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Application of Remote Sensing Techniques in The Geological and Some Environmental Studies of Abu-Durba Environs, Southwestern Sinai, Egypt.

By

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Note

The present thesis is submitted by Nashwa Waheeb Abed El-Nour to the Faculty of Science, Ain Shams University in partial fulfillment of the requirements for the degree of Master of Science in applied Geology Remote Sensing.

Beside the research work materialized in this thesis, the candidate has attended post-graduate course (structure Geology Devision, covering the following topics):

1-Photogeology
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ABESTRACT

Remote sensing is the science and art of obtain information in digital format about the objects, areas, or phenomena being investigated. The great advantage of having digital data is that can be processed and analyzed by computer.

The main purpose of applying remote sensing techniques in Abu-Durba area, which is located in southwestern part of Sinai of Egypt, is to discriminate lithological units and structural elements in order to produce more accurate geological and structural lineament maps.

The selected remotely sensed raw digital data covering Abu-Durba area was obtained by Landsat-7 satellite, Enhanced Thematic Mapper plus (ETM+) sensor (path/raw = 175/40). This sensor produce digital data that are composed of eight broad spectral bands each of them represent a different portion of the electromagnetic spectrum.

The image processing techniques of ETM+ data of Abu-Durba area have been carried out (using PCI geomatic V 9.1 software) to achieve the objectives of this work as summarized through the following steps.

1- Rectifications of the raw satellite ETM+ data: The geometric correction of row data has been occurred using image to image method for multispectral ETM+ bands (band-1 to band-7) and for panchromatic ETM+ band (band-8).

2- Enhancement of the ETM+ data: Some enhancement techniques for ETM+ data were performed such as histogram equalization and linear contrast stretching.

3- Construction of optimum color composite ETM+ images: The result was false color composite ETM+ images of spatial resolution 30m. in scale 1: 100000. These images were useful in the lithologic discrimination of the investigated area.

4- Construction of fused color composite image: The fusion processing has been carried out between the Lansat ETM+ multispectral data of spatial resolution 30m. and the ETM+ panchromatic band 8 of spatial resolution 15m. The colored fused image (15m. spatial resolution) was used for defined and delineated the boundary of most lithological rock units, and produced large scale geological map of scale 1:50000 for Abu-Durba area. This fused ETM+ image was also used for constructing the detailed drainage pattern map of the study area.

5- Preparation of band ratios of ETM+ digital data: The band ratio technique was applied to the satellite ETM+ Landsat 7 digital data of the study area. The statistical analysis of the processed 30 ETM+ ratio images were done. These ETM+ ratio images were tested for using in lithological interpretation of the study area. The ratio of ETM+ band 5 to band 7 (ETM+ 5/7) was used as a measure of the intensity of the hydroxyl adsorption, and the reflectance value of band ETM+ 5/1 ratio image is generally used for delineate the rocks bearing high contents of opaques. The Matulla Formation is well interpreted on the color composite ratio image, due to its blue color and sharp contact and the alluvial sediments are characterized by their yellowish colors on the color composite ratio image.

6- Principal component analysis (PCA): The color composite principle component image, composed of bands PC1, PC2, PC3 displayed in RGB respectively shows that the basement rocks are characterized by greenish blue color while the alluvial sediments are characterized by reddish to violet color.

7- Lineament extraction from ETM+ digital data: The automatic extraction of lineaments from the digital ETM+ data for the study area was performed by the line module of PCI Geomatica software version 9.1 under the default parameters. The resulting rose diagram shows that the main structural trends of the study area were in NE-SW, ENE-WSW, NW-SE, and N-S trends.

8- The comparison between Landsat TM image dated 1984 and Landsat ETM+ image dated 2002 of Abu-Durba area: This comparison was showed that there is a small erosions and corrosions in the eastern coast of the Gulf of Suez.

The false color image maps for eU, eTh, K and TC of the study area: The TC, eU, eTh, , and K % color raster maps as well as displayed color zonation maps indicates that Th and K are the two main radioelements in the investigated area. The values of natural radiation dose rates (0.0 to 2.04 mSv/y) in Abu-Durba area Southwestern Sinai, Egypt, remain in the safe side and within the maximum permissible safe radiation dose rate without harm to individual, with continuous external irradiation of the whole body(Abdel Aziz ,2000).

CONTENTS

CHAPTER VII. SUMMARY AND CONCLUSION

LIST OF FIGURES