ABSTRACT

Metasedimentary rocks of the Mesoproterozoic Umkondo group in eastern Zimbabwe record the presence of an epicontinental basin situated near the eastern margin of the Kalahari craton. The Umkondo group is subdivided into the Zimbabwe- and Mozambique facies. The Mozambique facies consists of highly deformed and strongly metamorphosed, greenschist- to amphibolite facies grade psammites and metapelitic schists that were clearly thrust westwards during the Mozambique orogeny ~ 550 Ma ago. The Zimbabwe facies comprises weakly to nonmetamorphosed strata of pebbly basal arkoses that are succeeded by shallow-marine stromatolitic limestones, cherts and cross-bedded arkoses that are interbedded with basalts and mafic and felsic tuffs. Rocks of the Zimbabwe facies were metamorphosed to greenschist- to prehnite-pumpellyite facies grade. Tuffs record input of pyroclastic material into the Umkondo basin and possibly reflect explosive volcanic activity related to the Umkondo igneous event. The Zimbabwe facies is locally deformed by north-south-trending, upright folds with wavelengths of up to tens of metres and east dipping small-scale thrusts that indicate a west-directed sense of movement.

Until now, there has been controversy as to whether the Zimbabwe facies rests nonconformably or tectonically on the Archaean Basement. West-verging small scale folds and small-scale thrusts are evidence that the Zimbabwe facies has been locally deformed. However, the pebbly basal arkose of the Zimbabwe facies rests depositionally on the Archaean Basement. Some Umkondo sills were emplaced along the nonconformity and their contacts with the Archaean Basement and overlying Zimbabwe facies strata are clearly intrusive. Most importantly, some Umkondo sills transgress the Archaean Basement/Zimbabwe facies contact and bedding without break. These observations, together with the lack of tectonic discontinuity at the Archaean Basement/Zimbabwe facies contact, and the occurrence of undeformed stromatolites in limestones near the contact, suggest that the contact is a nonconformity. The Zimbabwe facies is therefore authochtonous on a large scale and the west verging small-scale structures are indicative of localized movement that probably accommodated displacements on a maximum scale of hundreds of metres.

Dolerites intrude the Archaean Basement and the overlying Umkondo strata as both dykes and sills. U-Pb analyses of 5 single grain baddeleyite fractions from a granophyre that intrudes the lower Umkondo group yielded a crystallization age of 1108.5 ± 0.4 Ma. Nine grains from another sill that intrudes the upper levels of the Umkondo group yielded dates that are 2 to 7% discordant. A York (1969) regression through six analyses yielded an upper intercept of 1109.0 ± 2.2 Ma and lower intercept of 211 ± 41 Ma. The upper intercept is interpreted as the crystallization age, and hence the emplacement age of the sill, while the lower intercept age of 211 ± 41 Ma may be indicative of episodic Pb loss event that was probably associated with Karoo reheating throughout the Zimbabwe craton. These age data, combined with the Hanson *et al.* (1998) age of 1105 ± 2 Ma for another sill in the Chimanimani area show that the Umkondo sills in eastern Zimbabwe were emplaced in different stratigraphic levels of the Zimbabwe facies of the Umkondo group within a period of 4 Ma, i.e. between 1109 and 1105 Ma.

Precise age for the Guruve, Kamativi and Mutare dykes remain speculative since only one north northwest trending dyke in eastern Zimbabwe yielded baddeleyite grains. U-Pb analyses of 3 fractions of single baddeleyite grains and 2 multi-grain fractions from this dyke are concordant to slightly discordant. Four least discordant analyses yield a Pan-African age of 724 ± 2.1 Ma, which is interpreted to be the crystallistion age of the dyke and is nearly 400 Ma younger than the Umkondo sills. Thus the Mutare dykes are strictly not a swarm since a swarm comprises of dykes that are contiguous, contemporaneous and consanguineous (Ward *et al.*, 1999, 2000). Emplacement of dykes in eastern Zimbabwe was structural controlled by pre-existing faults since the dykes and faults patterns are similar and some dykes occur along sections of faults. Assuming minimum magma pressure required to open north northeast trending fractures, the maximum principal stress (σ_1) during the emplacement of the dyke was north northwest-south southeast and is consistent with contractional deformation in the Zambezi belt at the time of dyke emplacement. The dyke may be part of a Pan African tectonomagmatic event that may have affected the entire Zimbabwe craton and was associated with collision of the Congo and Kalahari cratons. It is inferred that dykes that fed Umkondo sills do exist in eastern Zimbabwe, but farther geochronological work is necessary to identify them, and to establish the ages of the Guruve and Kamativi dykes.

