FIRST QUARTERLY PROGRESS REPORT
NASA-"27930", GEOLOGICAL AND ENVIRONMENTAL RESOURCES INVESTIGATIONS IN EGYPT USING LANDSAT IMAGES

Principal Investigator: Dr. M. Abdel-Hady
Director, Remote Sensing Project
Academy of Scientific Research
and Technology, Cairo-Egypt.

1. Nubian Sandstone Basin Survey:

A large area of the Western Desert of Egypt, as designated on the enclosed map, has been, or is now being mapped using ERTS-1 satellite images. In doing that, the Nubian Sandstone aquifer which covers a large area of this Western Desert region is delineated. All these studies are supported by a thorough field verification, and in some areas by detailed field hydrological studies.

For areas (1), (2) and (3) reports were already published. Areas designated (4) and (5) are now being investigated and reports will be published within the next nine months.

However, because of the significance of this study to other countries in the North African and West Asian regions, a proposal for a transnational project has been developed for the management of the Nubian Sandstone Aquifer in North Africa, also for the Arabian Peninsula Aquifer. The Remote Sensing Project in Egypt, as a liaison for the Egyptian Government and through an agreement with 13 other countries in these two regions, has formalized an agreement with the United Nations Environment Program to prepare a feasibility study entitled:

> "Feasibility Study of a Proposed Transnational Project, Management of the Sandstone Aquifer in North Africa and The Arabian Peninsula".

This study, which will be prepared by the Remote Sensing Project in Egypt, will form a part of the Plan of Action to Combat Desertification to be presented by the Secretary General of the U.N. Conference on Desertification for consideration and adoption.

The countries involved in this study from Africa are:
Chad, Egypt, Libya and Sudan

The countries involved in Asia are:
Bahrain, Democractic Yemen Republic, Kuwait, Muscat, Qatar, Saudi Arabia, United Arab Emirates and Yemen Arab Republic.

It will be one of the main objectives of this feasibility study to define the aquifers, their geological characteristics and hydrological parameters, as well as their boundaries. Both the Nubian sandstone Aquifer and the Aquifer of the Arabian Peninsula are encountered in 12 countries which cover a huge area of more than 9 million km^2.

A major part of this feasibility study will be directed toward the applications of LANDSAT satellite images for the mapping of these major aquifers in North Africa and the Arabian Peninsula.

This feasibility study will compliment the existing mapping efforts conducted by the Remote Sensing Project for the Nubian Sandstone aquifer in Egypt and Sudan. It will also provide a good background for further extension of this work, to use LANDSAT images for the mapping of the other areas of the Sandstone Aquifer in the other countries of North Africa and the Arabian Peninsula aquifers.

Please refer to enclosed documents entitled:

- Feasibility Study of a Proposed Transnational Project Management of the Sandstone Aquifer in North Africa and the Arabian Peninsula Aquifer.

  Note by the Secretariat of the United Nations Conference on Desertification.

- Provisional Agenda
  First Meeting of the Panel on Management of the Sandstone Aquifer in North Africa and the Arabian Peninsula Aquifer.

2. Jonglei Canal Project:

During the past several months, the following steps were taken to implement this study:

a) LANDSAT images were compiled at various seasons for this area, and for the Equatorial lakes area. The region has been divided into priority areas , with the first priority area, as designated on the enclosed map, has been selected by mutual agreement between the Governments of Egypt and Sudan.

b) A detailed Study Plan was developed for the work to be conducted in this first priority area (copy enclosed). Plan of action has been approved by the Government of Egypt and is now being reviewed by the Government of Sudan for final approval to start the implementation of the study. Funds for conducting the investigation and for supporting field work will be provided by the Joint Technical Commission on the Nile Waters. A final action has been promised by the commission before the end of May 1976.

c) In the meanwhile, the Principal Investigator Dr. Abdel-Hady and some other members of the Remote Sensing Project staff have made a field visit to the area in Sudan, also to discuss with various Sudanese Government Agencies steps for the implementation of the project. Background documents and publications on this region have been collected and are now being reviewed. Because of the large number of volumes and reports on the hydrology of the Upper Nile Basin published by the Ministry of Irrigation of Egypt, a special effort is now being made to digest all this material in

preparation for the implementation of this project.

