

AN APPROACH FOR ANOMALIES SEARCH FOR PEDOLOGICAL CARTOGRAPHY USING REMOTE SENSING CASE OF THE REGION OF KSAR SBAHI AND BERRICHE (OUM EL BOUAGHI – ALGERIA)

T. Mostephaoui *

* CNTS, National Center of Spatial Technology, Laboratory of remote sensing, 1 avenue de la Palestine BP 13, ARZEW (ORAN) ALGERIA.- mostewfik@hotmail.com.

Commission VII, WG VII/1

KEY WORDS: An approach, exo-atmospheric, Cartographying, Multispectral classification algorithms, likelihood, minimum distance, parallelepedic, mahalanobis.

ABSTRACT:

The hand ling of exo-atmospheric TM bidate (march and September 1989) reflectance data was used for cartographying the land, using multispectral classification algorithms of the type supervised (Likelihood; minimum distance; parallelepedic; Mahalanobis; et SAM “ Spectral Angle Mapper “). The application concerns the region of ksar sbahi and berriche belonging to the semi arid bioclimatic level and is aimed to compare the classification results to the existing pedological map (established using traditional methods), by designing an approach. We are interested solely to the differences between the two documents and we shall call anomaly any information which can not find a plausible thematic interpretation.

The results obtained are promising and allowed us to surround the possible confusions about land spectral signatures. These anomalies are in general linteed with the leveling conditions of the objects and their interaction with vegetation.

1. INTRODUCTION

The great advantage of having data available digitally is that it can be processed by computer either for machine assisted information extraction or for embellishment before an image product is formed. The latter is used to assist the role of photointerpretation (J. A. Richards, 1993) and classifications the application concerns the region of KSAR SBAHI and BERRICHE (Figure1).

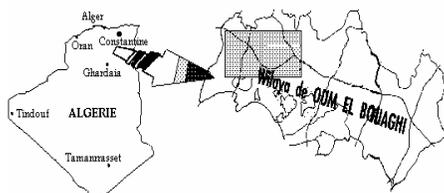


Figure 1. Geographic situation of the site survey d'Oum el bouaghi

2. METHODOLOGY

The first part of this study is oriented toward the manipulation of radiance and/ or planetary reflectances for each pixel, in order to cartography soils through multispectral supervised classifications algorithms using LANDSAT TM data with high spatial resolution (30 x 30 m) and spectral (7 channels), September and March 1989. The application concerns the region of KSAR SBAHI BERRICHE (Figure 2) and aims to the

confrontation of the classifications results applied in these regions to the pedological existing map (established with traditional methods by the BNEDER, 1994) (Figure 3) We are interested solely curiously to the differences between these « 02 documents» and we will call «anomaly» any information which does not find a thematic plausible interpretation (figure 4).

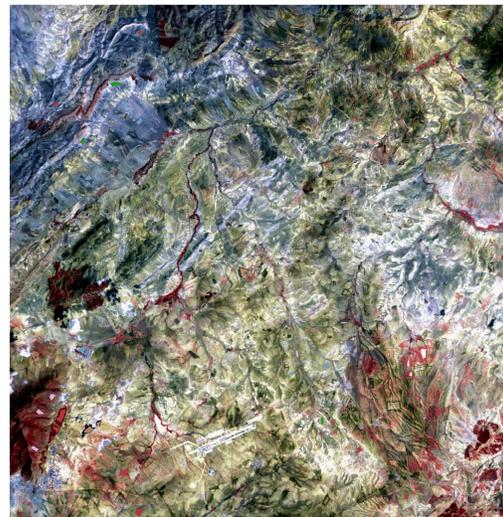


Figure 2. Image to be classified, consisting of a mixture of natural vegetation, waterways urban. 15 training regions are identified in solid color. Pixels from these were used to generate the signatures in table on the image of September 1989. This approach has a key objective the examination of «remote sensing object» in order to analyze the synthetic

character of the pixel which integrates the topographic conditions, moisture, climatic, ecological of the observed target. This mixing of information is at the same time the «strength» of the spatial image and paradoxically, it could constitute a mask which would prevent the direct access to the object «soil» searched. This mask is different every time and its identification or interpretation would come back to unveil the anomaly.