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CONTENTS

Abstract……i
Acknowledgements……iii
Contents……..iv
List of Figures……iix
List of Tables……xv

CHAPTER 1
INTRODUCTION 1
1.0 Location of Project Areas 1
1.1 Problem Definition and Justification of Study..... 10
1.2 Objectives of the Study 12
1.3 Research Methodology 13

CHAPTER 2
REGIONAL GEOLOGY: THE SIGNIFICANCE OF THE UMKONDO AND ASSOCIATED MAFIC INTRUSIVE ROCKS..... 14
2.0 Introduction..... 14
2.1 Umkondo Group 15
2.2 Regional Structure 16
2.3 Umkondo Dolerites and Basalts..... 17
2.4 Previous geochronology on Umkondo dolerites..... 18
2.5 Geochemistry of the Umkondo Dolerites 21
2.6 Mesoproterozoic Mafic Dykes in Zimbabwe – An Extension of Umkondo Magmatism Across Zimbabwe? 22
2.6.1 Kamativi Dykes 23
2.6.2 Mutare Dykes..... 25
2.6.3 Guruve Dykes 26
2.6.4 Chimbadzi Mafic/Ultramafic Dyke 27
2.6.5 Geochemistry of the Mutare-, Guruve- and Kamativi Dykes: A Review..... 28
2.7 Umkondo Igneous Province..... 29
2.8 Supercontinent Assembly - Rodinia 35
2.9 Discussion and Conclusions 38

CHAPTER 3
PETROGRAPHY OF ROCK TYPES AND FIELD RELATIONS OF THE UMKONDO GROUP IN EASTERN ZIMBABWE..... 40
3.0 Introduction..... 40
3.1 Archean basement Rocks..... 41
3.1.1 Basement Complex Granites..... 41
3.1.2 Metaironstone 42
3.1.3 Amphibolite Dykes 44
3.2 Mozambique Facies 44
3.3 Rocks of the Zimbabwe Facies, Umkondo Group..... 44
3.3.1 Pebbly Basal Arkose 46

3.3.2 Stromatolitic Limestone 47
3.3.3 Banded Cherts 49
3.3.4 Shales and Slates 50
3.3.5 Upper Arkose 51
3.3.6 Mafic Lapilli Tuffs and Mafic tuffs 52
3.3.7 Rhyolitic Lapilli Tuff 55
3.3.8 Umkondo Basalt 56
3.4 Depositional Environment for Umkondo Sediments 58
3.5 Dolerites 59
3.5.1 Dolerite Dykes – South of Mutare Town 60
3.5.2. Umkondo Dolerite Sills 61
3.5.3. Granophyres 63
3.6 Peperite 65
3.7 Discussion and Conclusions 68

CHAPTER 4
METAMORPHISM AND ALTERATION IN EASTERN ZIMBAWE 70
4.0 Introduction 70
4.1 Pre-Umkondo Regional Metamorphism 71
4.1.1 Metamorphism of Amphibolite Dykes 71
4.1.2 Metamorphism of Metaironstone 72
4.2 Metamorphism of the Mozambique Facies Rocks 74
4.3 Metamorphism of the Zimbabwe Facies 74
4.3.1 Metamorphism of Pelites - the Zimbabwe Facies 75
4.3.2 Metamorphism of Metabasites - the Zimbabwe Facies 75
4.4 Metasomatism 81
4.5 Discussion and Conclusions 83
4.5.1 Metamorphism in the Archean 83
4.5.2 Pan African Metamorphism and Alteration 85

CHAPTER 5
STRUCTURAL EVOLUTION OF THE UMKONDO GROUP AND THE UNDERLYING ARCHEAN BASEMENT 87
5.0 Introduction 87
5.1 Pre-Umkondo Deformation in Eastern Zimbabwe 87
5.2 Structure in the Mozambique Facies: The Mozambique Orogeny in Eastern Zimbabwe 90
5.3 Mozambique basement Gneiss/Mozambique Facies Contact 91
5.4 Mozambique facies/Zimbabwe facies Contact 94
5.5 Structure in the Zimbabwe Facies 94
5.5.1 Bedding 94
5.5.2 Foliation and Folding 94
5.5.3 Small-scale thrusts 101
5.6 Small-scale Faults. 103
5.7 Joints 104
5.8 Kinematic Analysis 106

5.8.1 Fault Analysis 106
5.8.2 Quartz Veins 108
5.8.3 Dolerite Dyke – Pull Apart Structure..... 108
5.9 The Zimbabwe Facies: An Autochtonous Sequence? 110
5.10 Post-Umkondo Kinematic/Dynamic Analysis..... 114
5.11 Discussion and Conclusions: 114
5.11.1 Synthesis of the Tectonomagmatic Events in Eastern Zimbabwe 114
5.11.2 Pan African Deformation..... 118

