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INVESTIGATION OF LONG SCOPE FOR HIGHWAY ENGINEERING PURPOSES TEST SITE ORIZABA-VERACRUZ

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TYPE III REPORT ON TEST SITE ORIZABA-VERACRUZ

SR- 9631/2

ING. FCO. JAVIER TORIBIO ARZATE

MEXICO CITY, JULY 1976.

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15. Abstract

A PROCEDURE FOR OBTAINING INFORMATION FOR HIGHWAY ENGINEERING PURPOSES FROM SATELLITE IMAGES BY THE USE OF CONVENTIONAL INTERPRETATION METHODS IS PRESENTED. THE STUDY IS DESCRIBED AND COMPARED WITH A PREVIOUS STUDY USING SMALL-SCALE AERIAL PANCHROMATIC PHOTOGRAPHY.

PREFACE.

OBJETIVES.- An investigation of the kindness of ERTS-1 images to obtain geographical information on land uses, geological and hydrological data for highway design and planning.

ANALYSIS TECHNIQUE.- Due to the fact that there is not a specialized equipment to produce compound-color compositions, the interpretation has been carried out visually using conventional methods by means of black and white photographic amplifications to a 1:500,000 scale. This scale simplified the correlation with the existent maps. It was necessary to use the four bands to obtain better results; if there is no stereoscopic vision, it is very difficult to apply it for practical purposes, therefore the researcher applied the common techniques monoscopically.

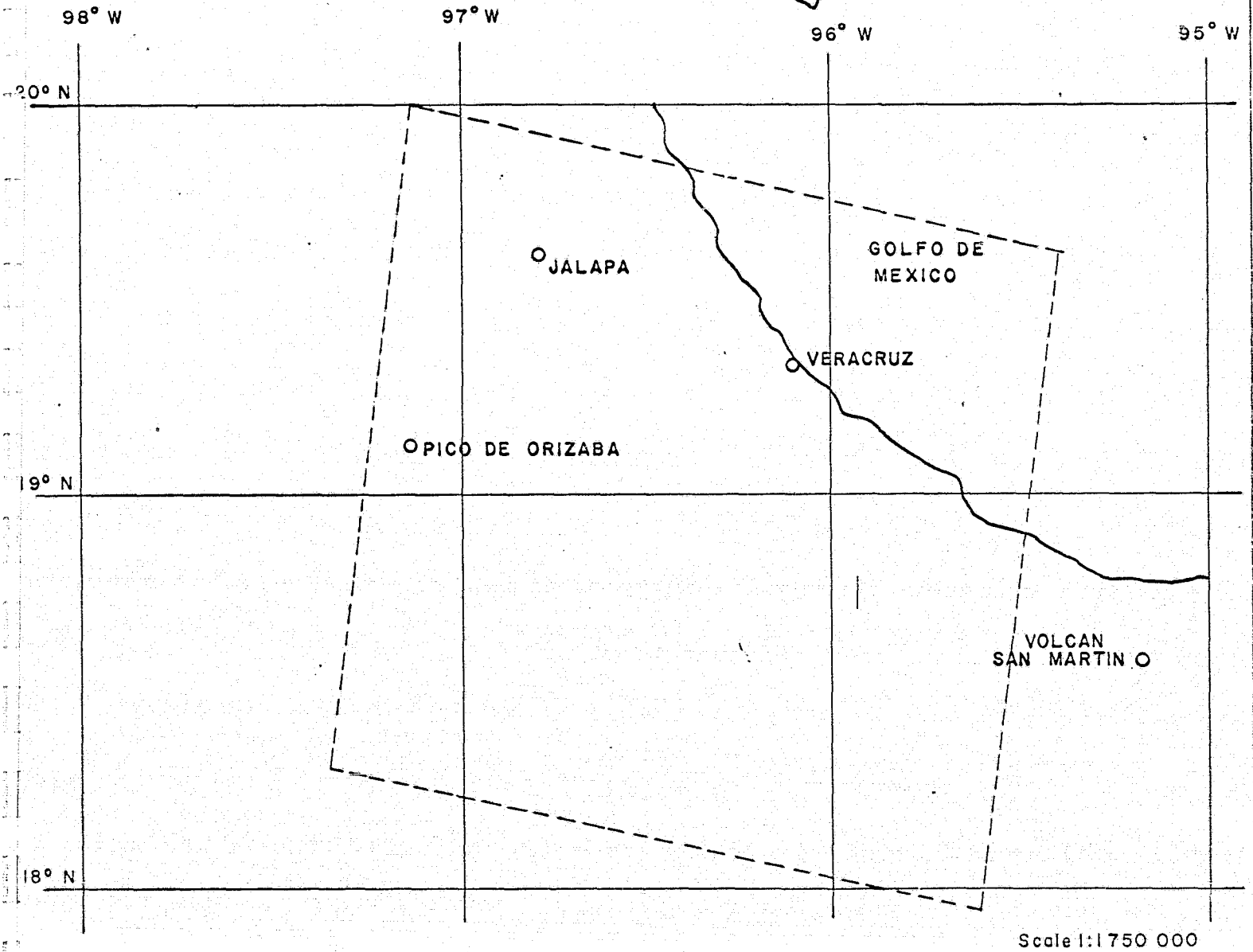
RECOMENDATIONS AND CONCLUSIONS.- According to the information - obtained from the ERTS-1 images, which were analyzed from the highway engineering point of view, it is possible to conclude that we can apply them partially in the stages of highway planning and route design; for detailed works it would be essential to continue using aerial photographs and the conventional study methods.

