بسم الله الرحمن الرحيم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

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شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

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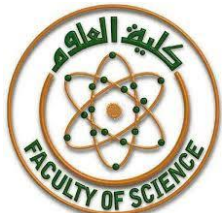

Geology Department

Using Hyper-spectral, Multi-spectral Remote Sensing and Geophysical Data for Detecting Alteration Zones around Wadi Saqia Area, Central Eastern Desert, Egypt

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DEDICATION

This work is dedicated to the souls of Prof. Mamdouh M. Abdeen, my Grandmother and my Grandfather, may Allah forgive them and bless their souls in paradise.

Also, I wish to dedicate this work to all My Family. They encouraged and supported me through all the stages of my life and still doing, may Allah keep them to me and help me not to fail them.

Sobhi M. Ghoneim

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ABSTRACT

This study presents the remote sensing (Hyper-spectral and Multi-spectral) and the Air-borne Gamma-ray Spectrometry data which have been used for detecting the alteration zones at Wadi Saqia area in the Central Eastern Desert of Egypt.

A Potassium Point anomaly map was obtained from the statistical treatment of the K (%), K/eU, and K/eTh spectrometric data. Anomalously High (X+3σ or more) areas were delineated and considered the most preferred areas for potassic alteration. If the maximum values exceed the (X+3σ) threshold, then (X+2σ) or (X+σ) is applied instead. Fourteen areas were delineated and suggested for the presence of potassic alteration.

The F-Parameter of Efimov [K*(eU/eTh)] was also implemented as proved approach for delineating the most preferred areas for hydrothermal alteration. The result of the Potassium point anomaly mapping was compared to that of the F-Parameter technique that was used as reference for validating the results. The Fourteen anomalous areas delineated from the Potassium point anomaly technique showed perfect correlation with the areas of highly anomalous F-parameter.

Remote sensing studies supported by field work and laboratory spectral analyses were implemented in this study as a

powerful approach for alteration mapping. A field study was conducted; samples from the different observed alterations were collected. The spectral signatures of these samples were measured using the “ASD TerraSpec Halo mineral identifier” hand-held spectroradiometer. Spectral analyses were performed to obtain the spectral characteristics of the alteration zones of the study are. The end-members were identified through comparing the measured spectra against the United States Geological Survey (USGS) spectral library. The identified end-members include; Kaolinite, Sericite, Montmorillonite, Chlorite, Epidote and iron oxides.

Different Remote sensing techniques were used to map the distribution of the identified end-members using Hyperspectral (Hyperion) and Multispectral (ASTER) satellite images. The used techniques for alteration mapping include; Spectral Angle Mapper (SAM), Spectral Feature Fitting (SFF), Constrained Energy Minimization (CEM), and Mixture Tuned Matching Filtering (MTMF) techniques.

As a prime factor for hydrothermal alteration to take place; Lineaments in the study area were extracted automatically using multi hill-shade images generated from the 12.5m Allos PAlSAR DEM data. A lineament density map was

produced showing the frequencies of lineaments per unit area. The lineaments and alteration data were successfully integrated together using the GIS weighted overlay model, a potentiality map of the alteration zones abundance was produced.

For validating the results of alteration mapping, locations of the observed alteration areas during the field study including the location of Semna gold mine were plotted on both the alteration mapping results obtained from ASTER and Hyperion remote sensing data. The accuracy of Hyperion data was found relatively higher than that of ASTER data. This is logic and mainly attributed to the extremely high number of spectral band in Hyperion compared to ASTER data.

A final integrated lithological-alteration map was produced containing the new lithological map obtained using the remote sensing techniques and the alteration zones delineated from both gamma-ray spectrometry and remote sensing methods.

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