CHAPTER 6
GEOCHRONOLGY OF THE UMKONDO DOLERITES AND POSSIBLE MESOPROTEROZOIC DYKES 121
6.0 Introduction..... 121
6.1 Sampling Procedure 121
6.2 Sample Preparation 123
6.3 Analytical Methods..... 125
6.4 Results..... 126
6.4.1 Age of the Dolerite Sills (JM0125 and JM0109)..... 126
6.4.2 Age of a Dolerite Dyke (JM0104) 128
6.5 Discussion and Conclusions 129
6.5.1 Significance of New Ages for Dolerite Sills..... 129
6.5.2 Significance of the Age of the North Northwest Trending Dyke 130

CHAPTER 7
FAULT AND DYKE ANALYSIS, MECHANISM OF MAGMA EMPLACEMENT FOR UMKONDO SILLS AND DYKES 133
7.0 Introduction..... 133
7.1 Methodology 133
7.2 Results of Fault and Dyke Analysis..... 135
7.3 Faults..... 136
7.3.1 Set 1 Faults..... 137
7.3.2 Set 2 Faults..... 139
7.4 Dolerite Dykes 139
7.4.1 Set 1 Dolerite Dykes 140
7.4.2 Set 2 Dolerite Dykes 140
7.5 Age Relationships between Faults and Dykes 142
7.6 Magma Transport Mechanisms..... 144
7.7 Crustal Emplacement for Ascending Magma 145
7.8 Emplacement Processes: Umkondo Basalts, Dolerite Dykes and Sills 146
7.9 Conditions Favourable for Dyke Emplacement along Pre-Existing Joints 147
7.10 Palaeostress Analysis Using Dykes 150
7.11 Discussion and Conclusions 151

CHAPTER 8

DISCUSSION AND CONCLUSIONS 154
8.1 Pre-Umkondo Deformation – D1 and D2 154
8.2. Evolution of the Umkondo group and its Significance..... 155
8.3 Pan African Deformation – D3 156
8.4. Magmatism in Eastern Zimbabwe 157
8.5. The 1.1 Ga Umkondo Igneous Event in Zimbabwe 157
8.6. Implications of the Age of Umkondo Sills 158
8.7. Pan African Magmatism 160
8.8 Conclusions and Recommendations 161

REFERENCES……...…163

APPENDICES……....178

Appendix 6.1. Locations of sampling sites for the Kamativi dyke dyke,Guruve dyke dykes, Mutare dykes and Umkondo sills. Baddeleyite grains were obtained only in samples JM0104, JM0109 and JM0125, and some metamict zircons in JM0138. Samples shown in italics were not processed due to time constraints……....178

Appendix 6.2. Umkondo igneous province and mesoproterozoic Umkondo basin in eastern Zimbabwe: Possible relevance to Rodinia……..….179

Appendix 6.3. Correlation of 1.1 Ga large igneous provinces on the Laurentian and Kalahari cratons: Implications for Rodinia reconstructions……180

Appendix 6.4. Coeval large-scale magmatism in the Kalahari and Laurentian cratons during Rodinia assembly……..181

LIST OF FIGURES

Fig. 1.1. Location map showing the areas of study in eastern Zimbabwe, Chinhoyi and Hwange. ……2
Fig. 1.2. The geology of the area around Chipinge showing Umkondo dolerite sills that intruded rocks of the Umkondo group. The dots represent the sampling sites. Modified after Watson (1969)……...3
Fig. 1.3. The geology of the Chimanimani area showing dolerite dykes and Umkondo sills that intruded rocks of the Zimbabwe facies of the Umkondo group. Dolerites are rare in the Mozambique facies of the Umkondo group. The dots represent the sampling sites. CSB = Cronley Schist Belt CNF = Chikwezi-Nyanyadzi fault, SF = Shinja fault, ZF = Zunguni fault, NF = Nyahodi fault. Modified after Watson (1969)……4
Fig. 1.4. The geology of the area south of Mutare. The north northwest trending dykes represent the Mutare dykes. The dots represent the sampling sites. Modified after Watson (1962)……....5
Fig. 1.5. The geology of the Middle Sabi area. Dolerites of presumably Umkondo age intrude Archaean Basement granites and metasedimentary rocks of the Umkondo group. Dots represent the sampling sites. Modified after Swift (1962)……6
Fig. 1.6. The geology of the Middle Sabi Valley area. Rocks of the Umkondo group overlie Archaean Basement granites and granulites of the Limpopo Belt. Dots represent the sampling sites. Modified after Swift (1962)……...……..7
Fig. 1.7. The geology of the Nyanga area showing dolerite sills and dykes that intruded the Archaean Basement granites and gneisses. Sills also intruded rocks of the Umkondo group. Dots represent the sampling sites. Modified after Stocklmayer (1978)……....8
Fig. 1.8. The geology of the area around Chinhoyi showing the northeast trending Guruve dykes. The sampling points are shown by dots. Modified after Stagman (1961)……..9
Fig. 1.9. The geology of the Dett area showing the Kamativi dykes that trend northeast. Sampling points are represented by dots. Modified after Lockett (1979)……...10
Fig. 1.10. Geology of the area around Nhedziwa Business Centre, Chimanimani District. (Insert)
Fig. 1.11. Structural mapping showing folding in Cherts, Mutsago Hill. (Insert)
Fig. 1.12. Structural mapping showing folding in Cherts, Mutsago Hill. (Insert)
Fig. 1.13. Structural mapping showing folding in Cherts, Mutsago Hill. (Insert)
Fig. 2.1 Spatial distribution of the Umkondo group and associated dolerite sills that intruded the strata at about c. 1100 Ma in eastern Zimbabwe and adjacent parts of Mozambique. The sampling sites of U-Pb geochronological samples reported in Hanson *et al.* (1998b) and Wingate (2001) are shown. Modified after R. Hanson (unpublished manuscript)……20
Fig. 2.2. Simplified map showing the distribution of mafic dyke swarms in Zimbabwe, modified after Wilson *et al.* (1987). DD = Deweras dyke, PF = Popoteke fault…….24
Fig. 2.3. Spatial distribution of mafic and felsic igneous rocks emplaced at ~ c. 1100 Ma across the Kalahari craton (KC) in southern Africa and Dronning Maud Land, Antarctica. The Umkondo Igneous Province of Hanson *et al.* (1998) is inferred to encompass much of the Kalahari craton including the original continuation of this

