
Dokhan Volcanics	a - N25° E , 60° ESE b - N32°W, 80° SW	A - strikes N - S , plunges 36° N B - " N20°W, " 50° SSE A`- " E - W, " 15° N
Porphyritic pink granites	a - N33° W , 75° SW b - N30° E , 70° SW	A - strikes N 2° W, plunges 33°N B - " N5° W , " 57° SSE A`- " N88° W, " 3°WNW
Pink granites	a - N40° E , 70° NW b - N12°W, 80° ENW	A - strikes N10° E , plunges 28°SSE B - " N 5°W , " 52°W A`- " N80°W, " 8°ESE
Red-pink granites	a - N 9° E , 55°WNW b - N45° W, 80° NE	A - strikes N14°W, plunges 36°SSE B - " N42°W, " 49°NW A`- " N66° E , " 15°NE
Red-granites	a - N28° E , 76° NW b - N32°W, 50° NE	A - strikes N16° W,plunges 50°SSE B - " N 8° E, " 36°NNE A`- " N74°W, " 4°WNW
Alkaline granites	a - N30° E, 70° NW b - N33°W, 72° NE	A - strikes N 2°W, plunges 25°NNW B - " N 4°E , " 65°SSW A`- " N88°W, " 4°ENE

Table (3) Normal radioactivity range of the various rock exposures

Rock unit	Radioactivity , cps		
	Minium	Maxium	Average
Matavolcanics	30	70	50
Quartz - diorites	45	85	65
Pinkish- grey granites	50	80	65
Dokhan Volcanics	70	120	95
Porphyritic pink granites	50	80	65
Pink granites	80	120	100
Red - pink granites	100	120	75
Red - granites	120	230	150
Alkaline granites	90	150	120