The disadvantage of not being able to obtain a stereoscopic vision makes it more difficult to apply it for our purposes. It is necessary to obtain compound-color copies in order to have a better interpretation of the ERTS-1 images.

LOCATION SKETCH
TEST SITE SR-9631/2

D

E-1306-16231 AND E-1431-16153
25 MAY 1973



Scale 1:1 750 000

WORKING DATA

The title of this work is "AN INVESTIGATION OF LONG SCOPE FOR HIGHWAY ENGINEERING PURPOSES-TEST SITE ORIZABA VERACRUZ"; it includes a general approach, purposes and objetives, which are detailed in the revised proposal forwarded to NASA on June 20, 1972, Number SR-9631/2, whose principal researcher was Francisco Javier Toribio Arzate of the Ministry of Public Works.

After a preliminary examination of the ERTS-1 images, and taking into account the resolution and working scales of such images, it is not possible to detect minor changes in highway and railroad engineering which is the main activity of this ministry.

This investigation was carried out on ERTS-1 images, dated may 25, 1973, ID E-1306-16231, MSS bands 4, 5, 6 and 7, black and white slides 1:1,000,000 scale; center of image coordinates N 18°51' Lat, W 097°06' Long; sun elevation 61°, sun azimuth 080°.
Sep. 27, 1973, ID E-1431-16153, MSS bands 4 and 6 black and white slides 1:1,000,000 scale center of image coordinates N 18°47' Lat, W 095°33' Long; sun elevation 54°, sun azimuth 122°. All images are of good quality and 95% cloud free.

The principal investigator made full use of photointerpretation techniques, mostly monoscopically.

The main geographical characteristics, such as shore and Gulf coast plain, the coastal lagoons of Mandinga, Camaronera, Alvarado and all the streams that flow into the Gulf of Mexico, principally the Papaloapan river have been identified in the Band No. 7 image, which is the one of best quality; other remarkable developments such as the Miguel Alemán dam, whose storage reservoir delineates the sedimentary rocks alignments that constitute the limits between the Sierra Madre Oriental, the eternal snow volcano "Pico de Orizaba" and the Tehuacán valley, which characterize the area, are also easy to identify.

The Band No. 7 image allowed a better delimitation of the agricultural regions which cover the areas of the Papaloapan, Atoyac and Jamapa rivers and the surroundings of the Miguel Alemán dam; the areas covered with woods and those without vegetation were also delimited, and this was made possible due to the degree and the moisture conditions.

Concerning with the geological basic information, at the stage of the preliminary project, the studied area was constituted by sedimentary and igneous rocks, which were delimited relatively easily in images 5 and 7. The sedimentary rocks were easily identified by their alignments and the different tonalities that separates them from the alluviums and the eroded materials.

The coastal plain is formed of alluvials, volcanic ashes and eroded consolidated materials or in consolidation process and dune sands in the coastal boundaries; it was difficult to identify the contacts among each other, except in those places where the moisture content is uniform as in the alluvial terraces of the befores mentioned rivers; in the more desertic areas, as in the Tehuacán valley, where the contact between rocks and soil is easy to identify, they have light grey or white colors, and the rocks have dark grey colors. An outstanding element in the studies area is the eternal snow volcano "Pico de Orizaba" - - - (18,830 ft), the highest of the Republic of Mexico, constituted by andesitic rocks; another important volcanic cone, located to the north of this last one and almost at the west end of the studies area is the "Cofre de Perote" (14,040 ft), also constituted by andesitic rocks.