craton into East Arntarctica. The possible members of the Umkondo Igneous Province are: UG: Umkondo dolerites, TG: Timbavati Gabbro, PW: Post Waterberg dolerites, PK: Dolerite sill intruding the Premier Kimberlite, AB: Dolerite sill intruding Archaean Basement, VD: Dolerite sill intruding Vredefort Dome, PG: Mogkware and Dibete-Shoshong, KM: Kanye Mochudi suite, TGC: Tshane gabbroic complex, XC: Xade complex, KG: Kgwebe rhyolites, GP: Grunehogna Province. Modified after R. Hanson (*Unpublished manuscript*) and Hanson *et al.* (In Press)……34

Fig. 2.4. Hypothetical configuration of Rodinia supercontinent of ~ 1000 to 750 Ma. Three possible positions are shown for the Kalahari craton: I, in East Gondwana adjacent to the East Antarctic craton (Hoffman, 1991; Dalziel, 1991, 1992; II, in West Gondwana adjacent to the Rio de la Plata craton of South America (Dalziel, 1997; Gose *et al.,* 1997); and III, in an isolated position directly opposed to the southern margin of Laurentia (Dalziel *et al.*, 2000). Mesoproterozoic orogenic belts are shown in brown colour……37

Fig. 3.1. Porphyritic granite with euhedral plagioclase phenocrysts that define a steeply dipping, east-northeast trending primary layering. Grid Ref.: 459105, 7835904……42

Fig. 3.2. Banding in metaironstone defined by alternating quartz-rich layers and grunerite-magnetite layers. Top photograph – plane polarised light, Bottom photograph - crossed polars. Sample JM0149; Grid Ref.: 451850, 7832660……..43

Fig. 3.3. Stratigraphic log from (a) a hill section west-northwest of Hot Springs (Grid Ref.: 432707; 7831387) and (b) from a hill section south-southeast of Hot Springs (Grid Ref.: 446960, 7818693). Basal arkose overly 20 cm wide layer of weathered granite (b). The sequences shown in a and b is basically uniform throughout the Zimbabwe facies of the Umkondo group, and individual formations within the group can be traced the entire length of the preserved basin……45

Fig. 3.4. Stratigraphic column showing the major rock types of the Zimbabwe facies of the Umkondo group in eastern Zimbabwe. Shallow-marine stromatolitic limestones and cherts succeed a pebbly basal arkose unit that unconformably overlies Archaean Basement granites. Deltaic and fluvial shale and the cross-bedded upper arkose unit record deposition in fluvial and deltaic environments..……...48

Fig. 3.5. Low amplitude stromatolites in a limestone boulder. The stromatolites from outcrops of a limestone that overlies the pebbly basal arkose unit show an upward younging direction. Grid Ref.: 439358; 7832748……49

Fig. 3.6. Banded chert interbedded with horizons of mafic tuff. The tuff horizons are finely laminated and strongly weathered, while the chert horizons have resisted weathering. Grid Ref.: 454455, 7830057……52

