

جيومورفولوجية طية ساسان- شمال غرب العراق
كما فسرت بواسطة الصور الجوية

عبدالخالق عبد الملك عبد الجبار
قسم الجيولوجيا، كلية العلوم
جامعة الانبار

نبيل صبحي الداغستاني
مركز التحسس النائي
جامعة الموصل

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using aerial photographs

Nabil S. Al-Daghastani
Remote sensing Center
Mosul University

Abdul-Khaleq A. Abdul-Jabbar
Geo. Dep. College of science
Anbar University

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ABSTRACT

This present study includes a limitation of geomorphologic features of Sasan Anticline, northwest Iraq, and interprets them by using aerial photographs without field work or check.

Conventional black-and-white photographs contain a great deal of usable geomorphologic information for their clarity and scarcity of vegetable cover. Also to increase the efficiency of field work because they can decrease the time and expenses.

The potential and utility of this study is to describe the relationship of rock materials, landforms and the processes in the area concerned and investigate the relationship of these forms and processes and their spatial arrangement.

The geomorphologic of Sasan Anticline is rather versatile, and the present approach emphasises the morphologic point of view. This approach is essentially based on the assumptions that the surface is composed of units which are convex-concave and convex-rectilinear in plan, with slope discontinuities bounding them. These can be identified and delineated from the aerial photographs of 1: 32,000 scale during the preliminary work.

Forms related to structural, denudational and fluvial origin were recognised in the studied area. These forms can be subdivided into smaller units which are governed by rock materials, processes, e.g.(erosion, creep and slump) and relief amplitude. The morphogentic landform units are indicated by coloured area. The specific landforms are given by way of line symbols.

الخلاصة

شملت الدراسة تحديد الظواهر الجيومورفولوجية لمنطقة طية ساسان، شمال غرب العراق، وتفسيرها باستخدام الصور الجوية بدون اللجوء الى العمل الحقل. وتكمن اهمية استخدام هذه التكنولوجيا في امكانية انجاز الدراسات

والمسوحات لمساحات واسعة بوقت قصير وبكادر قليل مقارنة بالطرق الاعتيادية والتي تعتمد على العمل الميداني. إضافة الى امكانية الحصول على معلومات من الصعب الحصول عليها بالطرق الاعتيادية، حيث اصبح نتيجة للممارسة والخبرة امر التعرف على الاشكال المختلفة لسطح الارض بمشاهدة الصور الجوية بواسطة المجسمات مهمة سهلة والى فهم افضل لعوامل الترسيب والتعرية المختلفة التي تتحكم في تغيير سطح الارض.

ان الفائدة الكامنة من هذه الدراسة هي لتوضيح العلاقة بين المكاشف الصخرية واشكال سطح الارض والعوامل التي تؤثر على سطح الارض بالاضافة الى تفصي العلاقة بين هذه الاشكال والعوامل المختلفة واثرها في توزيع هذه الاشكال. كما يمكن الاستفادة منها في تحديد مواقع ابار الاستكشافات النفطية والمائية وتحديد المقالع الصخرية المختلفة (حجر جيرى لصناعة السمنت وحجر طيني لصناعة الطابوق)، وتحديد المناطق الصالحة للزراعة أي السهلة والمنبسطة والمغطاة بالتربة وتحديد المواقع السكنية الملائمة.

ان جيومورفولوجية طية ساسان هي بالاحرى متنوعة، وأن التوصل الحالي في ضوء المعلومات الحاصلة تشير الى وجهة نظر مورفولوجية وأن هذا التوصل يستند بشكل اساس على الافتراض أن شكل سطح الارض في المنطقة المعنية متكون من وحدات مورفولوجية مقعره-محدبه ومقره-مستوية في مستوى تغير مفاجيء في سطوح المنحدرات التي تفصل بين هذه الوحدات. هذه الوحدات الجيومورفولوجية يمكن تشخيصها وتحديدتها بواسطة الصور الجوية ذات مقياس 1:32000 خلال المرحلة الاولى من الدراسة والبحث.

أن الخريطة الجيومورفولوجية المرسومة لمنطقة البحث قد ميزت ووضحت الاشكال الجيومورفولوجية ذات العلاقة بالتركيب الجيولوجي، ذات الاصل التعريوي وذات الاصل النهري. والاشكال الكبيرة بدورها قسمت الى وحدات صغيرة نتيجة لاختلاف نوعية المكشف الصخري والعمليات الطبيعية التي تأثرت بها والتي وضحت بواسطة الرموز.

