COMPREHENSIVE STUDY OF LEON-QUERETARO AREA

Investigation number SR-9631/7

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INTRODUCTION.

In this second stage of the study on the use of the information given by the Landsat Satellite, we present our advances in Geology and Edaphology.

A cartographic study that led to the elaboration of a photo-map is also included and we further report on our first experiences in the automatic analysis of the images.

METHODS.

In the last months work,was carried out in another zone of the León-Querétaro test site using images with central coordinates 20° 18' N, 100° 51'W. The interpretation of the resources was performed individually and conjointly in the four bands of the MSS with the aid of a Mini-Addcol Additive Color Viewer which ampliphies to scale 1:500 000; color prints scale 1:1 000 000 were also used.

Once again, as in the preceding stage, the traditional photointerpretive criteria, such as drainage pattern, tone and texture of the image, -- land forms, etc., were applied. Various images taken on different dates were used in order to study variations in the vegetation and their influence on textural features.

After the preliminary interpretation, a visit to the field on land ---

vehicle was carried out, with relatively easy location and identification of landforms in the field.

In orden to devise a form in which to fill the information interpreted - from the images, a study was carried out which led to the elaboration of a photomap of the area under study, cartographically defined and referred to a uniform system of rectangular coordinates, this being the Mercator Universal Transverse projection.

The first step taken was that of evaluating the geometric precision of the Landsat images and devising a methodology to supply a suficient number of ground control points for the plotting of the Landsat images. The following apparati were used: a coordinatograph, a mechanical coordinatograph, a rectifier and a point transfer device PUG, all Wild products.

The development of a computer program for the automatic interpretation of resources was begun. The following four programs have been terminated.

1. IMPIMAG. This program prints an image with the following ---- caracteristics:

   a) Prints tones of gray, all easily distinguishable.

   b) Prints at different scales 1 pixel per character, 4 pixel per - character, etc.

c) Prints any band selected and gives the size of the required region.

d) Interpolates with 16 tones of gray. This is very important since it aids the photointerpreter. Now the digital image has 128 shade of gray, from 0 to 127. If the photointerpreter locates a zone -- with the same shade in the photograph and considers the possible existance of a subclass, he can solicite, through this program, that an apparently homegeneous zone be displayed over a range of 128 shades.

2. ESTADI. This program determines the satistical values of the pixels, derives histograms, arithmetic means, dispersion diagrams, etc. This program classifies and prints clouds.

3. CLASIF. This program classifies and obtains homogeneous areas of identical characteristics.

It is an important aid to photointerpretation since it gives a basis for selecting homogeneous areas, this being called unsupervised learning When field data are fed to the computer and the latter clasifies, the - process is called supervised learning The program forms clusters using the Zhan minimal spacing tree.

4. CONSUL. This is a program which takes the ground tree of a geographical data base for later clasification. The geographical data base - used is the CETENAL data bank which is fed with CETENAL Cartographic

information given by the topographic, geologic, land use, edaphology, potential use, urban, climatological and touristic charts.

RESULTS.

GEOLOGY. Alignments were located whose intersections correspond to mineralization zones presently under exploitation. Complex alignments of circular type, perhaps formed by intrusions, some of then 30 km in diameter, were also observed. The lithology of the zone covered by - the images is constituded mainly of volcanic type rocks of different ages, excepting some which present charachteristics of intrusive igneous or sedimentary rocks. The definition of the lithology was made following field verification.

EDAPHOLOGY.

In the separation of soil asociations it was found that in this subhumid zone the images taken in winter were the most useful because most of the soils were relatively free of vegetation and easier to delimit.

Though a complete field study is yet to be done, it was found that the region covered by the image posseses in its lower part clay soils with a high moisture retention and dark coloration which in the image, on band 4 M.S.S., gives a very low reflectance. Varions lakes of diffe

