GEOMORPHOLOGY OF ASWAN-ABU SIMBEL AREA WESTERN DESERT, EGYPT

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ABSTRACT:

The aeolian features are the most characteristic in the studied area and affected mainly by weathring and geologic structures weathering features are mainly sand pains, dunes and sand accumulations in the sides of hills.

Sturctural features are mainly represented by small domes and basins along fault plane which are also affected by wind effect.

These domes and basins are formed due to the uplifting of the basement and tilting the overlying sedimentary cover.

Residual hills of different sizes are common in the studied area and restricted to the Southern side of the plateau surface.

The presence of inverted wadis is a good indication that the area has subjected to a wet period.

PREVIOUS WORK:

The following is a brief review of the previous literature concerning the area in question and its surroundings:-

Said and Issawi(1964), discussed the geomorphology of lower Nubia, Egypt in an attemp to account for the geological evaluation of the River Nile in this part of its course. They divided the Nubia area into four geomorphic units which are structurally delineated.

Butzer (1965) described the geomorphology of the Kurkur area, which he beleives to be primarily modeled by running water in late Tertiary and early Pleistocene times, and subsequently remodeled by wind. Analysis of the desert land forms thus:

Sculptured under semi arid to hyperarid conditions shows the drainage characteristics. Shape forms and surficial materials are distinctive from those commonly associated with humid environments.

Butzer and Hasan (1968) constructed a geomorphological map of Kurkur Oasis where three different pediements covered by Pliocene to lower Eocene limestone and chalk are encountered.

El-Ramly et al.(1971) studied the Kaolin deposits at Wadi Kalabsha indetail and constructed geological and topographical maps (Scale 1:2500).

El-Ramly (1973) constructed a geomorphological map arround Nasser lake and divided the present area into different geomorphic units.

El-Dawidar (1982) studied the landscape of the South Western Desert by using space images and classified the present area into different geomorphic features.

This work is a geomorphological study of the area South West of Aswan. A geomorphological map with a scale of 1:500,000 has been constructed.

The studied area is located between latitude 22°and 24° 10' N and longitude 31° 30' and the shores of the Lake Nasser to the East.

The Geomorphological Units in the investigated area are:-

1. UPLANDS:

The upland terrains are either superimposed on Eocene limestone or saudstone of older age.

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(a) Eocene LImestone Plateau:

It is located at the Western part of th studied area, covering 700 Km^2 and extends from Gebel Abu Domi, at the North, to Bir Dungul at the South. It's maximum altitude 457m at Gebel Domi and sloping to the South West. It is with hummocky surface covered by Garra limestone near the peripheries, whereas inside is generally flat, with yardings-like features made up of Dungul limestone.

It is partly covered by Hamada deposits. The surface of the plateau is affected by denudation and structural processes where it is cut by many faults.

(Wadi Seiyal and Wadi Falig faults toward it's Eastern part, and N-S regional faults, West of Kurkur Oasis).

(b) Scarps:

Scarp zone of Gebel Abu Domi-Gebel Kalabsha:

[illegible] in outline, consisting of many promontaries and their corresponding embayments.

Gebel Garra is the highest point in this scarp (445m near Kurkur Oasis) while at Sin El Kaddab (120m), the scarp gradually retreats to the North and North West leaving behind some residual hills.

West of Gebel Kalabsha the scarp is mainly formed of Garra limestone.

Toward the West of Gebel Kalabsha and at Gebel El-Digm, the scarp is modeled into two planation surface overhanging each other, the lowest is located East of Gebel Dogm, covered with fresh water limestone. The second lies North ward the scarp faces between Bir Dungul and Gebel El-Digm. It rises 138m to the North of Gebel Um Shaghir and 100m North of Gebel El-Digm, highly dissected by short wadis running N-S direction and structurally controlled.

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Wadi Tushka Depression:

A part of this Wadi is only located in the studied area which has an oval-shape and characterised by low gradient slopes and rises 170m.

Denudational Slopes:

They are mainly found along the shore of Lake Nasser, around Wadi Kurkur and Wadi Tushka. The altitude of these slopes at Wadi Tushka are 200-250m with slope gradient 10-25%, while at Wadi Kurkur are 150-170m with slope gradient 40%.

Most of them are superimposed on Cretaceous sandstone beds.

Denudational Hills:

They exist between Gebal Nassab at the North and stretching Southward till Gebel Hammam. These hills are present in the form of clusters seperated by depressions. They have an altitude 400m and capped by the hard Nubia or Gilf sandstones. They are oval in shape but some of them are characterised by yardang-like features.