Introduction

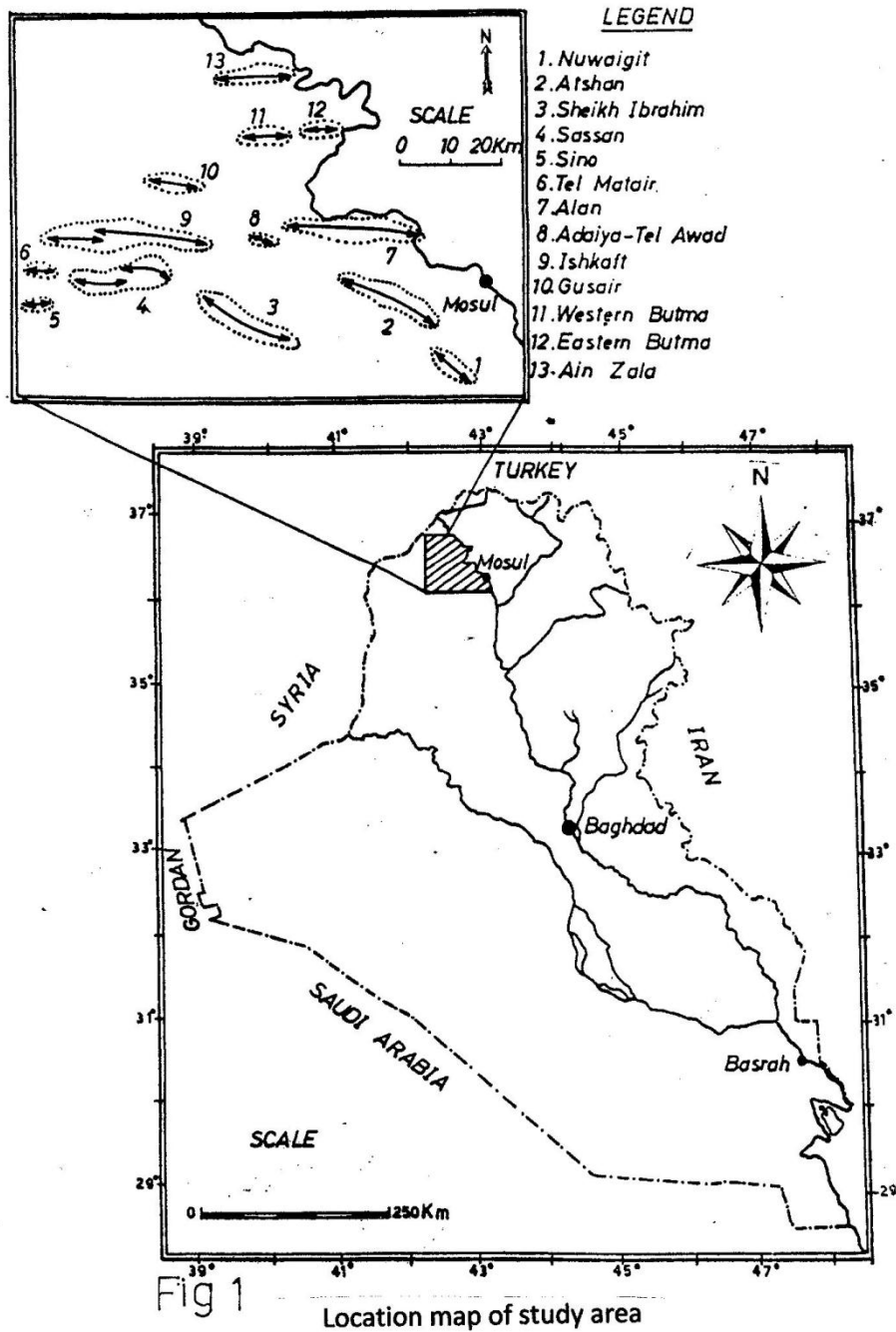
The present work is devoted to the analysis of photo data in the in the sasan anticline with aim of evaluating the geomorphologic analysis of this area. Sasan Anticline is situated 4KM northwest to Tel-Afar. The northeast limb of this anticline is steeper (upto 40°) than the southeast limb(4°-20°) (Al-Jumaily, 1976). The axis of Sasan Anticline exhibits 120° . It is 10 KM long and 7 KM wide.