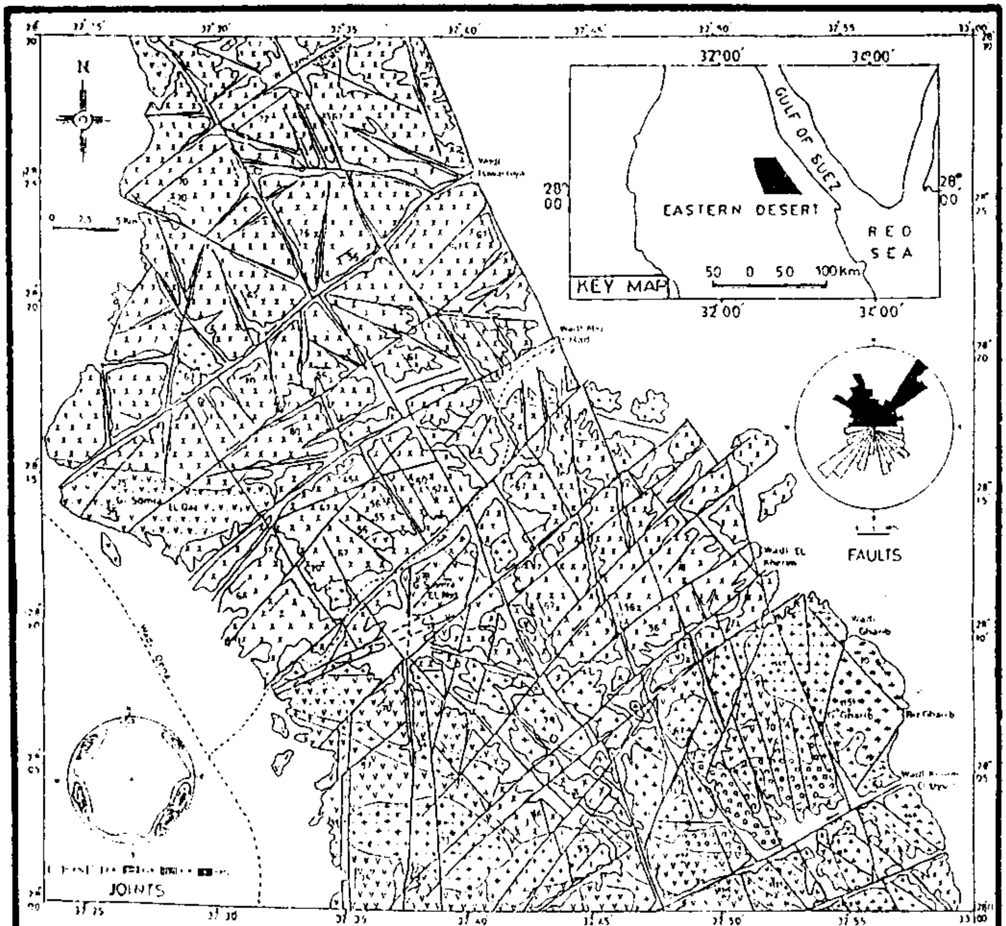

FIG. 1: GEOLOGICAL_STRUCTURAL MAP OF THE BASEMENT ROCKS BETWEEN LATITUDES 28° 00′ AND 28° 30′N, NORTH EASTERN DESERT, EGYPT.

Rock Units:

Wadi deposits. Red granites. Pink granites. Dokhan volcanics. Quartz diorites.
Alkaline granites. Red_pink granites. Porphyritic pink granites. Pinkish grey granites. Metavolcanics.

Structural Forms:

Strike_separation faults. Inclined joints. Geological boundaries. Desert roads. Spot level in meter.
Normal faults. Vertical joints. Wadis. Water wells. Radioactive anomalies.

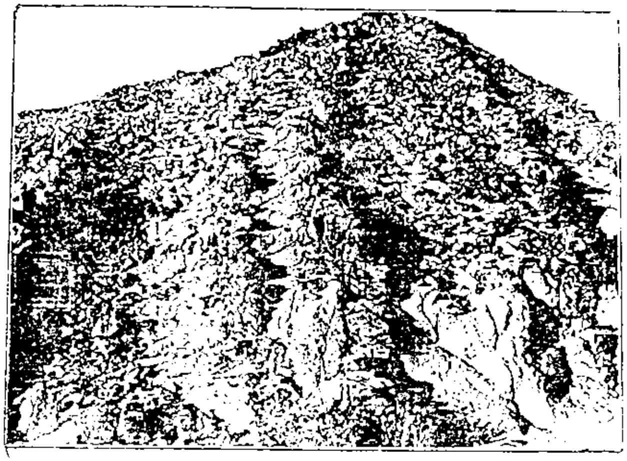

FIG.2. WIDE SPACING JOINTS IN PINKISH GREY GRANITES FILLED WITH THIN BASIC DYKES.

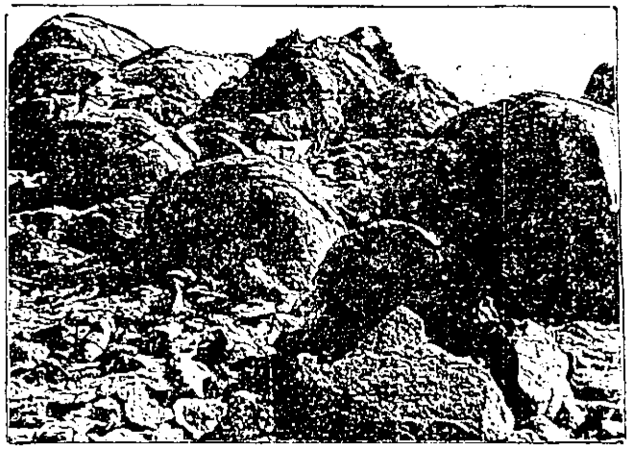

FIG. 3 :PINKISH GREY GRANITES WITH ROUNDED TO SUBROUNDED SURFACE APPEARANCE.

FIG. 4 :WELL DEVELOPED COLOUMNAR JOINTS IN DOKHAN VOLCANICS.

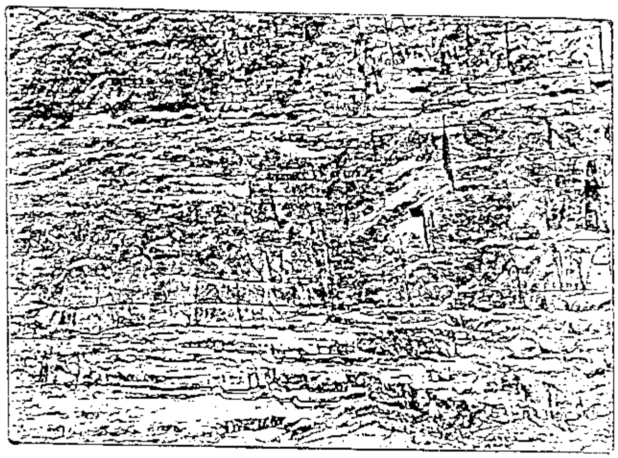

FIG. 5 :HORIZONTAL JOINTS IN PINK GRANITES FORMING SHEET_LIKE STRUCTURES.