Denudational Ridges:

They exist in Wadi El-Daris (400m height) and South Gebel Nassab (250m height). These ridges are severly dissected and have a NW-SE trend and sharp crested top.

Denudational Hummocks:

Extend towards the west till it abuts against Sinn El - Kaddab Scarp. The Nile cuts through the eastern edge of this surface (Pediplain) forming a canyon like feature. At Agha-Khan tomb the pediplain is terminated by the famous scarp west of Aswan which rises 80-120m above the Nile Water. The surface of this pediplain consists of Hummocks of sandstone. In general the surface of this pediplain slopes very gently towards the Nile. The pediplain surface is covered by Nubia beds and has an altitude of 200m.

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Landforms of Structural Denudational Origion:

The studied area is highly affected by tectonic movement, leading to many uplifts, faults, fault blocks and folds. Due to the relatively thin, sandstone cover, the uplift of the basement rocks is significent in the structural pattern of the area. This is clear at Um Shaghir region and some granitic bodies near Garf Hussein and at Wadi Kalabsha, where the sandstone beds are highly titled around the igneous masses. On top of these igneous masses hogbacks and sandstone cuestas are very common. Some dome-shaped features originated by the intrusion of basaltic bodies at Wadi Tushka.

Landorm units related to folded Structures:

Gebel El-Kasser Basin:

It is formed by several ridges mainly (cuesta type) covered by Kurkur limestone. In the western part of the basin the cuestas changed to hogbacks due to faulting and at the Southern part, the beds are twisted forming a narrow plunging nose. The core of the structure is covered by recent mud derived from the nearly limestone plateau. The limbs have an altitude 210-234m.

Gebel Marawa Basin:

It represents a relict of the retreated Sinn El Kaddab Scarp. It consists of Garra limestone and rises 251m. The lower most part is covered by Dakhla shale. The basin is affected by Kalabsha fault.

Kalabsha Koalin Quarry anticline:

This fold was created by the movement of sandstone blocks in between two faults namely Kalabsha fault at the North and a Southern fault located at the floor of Wadi Kalabsha. The core is flat relatively broad and rises 250m, Near the core the Koolin is quarried.

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Wadi Tushka anticline:

It is assuming an Altitude of 170-140m. Basaltic Sheets intruded it's flanks. The limbs are composed of Abu Ballas Formation. On top of Southern flank hills of Qaret El Makhrut exist which made up of Sabaya Sandstone. There are many other folds on the Nubia Plain south of Kalabsha Quarry.

Landforms related to the Uplift of the Basement:

The vertical movement of granit at Um Shaghir area led to the formation of a domal structure in the overlying sandstone beds are fully eroded while at the outer parts the sandstone beds of the Nubia Formation make cuestas.

Fault Blocks Land Scapes:

These blocks are well observed at the Northern part of the studied area connected mostly with N-S fault system North of Wadi Kalabsha, the area has been reclaimed and the fault blocks are now covered by Planation. South of Wadi Kalabsha the area is dissected by a number of N- S faults forming a series of grabens and horsts. The most significant fault blocks are:

Wadi Kalabsha - Wadi Kurkur fault block:

These blocks are covered by Upper Cretaceous Nubia Formation extending 30-50 Kms west of the Nile and rise about 50m above the surrounding low areas making a table land-like feature. The major feature is the Ras El Abd ridge with altitude 230-260m.

Fault Blocks South of Wadi Kalabsha:

These are composed of a series of grabens and horsts with step-like features. The blocks are bounded by a fault line scarp risses more than 30m. The grabens have altitude of 170-180m while the adjacent horsts have altitudes 200-230m. They are covered by Nubia beds and older rocks.

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Structural Depressions:

Most of these depressions are small in size except those associated with major structure. They are filled with mud or gravel sheets or aeolian deposits. They are shallow and elongated, whereas some are irrigular or circular in shape. Mostly these depressions are confined in between structures or between foot shapes of the scarps and structural ridges. The famous ones are: Dinegil, Wadi El Rafa and Riheiwa depressions.

Faulted Ridges:

They are very common South of Kalabsha quarries and East of Barq El Sahab Hill. Due to silicification along the faults affected the area: The planes become very hard and stand nearly vertical, against erosion processes forming dyke-like ridges stretching for ten of Kilometers.