Fig. 3.7. Flattened spherical to ellipsoidal structures in a very fine grained, light grey rock. The structures have variable diameters ranging from 2 to 4 mm. The spherical structures coalesce to form linear structures near the centre of the photograph that could be mistaken for trace fossils in the field. The lapilli have a mineralogy that is similar to the matrix, i.e. predominantly epidote, chlorite, actinolite and minor detrital quartz. Grid Ref.: 476148, 8019207……54

Fig. 3.8. Spherical lapilli in a matrix of similar composition, i.e. predominantly epidote, plagioclase, chlorite, prehnite and some grains of quartz. The dark material around

the lapilli possibly represent glass before alteration. Crossed polars. Sample JM 0111, Grid Ref.: 445109, 7810104……54
Fig. 3.9. Rhyolitic tuff with spherical lapilli that have resorbed margins. The lapilli are composed of quartz, plagioclase, K-felspar, epidote and sphene, and occur in a fine grained-matrix of similar composition. Occasional laths of plagioclase and oxides also occur in the matrix. Crossed polars. Sample JM0209; Grid Ref.: 435491, 7833026……55
Fig. 3.10. Amygdaloidal and vitrophric textures in an Umkondo basalt. The amygdales this microphotograph include pumpellyite, quartz and minor epidote, while chlorite occurs on the margin of the amygdale assemblage. Plagioclase and small crystals of clinopyroxene are set in a glass matrix. Crossed polars. Sample JM0115, Grid Ref.: 442699, 7825648…….57
Fig. 3.11. Palaeocurrent pattern obtained from cross beds in the Upper arkose unit north of Nyanga town (Grid Ref.: 475821, 8010947). The palaeocurrent is from north northwest to south southeast. Unimodal pattern with a large scatter possibly indicate a high sinuosity river or alluvial fan……...59
Fig. 3.12. Igneous textures are preserved in dolerite dykes including an ophitic texture in which many plagioclase crystals are enclosed by a single clinopyroxene crystal. Crossed polars. Sample JM0110, Grid Ref.: 436702, 7800301……...61
Fig. 3.13. Granophyric texture resulting from co-crystallisation of quartz and K-feldspar at the eutectic point in late magmatic fluids. Quartz intergrown with alkali feldpar are arranged about euhedral plagioclase crystal. Crossed polars. Sample JM0125, Grid Ref.: 480387, 7832272…….62
Fig. 3.14. An aphyric post-Umkondo dolerite dyke that intruded an Umkondo sill suggests the occurrence of a post-Umkondo mafic magmatic event. The sill is flanked by epidote-quartz veins on either side along the dyke margins. Grid Ref.: 461724, 7840425……62
Fig. 3.15. Cross section from X to Y (Fig. 1.10) showing a sub-horizontal Umkondo sill that intruded Archaean Basement granite. Gabbroic granophyres occur as lenses in the roof region of the sill..……64
Fig. 3.16. Plastically deformed sediment clasts folded into randomly oriented open folds in a peperite that occurs along a sill margin, which suggests absence of a remote stress field during deformation. The occurrence of the peperite suggests that Umkondo sills were emplaced before Umkondo sediments were completely lithified (Hanson *et al.*, 1998b). Grid Ref.: 469675, 7803150….……66
Fig. 3.17. Pink patches that occur in peperite predominantly consist of plagioclase and quartz and minor K-feldpar and biotite. These patches are possibly a product of anatexis of the siltstone during emplacement of the sill. Crossed polars. Sample JM0107, Grid Ref.: 469675, 7803150…….66
Fig. 3.18 Sections along lines A-B and C-D (Fig. 1.3). Umkondo sills have variable thicknesses along strike and transgress the Basement Archaean granite/Zimbabwe facies contact bedding. The Basement Archaean granite/Zimbabwe facies contact is a non-conformity and generally sub-horizontal……..67
Fig. 4.1. Amphibolite (metamorphosed dolerite) dyke with hornblende (hbl) being replaced by actinolite and chlorite (chl), which indicate retrograde metamorphism. Crossed Polars. Sample JM0217; Grid Ref.: 451463, 7830598……..…72