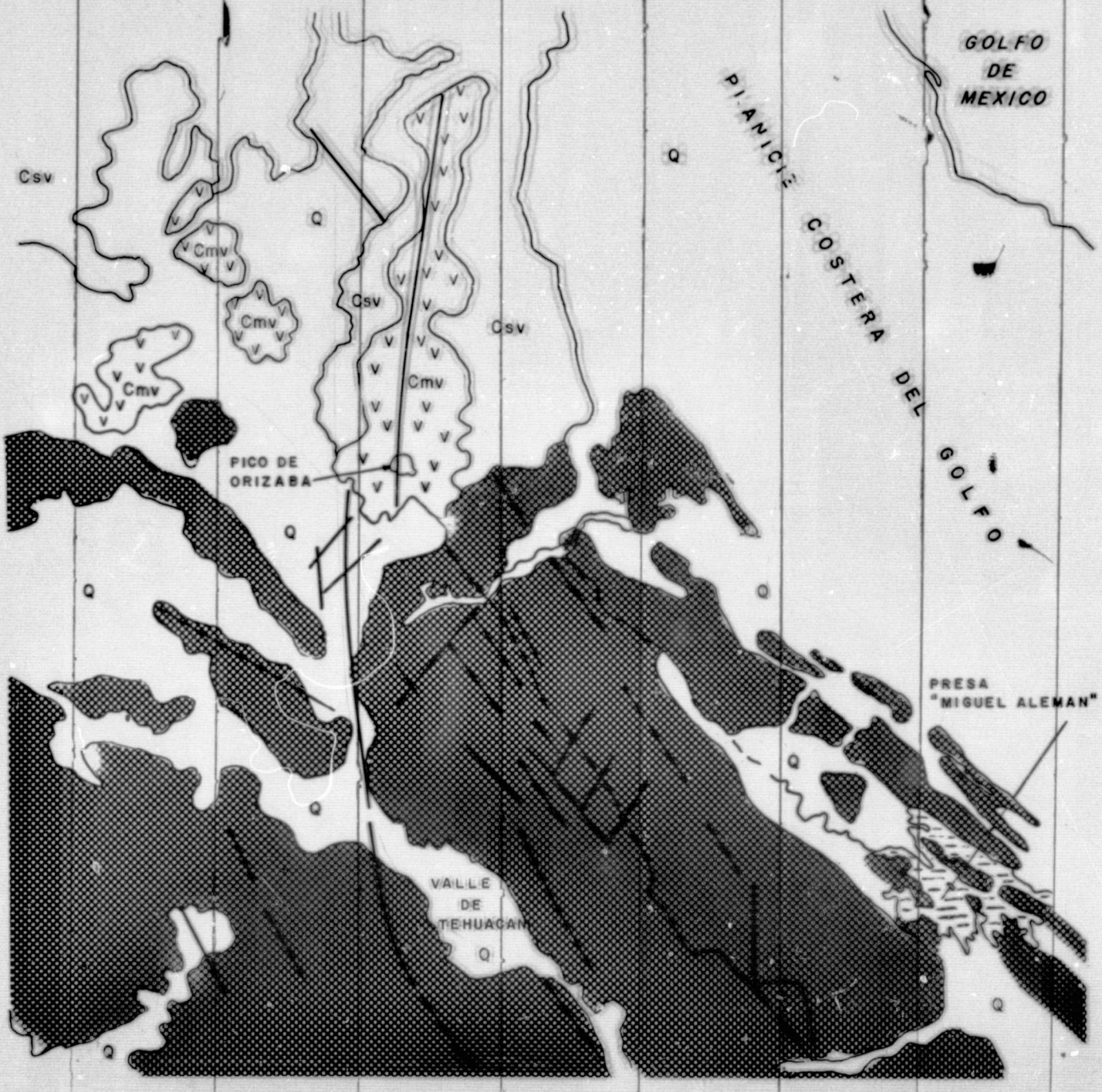
At the south-east end of the studies area it was possible to identify sedimentary rocks (limestone) and basaltic and andesitic igneous in contact with metamorphic rocks (schists and gneiss).

Band No. 7 image was the most adecuate one for the hydrological characteristics study; it is easy to identify the water bodies and the permanent streams in the whole area, and with quite detail the meandering of streams and dry rivers, flood areas and consecuently the general routes of the floodways.

The problems found during the investigations difficult to solve due to the studies character, are those refered to the identification of the existing roads and highways, which are logically very important.

According with the information obtained from the analyzed ERTS images, we can conclude that they are useful for the planning stages and routes project, when they are correlated with the existent maps. For more detailed works, it will be necessary to continue using aerial photographs and the conventional study methods, until the images resolution techniques is improved.