The area of Sasan Anticline is located nearly the southern margin of the folded zone of Iraq, and represents the transition zone between the Alpino-type area in the northeast and the Arabian shield (Dunnington, 1958 ; Naqib,1967). Sasan structure situated in the foothill zone of the unstable shelf (Budy and Jassim, 1984) The southern margine of the folded zone is not straight but there is a bend which changes from the east-west direction near the syrian border up to NW-SE direction south of mosul (fig 1).

Most of these structures could be oil bearing, and they include another raw materials (carbonate and gypsum).

Stratigraphy

The oldest rocks that crop out in the central portion of the area under study are of the basal horizon of the Al Fat'ha Formation of Middle Miocene age(Al-Jumaily and Domaci, 1976; and Mohi-Al-Din, et. al., 1977). Al Fat'ha members built the whole



structure of Sasan Anticline. Injana formation overlies it. Al Fat'ha Formation consists of two members (lower member and upper member) :

The lower member in Sasan Anticline consists of 4 horizons, these are from bottom to top :

- 1- 30M, well thickly bedded, hard, recrystallized, pale grey and fine grained dolomitic limestone.
- 2- 35M, thick, well thinly bedded, partly recrystallized, grey to brownish splintery and fine grained dolomitic limestone.
- 3- 20M, thick, marly limestone of yellowish to whitish colour which include lenses of white gypsum.
- 4- 15M, thick of the lower member is built by thickly bedded (about 1m), whitish, fine grained and partly recrystallized dolomitic limestone. The horizon characterized by the development of sinkholes.

The lower member of the Al Fat'ha Formation consists of gypsum (white to pale grey), dolostone, limestone (thinly bedded and considered good marker horizons) and marlstone (yellowish in colour).

The upper member consists of pale grey, partly recrystallized, splintery limestone, which is whitish colour, hard slightly fossiliferous, dolomitic and dolostone.

The upper member of Al Fat'ha Formation exhibits thick evaporitic sedimentation and thin horizon of dolomitic limestone, marlstone and claystone. Gypsum of this part is white to pale grey. There is a horizon of green gypsum also known.

Total thickness of Al Fat'ha Formation in Sasan Anticline can be estimated on the basis of the field-traverses up to 360M thick. (Al-Jumaily and Domaci, 1976, and Mohi-AL-Din, et.al., 1977).

Sediments of Injana Formation represent probably the final stage of marine conditions and beginning of the lagoonal to continental sedimentations.

It includes south of Sasan Anticline two beds up to 1M of partly fossiliferous, hard dolomitic limestone, which are sandwiched beds of sandstone and claystone. The thickness of the sandwiched horizon is up to 8M. Sandstone are up to 1.5M thick. Fine to medium grained, red, partly with silty materials. The colour of silty claystone is red or secondary green. Secondary gypsum is known in the joints of these rocks. .

Injana Formation of Upper Miocene are consists of claystone and sandstone. This sandstone is fine to medium grained of red colour. Most of this formation covered by quaternary sediments, due to its preservation only in the geographical depression, which represent in deepest syncline only in south of Sasan Anticline.

Quaternary deposits consist of soil, slope deposits and wadi fillings.

The aim of the study

It was intended to develop methodology for the rapid production of small- scale geomorphologic map of the study area, from aerial photographs using in expensive techniques in less time and at less cost than with more extensive field mapping.

The purpose of the geomorphologic analysis of the Sasan Anticline was to investigate the characteristics of the surface morphology, and their relationships to the lithology, structure and soil material.

Method of the work

Uncontralled small scale stereo models were used to show Sasan Anticline.

Preliminary analysis of air- photographs was under taken using a Topcon Stereoscope, with higher magnification used the instrument to elucidate further details. The interpretation of air-photos using stereo models between the match lines was carried out.

The study of aerial photographs has given the subject impetus since the characteristics of the landforms are more clearly seen over wide areas in aerial photographs of approximatly 1:32,000 scale than in the field. During the first interpretation landforms are outlined, and features of special importance.