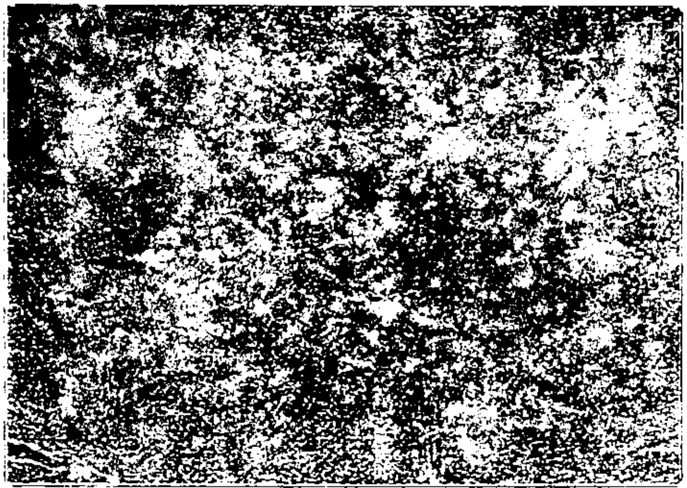

FIG.6:JOINTS IN RED GRANITES FILLED WITH IRON OXIDES.

FIG.7: TWO MAJOR CONJUGATE SHEAR JOINTS IN PINK GRANITES STRIKING N40°E, 70°NW AND N15°W, 80°NE, LOOKING N.

