The geology of the Mozambique belt and the Zimbabwe craton around Manica, Western Mozambique.

By

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Submitted in partial fulfilment of the requirements for the degree

Magister Scientia

in the Faculty of Science

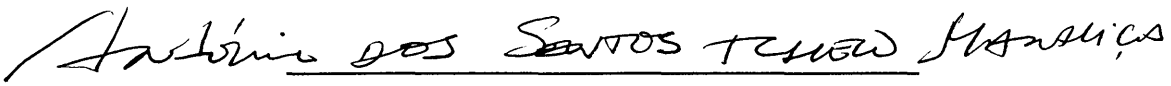
University of Pretoria

Pretoria

August 1998

1998

I Hereby certify that this thesis is my own work except where specifically acknowledged and that this thesis has not been submitted elsewhere for the purposes of being awarded a degree.



Acknowledgments

Various institutions and organizations have given support of one form or other for the realization of this project for the MSc. degree. Among these, some merit special mention.

Anglo American Prospecting Service (AAPS) funded all field expenses including subsistence and gave logistical support by means of transport and field material and equipment as required. In addition, they provided the necessary funds for accommodation and subsistence while in Pretoria. For all this support I whish to extend my sincere gratitude to this organization and, in particular, to Mr. Roy Corrans, Consultant Geologist and Director of the New Mining Business of which AAPS is part, and to Mr. Steve Marsh, then Head of AAPS, Clayville Office.

To fulfill the requirements for candidateship to this Msc. degree, I completed my Bsc. (Hons). at the Department of Geology, University of Pretoria, with full financial support from the Council for Geoscience in Pretoria. This support was extended to the first year of my MSc. studies. For this I fell in debt with this institution and, in particular, with Dr. Frick, the Director of the Council for Geoscience.

Major and trace elements analyses as well as microprobe and X-Ray Diffraction investigations were done at the laboratories of the Department of Geology of the University of Pretoria with the expenses covered by the department. For this reason I thank the Department and, in particular, Prof. de Waal, in his capacity as Head of the Department, for permitting this. Mrs M. Loubser, the analyst in the X-Ray fluorescence section, Mrs. S. Verryn who performed the XRD analyses and the late Mr. A.V. Atanasov who assisted in the microprobe analyses are thanked for their help.

I thank the Minister of Mineral Resources and Energy of Mozambique for allowing me to take a study leave, the National Director of Geology for the continued multidisciplinary support and the Provincial Director of Mineral Resources and Energy in Manica, Mr. Abdurremane Materia Machon, for the extremely useful logistic support while in the province.

I wish to express my unmeasurable gratitudes to Prof. Geoff Grantham who, not only gave the necessary academic guidance in his capacity as supervisor, but also made sure that all other necessary conditions were there for normal progress of the study. His comments into my various versions of the thesis, helped to bring the thesis to a level of acceptability not only technically but also in terms of language. I thank him, in addition, for financial support from his FRD grant which contributed to the radiogenic isotope studies, the rare earth element analyses and subsistence during 1998.

Prof. Snyman is thanked for his assistance in his capacity as co-supervisor and for the comments and suggestions made in the thesis.

Finally, my achievements would not have been possible if I did not enjoy support and encouragement from my family. So to you Paula, Danilo and Gisela I dedicate this thesis.

THE GEOLOGY OF THE MOZAMBIQUE BELT AND THE ZIMBABWE CRATON AROUND MANICA, WESTERN MOZAMBIQUE

Table of contents

List of Figures **Page no.**

List of Tables **Page no.**

List of appendices

1. Table showing samples per lithological unit, locality and coordinates of samples used in geochronology, geothermobarometry and thermochronology
2. Table of microprobe analyses of minerals used in the thermobarometry
3. Description of analytical techniques

THE GEOLOGY OF THE MOZAMBIQUE BELT AND THE ZIMBABWE CRATON AROUND MANICA, WESTERN MOZAMBIQUE.

Abstract

The study area comprises the Archaean Manica Greenstone Belt and the Vumba Granite Gneiss, the Proterozoic Messica Granite Gneiss of the Zimbabwe Craton, the possibly allochthonous metasedimentary sequence of the Frontier Formation, the granitoids of the Mozambique Metamorphic Province, which are subdivided into Vanduzi Migmatite Gneiss, the Chimoio Granodiorite Gneiss, the Nhansipfe Granitic Orthogneiss and the Pan-African Tchinhadzandze Granodiorite Gneiss. The rock sequences in the two provinces are cut by mafic intrusions.