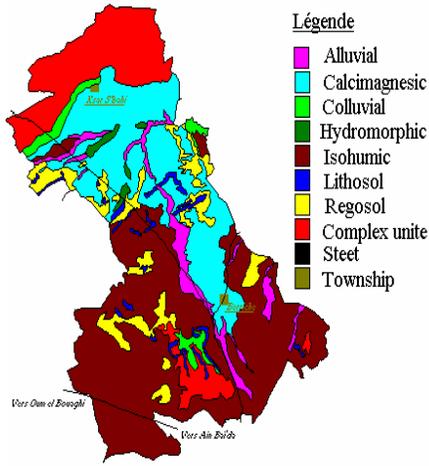


Figure 3. Pedological map of the township of KSAR SBAHI and BERRICHE

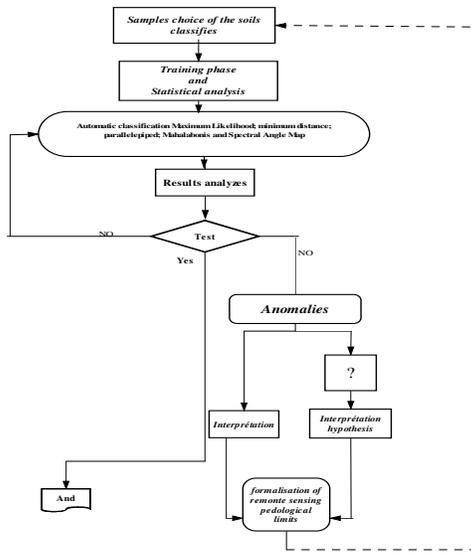


Figure 4. General organization chart of the approach

The powerful of the anomaly contributes to the understanding of factors which influence the spectral signatures considerably and to the identification of limits

of remote sensing when it comes to spectral characterization of objects on the ground (figure 5).

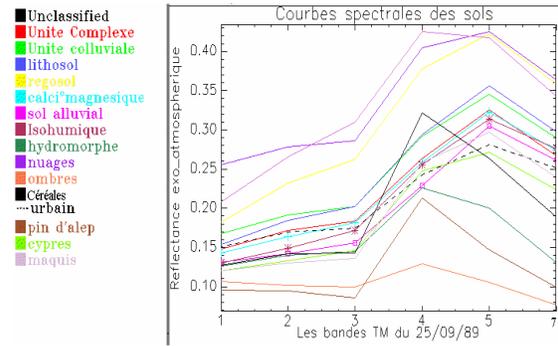


Figure 5. spectrals signatures characterization of 15th training regions of different objects.

Six algorithms of classification were exploited: the Maximum Likelihood, the minimum distance, MAHALANOBIS, the method parallépipéd and the approach of SAM « Spectral Mapper Angle». The choice of the samples- image is made on the basis of the pedological map in the BERRICHE plain (BNEDER, 1994), where 13 range of samples (representative 10 classes of soils) were selected.

3. RESULTS AND DISCUSSIONS

We confronted the results of different classifications with the pedological digitised map before, by the research of the pixels well classified with regard to the map and those that were badly classified and/ or unclassified (Figure 6).

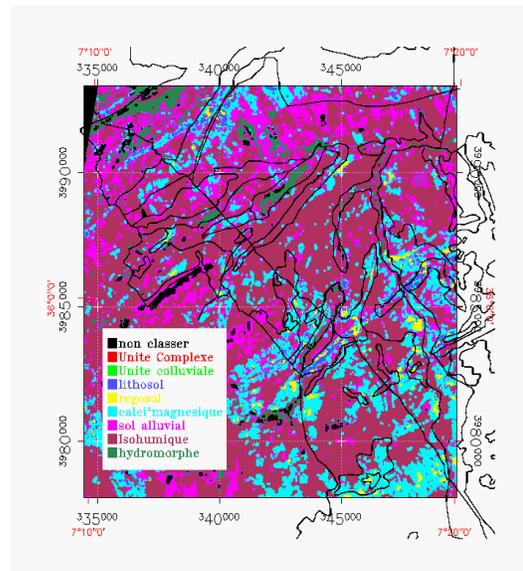


Figure 6a: Results of classifications by Maximum Likelihood method (northern part) of the September 1989 image

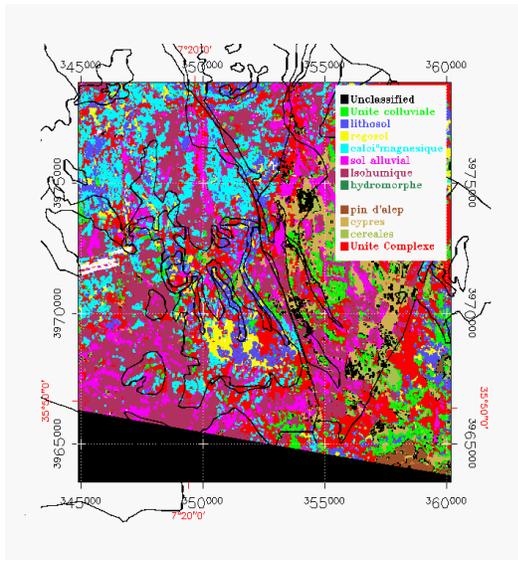


Figure 6b: Results of classifications by Maximum Likelihood method (southern part) of the September 1989 image.

