ACKNOWLEDGEMENTS viii
ABSTRACT x

CHAPTER 1 : INTRODUCTION 1 1.
1 General Statement .1
1.2 Location 2
1.3 Accessibility 2
1.4 Physiography and Climate 4
1.5 Previous Work -Genera1 4
1.5.1 Previous Work on the Study Area and Environs.6
1.6 Objective and Scope of the Present Work 16

CHAPTER 2 : GEOLOGIC SETTING 18

Introduction 18
2.1 Island -Arc Assemblage 19
2.1.1 The Meta volcanics 19
2.1.1.1 Basic meta volcanics 20
2.1.1.2 Intermediate metavolcanics 20
2.1.1.3 Acidic metavolcanics 23
2.1.2 The Volcaniclastic Rocks 23
2.1.2.1 Wadi Arak volcaniclastics 24
2.1.2.2 Volcanic breccia and Hyaloclastite 27
2.1.3 Banded Thinly Laminated Tuffs and Agglomerates ...29
2.1.4 Arc -Granitoids 31
2.2 The Volcanogenic Metasedimentary Rocks 34
2.2.1 The Green Metaconglomerates 38
2.2.2 Pebbly Metamudstones 38
2.2.3 Metamudstones and Metasi1tstones 40
2.2.4 The Grey Phyllites and Slates 40
2.2.5 Metagreywackps ; 42
2.2.6 Chlorite -Biotite -Epidote Schist 42
2.3 Molasse -Type Sediments (Hammamat Group) 42
2.3.1 Wadi Zeidun East and Wadi Meesar Molasse Basins 44
2.3.1.1 Wadi Zeidun basin 44
2.3.1.1 Wadi Meesar basin 47
2.3.2 Wadi Zeidun West Basin 50
2.3.3 Conglomerates 51
2.3.3.1 Basal conglomerate 51
2.3.3.2 Massive conglomerate 53

2.3.3.3 Graded and bedded conglomerate 55
2.3.4 Sandstones 55
2.3.5 Siltstones 57
2.4 Late -Collision Granites 60
2.4.1 El Shalul Pluton 60
2.4.2 El Hassanawia Pluton 64
2.4.2.1 Pink and porphyritic coarse grained granites 64
2.4.2.2 Buff, equigranular granites 67
2.4.3 Felsite and Microgranite Minor Intrusions 67
2.5 Dikes and Veins 67

CHAPTER 3 : PETROGRAPHY 70

3.1 Island -Arc Assemblage 70
3.1.1 The Meta volcanics 70
3.1.1.1 Metabasalt 70
3.1.1.2 Basaltic meta-andesite 73
3.1.1.3 Meta-andesite 77
3.1.2 The Volcaniclastic Rocks 77
3.1.2.1 Pine metatuffs 79
3.1.2.2 Lapilli metatuffs 79
3.1.2.3 Volcanic breccia 84
3.1.2.4 The banded iron oxide 84
3.1.2.5 Banded, laminated siliceous metatuffs , 86
3.1.3 Arc -Granitoids 86
3.2 The Volcanogenic Metasedimentary Rocks 92
3.2.1 Metamudstone and Metasiltstone 92
3.2.2 Slate 92
3.2.3 Phyllite 93
3.2.3.1 Quartz phyllite 93
3.2.3.2 Calcareous phyllite 93
3.2.3.4 Chlorite phyllite 97
3.2.3.5 Biotite -chlorite phyllite 97
3.2.4 Metagreywacke 97
3.2.4.1 Bedded metagreywacke 99
3.2.4.2 Foliated metagreywacke 99
3.2.4.3 Biotite-chlorite-epidote schist 101
3.2.5 Metaconglomerate 101
3.3 Molasse -Type Sediments (Hammamat Group) 104
3.3.1 Conglomerate 106

3.3.1.1 Purple and green conglomerates 106
3.3.1.2 Pebbles forming the conglomerates 106
3.3.2 Sandstone 113
3.3.2.1 Lithic arenites (subgreywackes) 113
3.3.2.2 Arkose 115
3.3.2.3 Feldspathic lithic arenites 115
3.3.2.4 Ferruginous arenites 115
3.3.3 Siltstone 115
3.3.4 Modal Composition and Provenance 118
3.3.4.1 Molasse sandstone 118
3.3.4.2 Volcanogenic sandstone 119
3.4 Late -Collision Granites and Felsites 122
3.4.1 El Shalul Pluton 122
3.4.1.1 Foliated, cataclastic granite 122
3.4.1.2 Pink alkali feldspar granite 124
3.4.2 El Hassanawia Pluton 124
3.4.2.1 Pink coarse grained granite 124
3.4.2.2 Porphyritic alkali feldspar granite 125
3.4.2.3 Buff medium grained granite 127
3.4.3 Porphyritic Microgranite and Felsite 129
3.4.4 Modal Analysis of the Granites 129
3.5 Dikes 131

CHAPTER 4 : METAMORPISM 136
4.1D Illite Crystallinity and Metamorphism 136
Introduction 136
4.1.1 Results and Discussion 139
4.2 Mineral Assemblage and Metamorphism 145

CHAPTER 5: GEOCHEMISTRY 147

Introduction 147
5.1 Geochemistry of the Metavolcanic Rocks 148 Generalities 148
5.1.1 Chemical Classification of the Studied Metavolcanics and Comparison with Other Metavolcanic Suites 152
5.1.2 Petrochemical Characteristics 155
5.1.3 Magma Type and Tectonic Setting 157
5.2 Geochemistry of the Volcanogenic Metasediments 167

5.3 Geochemistry of the Granitoid Rocks 170
5.3.1 Geochemistry of Wadi Maasar Granitoids and the Pink Granites 172
5.3.1.1 Magma characteristics and variation diagrams 176
5.3.1.2 Classification of the granitic rocks and tectonic environments 181
5.4 Geochemistry of the Granitic Pebbles Forming the Conglomerates 188
5.4.1 Petrochemical Characteristics 190
5.4.2 Classification and Tectonic Environments of the Granitic Pebbles 191

CHAPTER 6: STRUCTURE 194

6.1 Previous Work and Tectonic Context 194
6.2 Present Structural Studies and Evolution 195
6.2.2 Bedding (S.) 197
6.2.3 Foliation 197
6.2.3 Lineation 200
6.2.3.1 Pencil structure 200
6.2.3.2 Pebble elongation lineation 200
6.2.3.3 Mineral lineation 205
6.2.3.4 Fold axes 205
6.2.4 Faults 205
6.2.5 Folds 214
6.2.6 Shearing and Microstructures 218
6.2.6.1 Sense of shear 218
6.3 Strain Analysis of the Volcanogenic Metasediments and Molasse Sediments 225
6.3.1 Flinn Diagrams and Stereonet Projection 229
6.3.1.1 Concept and measurements 229
6.3.I.2 Results and discussion ; 230
6.3.2 Strain Analysis Using Rf/Phi Technique 232

DISCUSSION AND CONCLUSIONS 239
REFERENCES 250
ARABIC SUMMARY At end