The greenstone belt comprises mafic to ultramafic and pelitic schists and serpentinites of the Macequece Formation and metasediments of the M'Beza/Vengo Formation. The mafic to ultramafic schists and the serpentinites have chemical signatures of komatiites. The Vumba Granite Gneiss comprises the northern and southern Vumba granitoids dated at 3885±255 Ma, and 2527±632 Ma respectively. They vary from metaluminous to peraluminous, have normative QAP compositions of granodiorites and monzogranites and chemical signatures of mantle fractionates and volcanic-arc granitoids. The Early Proterozoic Messica Granite Gneiss is 2348±267 Ma old, is metaluminous and has QAP compositions of monzogranites and chemical signatures suggesting a crustal source and a volcanic-arc environment. The Frontier Formation comprises quartzite and pelitic schists. The Vanduzi Migmatite Gneiss comprises stromatic and stictolithic types. Two mineral assemblages are distinguished as they contain either garnet or hornblende. The Mid-Proterozoic Chimoio Granodioritic Gneiss is 1236±201 Ma old. It is granodioritic and metaluminous with a chemical signature of volcanic-arc granitoids. The Late Proterozoic Nhansipfe Granitic Orthogneiss is dated at 981±83 Ma and varies from metaluminous to peraluminous. The Rb, Nb and Y contents are typical of within-plate granitoids, whereas Ga, Zr, Al, Ce and Y are typical of A-type granitoids. The age of the mafic intrusions falls between ~500 and ~1100 Ma. The rocks typically contain plagioclase, hornblende and clinopyroxene with or without garnet and orthopyroxene. The chemistry of the rocks is typical of sub-alkaline tholeiites. The Tchinhadzandze Granodiorite Gneiss may be part of a Pan-African event which lasted till ~450-~500 Ma. The normative feldspar compositions and Rb, Ba and Sr contents are typical of granodiorites. It is metaluminous and has Rb, Y and Nb contents typical of volcanic-arc granitoids.

The planar fabrics in the Archaean granite-greenstone belt are characterized by E-W to SW-NE strikes and steep dips to N and S and to NW and SE. The mineral lineations and fold axes plunge 60° and 30° respectively towards the E. Within the Mozambique belt, around the central part and in the extreme east of the study area, the planar fabrics have essentially N-S strikes and steep dips to E and W in contrast with complex deformation observed in the migmatites and megacrystic granitoids.

The study area can be subdivided into three metamorphic blocks, namely, one of low-grade greenschist facies, one of medium-grade amphibolite facies and a third block of high-grade metamorphism.

Uittreksel

Die studiegebied behels die Argeïese Manica Groensteengordel en die Vumba Granietgneis, die Proterosoiëse Messica Graniet Gneis van die Zimbabwe-kraton, die moontlik allochtone metasedimentêre opeenvolging van die Frontier Formasie, die granitoïede van die Mosambiek Metamorfe Provinsie wat onderverdeel word in die Vanduzi Migmatiet Gneis, die Chimoio Granodioriet Gneis, die Nhansipfe Granitiese Ortogneis en die Pan-Afrikaanse Tchinhadzandze Granodioriet Gneis. Die gesteente-opeenvolgings in die twee provinsies word gesny deur mafiese indringings.

Die groensteengordel bestaan uit mafiese tot ultramafiese en pelitiese skiste en serpentiniete van die Macequece Formasie en metasedimente van die M'Beza/Vengo Formasie. Die mafiese tot ultramafiese skiste en die serpentiniete het chemiese kenmerke van komatiïete. Die Vumba Graniet Gneis bestaan uit die noordelike en suidelike Vumba granitoïede wat op 3885±225 Ma en 2527±632 Ma onderskeidelik gedateer is. Hulle varieer van metalumineus tot peralumineus, het normatiewe QAP samestellings van granodioriete en monsograniete en chemiese kenmerke van mantelfraksionate en vulkaniese-boog granitoïede. Die Vroeg-Proterosoïese Messica Graniet Gneis is 2348±267 Ma oud, is metalumineus, het QAP samestellings van monsograniete en chemiese kenmerke wat op korsoorsprong en vulkaniese-boog granitoïede dui. Die Frontier Formasie bestaan uit kwartsiet en pelitiese skis. Die Vanduzi Migmatiet Gneis behels stromatiese en stiktolitiese tipes. Twee mineraalversamelings word onderskei deurdat hulle óf granaat óf horingblende bevat. Die Middel-Proterosoïese Chimoio Granodioriet Gneis is 1236±201Ma oud. Dit is metalumineus en is tipies granodiorities met die chemiese kenmerke van vulkaniese-boog granitoïede. Die Laat-Proterosoïese Nhansipfe Granitiese Ortogneis is gedateer op 981±83 Ma en wissel van metalumineus tot peralumineus. Die Rb-, Nb- en Y-inhoud is tipies van intraplaat granitoïde, en die Ga-, Zr-, Al-, Ce- en Y-inhoud is tipies van A-tipe granitoïede. Die ouderdom van die mafiese intrussies lê tussen ~500 en ~1100Ma. Die gesteentes bevat tipies plagioklaas, horingblende en klinopirokseen met of sonder granaat en ortopirokseen. Die chemie van die gesteentes is tipies van subalkaliese tholeïïete. Die Tchinhadzandze Granodioriet Gneis is moontlik deel van 'n Pan-Afrikaanse gebeurtenis wat tot ~450-~500 Ma geduur het. Die normatiewe veldspaat-samestellings en die Rb-, Ba- en Sr-inhoud is tipies van granodioriet. Dit is metalumineus en het Rb-, Y- en Nb-inhoude tipies van vulkaniese-boog granitoïede.

Die vlakkige maaksels in die Argeïese graniet-groensteengordel word gekenmerk deur O-W tot SW-NO strekkings en steil hellings na N en S en na NW en SO. Die mineraallineasies en plooi-asse duik 60° en 30° onderskeidelik na die Ooste. In die Mosambiekgordel, naby die middel en in die ooste van die studiegebied, strek die vlakkige maaksels in wese N-S en hel steil na die Ooste en Weste, in teenstelling met die komplekse vervorming wat in die migmatiete en megakristiese granitoïede gesien word.

Die studiegebied kan in drie metamorfe terreine onderverdeel word, naamlik een van laegraadse groenskisfasies, een van mediumgraadse amfibolietfasies en 'n derde van hoëgraadse metamorfose.