Fig. 4.2. Fig. 4.2. The upper photograph shows schistosity in metaironstone defined by preferential alignment of small crystals of grunerite (Gr1) + chlorite (Chl) and quartz (Qtz). Larger crystals of grunerite (Gr2) that are oblique to the schistosity suggests static new growth across foliation. The presence of grunerite suggests amphibolite facies grade of metamorphism. Crossed polars. Sample JM 0151; Grid Ref.: 451815, 7832550.The lower photograph shows acicular actinolite crystals that are a product of replacement of recrystallisation of actinolite and replacement of grunerite. Crossed polars. Sample JM0149; Grid Ref.: 451850, 7832547……...……73
Fig. 4.3. Radiating groups of crystals of prehnite occur as patches (top photograph) or as amygdales (bottom photograph) in an amygdaloidal hypocrystalline basalt. Prehnite occurs in association with pumpellyite, which indicate prehnite-pumpellyite grade of metamorphism for the Umkondo basalts, and hence the Zimbabwe facies. Crossed polars. Sample JM0115; Grid Ref.: 440669, 7819648……..…77
Fig. 4.4. Anastomosing layering in a mafic tuff. The rock consists of metamorphic minerals, i.e. chlorite, epidote, quartz and sericitized plagioclase, and minor analcite and prehnite. The dark material probably represents glass before deformation. Crossed polars. Sample JM0124; Grid Ref. 474277, 8056126. ……..78
Fig. 4.5. Clinopyroxene rimmed by actinolite (act) suggesting retrograde metamorphism. Relict ophitic texture occurs in clinopyroxene (cpx), i.e. plagioclase crystals are enclosed clinopyroxene. Crossed polars. Sample JM0110; Grid Ref. 436702, 7800301……...78
Fig. 4.6. Pseudomorphs of actinolite after clinopyroxene. Relict clinopyroxene (cpx) occurs near the bottom left corner and near the centre of the photograph. Actinolite (act) coexists with chlorite (chl). Crossed polars. Sample JM 0103; Grid Ref.: 464923, 7787195…….79
Fig. 4.7. Intergrowths of biotite and chlorite and an opaque mineral (magnetite) replacing actinolite in a gabbro. Crossed polars. Sample JM0137; Grid Ref.: 462471, 7836120……79
Fig. 4.8. Pseudomorphs of chlorite intergrown with biotite after actinolite. Plain polarised light. Sample JM0137; Grid Ref.: 462471, 7836120……...80
Fig. 4.9. Fine grains of chlorite replacing actinolite in a dolerite, which suggest metamorphism down temperature. Crossed polars. Sample JM0103; Grid Ref.: 464923, 7787195……..80
Fig. 4.10. Two generations of epidote-quartz veins cutting an Umkondo sill in the Umvumvumvu River. The first generation of veins terminates against a post-Umkondo dyke. The second generation of veins cut the post-Umkondo dyke and the first generation of veins without any displacement. The two generations of veins represent two generations of hydrothermal alterations that affected the Zimbabwe facies of the Umkondo Group. Grid Ref.: 461700, 7840500……...82
Fig. 5.1. Quartz veins that occur in sheared Archaean Basement granites are parallel to the schistose fabric. The veins have been boudinaged and then folded into ptygmatic folds during progressive deformation that was associated with dextral strike-slip shears. The boudins document an east-west extension direction during deformation. Grid Ref.: 450085; 7832520……89

Fig. 5.2. Crenulation cleavage in meta-ironstone. The crenulation lineation plunges moderately towards north. Grid Ref.: 451669, 7832200……..……..89
Fig. 5.3. Lower hemisphere, equal area projections of poles to schistosity and crenulation cleavage in: (a) Sheared Archean basement granites and metaironstone in the area south of Chitimani School (Fig.1.10). A crenulation lineation in metaironstone plunges moderately towards north and a stretching lineation in granites plunges shallowly towards west or east and (b) Mozambique facies in the area around the Armour's Gap (Fig. 1.3), a crenulation lineation plunges shallowly towards north and the stretching lineation plunges shallowly towards east or west, which suggests an east-west transport direction……....90
Fig. 5.4. Intensely and penetratively deformed psammites of the Mozambique facies with east-dipping fabrics. Primary bedding is rarely preserved. Nyanga, Exact locality unknown. *Photograph by R. Hanson*……...92
Fig. 5.5. Schistosity in a quartz-mica schist wrapping around a σ-clast near the centre of the photograph. The σ-clast indicates that the top has moved to the west. Grid. Ref.: 497730, 7824570……..93
Fig. 5.6. Quartz-mica schists of the Mozambique facies overlying the Mozambique quartzofeldspathic gneiss (masked by brown grass) at the Armours Gap. The gneiss has been sheared into a quartz-muscovite schist and developed an S-C' fabric immediately below the contact. C' dips gently towards west and S dips steeply towards east, which implies a low-angle normal fault tectonic regime. Photograph taken from Grid Ref.: 498640, 7824590……93
Fig. 5.7. Cross section through the Mozambique facies/Zimbabwe facies contact. Intensely deformed rocks of the Mozambique facies that were thrust to the west dip underneath the Zimbabwe facies, and hence the Zimbabwe facies should be underlain by a thrust and the Mozambique facies/Zimbabwe facies contact is a tectonic contact. The dotted line represents the present erosional surface. The position of the National Parks Hut is shown as a reference point (Fig. 1.3). Modified after Dirks (1999)……97
Fig. 5.8. Equal area lower hemisphere projections of poles to bedding and foliation in the Zimbabwe facies in (a+) Chipinge, (b) Nyanga and (c to e) Chimanimani areas. Beds are sub-horizontal in a, b, c and e. Foliation in cherts dips steeply to moderately towards east or west (d). Folds in the Zimbabwe facies have sub-horizontal fold axes that plunge towards north or south (d and e)……...98
Fig. 5.9. Upright, open folds in deformed chert on the crest of Mutsago Hill. The chert unit overlies undeformed pebbly basal arkose. The fold has a sub-horizontal, north-south trending fold axis. (Grid Ref.: 460856, 7835245)……..99
Fig. 5.10. An asymmetrical parasitic fold verges towards west below the hammer. The fold axis is sub-horizontal and trends north-south. Grid Ref.: 460843, 7835202……99
Fig. 5.11. Cross sections showing open, upright folds in the chert unit of the Zimbabwe facies. The folds have wavelengths that range from a few centimetres to about 20 m and sub-horizontal fold axes that plunge north-south. The folds suggest an east-west shortening direction during deformation and accommodated shortening on a scale of