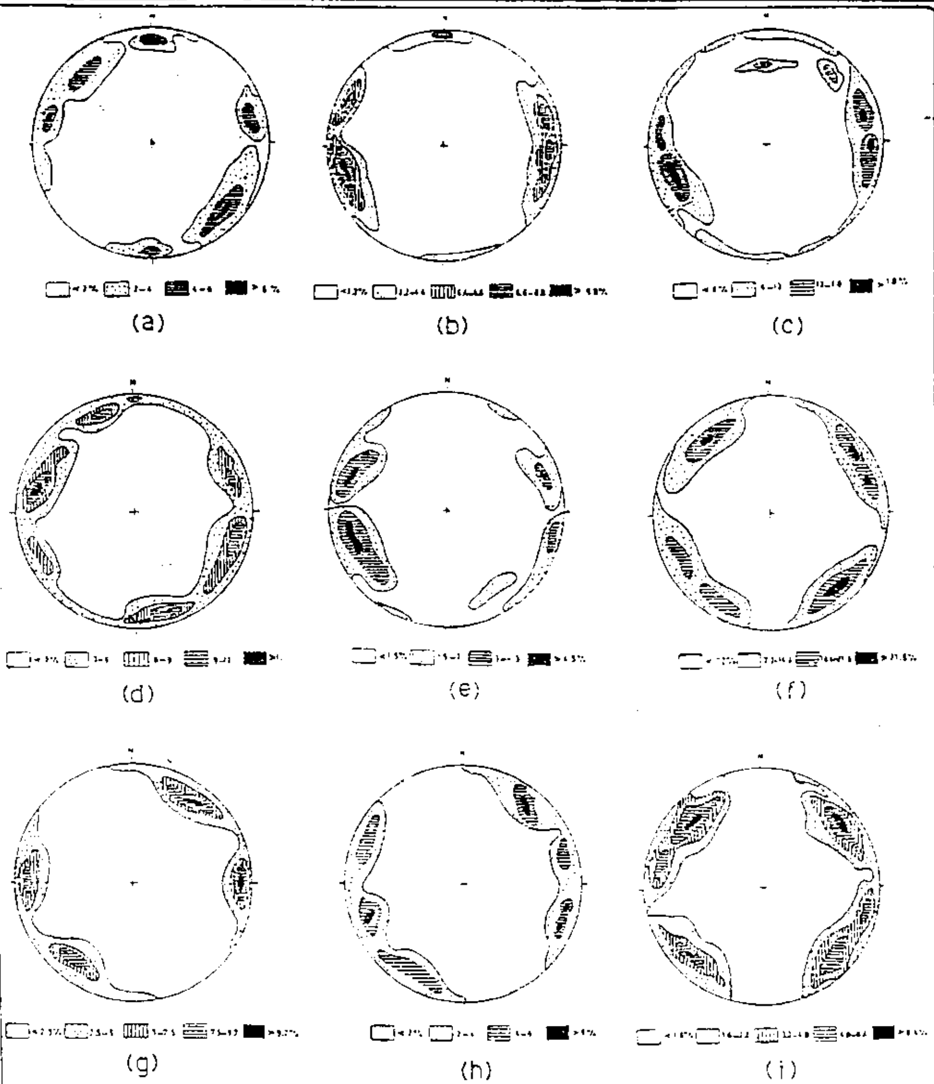

FIG.8:CONTOUR DIAGRAMS OF JOINTS IN METAVOLCANICS (e) QUARTZ_DIORITES (b), PINKISH GREY GRANITES (c), DOKHAN VOLCANICS (d), PORPHYRITIC PINK GRANITES (e), PINK GRANITES (f), RED_PINK GRANITES (g), RED_GRANITES (h) AND ALKALINE GRANITES (i), PLOTTED ON LOWER HEMI SPHERE.

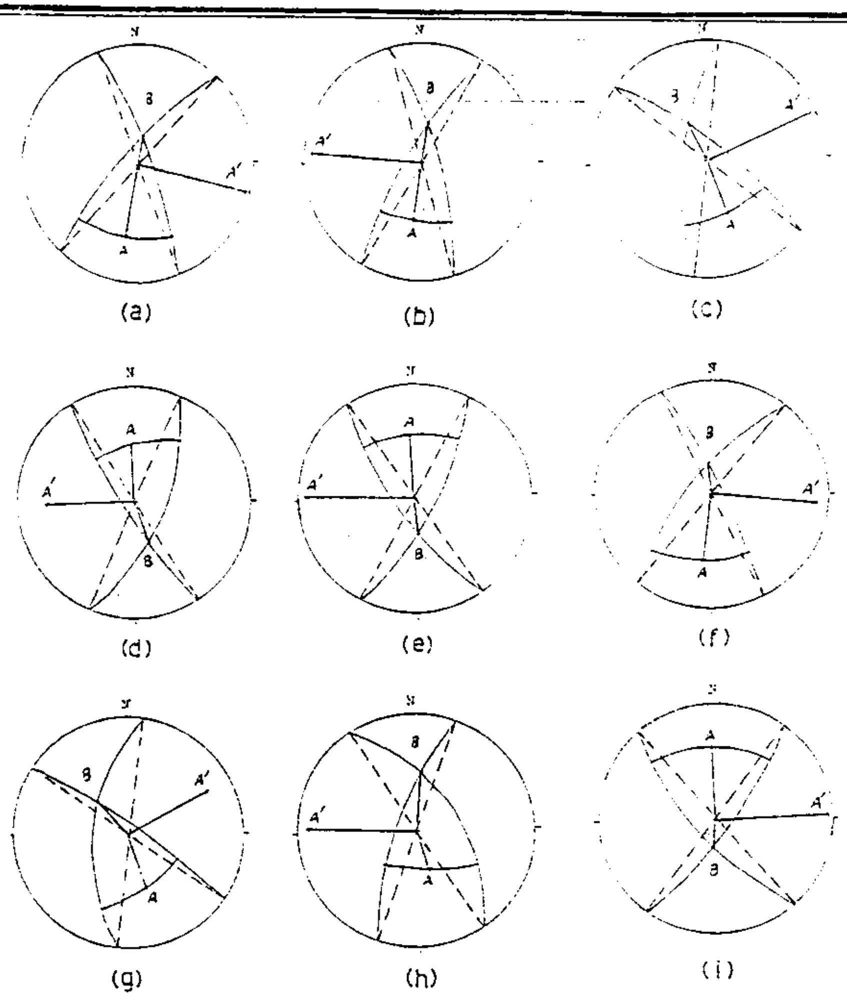

FIG.9:STEREOGRAMS OF TWO MAJOR CONJUGATE SHEAR JOINTS IN METAVOLCANICS (a), QUARTZ_DIORITES (b), PINKISH GREY GRANITES (c), DOKHAN VOLCANICS (d), PORPHYRITIC PINK GRANITES (e), PINK GRANITES (f), RED_PINK GRANITES (g), RED_GRANITES (h) AND ALKALINE GRANITES (i).