During the photo-interpretation, steep, moderate, and gentle reliefs are considered to be as inclined surfaces of over 35°, 5°-35° and less than 5° respectively. Finally the interpreted area was transfered to a base map complited from the aerial photographs using a topcon stereoscope. Following the scheme devised by I.T.C textbook (Zuidam and Zuidam, 1979). The detailed geomorphologic map of the study area was compiled.

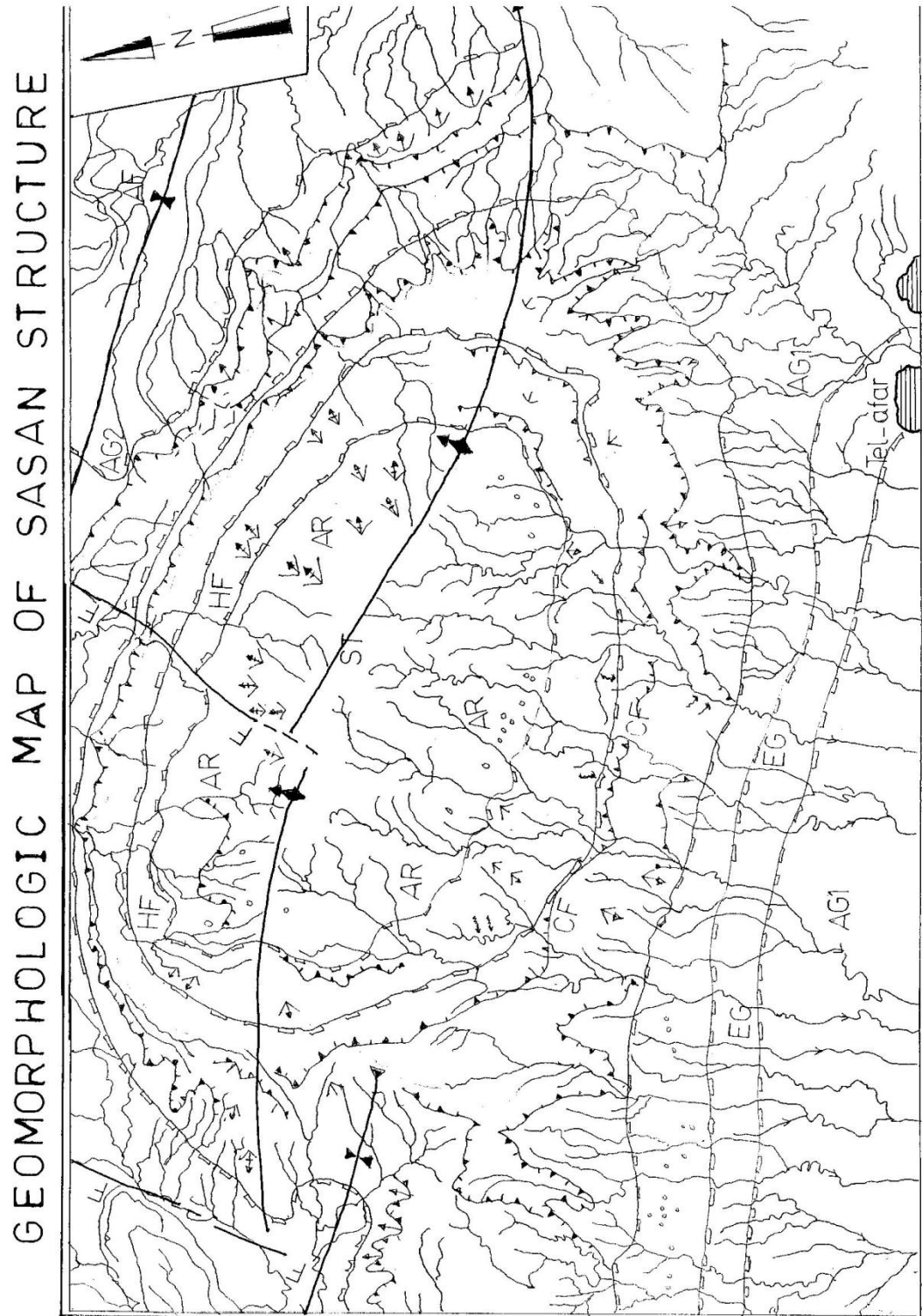
The geomorphologic map

Al-Daghastani and Al-Daghastani, 1996 mention that the both past and ongoing structural deformation by folding and faulting 'development of the strike-slip fault ' reflect the affect and play an important role in the morphotectonic of this regin.