Lower Sandstone Plateau:

It is well observed between Wadi Kurkur at the North and Gebel Garra at the South, Wadi Kalabsha divided it into two parts, the Southern part, is covered with Quseir clastic Member where its surface includes much flat topped nubbins. The Northern part is higher than the Southern part and is affected by granit uplift and few faults, it's surface includes residual hills of quartizite sandstone.

Strike Valley:

Due to the uplift of the granite bodies south of Um Shaghir hill, few wadis are confined in the area between Um Shaghir hill and the limestone plateau. Some of them run far 30 Kms. and assume an E-W trend.

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Glacis:

These features are descending either from the limestone plateau toward the Nubia plain or exist where talus accummulated on both sides of the valley floors. The following glacies can be recoghized in the studied area:

Front Slope Glacies:

It exists on the high steep slopes of the Dakhla Shale at the eastern side of the limestone plateau. Starts from the lower part of the Kurkur cliff and extends downward to the periphery of the Nubia plain.

Piedmont Glacis:

The piedmont glacies encircles the Eocene Plateau and composed mainly of gravels and pebbles derived from the Kurkur, Garra and Dungul limestone with less Nubia sandstone component. In some places it is covered by Tufa. At Wadi Kurkur and around El Kasser basin, they are still active. At the Eastern side of the plateau it is connected with the front slope glacies and descending to the Nubia plain. It's altitude is variable from 300 to 250m.

Valley Glacis:

This type is here of limited occurrence, exists below the cliff of Sabaya sandstone hills. It is composed of red silt with gypsum patches and rare sandstone pebbles and gravels. It's surface included acolized artifacts of Neolithic age and some grinding stones.

Landforms of fluvial Origin:

In the studied area, the fluvial landforms can be classified into the following:-

Drainage lines:

These lines comprise the wadis and their tributaries, their walls and floors.

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Wadi Kalabsha:

This is the most important Wadi in the studied area its catchment area is 3500 Km^2. Its bed sediments consist of siltstone including quartz pebble lenses. The width of the floor of the Wadi is 2 to 3 Km. Its elevation varies from 175m to 225, Most of the catchment area of this Wadi lies between Gebel Kalabsha in the North and the igneous body in the South near El Malki Nile bend. Some of the tributaries follow conspiceous structural patterns with V-shaped gullies on the plateau and U-shaped at the Nubia Plain.

Wadi Kurkur:

It flows in an Easterly direction where it debouches its water in the Nile, South of the High Dam. The catchment area of the Wadi is 800 Km^2 and located between fault block landmass in the Northern side and the hummocky terrain. The general profile of the Wadi is Zigzag in shape following structural lines mainly joints in the sandstone country.

Wadi Tushka:

A small part of this Wadi exists in the studied area, while the most of it, is now submerged under Lake Nasser. The catchment area of it in the studied area is 650 Km^2. Basaltic intrusions clearly observed in and around the tributaries of this Wadi blocked its course.

Inverted Wadis:

Most of the inverted wadis are here noticed in the depressions lying between Gebel Hammam and Gebel Nasmas and in the area North of Abu Simbel village. Near the embouchures of the wadi East of Gebel Masmas and ancient weak dendritic drainage pattern was observed indicates humid climate. The catchement of this wadi equals to 500 Km^2. The ancient wadi ridges are now intersected by the isolated hills. The drainage pattern reflects the old topography where massive, rounded dome-like hills are common. The main inverted wadi is superimposed on the Aby Ballas Formation, while the tribuitaries were superimposed on the Sabaya Sandstone.

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Windblown Sandplains (Sand Sheets):
Sand sheets covered most of the Eestern part of the studied area. They extend from Um Shaghir ridge in the North, passing through Wadi Tushka till Abu Simbel village in the South.

Ripples:
They are located in a few places and composed of medium grained quartz sands. These ripples can be classified into Long-Crested catenary ripples and Long to medium Crested transverse ripples superimposed in a large sand sheet.

CONCLUSION:

Owing to the alternation of arid and semi arid conditions during the Quaternary large ephemeral streams disappeared and the Wadis were subjected to further modification by mass wasting, wind erosion and wind deposition.

Streams of probable late Tertiary and more recent times drained Precambrian land East of El Malki Nile bend. This area was formerly a major drainage divide in the studied area.

Now, under present conditions of hyperaridity, the trunk streams are defunct, and their valley side slopes are being reduced mainly by mass wasting and wind erosion.

Alluvial fans are essentially inactive, and relatively small on the Nubia plain except those located near the slope of Sin El Kaddab.