For some soils units such; as the regosols, lithosols, colluvial and complex units; the multispectral Classification give conformal results with the pedological map. Otherwise, these units are well classified. But then, for the alluvial soils, hydromorphic, calcimagnésique and isohumic the classification present some anomalies.

The alluvial soils staking out the hydrographic system are well discriminated. In revenge, they are distinctly overvalued with regard to the map and they confound with isohumic soils and zones of shades. The similarity of their respective spectral signatures in the visible is an explanation (see graph of the spectral signatures) insofar as the humidity rate of these soils is in the origin. The zones to the shade - on the time of taking images [i.e] 09h 45 GMT- constitutes another problem that the resulted soils signature, obeys to the same phenomenon that the one of humid soils super weak reflectance in the visible. It is in the P.I.R that the distinctions appear. If they are always imposed, then we can really assign it to a problem of standard deviation in the PIR bigger than the one of visible.

The soils hydromorphic are absent from the classification as homogeneous class, but present under the form of pixels scattered in the image. This is attributed to the methods of classification «by pixels» utilized, or to a real reduced spatial extension with regard to the spatial resolution of TM images.

A confusion also appears between the soils isohumic and calcimagnésique. In the plains, the calcimagnésique soils are amalgamated with the isohumic soils, because of their content in elevated humidity, this confers to them near radiometric values of those isohumic soils. However, on the piedmonts and the glacier, the calcimagnésique soils

confound with the regosols to reason- presumably- of the moisture erosion which provokes a scouring of the superficial horizon, giving it a lucid hue near the one thus regosols. It is that the named unit «complex» appears in the plain on the classified image. This is considered quite normal since the unit in question is also constituted partially by regosols, localized exactly in the plain.

4. CONCLUSIONS

The so-called approach of classification of remote sensing data in the cartography showed that:

- Globally, the results are powerful if we utilize the methods of classifications type Maximum Likelihood

However, for the detail and of the precision of the classes limits, it is impossible to have a « blind» confidence on the results. This actually is explained by the heterogeneous and the complex character of the tests parcels, since that the soils are only rarely naked and monospecific.

- The spectral properties of the surfaces are generally those of the vegetation and therefore decrease the interest of the classifications in pedology, except in the regions where the plant cover is absent or little abundant. A phenological study of the vegetation of the survey region imposes for the choice of the periods of the satellite images acquisition.

1. An anomaly which is expressed either by an overestimate or an under estimation, like it is the case of the alluvial soils which is overestimated, whereas the soils isohumics or calcimagnésique are rather under estimated.
2. An other anomaly which is expressed by absence of the hydromorphic soils, despite the sampling settled.

REFERENCES

- Bildgen P., Lafage H. Et Kersabiec A. M. 1988.** Télédétection: étude de la réponse spectrale et classification des sols agricoles du département des BOUCHES-DU- RHONE. 113ème Congrès national des sociétés savantes, STRASBOURG, 1988. Pp 45-59.
- Cassirame P. 1977.** Méthodes de classification des données multidimensionnelles en télédétection. Application à la cartographie d'une région agricole (Camargue). Thèse doctorat en physique Spatiale à l'université PAUL SABATIER, TOULOUSE, 89 p.
- DUBUCQ 1989.** Reconnaissance des sols par télédétection et leur comportement par rapport à l'érosion dans le LAURAGAIS. Thèse 3è cycle, université de Paul sabatier de Toulouse. 273p.

Escadafal R., HUETE A. R., Post D. 1990.

Estimating soil spectral properties (visible and NIR) from color and roughness field data. Twenty-Third international symposium on remote sensing of environment, Bangkok, THAILAND, April 18-25, pp 1-11.

John A. Richards 1993. Remote sensing digital, an introduction Image analysis. Second, Revised and enlarged Edition Springer-verlag 340 p.

de sa Merge Nord. Thèse doctorat de 3eme cycle. Université de Paris I- PANTHEON SORBONNE, 271 p.

Markham B. L et Barker J. L., 1986. Landsat MSS and TM post calibration Dynamic Ranges, Exoatmospheric reflectances and At Satellite Temperatures. Laboratory for Terrestrial Physics-NASA/Goddard Space Flight Centre. GREENBELT, MD 20771. EOSAT, LANDSAT TECHNICAL NOTES, N° 1 August 1986.

Khineche A. 1983. Traitements et analyse d'image spatiale. Application à la région de l'Atlas Blideen et