The geomorphologic map produced during the preliminary stage and comprehensive mapping gives information on landforms, including geomorphologic processes involved in two levels.

- 1- Landform units or relief types.
- 2- Specific landforms.

The morphogenetic landform units are indicated by coloured area. The authors were able to differentiate three main groups of forms on the basis of their origin namely



EXPLANATION

The main Geomorphologic units

Units of structural origin

ST	Structural Plateau
AR	Anticlinal Ridge
HF	Hogback and Furrows
CF	Cuesta and Furrows

Units of denudatioal origin

EG	Erosion Glacis
AG1	Accumulation Glacis Level 1
AG2	Accumulation Glacis Level 2

Units of fluvial origin

AF	Alluvial fans
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Geomorphologic Symbols

	Asymmetrical double plunging anticline
	Syncline axis
	Gentle dip slope
	Moderate dip slope
	Steep dip slope
	Scarp
	Fault
	Break of slope
	Rill erosion
	Sinkhole
	Gully erosion
	City

Scale 1 : 32,000

structural, denudational and fluvial units. The specific landforms are given by way of line symbols.

The distribution of landform is presented on the geomorphologic map of the study area (fig 2). The three main groups are characterised as follows.

Units of structural origin

1-Anticlinal plateau

This unit occupies the highland on the limestone at the crest of the main anticline. This is a gentle undulating closed plateau with gentle to moderate marginal slopes. The present distribution of these surfaces in the landscape reflect the role of the structure and the lithology in their morphologic pattern is altered later by subaerial denudation.

2-Asymmetrical anticline ridge

In the core of Sasan Anticline a distinct anticline ridge can be seen. The lithology is exposed in this ridge to be the oldest land system known in the area. This ridge has an axial trend in a NW-SE direction and 8KM long. The northwestern limb of this ridge is steep whereas the southeastern side is moderate. Various types of erosional processes is operating although gully erosion and sinkhole are the most dominant.

3-Hogsback and furrows

This unit occupies the northwestern limb of Sasan Anticline. The hogsback ridge is made up of steep inclined of $> 35^\circ$ composed mainly of hard limestone interbedded with soft gypsum and marlstone.

4-Cuesta and furrows

The cuesta ridges occupy mainly the southern flank of Sasan Anticline. This unit is made up of moderately inclined ridge 35° composed of mainly hard limestone interbedded with soft gypsum and marlstone.

Units of denudational origin

1-Erosion glacis

Generally aligned along the fronts of Sasan Anticline. These surfaces slope gently away from Sasan Anticline and have parallel drainage with mild gullying. Many localities contain steeper or gentler slopes but these must have ridge and furrows smaller than the mapping cell (at 1:32,000 scale) and thus too small to be plotted on the map as a separate units. Nevertheless, crest lines of the hard limestone are large enough to be delineated on the map.

2-Accumulation glacis level 1.

This level of accumulation glacis on sandstone and claystone of the Injuna Formation, The upper slopes in the southern parts of Sasan Anticline which flat or gently dipping, and the are interpreted as accumulation glacis. There is no mesa relief and little weathering or erosion. It is covered by quaternary deposits which consist of soils, slope deposits and wadi fillings. Red semiarid soil include the eluvial components above all. The authors believes that sheet run-off become the essential agent of relief.

3-Accumulation glacis level 2.

The second level of accumulation glacis on quaternary, in the north of Sasan Anticline . There is shallow depression (syncline) of gentle slopping up to 7° . That the accumulation glacis are formed after the forming and transport of debris and degradation of the bedrock.

Units of fluvial origin

1-Alluvial fans

Alluvial fans are dissected and occupies only a small area within the Sasan Anticline.They are resulted from erosional and depositional changes over a period of time.

Conclusions

Airphoto-interpretation is a valuable technique for the geomorphologic analysis in the study area. Forms related to structural, denudational and fluvial origion were recognised in studied area. These forms can be subdivided in to smaller units which are governed by rock materials, processes , e.g (erosion) and relief amplitude.

The geomorphologic map shows the distribution of the main landforms are coloured area. The spicific landforms are given by way of line systems.

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