The broad flat floored wadis at the Eestern part of the area with their characterised conical residual hills, ripples, linear dunes and sand sheets signify a complex interplay of running water, wind and mass wasting under Quaternary climatic fluctuations.

The large size depressions appear to be the result of a combination of structural weaknesses and wind erosion.

Due to the relatively thin sandstone cover, the uplift of the basement rocks is significent in the structural pattern of the area which noticed at Um Shaghir region, where the sandstone beds are highly tilted around the igneous masses and hogbacks and cuestas are common.

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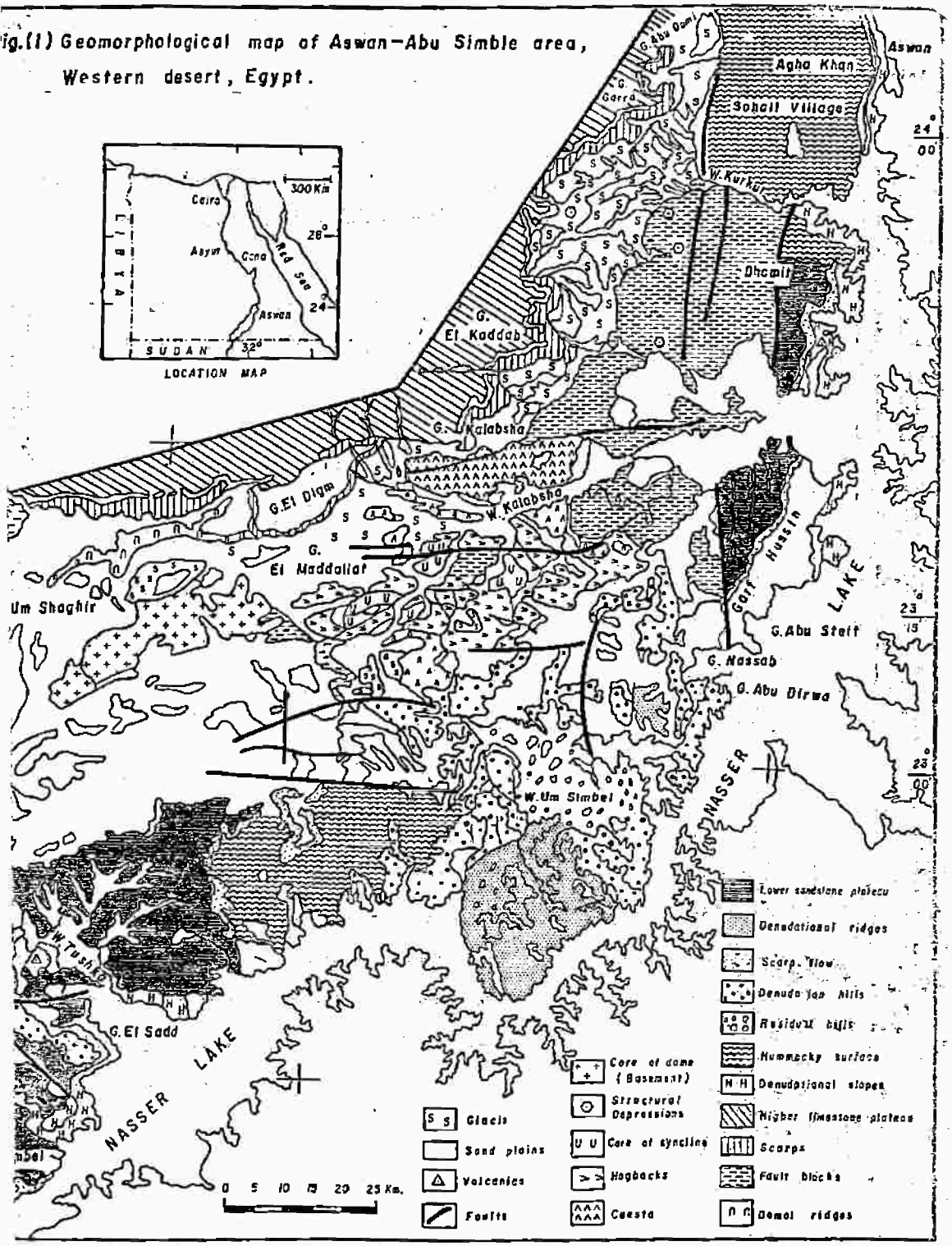

ig.(1) Geomorphological map of Aswan–Abu Simble area, Western desert, Egypt.