FIG.10: AN APLITE DYKE SEPARATED BY A NNE_SSW STRIKE_SEPARATION FAULT, LOOKING N.

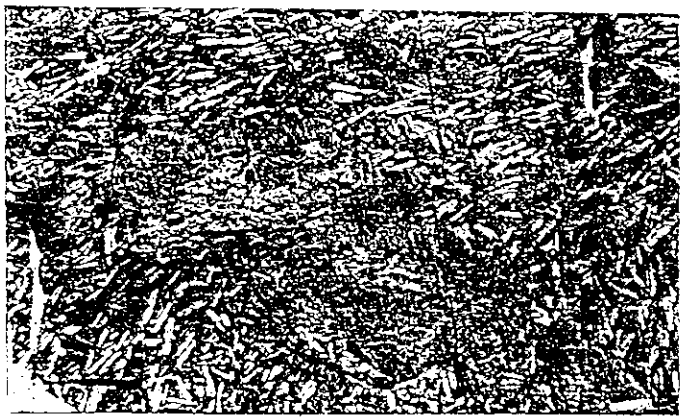

FIG.11: A FAULT PLANE WITH SLICKENSIDES SHOWING NORMAL DISPLACEMENT.

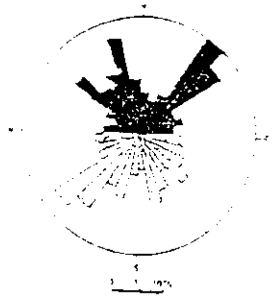

FIG.12

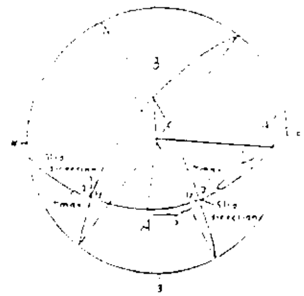

FIG.13

FIG. 12 : ROSE DIAGRAM OF 320 FAULTS BASED ON LENGTH (UPPER) AND NUMBER (LOWER) PROPORTIONS.

FIG. 13 : STEREOGRAM OF TWO MAJOR CONJUGATE SHEAR FAULT PLANES.

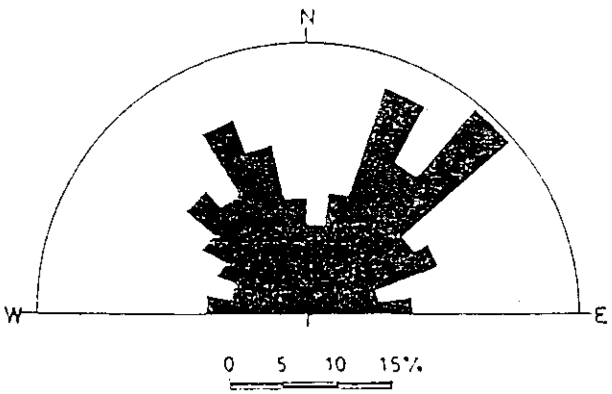

FIG.14 : ROSE DIAGRAM OF WADI LINES BASED ON LENGTH PROPORTION.

FIG.15: A RESISTANT ACID DYKE ACTING AS SPINE TO HIGHLY WEATHERED PINKISH GREY GRANITES. LOOKING SE.

FIG.16: MAJOR NNW_SSE FAULT IN PINK GRANITES WITH A FAULT ZONE FILLED WITH BASIC DYKE, LOOKING N

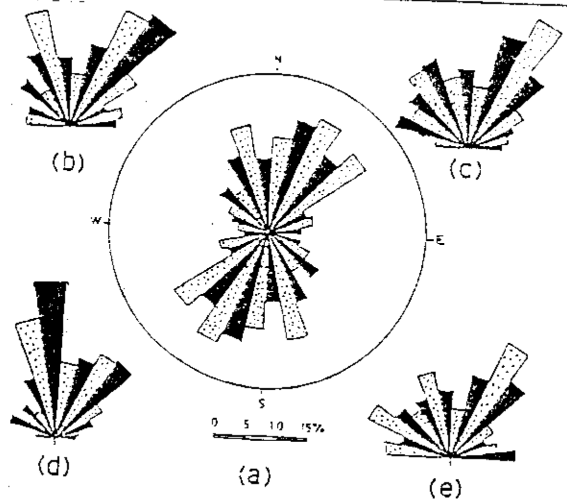

FIG.17: ROSE DIAGRAMS OF 1484 DYKES (a), ACIDIC (b), INTERMEDIATE (c), ALKALINE (d) AND BASIC (e).