(Please refer to enclosed document entitled: Proposal, Planning for Conservation of Bahr El Jebel (Upper Nile) Flood Waters in Sudan and Egypt Using Remote Sensing).

3. Structural Lineation Map of Egypt:

In mapping the areas as designated on the enclosed map, a structural lineation map is compiled for each area. After all the areas are finished, a general structural map for all of Egypt will be constructed. The results will be also analized for their significance and relationship to the Mediterranean and Red Sea tectonics. Also their practical implications will be emphasized.

Already, and as a result of the structural mapping conducted by the Remote Sensing Project for Sinai Peninsula, the Suez Canal Zone and the northern section of the Red Sea Area, using LANDSAT images, a new theory concerning the history and formation of the Nile Delta has been advanced. This new theory considers the Delta basin as an extension of the Red Sea Rift, modified by the Mediterranean tectonics. This theory is now being verified and is expected to have very significant practical and economic implications, especially for the exploration for natural gas and petroleum in the Nile Delta and the extreme north of the Sinai Peninsula.

A separate report, with a press release is now being prepared concerning this new theory, supported by interpreted LANDSAT images, aircraft remote sensing data and other field verifications.

4. Beach Erosion Studies Along the Northern Shores of Egypt

Field studies and groundtruth data to support satellite image interpretations for this study was originally intended to be provided by the United Nations Development Program, as a part of a general UNDP study in this area. However, because of some severe limitations and cut-backs on this project funding situation, starting has been delayed on this phase. It is still being considered, but will be delayed until funding support for field work becomes available.

C.I.

Regional Prospecting for Iron Ores in Bahariya Oasis-El Faiyum area, Egypt, Using Landsat Satellite Images

(Part I)

By :

Professor Dr. E.M. El Shazly

Professor Dr. M.A. Abdel Hady

Dr. M.A. El Ghawaby

Dr. S.M. Khawasik

Investigation Conducted By:

Remote Sensing Research Project

Academy of Scientific Research and Technology

Cairo, Egypt

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ABSTRACT

Based on deep theoretical and practical considerations of iron deposition in the northern and central Western Desert of Egypt, an area exceeding 100,000 km^2 is chosen for regional iron ore prospecting. This area has been called Bahariya Oasis - El-Faiyum area and it extends from the west of Bahariya and Farafra Oases eastwards to the Nile Valley. The most modern techniques of regional prospecting of iron deposition have been applied under the prevailing conditions in this area, especially the interpretation of LANDSAT satellite images and quantitative structural analysis.

New discoveries of iron occurrences have been registered as a result of the present prospecting work, and the conditions of the already known iron ore deposits and occurrences are regionally connected and verified. Several localities are recommended for more detailed prospecting and exploration for iron ore deposits, which are arranged according to their priorities.

Geologic Interpretation of Landsat Satellite Images for West Nile Delta Area, Egypt

Professor Dr. E.M. El Shazly

Deputy Director of the Atomic Energy Establishment, and Director of the Geological Group of the Remote Sensing Research Project, Cairo, Egypt.

Professor Dr. M.A. Abdel-Hady

Professor of Civil Engineering, Oklahoma State University, U.S.A., and Director of the Remote Sensing Research Project, Cairo, Egypt.

Dr. M.A. El Ghawaby **Dr. I.A. El Kassas**
Geologist S.M. Khawasik

Geologists, Geology and Raw Materials Department, Atomic Energy Establishment, and Researchers in the Remote Sensing Research Project, Cairo, Egypt.

Dr M.M. El Shazly

Assistant Research Professor, Desert Institute, Cairo, Egypt

Dr. S. Sanad

Researcher, Desert Institute, Cairo, Egypt.

Published by

The Remote Sensing Research Project,
Academy of Scientific Research & Technology,
101 Kasr El Aini Street, Cairo, Egypt

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abstract

This study is based mainly on the interpretation of LANDSAT-1 satellite images for an area covering about 85,000 km² including the west of the Nile Delta and the adjacent north Western Desert of Egypt. From this study, new geological, structural lineation and drainage maps have been constructed on scales of 1 : 500,000 and 1 : 1,000,000. Furthermore, the groundwater hydrogeological characteristics and potentials of the same area have been compiled and evaluated in the light of the new investigation to help proposed reclamation projects to be carried out there.

