The Study of Geomorphologic Units Using Landscape and Photomorphic Unit

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SUMMARY

For studying and differentiation of geomorphological units in part of Hableh-Rood drainage basin. Enhancement Tematic Mapper (ETM+) Landsat data with the bound combination of 7,4,1 in red, green and blue colors were used. For image enhancement, stretching and filtering methods used. For studying Facies and differentiation and interpretation of photomorphic units, geology, topography, vegetation and land use maps, Arial photography and other data and field controls were used. Also for processing image, Ilwis software was used. According to the result, forty fore photomorphic units were differentiated, of whose two is agriculture land, three alluvial trasses, three intermountains, twenty eight mountains and eight are hills. The regarded Scale for displaying image or amont of image magnification on monitor for interpretation of units play important role in differentiates and interpretation phenomenal. The best differentiation of photomorphic units was obtained with the scale of 1:50000.This study has shown the potential of Landsat data for differentiation of land phenomenal and different facies of arid region and quick access to geomorphological unit map.

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1. INTRODUCTION

Facies is the smallest part of a geomorphologic unit caused by degradation and erosion which plays a major role in natural resources studies. Antrope and Daels (1977) have proposed photomorphic unit analysis based on the landscape feature. Size, pattern, color and composition of homogenous units (PMU) .Among the affecting factors drainage pattern, topography, vegetation cover, land use and litology are the most important cases. The photomorphic change in different regions is a base to group various land units. This research aimed to find out the capability of ETM+ satellite image for classification and delineation of geomorphic facies in Hableh Rood basin, Garmsar- Iran.

2. MATERIALS AND METHODS

The study area is 47639 ha located in the southern part of Hableh rood basin (fig.1). Mountains are dominant land features. While some pats are located in lowlands.
The following materials were used in the study:

1. Multi spectral scanner of ETM+ data (path 164 , row 35, date :28.10.2002);
2. Topographic map (scale 1:50,000) of national carto center of Iran (6460I, 6560III);
3. Geologic maps including Garmsar sheet (scale 1:100,00) and Semnan sheet (scale 1:250,000) from national geologic survey;

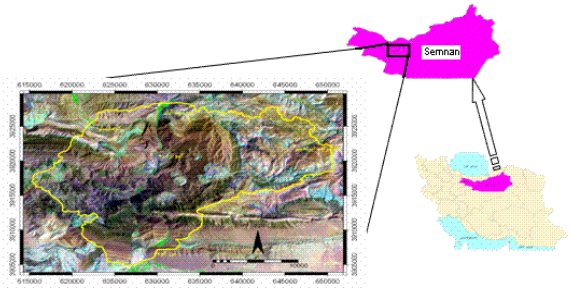

Figure 1. The study area in the southern part of Hableh rood basin

4. Digital file of topographic maps of 1:25000 of UTM and 1:50/000 of armed force cartographic organization;
5. Aerial photographs of the study area (Scale 1: 50000);
6. ILWIS 3.2 software;

2-1 Method:

The flowchart of research is as follow:
1. Use of correlation graphs, bands histogram, color composite preparation, principal components analysis (PCA) enlarging /downscaling of the image;

2. Optimum index factor (OIF) (Equation 1) (Table1) and visual comparison of twenty composites were used to find out the most appropriate set of bands (fig.2);

Equation 2: $$OIF = \frac{\sum_{J=1}^{3} SDi}{\sum_{j=1}^{3} [ccj]}$$

(Standard deviation total of tree band $\sum_{j=1}^{3} SDi$) (Correlation coefficient total between two of tree band $\sum_{j=1}^{3} [ccj]$)

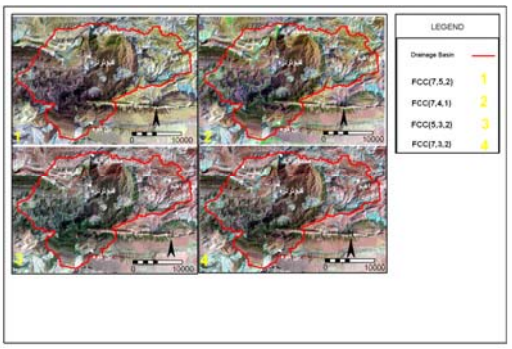

Figure 2. visual comparison of forty FCC

Table1. Comparison of twenty composites were used to find out the most appropriate set of bands

Number	Composite	Standard deviation total	Correlation total	OIF
1	1‹3‹5	82/90	2/77	29/92
2	3‹5‹7	96/85	2/69	36
3	3‹4‹5	82/66	2/73	30/2
4	1‹3‹7	75/51	2/56	29/5
5	3‹4‹7	75/13	2/62	28/7
6	3‹2‹5	88/82	2/76	32/18
7	7‹3‹2	81/2	2/65	30/64
8	1‹3‹4	61/41	2/74	22/41
9	4‹5‹7	82/53	2/68	20/79
10	1‹5‹7	82/91	2/58	32/14
11	3‹2‹1	67/48	2/88	23/43
12	2‹3‹4	67/1	2/83	23/71
13	7‹5‹2	88/6	2/68	33/06
14	5‹4‹1	68/81	2/62	26/26
15	5‹4‹2	74/5	2/73	27/39
16	1‹2‹5	74/88	2/73	27/43
17	7‹4‹1	61/06	2/48	24/62
18	7‹4‹2	66/88	2/58	25/92
19	7‹2‹1	67/26	2/59	25/97
20	4‹2‹1	52/8	2/77	19/06