5-1



25MAY73 C N18-51/W097-00 N N18-52/W097-01 M35 7 R SUN EL61 AZ000 189-4266-N-1-N-D-IL NASA ERTS E-1306-16231-7 01

Q - Pleistocene and modern
Sea terraces, gravels, sands, silts, conglomerates and sand dunes in the coast region.

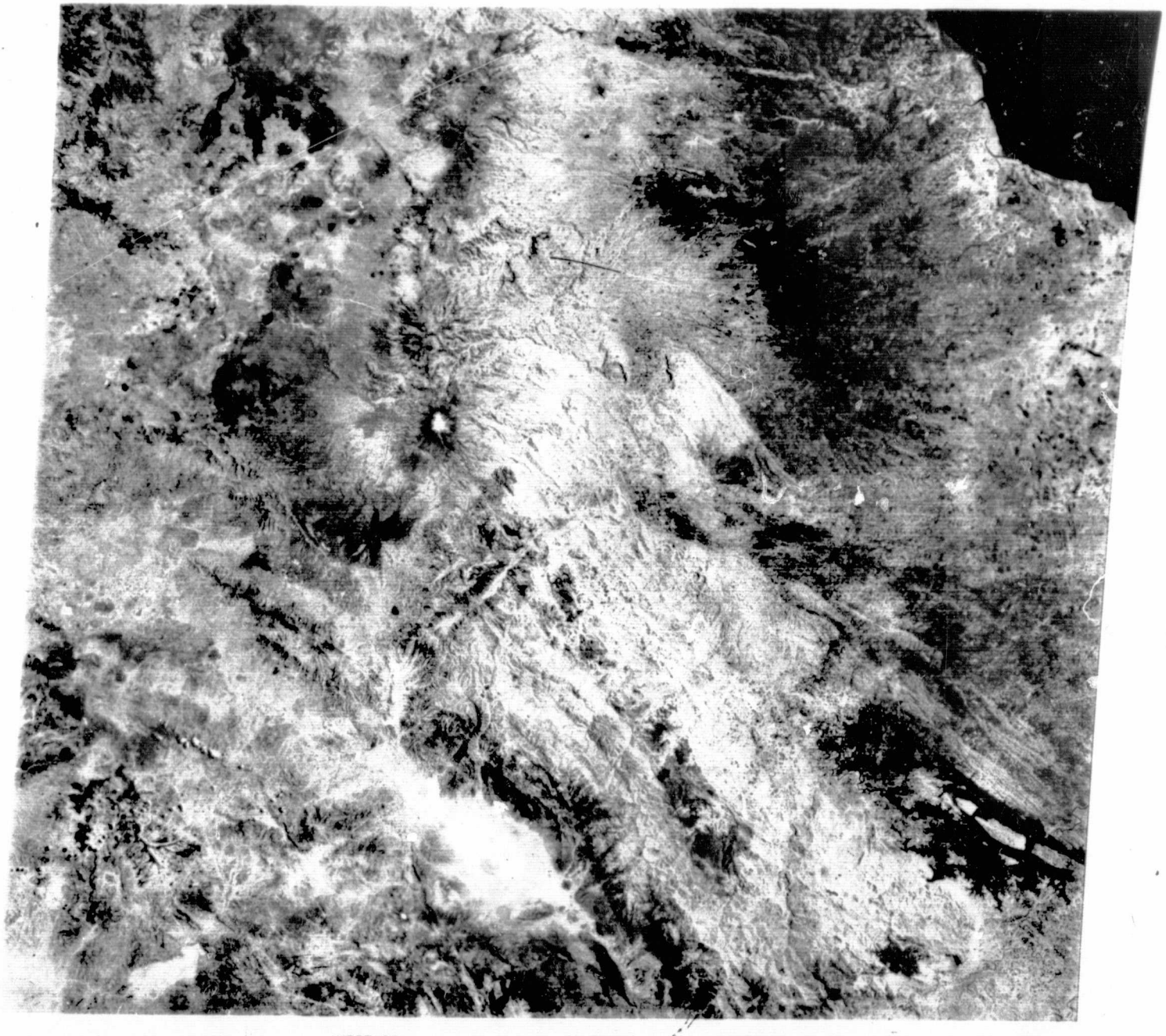
Csv - Volcanic Superior Cenozoic
Volcanic rocks, andesites, tuffs and breccias

Cmv - Volcanic Middle Cenozoic
Lava spillings, andesitics and basaltics.

- Inferior and Superior Cretacic
Sedimentary rocks of calcareous clay constitution, shales, marls and stratificated limestone.