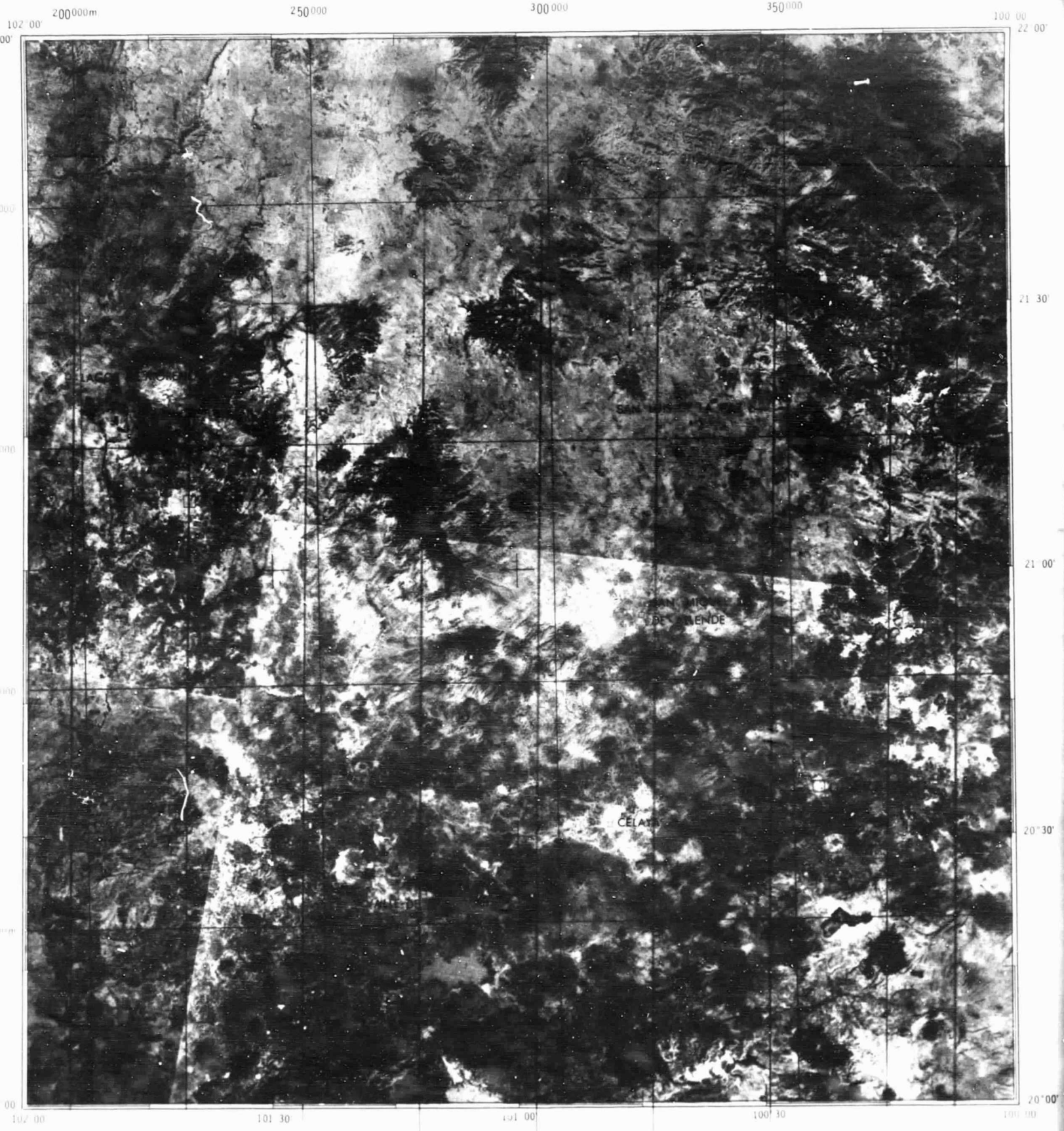
rent sizes exist in the zone, giving the impresion of a deficient regional drainage.

Some areas of minimum reflectance in all bands correspond to flooded zones, parts of which are devoted to agriculture in the dry season, this being confirmed by comparing images of different dates.

In the higher parts, various tonal and textural changes are observed -- which may be delimited in the image and which correspond to different soil associations. This will be confirmed in a future field verification.

CARTOGRAPHY. A photomap of the test site was elaborated (copy - annexed) in Mercator Universal Transverse Projection, with four -- images on band 5, using 27 photogrammetric control points obtained -- directly from the 1:50 000 CETENAL topographic map. A precision of 0.25 mm in mean quadratic error was achieved in the finished product. Distances were measured on the photomap and compared to those obtained by analytical methods, with a resulting mean quadratic error of 128.11 m.

Automatic Interpretation. - A print is enclosed of a portion of an image.



CETENAL

OFICINA DE RESTITUCION

FOTOMAPA ESC. 1:1 000,000

IMAGENES LANDSAT 1973

BANDA 5