3. The best false color composition (FCC) set was selected with higher resolution for delineation of photomorphic units;
The field works (fig .3), question with load people, topographic and litologic maps as well as drainage pattern ware in corporate in GIS to interpret PMU;
The interpretation keys Such as dominant color classes , texture , pattern in clouding drainage network , morphology , land use as well as other affecting parameters were applied on FCC(7,4,1) composite in scale of 1:50,000 to classify PMU (fig .4);
4. Finally PMU were incorporated to prepare geomorphic facies map.

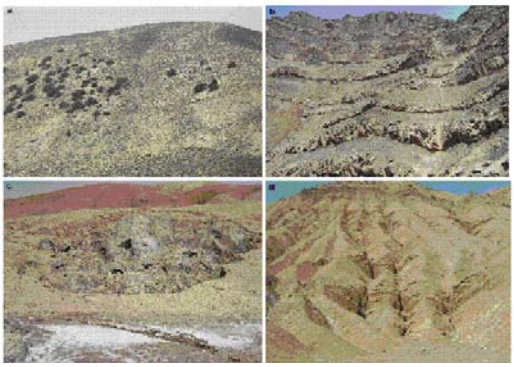

Figure 3. The field works and observation

3. Results

The visual interpretation of FCC composites revealed that higher OIF bands have lower capability for classification of land features. then based on the results of other researchers and visual comparison of FCC, the most relevant composition set of FCC (7,4,1) of red , green , and blue bands were chosen for visual interpretation. For example composition set of 7,4,1 has higher capability for marls , salt dunes types (halite and gypsum) as shown in fig.4.

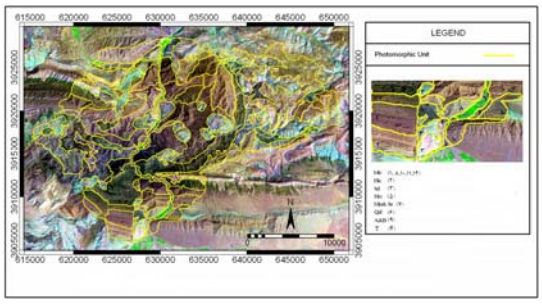

Figure 4. Classify PMU map on FCC (7,4,1)

Consequently, forty fore, PMU were categorized(fig.4)in the region including two agricultural units, the alluvial terraces units, three intermountain plain units, twenty eight mountain units and eight hill units , (table 2) .finally the simples PMU were incorporated to produce geomorphic facieses which resulted in twenty units in the region (fig.5).

Table2. A few The interpretation keys Such applied on FCC (7,4,1) composite to classify PMU

PMU	facies*	Color	texture	pattern (Drainage network, Stream)	Background	litology	land use
1	Mio	Violet	middle	Irregular	Laciniate	M2	Poor Range
2	Hio	Brown and Bright strip	Coarse	-	Black and Bright Strip	M_3c	Bare land
3	Sd	bright blue	middle	--	Pink Gall	OLsa	Bare land
7	Mio &se	Mahogany	Coarse	Deep	Irregular	M_3ab	Very Poor Range
10	Mio	Gray	Coarse	Irregular	Irregular	PLc	Poor Range

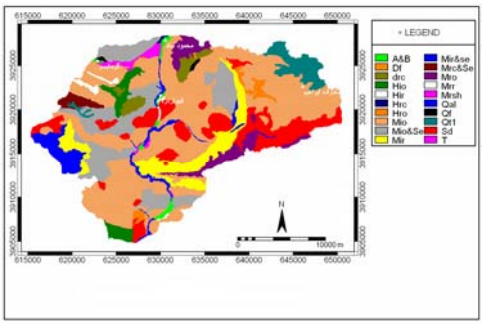

Fig5. Geomorphic facies map

4. Conclusion

The interpretation of photomorphic units of the study area in dictated the importance of dominant color compared to others criteria such as pattern. The different colors of photomorphic units are mainly related to litology, soil type, moisture nutrients and organic mattes. For instance, salt dune unit (Sd) has a bright blue pattern (fig.4).

Meanwhile, pattern of the image associated with litologic units and digital elevation model (DEM) could result betters interpretation in sand stones (MIO).

Having tree-like drainage network. The overlaying process also showed higher correlation between photomorphic and units which litologic might be helpful for correction of litologic units as shown in shown and salt dunes.

Another trail and error process was considered to find the role of image scale on the monitor. It presents from false interpretation and classification of photomorphic units. It seems that difference mountain and plain morphology has an evilent affect on scale selection others important factor is the false color composition set because photo morphic units' classification is based on visual interpretation of land features. Similarly finding out smallest facies unit remains an important task.

5. Refrance

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