- Fractures and Failures

OVERLAY Nº 1



W097-301 N018-001 W097-00 W096-301
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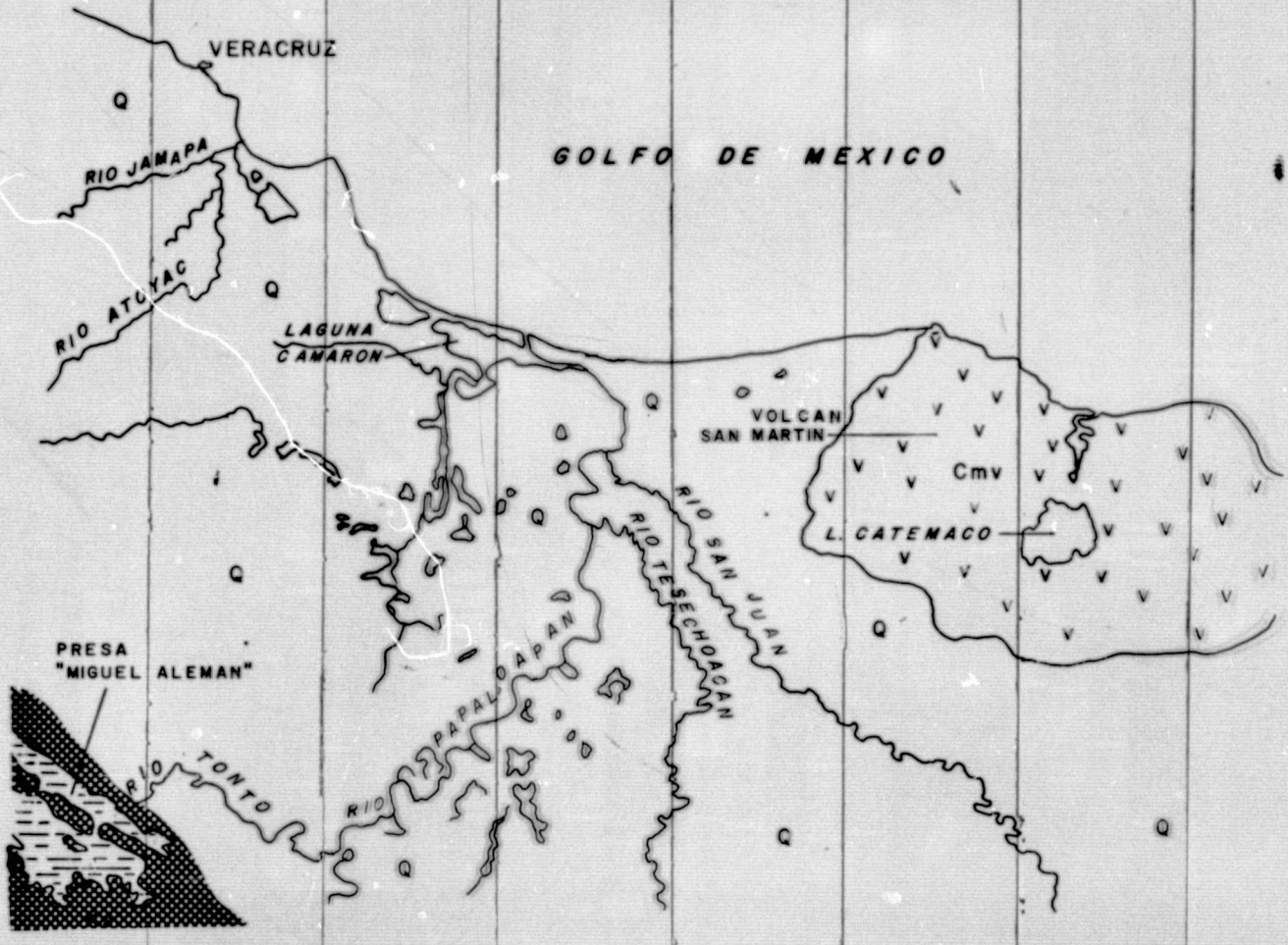

27SEP73 C N18-47/W095-33 N N18-45/W095-27 MSS 6 R SUN EL54 AZ122 I68-6069-A-1-N-D-2L NASA ERTS E-1431-16153-6 01

Q - Pleistocene and modern
Sea terraces, gravels, sands, silts, conglomerates and dunes in the coast region.

Cmv - Volcanic Middle Cenozoic
Lava spillings, breccias, tuffs and volcanic ashes of basaltic composition.

- Inferior and Superior Cretacic
Sedimentary rocks of calcareous clay constitution, shales, marls and stratificated limestone.