~10-40 m. The chert unit overlies an undeformed, sub-horizontal pebbly basal arkose (yellow) unit……...100
Fig. 5.12. Finely laminated siltstone (Grid Ref: 428670, 7793640) deformed by a west verging fold that has a north, shallowly plunging fold axis. Fold vergence suggests an east to west direction of transport……..101
Fig. 5.13. Shallowly east-dipping (104/30) thrust displacing siltstone beds (above the hammer in photograph) near the Zimbabwe facies/Archaean Basement granite contact with a reverse sense of movement, i.e. top to the west. The dip separation, illustrated in the sketch diagram, is about 60 cm (Grid. Ref.: 428670, 7793640)……..102
Fig. 5.14. Small-scale thrust cutting through the centre of the microphotograph. The thrust dips shallowly towards east and has displaced layering in banded cherts. Layering in the hanging-wall curves downwards suggesting a reverse sense of movement, that is top to the west (Grid Ref.: 460794, 7835284)……..103
Fig. 5.15. Equal area lower hemisphere projections of poles to faults and joints. Faults and joints are sub-vertical. Slickenside lineations on fault planes plunge shallowly towards north or south. Fault data were obtained from the Umvumvumvu river bridge (Grid Ref.: Grid Ref.: 461820, 7840655)……..104
Fig 5.16. Moving average rose diagrams showing the orientations of joints (a) and small-scale faults (b). The majority of the faults trend between north northwest and north northeast and have accommodated a dextral strike-slip displacement. The faults are parallel to joints suggesting that the faults formed on pre-existing joints……105
Fig. 5.17. Results of the kinematic analysis. (a) Lower hemisphere stereographic projections of 7 faults with a predominantly dextral strike-slip displacement from the Umvumvumvu River. (b) Contours for the P-axis shortening and (c) Contours for the T-axis representing the direction of extension. (d) Eigenvectors for the P and T axes……107
Fig. 5.18. Contemporaneous north- and east trending epidote-quartz veins that cut an Umkondo sill in the Umvumvumvu River (Grid Ref.: 461765; 7840438). The geometry of the veins suggests that the opening direction during vein propagation probably ranged from east-west to northwest-southeast and was associated with dextral strike-slip sense shears……...109
Fig. 5.19. A north northeast trending dyke intruding an Umkondo sill and displacing epidote-quartz veins in the Umvumvumvu River (Grid Ref.: 461725; 7840406). The dyke was emplaced in a pull-apart structure and displaced epidote-quartz veins. The sense of displacement is dextral strike-slip and the opening vector is 339º. The orientation of the least compressive stress (σ_3) was north northwest-south southeast during dyke emplacement and was a dextral strike-slip tectonic regime……..110
Fig. 5.20. Cross section showing a sill that is continuous from Archean basement granite to the Zimbabwe facies. The sill transgresses the contact without break suggesting that the Zimbabwe facies is autochtonous on a large scale……...113

Fig 5.21. Structural map showing the major fabric trends, zones of thrusting and strike-slip shear zones in the granite-greenstone terrains of the Zimbabwe Archaean craton. The east northeast to northeast trending strike-slip shear zones in the Zimbabwe craton were formed during a north northwest-south southeast compression associated with thrusting of the Northern Marginal Zone (NMZ) of the Limpopo belt onto the