The investigated area is covered by extensive exposures of sedimentary rocks ranging from Late Cretaceous to Holocene, in addition to foreland basic volcanics of Late Oligocene-Early Miocene age. It has been possible to construct on the LANDSAT images thirty four geological and environmental units in the investigated area. Of especial importance from the scientific and applied points of view, is the classification and mapping of the Miocene into nine units; the Pliocene into four units and the Quaternary into sixteen units. This work helps to decipher the geological history of northern Egypt, the Mediterranean Sea and the Nile Delta. At the same time these units represent great contrasts in physical and chemical characteristics influencing the suitability of soils for land reclamation, and the movement and quality

of groundwater and drainage water on the surface and in the subsurface. It is emphasized that additional irrigation waters should not be introduced in the area of investigation until detailed geological and hydrogeological studies have been carried out.

A program of field verification for information interpreted from LANDSAT images has been conducted, and chemical mineralogical analysis has been performed on samples collected from some geologic units distinguished on the images, especially on the western peripheries of the Nile Delta.

The present study has given the major structural lineations, especially folds, faults and pronounced long fractures, which contributed to the development of major features in the area including the Nile Delta, Wadi El Natrun, and Siwa Oases and comparable depressions, the morphology of the Mediterranean coast, ... etc. Careful examination of the satellite images delineated the main drainage lines and their characteristics in such an area where the topographic contrast poor.

The new maps prepared from LANDSAT satellite images are more detailed and much more elaborate as compared to previous maps prepared by the traditional methods.

Geology of Sinai Peninsula from ERTS-1 Satellite Images

E.M. El Shazly

Deputy Director of Atomic Energy Establishment, and Director of the Geological Group of the Remote Sensing Research Project, Cairo, Egypt.

M.A. Abdel Hady

Prof. of Civil Engineering, Oklahoma State University, USA, and Director of the Remote Sensing Research Project, Cairo, Egypt.

M.A. El Ghawaby, I.A. El Kassas

Geologist, Geology and Raw Materials Dept., Atomic Energy Establishment, and Researchers in the Remote Sensing Research Project, Cairo, Egypt.

M.M. El Shazly

Assistant Research Professor, Desert Institute, Cairo, Egypt.

Published by

The Remote Sensing Research Project, Academy of Scientific Research and Technology, 101, Kasr El Aini Street, Cairo, Egypt.

abstract

The construction of new geological, structural lineation and drainage maps from the ERTS-1 satellite images has been carried out for Sinai Peninsula on 1:500,000 and 1:1 000,000 scales. Furthermore, two interpretation maps have been prepared on the same scale for the petroleum, mineral and construction material potential as well as the groundwater potential of the Peninsula. These maps prepared by the Remote Sensing Research Project are more elaborate, precise and showing greater details as compared to the previous maps made on comparable scales by the classical techniques.

The present work has given the geological units; the folds, faults and lineaments; and the drainage pattern of Sinai Peninsula. These fundamentals are applied to large scale appreciation of the natural resources and environment of the Peninsula and the general elaboration of projects of its development in various fields of construction, engineering, petroleum, minerals, agriculture, etc.

Geological and Groundwater Potential Studies of El Ismailiya Master Plan Study Area

E.M. El Shazly

Deputy Director of the Atomic Energy Establishment, and Director of the Geological Group of the Remote Sensing Research Project, Cairo, Egypt.

M.A. Abdel Hady

Professor of Civil Engineering, Oklahoma State University, U.S.A., and Director of the N.S.F. Remote Sensing Research Project, Cairo, Egypt.

M.M. El Shazly

Assistant Research Prof., Desert Institute Cairo, Egypt

M.A. El Ghawaby and I.A. El Kassas

Geology and Raw Materials Dept., Atomic Energy Establishment, and Researchers in the Remote Sensing Research Project, Cairo, Egypt

A.B.I. Salman and M.A. Morsi

Geologist, Geology and Raw Materials Dept., Atomic Energy Establishment, Cairo, Egypt.

Published by

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abstract

New geological, structural and drainage maps have been made and studied from ERTS-1 satellite images for El Ismailiya Master Plan Study area. The groundwater, hydrogeological characteristics and potentials of the same area have been compiled and evaluated to serve the purpose of the reclamation projects to be carried out.