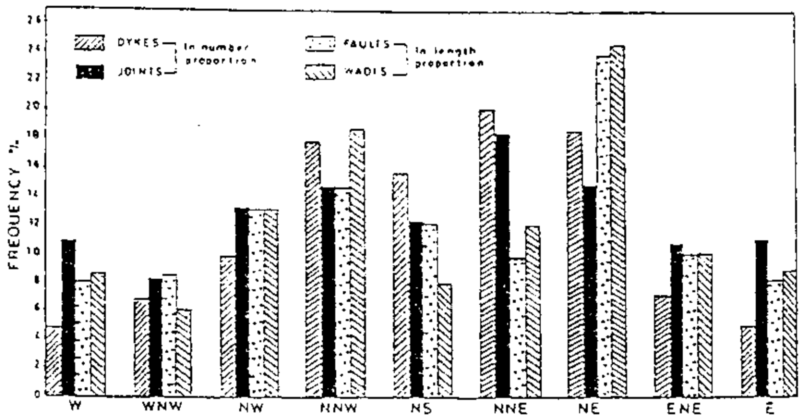

FIG.18: COMPARATIVE HISTOGRAMS OF DYKE SWARMS, JOINT SETS, FAULT SETS AND WADI LINES.

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التحليل التركيبى لصخور القاعده بين خطى عرض ٢٨ ٠َ ٢٨ و ٣٠َ ٢٨ شمالا وعلاقتها بالنشاط الاشعاعى - شمال الصحراء الشرقية مصـــــر

لطفى مصطفـى نصير
هيئة المواد النووية - القاهره - مصــر

تمثل المنطقة الواقعة بين عرض خطى عرض ٠َ ٢٨ ، ٣٠َ ٢٨ شمالا جزءا من الحزام التجبلى المصرى فهى مكونة من صخور نارية ومتحوله ترجع الى عصر ماقبل الكمبرى. ولقد تعرضت هذه الصخور منذ نشأتها الى العديد من الحركات التكنونية والتى تعتبر الفواصل والفوالق من أهم آثارها .

ولقد قيست الاتجاهات لعدد ٩٦٨٠ فاصلا، ٣٢٠ فالقا فى مختلف الصخور بالمنطقة وعولجت هذه القياسات احصائيا وتركيبيا فى ضوء التركيب الاقليمى لمصر كما درست علاقة هذه التراكيب بالنشاط الاشعاعى بالمنطقة .

اسفرت الدراسة بأن الفواصل عديدة ومختلفة فيما بينها فى الاتجاهات والكثافة والتوزيع ويرجع ذلك الى الاختلاف فى خصائص وكيميائية الصخور ومع ذلك فقد أمكن تمييز ثلاث مجموعات من الفواصل تسود فى الاتجاهات شمال شمال شرق -جنوب جنوب غرب ، شمال شرق - جنوب غرب ، شمال شمال غرب - جنوب جنوب شرق حيث تمثل المجموعة الاخيرة أقدمها . ومن ناحية أخرى وجد أن الفوالق تسود أيضا فى ثلاث اتجاهات هى شمال شرق - جنوب غرب، شمال شمال غرب - جنوب جنوب شرق، شمال غرب - جنوب شرق حيث ان الاتجاه الأول يمثل أحدثها . ومن دراسة تحليل مجالات الاجتهاد العامه وجد أن المنطقة قد تعرضت لعديد من القوى الاقليمية القديمة والتى يتجه آخرها من الشمال الى الجنوب بزاوية غطس مقدارها ٣٥ فى اتجاه الجنوب.

من ناحية النشاط الأشعاعى فقد وجد أن لكل صخر مدى اشعاعى معين يرتبط ارتباط وثيقا بخواص وكيميائية وتركيب هذا الصخر أما القراءات الاشعاعية المرتفعه وكذا الشاذات الاشعاعية فهى محكومة بالتراكيب والفوالق التى تضرب أساسا فى الاتجاهات شمال شمال غرب - جنوب جنوب شرق ، شمال غرب - جنوب شرق ، شمال جنوب.