Zimbabwe craton. CZ: Central Zone of the Limpopo Belt. The structural map is modified after McCourt and Vearncombe (1991) and Treloar *et al.* (1991)…….117
Fig. 5.22. Pan African orogenic belts in Southern Africa: The Mozambique belt is located on the eastern margin of southern Africa resulted from collision of east and west Gondwana. The Damara-Lufilian-Zambezi belt system by collision of the Congo and Kalahari cratons. Deformation in the Zambezi belt was contemporaneous with magmatism in the Congo and Zimbabwe cratons at about 720 Ma. The map is modified after Hanson (Unpublished manuscripts)……...120
Fig. 6.1 Microphotographs showing baddeleyite grains from samples JM0109 and JM0125. The grains are light to dark brown in colour, thin and elongate plates with typical aspect ratios of about 10:5:1……..125
Fig. 6.2 U-Pb Concordia diagram of baddeleyite fractions from an Umkondo sill (sample JM0125) that intruded the upper arkose unit of the Zimbabwe facies south southeast of Cashel (Grid Ref.: 480387; 7832272). Linear regression is through 6 of the 9 discordant data points and gives an upper intercept age of 1109.0 ± 2.2 Ma that is interpreted to be the emplacement age of the sill, and a lower intercept age of 211 ± 41 Ma…….127
Fig. 6.3 U-Pb Concordia diagram for an Umkondo sill (JM0109). The weighted mean of the analyses gives an age of 1108.5 for the sill that intrudes metasedimaentary rocks the lower Zimbabwe facies……128
Fig. 6.4 Concordia diagram of baddeleyite fractions from a north northwest trending dyke (sample JM0104) that occurs to the south of Chimanimani town. The four least discordant analyses yield a Pan-African age of 724 ± 2.1 Ma that is interpreted as the emplacement of the dyke, and hence the Mutare dyke swarm……..129
Fig. 7.1. Moving average rose diagrams showing the frequency of the orientation (a) and lengths (b) of individual faults and their segments (c and d) in the area mapped by Watson (1969). The counting interval is 5º, but the interval is shifted in 1º-steps to produce a moving average…….137
Fig. 7.2. Moving average rose diagrams showing the frequency of the orientation (a) and lengths (b) of individual dolerite dykes and their segments (c and d) in the area mapped by Watson (1969). The counting interval is 5º, but the interval is shifted in 1º-steps to produce a moving average……141
Fig. 7.3. The azimuths of faults/dykes plotted against their frequency show that the trends of dykes mimics that of the faults which strongly suggests that the dykes were emplaced along pre-existing faults……143
Fig. 7.4 The level of emplacement of Umkondo and lavas and dykes was dependent on the interaction of the magma pressure (P_m), vertical stress (S_v). Umkondo flood basalts show that the magma driving pressure, at least at times, maintained a positive driving pressure to the surface of the earth. Horizontal anisotropies such as the non-conformity and bedding have facilitated emplacement of Umkondo sills……146
Fig.7.5 The relationship between the normal stress (σ_n), acting on a fracture plane and the fracture orientation (θ), the opening direction (μ) and the maximum (S_H) and minimum (S_h) principal stresses after Jolly and Sanderson (1997)……...149
Fig. 7.6. Mohr circle construction, after Jolly and Sanderson (1997), showing the maximum shear stress (τ_{max}), the opening angle of a fracture (μ), and the maximum (S_H) and minimum (S_h) principal stresses……..150

LIST OF TABLES

Table 2.1. A summary of geochronological data for Umkondo dolerites in Eastern Zimbabwe and associated Mesoproterozoic igneous rocks in southern Africa and the Grunehogna Province. The Mashonaland ages for some Umkondo sills reflect inheritance, and the post Umkondo ages reflect Ar-loss during subsequent tectonothermal events. From Hanson *et al.* (In Press), with minor modifications…..31

Table 3.1. Summary of palaeocurrent data from two units of the Zimbabwe facies…….59

Table 5.1. The attitude of small-scale faults that cut an Umkondo dolerite sill and the associated slickenside lineation. Most faults have a dextral sense of displacement..106

Table 6.1 Isotopic data for baddeleyite grains from three dolerite samples. B_1-B_{10} represent grain fractions that correspond to labels on the concordia diagrams and the number of multi-grains are shown in brackets. Sample weights are measured to within 40% using measured dimensions and density. Percentage discordance = 100 – (100 x [$^{206}Pb/^{238}U$ age] / [$^{207}Pb/^{206}Pb$])…….126

Table 7.1. Classification of faults in the Chimanimani area according to their azimuths using 8 cardinal compass directions……..135

Table 7.2 Classification of faults in the Chimanmani area into two sets and subsets. Most faults in the area have accommodated a dextral (D) strike-slip separation of a few hundreds of metres. S denotes sinistral. Down throw side is predominantly to the south for set 1 faults and to the west for set 2 faults……..136

Table 7.3. Summary of the results of dyke analysis. Dykes are hosted in granites (G), the upper arkose unit (m3), metapelites (m2), dolerite sills (Dm), quartz-mica schists (m), and quartz vein (Q). ……..140

Table 8.1. A summary of the major metamorphic, deformation and magmatic events in eastern Zimbabwe……..155