IN THE NAME OF GOD

# PORPHYRY COPPER DEPOSITS EXPLORATION MODELLING, USING INTEGRATED REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEM TECHNOLOGIES, MEIDUK AREA, KERMAN PROVINCE

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THESIS

SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY (Ph.D)

IN

ECONOMIC GEOLOGY

SHIRAZ UNIVERSITY

SHIRAZ, IRAN

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JUNE 2001

**DEDICATED TO:**

**My wife, FARAH**

## ACKNOWLEDGEMENTS

The author wishes to express his gratitude to Professor Farid Moore for supervising the thesis and for his much appreciated advice, guidance, and constructive criticism.

Dr. A. Alimohammadi from Remote Sensing Group of Tarbiat Modares University, Dr. J. Hassanzadeh from Department of Geology of Tehran University, Dr. H. Ranjbar from Mining Group of Shahid Bahonar University, and Dr. S. Liaghat from Department of Geology of Shiraz University are thanked for critically reading the thesis and helpful suggestions.

Thanks are also due to Geological Survey of Iran for giving access to geochemical and geophysical data. I am also grateful to the head of Natural Resources Office of Fars Province, Mr. Shah Amirian, for his constructive cooperation, and the staff group of the GIS section of this office, Mr. A. Owji, Mr. M. K. Saiiyan, and Mr. Raoufat for their help in digitizing the data layers, and preparing a number of illustrations.

I am also indebted to the staff group of the Department of Geology, Shiraz University, for their much appreciated help.

Last but not the least, I am indebted to my wife, Farah, for all her understanding, patience, and encouragements and to my son and daughter for their endurance during the preparation of this work.

# ABSTRACT

**PORPHYRY COPPER DEPOSITS EXPLORATION MODELLING, USING INTEGRATED REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEM TECHNOLOGIES, MEIDUK AREA, KERMAN PROVINCE**

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Three principal component analysis techniques namely the selective, developed selective or Crosta, and the standard method are used for alteration mapping around porphyritic intrusives of Meiduk area, Kerman Province, SE Iran. The comparison of techniques is mainly based on visual and field observation analysis of the results. Selective principal component analysis using TM bands 5 and 7 enhances the alteration haloes in PC2 image, but the vegetated areas are also enhanced which interfere with the alterations. Carrying out the developed selective method on bands 1, 4, 5, and 7 of TM data enhances the hydroxyl alterations in PC4 image, without any enhancement of vegetation. The Crosta technique on bands 1, 3, 4, and 5 enhances the iron-oxide stained areas in PC4, but much of the area coincided with sedimentary units. So, the hydroxyl mapping technique of Crosta is suggested for alteration mapping around porphyry intrusive bodies.

The alteration haloes, lithology, distance from E-W lineaments, geochemical, and geophysical anomalies data are input into GIS and the integration models of Boolean logic, Index Overlay, Fuzzy logic, Dempster-Shafer belief function, and Weights of Evidence are applied to create the favourability map for porphyry copper in the study area. The most favourable areas in each output map are matched with the Meiduk and Sara porphyry copper deposits, and in less times on the Abdar occurrence. New targets with mostly moderate favourability are located around known deposits or in the eastern and southern parts of the area.

Since the weights of evidence approach uses statistical measures to characterize the spatial associations between known deposits and map patterns to establish a weight for the evidence layer, a training site with known deposits is required to implement this method. Generally speaking, most regions of Iran and also the Urmieh-Dokhtar magmatic belt are not well explored and only a few known mineral deposits and occurrences are located in regions under investigations. Therefore, it is suggested that the weights of evidence approach could not be a precise and suitable method for potential mapping in this region and most parts of Iran. The knowledge-driven approaches based on fuzzy and Dempster-Shafer model are more appropriate, as their data modelling is not based on the statistics of explored deposits or occurrences.

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